Sinn
Bedeutung 15

Sinn und Bedeutung 15

Proceedings of the 2010 Annual Conference of
the Gesellschaft für Semantik

Edited by
Ingo Reich
Eva Horch
Dennis Pauly

universaar
Universitätsverlag des Saarlandes
Saarland University Press
Presses Universitaires de la Sarre

Ingo Reich, Eva Horch, Dennis Pauly (Eds.)

Sinn und Bedeutung 15

Proceedings of the 2010 Annual Conference of the Gesellschaft für Semantik

universaar
Universitätsverlag des Saarlandes
Saarland University Press
Presses Universitaires de la Sarre

Universitätsverlag des Saarlandes
Saarland University Press
Presses Universitaires de la Sarre

Postfach 151150, 66041 Saarbrücken

ISBN 978-3-86223-038-9 gedruckte Ausgabe
ISBN 978-3-86223-039-6 Online-Ausgabe
URN urn:nbn:de:bsz:291-universaar-300

Projektbetreuung *universaar*: Isolde Teufel

Satz: Eva Horch, Dennis Pauly, Ingo Reich
Umschlaggestaltung: Julian Wichert

Gedruckt auf säurefreiem Papier von Monsenstein & Vannerdat

Bibliografische Information der Deutschen Nationalbibliothek:
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

Contents

Preface

These proceedings contain all papers presented at the 15th annual conference of the *Gesellschaft für Semantik*, »Sinn & Bedeutung 15«, which took place on September 9 - 11, 2010, at Saarland University, Saarbrücken.

The papers in this volume cover current issues in natural language semantics, pragmatics, the syntax-semantics interface, psycholinguistic studies related to meaning, and the philosophy of language.

The »Sinn & Bedeutung 15« conference was organized by the *Gesellschaft für Semantik* and the *Department for German Studies* at Saarland University, Saarbrücken.

We would like to thank the countless reviewers for providing detailed and fair reviews in due time, the members of the program committee for putting together such a great program, and finally all supporting institutions, whose funding made »Sinn & Bedeutung 15« possible in the first place.

These proceedings are also available electronically from Saarland University Press (*universaar*) at *http://universaar.uni-saarland.de/monographien/*

Saarbrücken, July 2011
The editors

Local Organizers

Ulrike Demske
Ellen Geibel-Stutz
Nele Hartung
Eva Horch
Sergey Kulakov
Sabine Mayer-Saar
Anna Mönnich
Dennis Pauly
Christian Ramelli
Ingo Reich
Ulyana Senyuk
Julia Stark

Programm Committee

Claudia Maienborn
Cécile Meier
Ingo Reich
Magdalena Schwager
Arnim von Stechow
Ede Zimmermann

Supporting Institutions

DFG
Ministerium für Wirtschaft und Wissenschaft des Saarlandes
Freunde der Universität des Saarlandes
KWT
Oxford University Press
Palgrave Macmillan
Mouton de Gruyter
Emerald
DUDEN
Peter Lang Verlag

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 9–30. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Specificity, Referentiality and Discourse Prominence: German Indefinite Demonstratives*

Klaus von Heusinger
University of Stuttgart
Klaus.vonHeusinger@ling.uni-stuttgart.de

Abstract. There are various notions of specificity, ranging from Fodor & Sag's (1982) referentiality view to Givón's (1983) discourse prominence view. Ionin (2006) discusses the relation between these two perspectives by analyzing the English indefinite *this*. She represents indefinite *this* as a referential operator in the sense of Fodor & Sag (1982), but also adds the felicity condition of "noteworthiness". She notes that it is an open question how these two properties of indefinite *this* are linked to each other. Wright & Givón (1987) claim that the discourse prominence is primary and that referential properties are derived from it. I argue that the contrary holds: On the analysis of German indefinite demonstrative *dies* ('this') and *so'n* ('such-a') I demonstrate how we can derive discourse properties of indefinite demonstratives from their referential properties.

1 Introduction

Specificity is a semantic-pragmatic notion that distinguishes between different uses or interpretations of indefinite noun phrases. It is related to the communicative notion of "referential intention". A speaker uses an indefinite noun phrase and intends to refer to a particular referent, the referent "the speaker has in mind". This function of the indefinite has various consequences for sentence and discourse semantics. In this article I focus on two aspects of specificity: Fodor & Sag's (1982) notion of referentiality and

* Part of this presentation is joint work with Sofiana Chiriacescu (*so'n*) and Annika Deichsel (indefinite *dies*). I am grateful to the audience of Sinn und Bedeutung for helpful comments, and to Sofiana Chiriacescu, Annika Deichsel, Cornelia Ebert, Donka Farkas, Ljudmila Geist, Jeanette Gundel, Dag Haug, Irene Heim, Elsi Kaiser, Hans Kamp, Edgar Onea, Albert Ortmann, Alice ter Meulen for constructive comments and considerable assistance on earlier versions of this paper. The research is supported by the German Science Foundation by a grant to the project C2: *Case and referential context*, as part of the Collaborative Research Center 732 *Incremental Specification in Context* at the University of Stuttgart. Furthermore, I gratefully acknowledge the support of the Fritz Thyssen Foundation and the VolkswagenStiftung (*opus magnum*).

Givón's (1983) notion of discourse prominence as the central effect of specific indefinites. This two-sided behavior of specific indefinites was illustrated by the referential and discourse properties of indefinite *this* in English (Perlman 1969, Maclaran 1980, Prince 1981, Ionin 2006). The demonstrative *this* in English has an "indefinite" or "presentative" use, as in (1) and (2a). In (1) the noun phrase *this man* is clearly indefinite as it appears in an existential context. It is discourse- and speaker-new and Ionin (2006) argues that it is felicitously used if it introduces an interesting or "noteworthy" property into the discourse. The use of indefinite *this* in (2b) is not felicitous as the given information is not noteworthy, but rather expected (examples from Maclaran 1980 and Ionin 2006):

(1) There is **this man** who lives upstairs from me who is driving me mad because he jumps rope at 2 a.m. every night.

(2) a. I put a/this 1$ stamp on the letter and realized too late that it was worth a fortune.
b. I put **a/*this 1$ stamp** on the letter. I wanted to mail the letter to Europe.

Besides these discourse properties, Prince (1981) also discusses particular referential properties that are characteristic for specific or referential indefinites (Fodor & Sag 1982). Indefinite *this* always takes wide scope with respect to extensional operators, as illustrated in (3a). On the other hand, the indefinite noun phrase *a poem* in (3b) is ambiguous between a wide-scope reading and a narrow-scope reading, thus allowing for the inference that different students might have read different poems.

(3) a. He gave an A to every student who recited **this poem** by Pindar.
(→ Only one poem overall)
b. He gave an A to every student who recited **a poem** by Pindar.
(→ Possibly many poems)

Indefinite *this* in (4a) always allows an existential entailment or presupposition, while the ordinary indefinite article *a* does not. (5a) shows that it is a presupposition, since it allows an existential inference even under negation.

(4) a. Alice wanted to kiss **this sailor boy**. (→ There was a sailor boy)
b. Alice wanted to kiss **a sailor** boy. (-/-> There was a sailor boy)

(5) a. Mary didn't buy **this pink truck**. (→ There was a pink truck)
b. Mary didn't buy **a pink** truck. (-/-> There was a pink truck)

Fodor & Sag (1982) observe that the use of indefinite *this* is different from the use of the definite article in such contexts. The definite article presupposes familiarity of speaker and hearer with the associated referent, while the indefinite demonstrative only indicates familiarity of the speaker, but unfamiliarity of the hearer. It is the prototypical instance of a specific (or referential) indefinite noun phrase. Its definition (6) expresses that a specific or referential indefinite introduces a new discourse referent such that the speaker has a "unique individual in mind". Heim (2011, ex. (56)) formulates Fodor & Sag's (1982) original idea in a two-dimensional semantics with a context set *c* and an evaluation point *i*. The indexical or referential meaning of an indefinite only depends on the utterance context, as it is the case for regular indexical expressions. Ionin (2006) adds a felicity condition to this definition in order to motivate the use of such a referential indefinite, as in (7). The use of indefinite *this* is only felicitous if the speaker contributes a noteworthy property to the introduced referent.

(6) Referential indefinites (Fodor & Sag 1982, Heim 2011, ex. (56))
$[\![a_{ref}\ \alpha]\!]^{c,i}$ is defined only if there is a unique individual that the speaker of c has in mind in c, and this individual is in $[\![\alpha]\!]^{c,c}$; where defined, $[\![a_{ref}\ \alpha]\!]^{c,i}$ = this individual.

(7) Indefinite *this* (Ionin 2006: 187)
A sentence of the form [sp α] ϕ expresses a proposition only in those utterance contexts c where the following felicity condition is fulfilled: the speaker of c intends to refer to exactly one individual x_c in c, and there exists a property u which the speaker considers noteworthy in c, and x_c is both α and u in c. When this condition is fulfilled, [sp α] ϕ expresses that proposition which is true at an index i if x_c is ϕ at i and false otherwise.

Ionin (2006) combines the two characteristics of indefinite *this* in her definition (7): (i) the "referential intention" of the speaker yielding the semantic property of high referential strength described above; and (ii) the noteworthiness property closely related to the pragmatic property of high prominence in the discourse. She discusses the relation between these two properties, but without conclusion. Wright & Givón (1987) focus on discourse prominence and compare the grammaticalization of indefinite *this* with the indefinite article *a*. They argue that such indefinite articles first acquire a pragmatic discourse function and only then the referential function. Generalizing the empirical data they found, Wright & Givón (1987, 29) maintain the claim (8) and argue that grammaticalization starts with

pragmatic discourse functions and then proceeds to semantic functions such as high referential strength.

(8) Implicational relation between pragmatic and semantic reference
"If a nominal is prag-referential, then it is most likely to also be SEM – referential (but not vice versa)"

With this short overview on indefinite *this* we are now in a position to formulate the research questions of this paper with respect to specificity: (i) Are discourse prominence and referentiality two instantiations of specificity, (ii) if so, are they related, and (iii) if they are related do they exhibit the implicational relation in (8) or the opposite. I argue that (8) does not correctly describe the situation with indefinite *this* in English and with its two German equivalents. While the analysis of indefinite *this* in English might not be conclusive (cf. Ionin 2006) the comparison with the two German specific indefinite articles *dies* and *so'n* (< *so+'n*, 'such+enclitic indefinite article') indicates that the semantic function is primary and the discourse prominence derived.

Section 2 summarizes different types of specificity and discusses the different ways to group these subtypes together. Section 3 presents the semantic analysis of specificity in terms of referential anchoring. Section 4 and 5 provide information about the different uses and functions of German indefinite *dies* and *so'n*. Section 6 discusses some of their discourse functions and section 7 focuses on their referential properties. Section 8 presents an analysis of the function of indefinite demonstratives and section 9 formulates a first hypothesis concerning the semantics of such demonstratives in terms of referential anchoring. Section 10 concludes with a brief summary and some new research questions.

2 Types of Specificity

The notion of specificity is associated with various types of data and accounted for in different theories (see Farkas 1994, Ionin 2006, Kamp & Bende-Farkas 2006, and von Heusinger 2011 for an overview). I suggest to classify the various notions of specificity in seven types: (i) Specificity in opaque contexts (***referential specificity***) expresses a contrast between a reading that allows existential entailment (9a) and a reading that does not (9b); (ii) ***scopal specificity*** (often also including type (i)) refers to the ability of certain indefinites to escape scope islands like the conditional in (10a), that a universal quantifier cannot escape (10b); (iii) ***epistemic specificity*** ex-

presses the contrast between speaker's knowledge (11a) and speaker's ignorance (or indifference) (11b) about the referent of the indefinite.

(9) a. Paula believes that Bill talked to *an important politician*. (-> there is an important politician)
b. Paula believes that Bill talked to an important politician. (but there is no important politician)

(10) a. If *a friend of mine from Texas* had died in the fire, I would have inherited a fortune. (possible reading: there is a friend of mine and…)
b. If *each friend of mine from Texas* had died in the fire, I would have inherited a fortune. (not possible: for each of my friends, if one of them…)

(11) a. *A student in Syntax 1* cheated in the exam. I know him: It is Jim Miller.
b. *A student in Syntax 1* cheated in the exam. But I do not know who it is.

(iv) ***specificity*** is sometimes associated with different types of ***familiarity*** such as d-linking, partitivity, and presuppositionality: the indefinite is part of an already introduced set, as in (12a), or not, as in (12b); (v) ***specificity*** is also related to ***topicality*** as in (13a), where the topical element can be understood as a specific expression, while (13b) only expresses an existential claim.

(12) a. 50 students entered the room. I knew *two girls*.
b. 50 students entered the room. They greeted *two girls* (already in the room).

(13) a. *Some ghosts* live in the pantry; others live in the kitchen.
b. There are *some ghosts* in this house.

There are two further notions of specificity that concern the forward referential potential of indefinites: (vi) ***specificity as noteworthiness*** assumes that the presentative *this* in (14) signals that the speaker intends to assert a noteworthy property of the referent, as in (14a), while (14b) is reported to be infelicitous since no such property is mentioned. (vii) ***specificity as discourse prominence*** refers to an aspect of discourse prominence, namely "referential persistence" or "topic shift", i.e. the potential of an indefinite to introduce a referent that will be mentioned again and may even become a topic in the subsequent discourse.

(14) a. He put *a/this 31 cent stamp* on the envelope, and only realized later that it was worth a fortune because it was unperforated.
b. He put *a/#this 31 cent stamp* on the envelope, so he must want it to go airmail.

(15) a. There was a king and the king had a daughter and he loved his daughter …
b. There was a king and # the season was very short and hot …

These different subtypes of specificity can be roughly categorized into larger groups as in Figure 1 with a referential notion, a familiarity notion and a discourse prominence notion of specificity.

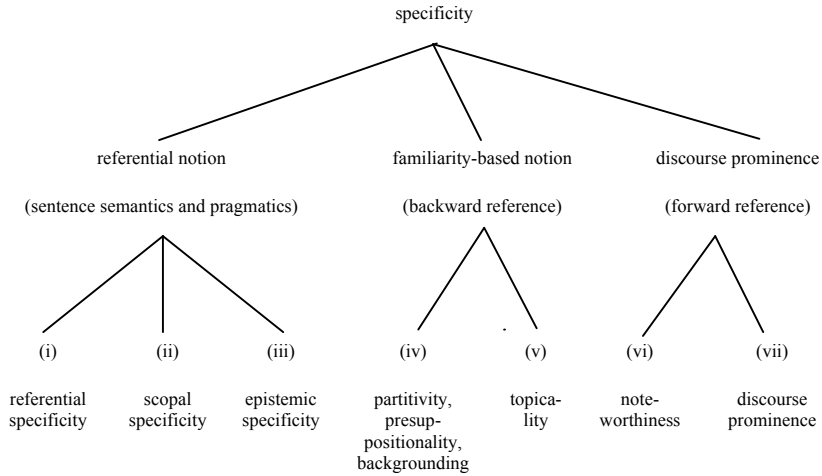


Figure 1: Family tree of specificity

Researchers on specificity differ in their assumptions on (a) which subtype qualifies for specificity proper and (b) how many representations are necessary to cover these types. Fodor & Sag (1982) take the subtypes (i)-(iii) as the central notion of specificity and assume the single representation (6) for them. Farkas (1994) argues that (i)-(iv) are independent subtypes but with similar effects. She suggests different representations, which are, however, similar in the effect that they reduce the restrictor set of the indefinite. Kamp & Bende-Farkas (2006, submitted) assume that epistemic specificity is the central notion which is basically the same as (i) and from which we can

derive effects described under (ii). Prince (1981) and Ionin (2006) analyze indefinite *this* and show that (vi) is related to (i)-(iii). Givón (1983) focuses on the discourse prominence aspect (vii) and assumes the implicational hierarchy of object domains in Figure 2, according to which a discourse prominent expression implicates that the associated referent is intended by the speaker, and what is intended also has a reference in the world. It is the general scheme from which Wright & Givón's (1987) more specialized implicational relation (8) above is derived.

discourse prominence > speaker's intentions > reference in the "world"

Figure 2: Ranking of specificity types according to Givón (1984: 135)

3 Referential Anchoring

Different contrasts associated with different kinds of specificity can be best unified by the following generalization: In its prototypical use, the concept of specificity is associated with the communicative notion of referential intention. Grammatical contrasts, such as specific articles, indefinite pronouns or differential object marking associated with this function are also used to express relations between discourse entities which do not express "referential intentions" in the literal sense. Rather, it seems that specificity is a grammaticalized means to structure the relations among discourse items: A specific indefinite is *referentially anchored* to a salient discourse participant or another discourse referent, i.e. "the referent of the specific expression is linked by a contextually salient function to the referent of another expression" (von Heusinger 2002: 45). Under this account the context has to provide two parameters: the anchoring function and the anchor itself. The speaker has to be able to specify the anchoring function, while it must be unfamiliar for the hearer, the same way as the intended referent must be unfamiliar. Still the hearer has to represent the fact that there is an anchoring function. The anchor, however, must be familar to both speaker and hearer, which allows speaker and hearer to share the scopal properties of the indefinite. This concept of specificity is a refinement of Fodor & Sag's (1982) original account in terms of referential (Kaplan-style) expressions. Below I present a sketch of the theory by stepwise modifying Fodor & Sag's (1982) original proposal. They assume two semantic representations for existential indefinites and referential indefinites, as in (16).

(16) a. $[\![a_{quant}\ N]\!] = \lambda Q.\ \exists x.\ [N(x)\ \&\ Q(x)]$

b. $[\![a_{ref}\ N]\!]$ = is defined only if there is a unique individual that the speaker of the sentence has in mind, and this individual is N

The definition (16b) might be adequate for English indefinite *this*, but it has been shown that it is not sufficient to account for various other types of specific indefinites. It needs additional modifications affecting the parameters listed in (17):

(17) Modification of the original Fodor & Sag (1982) account (= (4b))
(i) replacing the uniqueness condition by an explicit anchoring function
(ii) allowing for other anchors than the speaker
(iii) allowing for different content of the anchoring function

The uniqueness condition in definition (16b) is 'built in' by a function from the anchor to the referent: *f(anchor) = referent*. The second modification concerns potential anchors, which can be the speaker in (18), but also some other attitude holder in (19). But we can abstract even further, as the anchor can also be realized by a quantifier phrase, as in (20).

(18) Paula believes that Bill talked to an important politician.

(19) a. George: "I met a certain student of mine today."
b. Jack: "George said that he met a certain student of his today."

(20) Every husband had forgotten a certain date – his wife's birthday.

The third modification affects the status of the content of the anchoring function. The anchor must in principle be familiar to both speaker and hearer, i.e. it must be contextually given or accessible. The content of the anchoring relation must be hearer-new in order to distinguish between specific indefinites and definites. (21) and (22) demonstrate that the exact definition of the function may even be unknown to the speaker (see Enç 1991: 20 for discussion):

(21) The teacher gave every child a certain task to work on during the afternoon.

(22) Each reporter was assigned to a certain politician by the editor of the paper.

We can summarize the modifications and give the informal definition of referential anchoring in (23):

(23) Informal definition of specificity in terms of referential anchoring

A specific indefinite a N is represented by an anchoring function f from an anchor to an individual and this individual is N. Both the anchor as well as the anchoring function must be given in the context
a) anchor is speaker- and hearer-given
b) content of anchoring function is hearer-new

Von Heusinger (2002 based on earlier work) cashes out the idea of referential anchoring in terms of parameterized or Skolemized choice functions, also known from Kratzer (1998) and Chierchia (2001, 2005). The idea is that the indefinite article can translate into the complex pronominal element f_x with x being a parameter that might be bound by some context agent or some quantifier phrase that has wider scope than the indefinite. The function f applied to the anchor yields a choice function that is applied to the set denoted by the descriptive content of the indefinite yielding the referent, as in (24) adapted from Roberts (2007) (for alternative treatments of this idea see Kamp & Bende-Farkas (to appear), Onea & Geist 2010).

(24) Referential anchoring with parameterized choice functions
i) complex pronominal element f_x
ii) x parameter (= anchor), the argument of f, binding is pragmatically given
a) might be bound by some context agent (speaker etc.)
b) might be bound by a wider scope QP to yield intermediate scope
iii) f(x): a choice function that takes a set denoted by DC as its argument and yields an element of that set

In summary, the concept of referential anchoring provides a consistent account of specificity. It links the notion of referential intention to a semantic representation with an anchoring function and an anchor. The anchor must be familiar to speaker and hearer, while the content of the function must not be familiar to the hearer (and is generally familiar to the speaker). Still the hearer has to establish a permanent representation for the specific indefinite, based on the assumption of the existence of such an anchoring function. Thus, this account ties in with the other concepts of specificity, including familiarity-based and discourse-based concepts, discussed in the next sections.

4 Indefinite *dies*

German has a proximal demonstrative *dieser, diese, dies(es)*, and a not very productive distal *jener, jene, jenes*. The proximal demonstrative has various functions, the most important of which are listed in Table 1:

a)	deictic	discourse status	further characterization	ex.
b)	anaphoric	speaker- and hearer-known	perceivable in situation	(25)
c)	discourse deictic	speaker- and hearer-known	discourse-given	(26)
d)	recognitional	speaker- and hearer-known	reference to discourse (items)	(27)
e)	indefinite	speaker- and hearer-known, but discourse-new	shared (personal) knowledge	(28)
f)	emotional	speaker-known hearer-new, discourse-new	unaccented	(29)
g)	deictic	speaker-known	emotional / social distance	(30)

Table 1: usages of *dies* in German

(25) Nimm diesen Apfel.
Take this apple.

(26) Es war einmal ein König. **Dieser König** hatte eine Krone.
Once upon a time there was a king. This king had a crown.

(27) Er sagte: „Ich liebe Dich“, und mit **diesen Worten** ging er.
He said „I love you“, and with these words he left.

(28) Weißt du was mit diesem Telefon passiert ist, das immer in deinem Zimmer war?
Do you know what happened to that (dieses) phone that used to be in your room?

(29) Gestern kam ich in eine Bar und da war **dieser Fremde**, der mich die ganze Zeit anstarrte.
Yesterday I walked into a bar and there was this stranger who stared at me all the time.’

(30) Und dann traf ich **diesen Nachbarn** von dir.
And then I met this neighbour of yours.

The deictic use (25), the anaphoric one (26) and the discourse deictic one (27) are expected from the general function of demonstratives. They are clearly definite and discourse-given. The recognitional (or "anamnestic") function (27) is discourse-new, but speaker- and hearer-given, i.e. definite. The indefinite (or presentative) use in (29) is speaker-given, but discourse-new and hearer-new. Lakoff (1974) describes an emotional use of the demonstrative in (30) and subsumes the indefinite use under it. However, I maintain that the indefinite use is independent as it is the case for the English indefinite *this*. The recognitional and indefinite uses are somewhat informal, but still to be found in written texts.

5 Indefinite *so'n*

German provides another indefinite demonstrative, namely the form *so'n*, which derives from the demonstratives for properties *so* 'such' and the reduced and enclitic indefinite article *'n*. It can substitute most, if not all, instances of indefinite *dies* in German. This form is rarely found in formal language, but quite frequent in informal registers. The spelling varies between *so'n* and *son*. Both forms can be found in the literature as well as in written versions of informal registers. It is controversial whether it constitutes an independent determiner with its own semantics, or is a merged form with a compositional semantics of demonstrative and indefinite article plus some pragmatic rules (as in the case of German prepositions with weak definite articles). Henn-Mennesheimer (1986) and Lenerz & Lohnstein (2004) assume that it consists of two underlying forms, while Hole & Klumpp (2004) maintain that it constitutes one form. They argue that *so'n* shows a plural paradigm in (31), which cannot be explained by a merged form since the indefinite article in German has no plural form (See also Chiriacescu 2011, von Heusinger (to appear) for more examples and a detailed discussion. Note that we could not find examples for the genitive):

(31) Paradigm of *so'n*

Sg.		Pl.	
Nom.	*so'n Pullover*	Nom.	*so'ne Pullover*
Gen.	*so'nes Pullovers*	Gen.	*so'ner Pullovers*
Dat.	*so'nem Pullover*	Dat.	*so'nen Pullover*
Akk.	*so'nen Pullover*	Akk.	*so'ne Pullover*

German has a second demonstrative for properties, namely *solcher, solche, solch(es)*, which behaves in function and distribution like English *such*. *So* is

more flexible as it does not take nominal inflection. It has various functions, but we focus on usages with adjectives and unmodified nouns as in Table 2:

notion		discourse status	further characterization	ex.
a)	gradable + deictic	speaker- and hearer-known	refers to a grade	(32)
b)	gradable + anaphoric	speaker- and hearer-known	refers to a grade	(33)
c)	deictic	speaker- and hearer-known	refers a to a property or to a type (kind)	(34)
d)	anaphoric	speaker- and hearer-known	refers a to a property or to a type (kind)	(35)
e)	intensifier	speaker-known	shifts the standard upwards (only with gradable nouns)	(36)
f)	„hedging“	noun for exact description is unknown	denotation is extended	(37)
g)	indefinite	speaker-known, hearer-new, discourse-new	unaccented	(38)
h)	emotional	speaker-known	emotional / social distance	(39)

Table 2: usages of *so* in German
(Ehlich 1986, Eisenberg 1994, Umbach & Ebert (to appear))

(32) Ana ist so *groß*.
Ana is so tall.

(33) Ana ist 1,80m groß. Maria ist auch **so groß.**
Ana is 1.80m tall. Mary is also so tall.

(34) Er hat so **ein Auto.**
He has such-a car.

(35) Maria hat ein Auto mit Heckklappe. **So ein Auto** hat er auch.
Mary has a car with a hatchback. Such-a car does he also have.

(36) Er ist so ein Kind / so ein Pedant.
He is such a child/ pedant.

The deictic and anaphoric uses of demonstrative *so* are illustrated with adjectives and nouns in (32) – (35). *So* refers to a grade if applied to adjectives and to a situationally or anaphorically given property if applied to nouns. It can trigger an intensified reading if applied to (unmodified) nouns that are inherently gradable, as in (36). *So* can trigger different kinds of hedging processes, as in (37), where it signals that the client can identify the referent, but does not have the correct lexical item at hand. With semantically bleached nouns like *type, man, guy* or with nouns in their typical environment, as in (38), neither an intensified nor a hedging function seems appropriate. Rather the form signals that a speaker-known, but hearer- and discourse-new referent is introduced. *So'n* also shows an "emotional" use, as in (39). In the following we focus on the indefinite function of *so'n*.

(37) Kunde im Geschäft: „Haben Sie **so eine Klammer**?"
Client in shop: Do you have such a clip?

(38) Da gibt's so'nen Lehrer in meiner Schule in den ich verliebt bin.
There is such -a teacher in my school whom I'm in love with.

(39) Peter hat **so'n Hund** gekauft.
Peter bought such-a dog.

6 Discourse Properties

Prince (1981) and Ionin (2006) report that indefinite *this* in English is only felicitous if the referent is taken up in the discourse and a noteworthy property is asserted with respect to it. Givón (1983) presents a quantitative study on the referential persistence of referents introduced by indefinite *this*. Here I can only report a first impression from corpus searches and the results from a pilot study on discourse prominence. A referent introduced by indefinite *dies* or indefinite *so'n* is typically picked up in the subsequent discourse, as in (40) and (41). Please note that the two indefinite determiners can replace each other and can also be replaced by the indefinite article (for more examples see Chiriacescu 2011, von Heusinger (to appear)).

(40) Da war **dieser Typ** aus Deutschland, den ich in einem Hostel auf der neuseeländischen Insel Waiheke kennen lernte. Vielleicht hieß **er** Wolfgang, vielleicht Volker - nicht so wichtig. Ich erinnere mich nur, dass **er** nett, ... (Cosmas)
'There was **this guy** from Germany who I got to know in a hostel on the New Zealand island Waiheke. May be **he** was called Wolfgang, maybe Volker – not that important. I just remember that **he** was nice…

(41) In unsrer Stadt gibts **so'n Mann** er ist nicht irgendeiner, nein, **er** ist unser neuer Bürgermeister, **er** sieht aus wie ein Vogelstrauß. (Google)
'In our city there is **such-a man**, **he** is not anyone, no, **he** is our new mayor, he looks like an ostrich.'

I distinguish three different types of discourse prominence that can be measured. (cf. Givón 1983, Chiriacescu & von Heusinger 2010): (i) *referential persistence* or the number of anaphoric expressions referring back to the discourse referent; (ii) *topic shift potential* or the distance between the discourse referent and its use as topic in the subsequent discourse, and (iii) *discourse activation* or the level of activation that determines the DP-type of the next anaphoric expression (according to the Givenness Hierarchy of Gundel et. al. 1993). Sofiana Chiriacescu and Annika Deichsel performed a pilot sentence continuation test. 10 subjects read the small fragment in (42) and were asked to continue it with five sentences. We then analyzed the five continuation sentences according to the three discussed parameters. I present the results from referential persistence (see Chiriacescu 2011 and Deichsel 2011 for more results). We counted the absolute number of all referential items that were anaphorically linked to the expression *ein / so'n / dieser Mann* in Figure 3.

(42) Das Essen in dem Restaurant war wirklich total lecker, aber ziemlich teuer. Als **ich** nach fünf Gängen beim Dessert war, hab' **ich** gesehen, wie **ein / so'n / dieser** Mann Sekt bestellte.
'The meal in the restaurant was really excellent, but quite expensive. When I got to dessert after five courses, I saw that *a / such-a / this* man ordered champagne.'

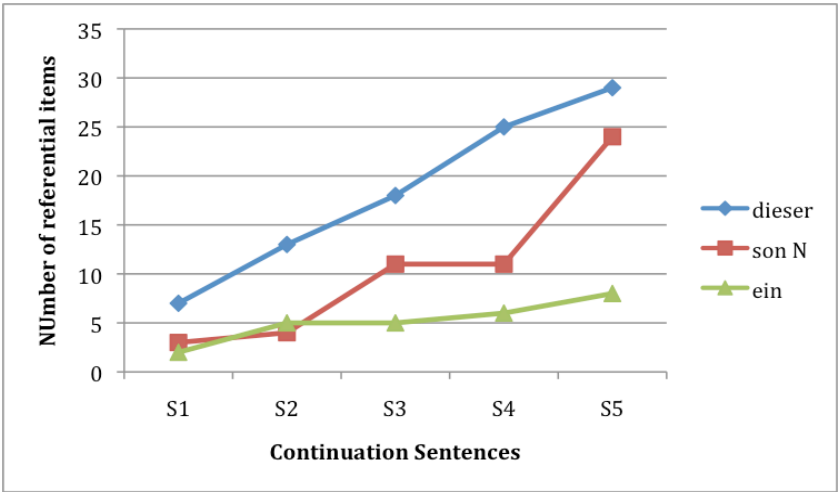


Figure 3: Referential persistence of ein / so'n / dieser Mann in (42)

The sum of all items referring back to the indefinite in the five sentences provided by the 10 subjects is 29 for indefinite *dies*, 24 for indefinite *so'n*, but only 8 for the indefinite article *ein*. This clearly indicates a difference between indefinite *dies* and the indefinite article *ein,* with indefinite *so'n* taking an intermediate position. We can safely conclude that both indefinite demonstratives signal discourse prominence.

7 Referential Properties

The two indefinite demonstratives also show particular referential properties. I can only provide a few test sentences concerning referential specificity in (43) and (44), scopal specificity in (45) and epistemic specificity in (46). Table 4 summarizes the results of my own judgments and of the judgments of some informants (we also did a pilot questionnaire which confirmed the first intuitions – see Chiriacescu 2011 for *so'n* and Deichsel 2011 for *dies*).

The indefinite article in (43) and (44) allows a referential and a non-referential reading, with a preference for the latter. The use of indefinite *dies* is only compatible with the referential reading, while *so'n* has a preference for a referential reading, but is compatible with a non-referential reading, which is particularly obvious in (44).

(43) Eva will einen / so'n / diesen Film über Eliade sehen.

Eva wants to watch a / such-a / this movie about Eliade.

(44) Maria will einen / so'nen / ?diesen Prinz auf einen weißen Ross heiraten.
Mary wants to marry a / such-a / this prince on a white horse.

The indefinite article *ein* in (45) signals a preference for narrow scope, the indefinite *dies* always indicates wide scope, and the indefinite *so'n* either allows a wide-scope reading or a narrow-scope reading of the referent (covariation with the universal quantifier), but then with a wide-scope reading of a property that is characteristic for all referents. We find similar intuitions for the epistemic reading in (46): The indefinite article allows both readings (with a preference for a non-specific reading), the indefinite *dies* only the (epistemic) specific reading, and the indefinite *so'n* clearly signals the specific reading, but may also by compatible with the non-specific reading, however, intuitions are unclear and blurred by other functions of *so+n*.

(45) Jeder meiner Kollegen hat ein / dies / so'n Buch von Eliade gelesen.
Each of my colleagues read a / this / so-a book by Eliade.

(46) Ein / so'n / dieser Student in der Einführung hat beim Examen geschummelt.
A / this / such a student in the introduction has cheated in the exam.

	Referential specificity (43) + (44)	Scopal specificity (45)	Epistemic specificity (46)
ein	non-ref > ref	narrow > wide	non-spec > spec
so'n	ref > (non-ref)	wide > narrow (with wide scope for a property)	spec (*non-spec)
dieser	ref (*non-ref)	wide (*narrow)	spec (*non-spec)

Table 4: Referential properties of *ein, so'n, dieser*

This brief overview of the referential properties of the two indefinite demonstratives clearly indicates a high referential strength in contrast with the indefinite article *ein*, but also some differences between *dies* and *so'n*. *Dies* is more like the English indefinite *this*, always referential, scopal and epistemic specific, whereas *so'n* shows more variation which has to be investigated in more detail.

8 Demonstration and Topic Shift

I assume a Kaplan- (1977/1989) style semantics for demonstratives according to which a demonstrative expression refers directly to its referent. The expression needs an accompanying demonstration (ostension), which raises the attention of the hearer to the intended referent. This semantics can be applied to demonstrative *dies* referring to entities, and to demonstrative *so*, referring to properties, as in (47) (see also Roberts 2002).

(47) Deictic readings of demonstratives
   a. ⟦*dies* N⟧ = is defined only if there is a demonstration d focussing on (raising the attention to) a unique referent such that the referent is N (some additional conditions that the referent must be close to speaker etc.)
   b. ⟦*so'n* N⟧ = is defined only if there is a demonstration d focussing on (raising the attention to) a unique property P and there is a referent x such that x is N and P. (some additional conditions that the referent must be close to speaker etc.)

Demonstratives are used without demonstration in their anaphoric use. They even introduce new discourse items as discussed in this article. It seems that the act of demonstration to a visible or perceivable object is shifted to the intention of the speaker towards a referent, which is unknown to the addressee. We can formulate a preliminary hypothesis that demonstrative nouns raise the attention of the hearer towards a new discourse item in (i) the (visible) situation, (ii) in the previous text, or (iii) in the subsequent text. We modify (47) to an informal definition of indefinite readings of demonstratives in (48):

(48) Indefinite readings of demonstratives
   a. ⟦$dies_{indef}$ N⟧ = is defined only if there is an intention of the speaker to focus on (to raise the attention to) a unique referent such that the referent is N.
   b. ⟦$so'n_{indef}$ N⟧ = is defined only if there is an intention of the speaker to focus on (to raise the attention to) a unique property P and there is a referent x such that x is N and P.

If the hearer recognizes the referential intention of the speaker, the hearer will establish a permanent discourse representation for the introduced referent: (i) indefinite *dies*: for an individual discourse referent; (ii) *so'n*: for the intended property and therefore also for the individual that falls under that property.

This provides the link between a noteworthy property (see Ionin 2006) and the prominence of the discourse referent (Givón 1983).

9 Referentiality and Discourse Prominence

In the last section we have sketched the shift from a deictic or anaphoric use of a demonstrative to an indefinite use. The idea is that one of the fundamental functions of demonstratives is to raise the attention towards a new referent. In this section I want to propose the link to the semantics of specific indefinites spelling out the relation between the referential properties and the discourse properties of the indefinite demonstratives in German (and English). Definition (48) for the indefinite reading of demonstratives includes as one of its central conditions the speaker's intention. We have seen earlier that definition (23), repeated as (49), for specificity semantically represents this intention as an anchoring function between an attitude holder (or some other discourse referent) and the intended referent. This anchor is speaker- and hearer-given, but the content of the anchoring function is hearer-new, and therefore the intended referent is new, too.

(49) Informal definition of specificity in terms of referential anchoring
A specific indefinite a N is represented by an anchoring function f from an anchor to an individual and this individual is N. Both the anchor as well as the anchoring function must be given in the context
a) anchor is speaker- and hearer-given
b) content of anchoring function is hearer-new

If we use this definition for representing the informal concept of "referential intention" in (48) we can formulate (50) for a semantics of indefinite demonstratives. For both the anchor must be the speaker (thus reflecting the "demonstrative" or indexical nature). For *dies* the anchoring function yields the intended referent, while for *so'n* the anchoring function yields a property with which we uniquely identify the referent (reflecting the original nature of *so* as a demonstrative of properties). Thus indefinite *so'n* only indirectly promotes a referent to high referential strength and high discourse prominence.

(50) Indefinite readings of demonstratives
a. $[\![dies_{indef}\ N]\!]$ = is defined only if there is an **anchoring function from the speaker** to an object such that the object is N.
b. $[\![so'n_{indef}\ N]\!]$ = is defined only if there an **anchoring function from the speaker to a property P** such that the referent is N and that there is a referent x such that x is N and P.

We can conclude that the referential property of "referential intention" is the core meaning of indefinite demonstratives. It is best represented by referential anchoring. We can then derive from this core-meaning the discourse function of "raising attention" as illustrated in section 8. We can also account for the differences between the two indefinite demonstratives – they are of different semantic types, they are represented by different semantic representations (giving rise to different semantic properties) and thus they also trigger different kinds of discourse prominence as reported above.

10 Summary

I have shown that German has two additional indefinite articles, indefinite *dies* and (informal) *so'n* corresponding to English indefinite *this.* Both articles have grammaticalized from deictic expressions. They are different: indefinite *this* derives from the demonstrative for objects, while *so'n* derives from the demonstratives for properties. They are used to signal discourse prominence and they show a strong tendency for a referential meaning (wide scope with respect to other operators, rigid reference etc.). Indefinite *dies* has a higher discourse prominence and a higher referential strength than indefinite *so'n,* which only indirectly promotes the referent to high referential strength and high discourse prominence. I have argued that the shift from the deictic or anaphoric use of a demonstrative to an indefinite use can be best explained by a semantics of "referential anchoring". This semantics makes it possible to represent the "referential intention" of the speaker in an adequate way, qualifying for a specific interpretation of these demonstratives. The specific semantics then allows for discourse prominence, e.g. for referential persistence. In this view the referential properties are primary and the discourse properties are derived, contradicting Wright & Givón's (1987) claim. This picture needs more empirical coverage and a carefully worked out semantic representation, which are two challenging research issues.

References

Chiriacescu, Sofiana. 2011. *Topic shifters.* Dissertation. Universität Stuttgart.

Chiriacescu, Sofiana & Klaus von Heusinger. 2010. Discourse prominence and pe-marking in Romanian. *The International Review of Pragmatics* 2. 298–322.

Chierchia, Gennaro. 2001. A puzzle about indefinites. In: C. Checchetto, G. Chierchia & M.-T. Guasti (eds.). *Semantic Interfaces: Reference, Anaphora and Aspect*. Stanford: CSLI Publications. 51–89.

Chierchia, Gennaro. 2005. Definites, locality, and intentional identity. In: G.N. Carlson & F. J. Pelletier (ed.). *Reference and Quantification*. *The Partee Effect*. Stanford/Calif.: CSLI Publications. 143–178.

Deichsel, Annika, 2011. *The Semantics and Pragmatics of Indefinite Demonstratives*. Ms. Universität Stuttgart

Ehlich, Konrad. 1986. So- Ueberlegungen zum Verhaeltnis sprachlicher Formen und sprachlichen Handelns, Allgemein und an einerm widerspenstigen Beispiel. In: I. Rosengren (eds.). *Sprache und Pragmatik. Lunder germanistische Forschungen* 55. 279–298.

Eisenberg, Peter. 1994. *Grundriss der deutschen Gramatik*. Stuttgart: Metzler.

Endriss, Cornelia. 2009. *Quantificational Topics. A Scopal Treatment of Exceptional Wide Scope Phenomena*. Dordrecht: Springer.

Enç, Mürvet. 1991. The semantics of specificity. *Linguistic Inquiry* 22. 1–25.

Farkas, Donka. 1994. Specificity and scope. In: L. Nash & G. Tsoulas (eds.). *Actes du Premier Colloque Langues & Grammaire*. Paris. 119–137.

Fodor, Janet & Ivan Sag. 1982. Referential and Quantificational Indefinites. *Linguistics and Philosophy* 5. 355–398.

Givón, Talmy. 1983. Topic Continuity in Discourse. An Introduction. In: T. Givón (ed.). *Topic Continuity in Discourse. A Quantitative Cross-Language Study*. Amsterdam; Philadelphia: Benjamins. 1–41.

Gundel, Jeanette, Nancy Hedberg & Ron Zacharski. 1993. Cognitive Status and the Form of Referring Expressions in Discourse. *Language* 69. 274–307.

Heim, Irene. 2011. Definiteness. In: Klaus von Heusinger & Claudia Maienborn & Paul Portner (eds.). *Semantics. An International Handbook of Natural Language Meaning.* Vol. 2. Berlin; New York: de Gruyter.

Henn-Memmesheimer, Beate. 1986. *Nonstandardmuster. Ihre Beschreibung und das Problem ihrer Arealität*. Tübingen: Niemeyer.

von Heusinger, Klaus. 2002. Specificity and definiteness in sentence and discourse structure. *Journal of Semantics* 19. 245–274.

von Heusinger, Klaus. 2011. Specificity. In: Klaus von Heusinger & Claudia Maienborn & Paul Portner (eds.). *Semantics. An International Handbook of Natural Language Meaning.* Vol. 2. Berlin; New York: de Gruyter.

von Heusinger, Klaus. to appear. Referentialität, Spezifizität, und Diskursprominenz im Sprachvergleich. In. Lutz Gunkel (ed.). *Deutsch im Sprachvergleich – Grammatische Kontraste und Konvergenzen.* Berlin: de Gruyter.

Himmelmann, Nikolaus P. 1996. Demonstratives in Narrative Discourse. A Taxonomy of Universal Uses. In: Barbara Fox (ed.). *Studies in Anaphora*. Amsterdam: John Benjamins. 203–252.

Hole, Daniel & Gerson Klumpp. 2000. Definite type and indefinite token: the article son in colloquial German. *Linguistiche Berichte* 182. 231–244.

Ionin, Tania. 2006. This is definitely specific: specificity and definiteness in article systems. *Natural Language Semantics* 14. 175–234.

Kamp, Hans & Ágnes Bende-Farkas. 2006. Specific Indefinites: Anchors and Functional Readings. Ms. Universität Stuttgart.

Kamp, Hans & Ágnes Bende-Farkas. submitted. Epistemic specificity from a communication-theoretical perspective. *Journal of Semantics.*

Kaplan, David. 1977/1989. Demonstratives. An Essay on the Semantics, Logic, Metaphysics, and Epistemology of Demonstratives and Other Indexicals. In: J. Almog, J. Perry & H. Wettstein (eds.). *Themes from Kaplan*. Oxford: Oxford University Press. 481–563.

Kratzer, Angelika. 1998. Scope or pseudoscope? Are there wide-scope indefinites? In: S. Rothstein (ed.). *Events and Grammar*. Dordrecht: Kluwer. 163–196.

Lakoff, George. 1974. Remarks on this and that. *Chicago Linguistic Society* (CLS) 10. 345–356.

Lenerz, Jürgen & Horst Lohnstein. 2004. *Nur so*-Strukturaspekte der Vergleichskonstruktion. In: Franz Josef d'Avis (ed.). *Deutsche Syntax: Empirie und Theorie*. Symposium Göteborg, 13–15 Mai 2004. Acta Universitatis Gothoburgensis. 81–103.

Maclaran, Rose. 1980. On two asymmetrical uses of the demonstrative determiners in English. *Linguistics* 18. 803–820.

Onea, Edgar and Ljudmila Geist. 2010. *Indefinite Determiners and Referential Anchoring*. Ms. Universität Göttingen and Universität Stuttgart.

Prince, Ellen. 1981. On the Inferencing of Indefinite-this NPs. In: A. Joshi & B. Webber & I. Sag (eds.). *Elements of Discourse Understanding*. Cambridge: CUP. 231–250.

Roberts, Craige. 2002. Demonstratives as Definites. In: K. van Deemter & R. Kibble (eds.). *Information Sharing: Reference and Presupposition in Language Generation and Interpretation*. Stanford: CSLI Publication. 89–136.

Roberts, Craige. 2007. *Specificity and Incomplete Descriptions*. Handout UMass/Amherst, March 27, 2007.

Umbach & Ebert. (to appear). German demonstrative *so* – intensifying and hedging effects. In: H. C. Schmitz & H. Zeevat (eds.). *Proceedings of*

the ESSLLI X Workshop on formal and experimental approaches to discourse particles and modal adverbs.
Wespel, Johannes. 2006. *Indefinite demonstratives*. Ms. Universität Stuttgart.
Wright, S. & Givón, Talmy. 1987. The pragmatics of Indefinite Reference: Quantified Text-Based Studies. *Studies in Language* 11. 1–33.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 31–54. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On the Semantics of Existence Predicates

Friederike Moltmann
IHPST (Paris1/ENS/CNRS), Paris
Friederike.Moltmann@univ-paris1.fr

Abstract. The most common philosophical view about the notion of existence is that it is a second-order property or existential quantification. A less common view is that existence is a (first-order) property of 'existent' as opposed to 'nonexistent' (past or merely intentional) objects. An even less common view is that existence divides into different 'modes of being' for different sorts of entities. In this paper I will take a closer look at the semantic behavior of existence predicates in natural language, such as 'exist', 'occur', and 'obtain', arguing that existence predicates in natural language support the two less common philosophical views. I will develop explicit analyses of existence predicates in their time-relative and space-relative uses which will explain why they apply to some kinds of entities, but not others.

1 Introduction

The most common philosophical view of existence is that existence amounts to existential quantification (the Quinean tradition) or is a second-order concept (the Kant-Frege tradition). A less common philosophical view is that existence is a first-order property distinguishing between nonexistent (past, possible, or merely intentional) objects and existing objects. An even less common philosophical view is that existence divides into different 'modes of being' for different kinds of entities (a view held, for example, by Aristotle, Heidegger, Sarte, Ryle, and more recently McDaniel).[1] The aim of the present paper is to take a closer look at how the notion of existence is in fact expressed in natural language. In natural language, it appears, existence is not so much expressed by quantification, which can be shown to be neutral as regards any distinction between existent and nonexistent objects that one might draw. Rather existence is expressed by predicates, and that is, first-order predicates. Furthermore, there is, at least in English, no single existence predicate, but rather at least three: *exist, occur* (or related predicates such as

[1] For a recent defense of the Quinean view, see van Inwagen (1998). For a recent defense of a view of existence dividing into different modes of being see McDaniel (to appear a, b).

happen or *take place*), and *obtain*. The semantic behavior of such existence predicates (regarding the kinds of entities that they can apply to and the sorts of adverbial modifiers they allow) reveals a notion of existence that divides into at least three different kinds of modes being, reflecting the distinction between endurance and perdurance, as well as their space-related analogues, but also the particular mode of being of such entities as states, facts, conditions, and laws. Existence predicates reflect such distinctions primarily in their time- and space-related uses, but in fact the location-independent uses of existence predicates should best be understood as derivative upon their location-dependent uses.

I will first clarify the notion of an existence predicate itself as well as some fundamental semantic differences in natural language between constructions of existential quantification and existence predicates. I then discuss the semantics of the three existence predicates *exist, occur*, and *obtain* in greater detail.

2 The Notion of an Existence Predicate

While many philosophers take existence to amount to just existential quantification, it has hardly escaped philosophers' attention that natural language displays existence predicates, in particular, of course, the predicate *exist*. A number of philosophers, most notably Frege, have taken *exist* to be a special, second-order predicate, applying to concepts rather than individuals. However, from the point of view of natural language semantics, *exist* clearly is a first-order predicate.[2] It does not require, like putative second-order predicates, predicative terms, but rather requires expressions in subject position that act as singular terms, as in (1a, b) and (2a, b), or that act as quantifiers binding individual variables, as in (1c):[3]

(1) a. The president of France exists.
b. Mars exists.

[2] Philosophers that have argued that *exist* is a first-order predicate include Miller (1975, 1986, 2002), Salmon (1987, 1989), and McGinn (2000).

[3] *Exist* also allows for bare plurals or mass nouns in subject position, in which case it does seem to express existential quantification:

(i) a. Giraffes exist.
b. Gold exists.

However, as will be shown later, bare plurals and mass nouns in the subject position of *exist*-sentences are in fact kind-referring, and thus singular terms. This means that *exist* is a first-order predicate in sentences like (i-a, b) as well.

c. Some planet exists.

(2) a. The king of France does not exist.
b. Vulcan does not exist.

When *exist* is viewed as a first-order predicate in positive existence statements as in (1a, b, c), it is generally taken to express a trivial or almost trivial property, the property every entity has or, less trivially, the property that every present and actual entity has. The occurrence of *exist* in negative existentials, as in (2a, b), is more difficult to handle. The main focus of this paper is the application of time- or space-relative uses of existence predicates to particular kinds of entities, but for an appropriate discussion of existence predicates a few words are necessary concerning negative existentials.

There is a significant debate of how to analyse negative existentials with singular terms, while treating *exist* as a first-order predicate. On one view, the subject term in negative existentials is an empty term, *exist* expresses the trivial property everything has, and negation is taken to be external negation. On that view, (2b) will mean: 'it is not true that Vulcan exists'. On another view, the Meinongian view, the subject term in a true negative existential always stands for an entity, but a 'nonexistent' entity, an entity of which *exist* is false. There is also a third, hybrid view, that of Salmon (1987, 1998), on which the subject term in true negative existentials sometimes stands for an object of which *exist* is not true, namely an object that has existed only in the past or a merely possible object. If the subject of the negative existential is a fictional term, though, Salmon takes it to be empty, with negation then being external negation.

Negated existence predicates in existentially quantified sentences present a particularly interesting phenomenon which appears to give support for the Meinongian view. Meinongians have long argued that existential quantification, unlike predication with *exist*, is not existentially committing.[4] This is displayed by the following 'Meinongian' statement:

(3) There are things that do not exist.

The Meinongian statement in (3) can hardly serve as a piece of 'linguistic evidence' for the Meinongian view, though: a sentence like (3) serves to express a philosophical position, rather than being a 'natural' sentence of natural language, a sentence that can be used without thereby making explicit a philosophical conviction. But there are constructions in natural language that appear to involve intentional objects as semantic values of subject terms

[4] Recent Meinongians include Parsons (1980) and Priest (2005).

in negative existence statements. The relevant sentences are entirely natural in the sense that they hardly sound like the expression of a philosophical view. These are examples:

(4) a. Some people John mentioned do not exist.
b. Some things John thought of do not exist.

In (4a, b) the subject consists of a definite description formed, crucially, with an intentional verb, such as *mention* or *think of*. Such verbs appear to take intentional 'nonexistent' objects as arguments when the intentional act they describe is not successful, and these entities appear to be the ones the existential quantifiers in (4a,b) range over.

If intentional 'nonexistent' objects are involved in existentially quantified negative existentials as in (4), then they may just as well be involved in negative existentials with apparent empty proper names and descriptions associated with a failed or pretend act of reference (and in particularly descriptions formed with intentional verbs as in *the woman John mentioned does not exist*). However, this paper is not the place to defend such a view further.[5] What is important in the present context is simply the difference displayed by existential quantification and existence predicates in natural language.

The apparent ability of natural language quantifiers to range over nonexistent objects is not the only respect in which existential quantification in natural language differ from existence predicates. There is a further fundamental difference between sentences with an existence predicate and with existential quantification. Existential quantifiers in natural language may range over entities of any kind whatsoever, but existence predicates in natural language are generally restricted to a particular kind of entity. Thus, *exist* is restricted to enduring objects (basically material objects), at least in its tensed form. For perduring entities, that is, events, *occur* (or *happen* or *take place*) is the appropriate existence predicate instead. Moreover, for entities of the sort of states or facts, abstract entities in a certain sense, there is a specific existence predicate in English, namely *obtain*.

The apparent variety of existence predicates in natural language raises the question of what makes a predicate an existence predicate in the first place. This question obtains importance in view of the fact that in the history of philosophy there have been a variety of views as to what 'modes of being' there are. Thus Sartre took conscious entities to engage in a distinctive mode of being and in the phenomenological tradition 'being experienced' was considered a mode of being (even the only one). The question thus is: is there

[5] See McGinn (2000) for a philosophical defense of that view.

a criterion that tells us whether a predicate is an existence predicate in a linguistically relevant sense? There is in fact a very clear criterion for existence predicates, namely the semantic behavior of predicates under negation. Negative existentials display the peculiarity that they can be true even if the subject does not refer to or stand for an actual object. Other predicates simply do not display that particular feature. Ordinary predicates when negated will in such a case lead to sentences that intuitively lack a truth value (such as *the present king of France is bald*).

Intentional verbs like *think of*, *mention*, or *describe*, as already mentioned, arguably take intentional objects as arguments (*John thought of the woman Bill mentioned*). Unlike existence predicates, though, they do not systematically yield truth when negated. Thus, the sentence below may very well be false, even if the woman John described does not exist:

(5) Bill did not think of the woman John described.

Ordinary (non-intentional) predicates thus are subject to the following condition:

(6) a. A (intransitive) predicate P is an ordinary predicate iff for any world w and time t, for any singular term T, if T does not stand for an actual entity in w, then neither [T not P]$^{w, t}$ = true nor [T not P]$^{w, t}$ = false.

By contrast, existence predicates are subject to the following condition (formulated so as to remain as neutral as possible regarding the treatment of negative existentials):

(6) b. Criterion for Existence Predicates
An (intransitive) predicate P is an *existence predicate* iff for any world w and time t, for any singular term T, if T does not stand for a (present, actual) entity in w, then [T *not* P]$^{w, t}$ = true.

Applying the criterion to some putative existence predicates, *exist* obviously is classified as an existence predicate, as are *occur* and *obtain* given the possible truth of the sentences below:

(7) a. The event John mentioned did not occur.
b. The situation John described did not obtain.

Live and *be alive* are putative existence predicates, but by the criterion they do not come out as such:

(8) The person Mary mentioned does not live / is not alive.

Live and *is alive* presuppose that the object they apply has been alive before; they do not specify the actual existence of an object of thought. The criterion also rules out as existence predicates a range of other predicates that according to particular historical philosophical views might be regarded as such, for example *being experienced*.

With this clarification of the notion of an existence predicate as such, let us now focus on the semantic differences among different existence predicates as well as their time- and space-related application.

3 The Difference between *exist* and *occur*

Existence predicates when they occur in a positive sentence in a tensed form have a particular lexical meaning relating an entity in a certain way to its location in time. Let us first look at the two existence predicates *exist* and *occur*. We have already seen that tensed *exist* applies to 'enduring' objects (which I will call simply 'objects'), whereas *occur* applies to 'perduring' object', that is, events.

The categorial restrictions of *exist* and *occur* give support for 'three-dimensionalism' as opposed to 'four-dimensionalim' regarding material objects. On a four-dimensionalist view, events and objects are both space-time worms bearing the same relation to space and time: they are both 'spread out' in space and time. This means that they both occupy a spatio-temporal region by having parts that occupy the subregions of the spatio-temporal region. Given the four-dimensionalist view, it is hard to see how time-relative *exist* could be restricted to one sort of four-dimensional object rather than another. By contrast, on a three-dimensionalist view, objects and events will be fundamentally different kinds of entities, bearing fundamentally different relations to time: objects endure, whereas events perdure. These restrictions are easy to formulate on a three-dimensionalist view

The standard view of endurantism draws the distinction between enduring and perduring entities as follow (Lewis 1986, Hawley 2001): An enduring entity occupies a time t by being wholly present at each moment of t, whereas a perduring entity occupies a time t by some part of it being present at any moment of t. Endurance thus requires complete presence of an object at each moment of its lifespan. By contrast, perdurance requires only the presence of a part of an entity at any moment of its duration. The notions of endurance and perdurance correspond to time-relative existence and extension, in the following sense of Fine (2006): enduring entities exist at a time, which means they are completely presence at each moment of the time;

by contrast, perduring entities are extended over a time, which means only a part of them needs to be present at any given moment of the time. This way of drawing the distinction means that perduring entities can have temporal parts, whereas enduring entities cannot. Entities such as organisms, artifacts, and entities with lasting spatial boundaries, such as countries or stones, are among the enduring entities, whereas events are examples of perduring entities.

The distinction between enduring and perduring entities in terms of time-related existence and extension seems well suited for capturing the lexical meanings of *exist* and *occur*. However, *exist* cannot just express the property that holds of an object x at a time t iff the whole of x is present at each moment of t, and *occur* cannot just express the property that holds of an object at a time t iff for any moment t' of t, some part of x is present at t'. This would allow both *occur* and *exist* to apply to momentaneous events. *Exist* and *occur* will in addition impose particular sortal constraints on the entities they can apply to. *Exist* imposes the condition that the entity it applies to not be able to have temporal parts, in virtue of the kind of entity it belongs to. *Occur* imposes the condition that the entity it applies be able to have temporal parts, in virtue of the kind it belongs to.

Thus the lexical meanings of tensed *exist* and of *occur* will be as follows:

(9) a. The lexical meaning of tensed *exist*
For an entity x that cannot have temporal parts, for a time interval t, $x \in [\textit{exist}]^t$ iff for every $t' < t$, the whole of x is present at t'.

b. The lexical meaning of *occur* (preliminary formulation)
For an entity x that can have temporal parts, for a time interval t, $x \in [\textit{occur}]^t$ iff for every $t' < t$ some part of x is present at t'.

There is a problem, though, with giving the meaning of *exist* and *occur* as in (9), and that is that it fails to account for the fact that *exist* is a stative verb, whereas *occur* is an eventive verb. It is remarkable that in natural languages there is generally no stative existence predicate of events, even though 'extension in time' appears to be a state. English *occur* clearly is an eventive verb: it takes adverbials modifiers that are typical of event predicates, such as *suddenly* or *quickly*, modifiers that are impossible with stative predicates; moreover it allows for the progressive (*the event is occurring right now*), which again is typical of eventive predicates. *Occur* thus does not describe a state of extendedness over a time, but rather it describes a transition, or rather

a series of transitions, from an event part being at a time to another event part being at a subsequent time.

In order to account for this difference between *exist* and *occur,* it is useful to adopt the Davidsonian view of the semantics of verbs on which events (and states) act as implicit arguments of verbs. Given the Davidsonian view, the implicit event arguments of verbs will also be the referents of the corresponding nominalizations such as *the occurrence of the murder* or *the existence of the house*. *Occur* will thus express a two-place-relation between occurrences and (occurring) events and *exist* a two-place relation between states of existence and (existent) entities.

Occurrences appear to be a kind of temporal abstraction from the occurring events. This is indicated by the differences in the kinds of predicates that occurrences and occurring events accept: occurrences, unlike occurring events, do not accept qualitative predicates:

(10) a. The murder was grisly / brutal.
b. ??The occurrence of the murder was grisly / brutal.

Occurrences do allow for other types of event predicates, though, for example temporal and attitudinal predicates:

(11) The occurrence of the murder was sudden / unexpected.

Thus it appears that occurrences are events that retain none but the temporal features of the corresponding occurring events. Occurrences may therefore be viewed as transitions from the presence of a proper part of the occurring event at a time to the presence of a proper part of the occurring event at a subsequent time. I will take the 'presence' of an event part at a time to be a temporal trope: the relational trope that is the instantiation of the temporal *at*-relation (AT) in the event and the time. Within the Davidsonian semantics of events, the lexical meaning of *occur* can thus be reformulated as follows, where f is the function mapping an n-place relation and n entities to the instantiation of the relation in those entities:

(12) The lexical meaning of *occur*
For a time t and events e and e', <e, e'> ∈ $[occur]^t$ iff e = the sequence of transitions from f(AT, e'', t') to f'(AT, e''', t'') for any subsequent times t', t'' < t for which there are event parts e'' and e''' of e.

What about momentaneous events, a flash or a crack? The account applies here as well: the occurrence of such a momentaneous event is simply a single trope that is the manifestation of the temporal 'at'-relation with respect to that event and the moment it occurs.

The Davidsonian semantics of verbs can also be applied to *exist*. *Exist* is a stative verb, satisfying standard linguistic criteria for stativity. Also its nominalization *existence* clearly describes a state rather than an event. Looking at the range of predicates that can apply to 'existences', though, it appears that existences are states of a particular sort: existences have fewer properties than one might have thought states of existence should have. For example, a state of existence, one might think, should have a spatial location, being located just where the object is during its existence. But sentences with *exist* do not allow for spatial modifiers:[6]

(13) a. *John exists in Germany.
b. *The king of France existed in France.

Obviously, the location modifiers cannot be predicated of the state of existence, and thus existences, if they are Davidsonian event arguments, simply cannot have spatial location.

The location modifiers in (13a, b) may be understood in another way than as predicates of the Davidsonian event argument. In natural language semantics, two different kinds of adverbial modifiers in fact need to be distinguished: adverbials that act as adjuncts and adverbials that act as complements. If an adverbial modifier is obligatory, it will be a complement; if it is not, it may be adjunct (though it need not be). As an adjunct, an adverbial acts as a predicate of the state or event described. As a complement, it provides an argument of the relation expressed by the verb, and thus generally provides a component that is constitutive of the described event or state.[7] *Exist* does not allow for location modifiers as complements either, when it applies to material objects. The reason is that material objects do not exist in space: for an entity e to exist at a spatial location l requires e to be completely present at each sublocation of l. But this is impossible for material objects. Material objects are rather extended in space: they occupy a space by having some part being at any sub-region of the space. Since material objects have spatial parts, they cannot be completely present at each sublocation of their location.

---

[6] There is one important exception to this generalization, namely *exist*-sentences with bare plurals and mass nouns, which in fact are kind-denoting terms:

(i) Giraffes exist only in Africa.

I will turn to those in Section 3.

[7] A variety of syntactic tests distinguish adjunct and complement adverbial modifiers, which I will not go into.

Recent linguistic semantic work on stative verbs can help give an answer to the question why *exist* resists location modifiers as adjuncts. It has long been observed that in fact most stative verbs do not allow for location modifiers and thus display what is known as the Stative Adverb Gap (Katz 2003). Among those verbs are *know, own*, and *weigh*:

(14) a. ??John knows mathematics in France.
b. ??John owns a watch in Munich.
c. ??John weighs 100 kilos in Germany.

In fact, such verbs also resist a range of other modifiers, such as manner modifiers, and they cannot form the complement of perception verbs:

(15) a. ??John owns a watch with a lot of effort.
b. ??John knows French in a strange way.

(16) a. ??Mary heard John know French.
b. ??Mary saw John weigh 100 kilos.

Exist in fact patterns with that class of verbs also in these two respects:

(17) a. *The house has existed for a few years in a strange way.
b. *John saw the house exist for many years.

Maienborn (2007) has proposed an ontological account of the Stative Adverb Gap, tracing it to the particular nature of the state most stative verbs describe.[8] Maienborn argues that stative verbs take states as arguments that are abstract in the sense of a Kimean conception of events or rather states. A Kimean account of states will consist in a specification of the existence and identity conditions of states on the basis of a property, an individual, and a time, as below.

(18) <u>The Kimean account of states</u>
a. For a property P and an object o, f(P, o) obtains at a time t iff $o \in P^t$.
b. For properties P, P', o, o', f(P, o) = f(P', o') iff P = P', o = o'.

The Kimean account of states amounts to an implicit definition of states. This means that states will have only those properties as intrinsic properties that are specified by the account itself. Thus, they will have properties of temporal duration, but not of spatial location. On a Kimean account, states will come

[8] There is an alternative proposal concerning the Stative Adverb Gap, namely that of Katz (2003). Katz argues that stative verbs lack an event argument position. But see Maienborn (2007) for discussion.

out as abstract in the sense of not involving a particular manifestation; rather all there is to a Kimean state is what is specified by the account itself.[9]

The condition of complete presence that *exist* imposes requires some qualifications. It cannot be that strictly all the parts of an enduring object need to be present at any moment of the lifespan of the object; this should only hold for atemporal parts, not the parts that a material object may have only at some point during its lifespan (Fine 2006). Also the atemporal parts need to be understood appropriately. An object may have functional parts which can be constituted by different material at different times and thus are not strictly speaking material parts. Furthermore, the question arises whether complete presence should not also include essential features of an object, such as its configuration or form if it is essential or qualitative features. In any case, what defines existence at a time should be the recurrence of features and parts constitutive of an object throughout the time, not the presence of material parts as such.

4 Space-Relative Existence

Ordinary material objects generally cannot bear the existence relation to a spatial location because they cannot be completely present at the spatial sublocations. But there are entities for which space-relative existence is possible. Fine (2006) in fact argues for a generalization of existence at a time, as complete presence at a time, to existence at a spatial location, that is, complete presence at a location. Fine gives the example of a composite aroma of coffee and vanilla whose presence at a location, he argues, requires the presence of both the aroma of vanilla and the aroma of coffee. This example is not unproblematic from the present point of view, though: aromas do not go along very well with the existence predicate *exist*:

(19) a. ??The aroma exists in that room.

The reason why aromas do not go along with *exist* appears to be an ontological one. Aromas as particulars simply cannot be wholly present at different locations. Only aromas as kinds can, as in the examples below:[10]

[9] Verbs that describe Kimean states contrast with verbs that describe what Maienborn calls 'Davidsonian states'. The latter include verbs like *stand*, *sit*, and *sleep*. Concrete states do allow for location and manner modifiers and can be the object of perception.

[10] Sounds and physical fields for Fine are other cases of entities involving complete presence at a given location. I find the example of sounds even more problematic than aromas. Sounds neither as particulars nor as kinds seem to accept existence predicates, including location-relative existence predicates in particular:

(19) b. This kind of perfume does not exist in France anymore.
c. This kind of aroma only exists in oriental countries.

What are aromas as particulars? Arguably aromas as particulars are tropes without a bearer: they are mere spatio-temporally located features. Tropes in fact in general do not go along very well with space-relative existence predicates:

(20) ??The greenness of the plants exists everywhere in the garden.

Space-relative *exist* with tropes is not possible because tropes as particulars (with or without a bearer) cannot be present at different locations at once.

But there are entities, particular sorts of abstract entities, with which space-relative *exist* is perfectly natural. One such case is languages. Languages can be completely present at different places, and they do allow for location modifiers with *exist*:[11]

(21) This dialect does not exist in this region anymore.

It is easily explained why languages have space-relative existence. The location of a language is the region where the language is spoken, and every part of that region should count as a location of the language, and of course the entire language.

Other entities that display space-relative existence include condition-like entities such as situations and laws, which also allow for space-relative *obtain*, as will be discussed later.

Another important case of abstract entities displaying space-relative existence are kinds. This requires a little linguistic elaboration. It is a common view among linguists that kinds can be the referents of bare mass nouns and plurals, in particular with predicates like *widespread* or *rare*:[12]

(22) a. Ants are widespread.
b. White gold is rare.

Whereas kind reference of bare plurals and mass nouns with predicates like *widespread* is considered unproblematic, linguists are not unanimous that bare plurals and mass nouns are always kind-referring. Some linguists, in

---

(i) a. ?? The sound exists throughout the house.
b. This kind of sound does not exist in modern opera houses anymore.

[11] Thanks to Roger Schwarzschild for bringing this example to my attention.
[12] Obviously these need not be natural kinds, but may include kinds of artifacts – in fact kinds of any sorts of entities.

particular Carlson (1977) and Chierchia (1998), held the view that bare mass nouns and plurals are (almost) always kind-referring (with the predicate being responsible for different readings). Other linguists hold the view that with some predicates, such as *eat* or *buy* bare plurals or mass nouns express existential quantification ranging over the instances of the kind (such as quantities or individuals). The present discussion fortunately can stay entirely neutral as regards those two linguistic views. There are a range of tests for kind reference that tell if a given occurrence of a bare mass noun or plural can only be kind-referring, and these tests show clearly that with *exist* a bare plural or mass noun must be kind-referring.

First, anaphora when they take a bare plural as subject of an *exist*-sentence as antecedent stand for the entire kind, not one of the instances that an existential quantifier would range over:

(23) a. Dinosaurs do not exist. But they once did exist.
b. Three dinosaurs do not exist. *But they (three dinosaurs or other) once did exist.

Moreover, bare plurals and mass nouns can be modified by a relative clause whose predicate is an instance-distribution predicate:

(24) Dinosaurs, which used to be widespread in Europe, do not exist anymore.

Also temporal modifiers of *exist* with bare plurals or mass nouns show kind reference:

(25) a. Dolphins still exist.
b. Dinosaurs no longer exist.

The same holds for aspectual predicates such as *continue* or *cease*:

(26) a. Dinosaurs continued to exist.
b. Dinosaurs ceased to exist.

Finally, bare mass nouns and plurals do not allow an interpretation on which they act as existential quantifiers taking wide scope over other quantifiers or negation in the sentence, unlike ordinary existentially quantified NPs:

(27) a. Dinosaurs do not exist anymore. (impossible as: for some dinosaurs x, x does not exist anymore)
b. Two dinosaurs do not exist anymore. (ok as: for two dinosaurs x, x does not exist anymore)

Thus, bare plurals and mass nouns in *exist*-sentences stand for kinds, in the relevant (linguists') sense.

An important observation about *exist*-sentences with kind terms is that they also allow for terms referring to kinds of events:

(28) Great wars still exist.

The crucial observation now is that *exist*-sentences with kind terms, including terms for kinds of events, allow for location modifiers:[13]

(29) a. Giraffes still exist in Africa.
b. Political protests do not exist in Bhutan.

What does the existence of a kind amount to, and the existence of a kind at a location in particular? Given the semantics of existence statements with kind terms, obviously, the existence of a kind as such means that there is an actual instance of the kind, and the existence of a kind at a location means that there is an instance of the kind at the location. That is, the existence of a kind at a location means that the kind is instantiated in an individual at the location (or at a part of the location).

Location-relative existence applied to kinds should also amount to complete presence at the relevant locations. But in what sense could a kind be completely present at a location, being instantiated in an individual at the location? It should somehow mean that all the parts of the kind are present at the location of the individual instantiating the kind. But what are the parts of a kind? One might think that the parts of a kind are the instances of the kind, a kind being a sort of plurality of all its instances (or all its possible instances). But this would give the wrong result since not all the instances can be at any location at which a kind is instantiated. In fact, the more common view about the parts of a kind is that the parts are the characteristics of the kind, that is, the attributes that together make up the 'essence' of a kind. Complete presence of a kind at a location would thus mean instantiation of all the attributes of the kind in an individual at the location.

There is one remaining puzzle concerning the space-relative existence of kinds. One might have thought that an existence statement locating a kind

[13] There are in fact two linguistically relevant notions of kind: referents of bare plurals or mass nouns and kinds as referents of definite singular kind terms as in (i) below. Only the former not the latter allow for space-relative *exist*, as seen in (ii):

(i) The giraffe is mammal.
(ii) a. Giraffes exist everywhere.
b. ??The giraffe exists everywhere.

at a spatial region such as (29a) should state the complete presence of the kind at each sub-location of the location mentioned by the location modifier, just as a time-relative existence statement requires the complete presence of the individual at each moment of its lifespan. This is not the case in (29a), though, which does not require the complete presence of the kind 'giraffes' in each part of Africa. It is in fact sufficient that the kind be completely present just at the locations in Africa, and it suffices that there be just some instances of the kind in Africa.

It seems that this puzzle has less to do with space-relative existence for kinds as such than with the semantics of English locative sentences. A weak, existential condition seems to be part of the semantics of locative modifiers in general, for example in the sentence below:

(30) John resides in Munich.

In Munich specifies that John's residence is located somewhere in Munich, not that it is located everywhere in Munich or all over Munich.[14]

Not just location modifiers with *in*, but also those with a variety of other spatial prepositions locate the described event or individual in fact just somewhere within the location mentioned. This is illustrated with location-relative existence statements below:

(31) a. Giraffes exist outside of Africa.
b. Giraffes still exist near the coast.

Also the location modifiers in (31) do not give the precise location of the entity in question. Thus, for a term T, *in* T locates an entity somewhere in the location that T refers to, *outside* T locates it somewhere outside that location, and *near* T locates it somewhere 'near' that location.

Only special locational modifiers such as *throughout* and *all over* require that every part of the location mentioned is where the entity or event in question is located:

(32) a. Giraffes exist throughout Africa.
b. Giraffes exist all over the world.

[14] Existential quantification is in fact also involved in the semantics of temporal modifiers:

(i) John resided in Munich last year.

Last year requires John to have resided in Munich at some point in the last year, not throughout the last year.

This is because such location modifiers are in fact quantificational, containing an explicit (*all* in (32b)) or implicit (*thoughout*) quantifier ranging over the parts of the location.

A distinction thus needs to be made between the location mentioned by the location modifier and the *strict location*, the location that is in fact where exactly the entity or event in question in located. The complete-presence condition of *exist* needs to be fulfilled only with respect to the parts of the strict location, not the location mentioned.

With an ordinary location modifier, an existence statement concerning a kind requires just that the kind be instantiated in an individual at some sublocation of the location mentioned by the modifier, the strict location. But would this not require that the kind be present at each sublocation of the location of a relevant instance of the kind? This is certainly not the case. The location of an instance should in fact count as a minimal location for the kind. The reason for that is this. Kinds inherit their location from the location of their instances; they cannot have a location in any other way. Thus they could not possibly be located at a proper part of the location of an instance of the kind.

As a consequence of the possibility of the space-relative existence of kinds, kinds can be multiply located. That is, *exist* may locate a kind at different locations, which amounts to the kind being 'entirely' present in instances of the kind at those locations. This matches well the Aristotelian view of universals as being able to be multiply located, located just where the instances are located.

The existence of a kind at a location obtains in virtue of an entity that completely instantiates the kind being at the location. Note that this in-virtue condition does not require that the instances of the kind 'exist' at the location in question. A requirement that the instances exist at the location could not be fulfilled by instances that are enduring objects and thus cannot exist at locations. Moreover, such a requirement could not be fulfilled by instances that are events, since events do not 'exist' in the first place. Rather for the existence of a kind at a location l, it suffices for an instance to simply be at l. The relation of being at a location is applicable both to enduring objects and to events.

Kinds generally have properties in virtue of their instances exhibiting particular conditions. So far the examples involved kinds as referents of bare mass nouns and plurals. In the linguistic semantic literature, it has been argued that kinds in this sense obtain certain of their properties in a particularly strict sense from their instances. Ever since Carlson (1977), it has become a common view to take the application of so-called stage-level and

individual-level predicates to kinds to be obtained from predicates applying to individuals on the basis of existential and generic quantification over instances of the kind. Individual-level predicates generally are taken to be predicates that are true of individuals throughout their lifespan. Such predicates generally exhibit a generic reading when applied to kinds, as in (33a):

(33) a. Firemen are intelligent.

Stage-level predicates are generally taken to be predicates that are true only of a 'temporal stage' of an individual. Such predicates generally exhibit an existential reading when applied to kinds, as in (33b):

(33) b. Firemen are available.

On the Carlsonian view, individual-level predicates are lifted to kind predicates on the basis of generic quantification over individuals and stage-level predicates on the basis of existential quantification, as below:[15]

(34) a. For an individual-level predicate P, for a kind x, $x \in [P_{kind}]$ iff Gn y [y I x; $y \in [P]$].
b. For a stage-level predicate P, for a kind x, $x \in [P_{kind}]$ iff $\exists$y [y I x; $y \in [P]$].

Given the Carlsonian view, the question arises, should *exist* be classified as a stage-level predicate or as an individual-level predicate? *Exist* when applied to kinds of concrete objects clearly triggers an existential not a generic interpretation. But *exist* is not easily classified as a stage-level predicate. *Exist* necessarily holds of an entity throughout its life span. A characterization of stage-level predicates as predicates expressing accidental properties seems to do better. Concrete entities generally exist only accidentally, not essentially. Since this paper does not provide the space for an in-depth discussion of the stage-level/individual-level distinction as such, let us just note that *exist*, if anything, goes along with the class of predicates generally classified as 'stage-level', rather than those classified as 'individual-level'.

Exist as a stage-level predicate applying to kinds could obviously not be obtained by the condition in (34b), by existential quantification over instances with the application of *exist* to particular instances. Location-relative *exist* as a kind predicate is not obtained from location-relative *exist* as a predicate applying to individuals. Rather location-relative *exist* involves

[15] Gn is the generic quantifier, see Krifka et al. (1995).

existential quantification over instances fulfilling a 'weaker' condition than existence relative to the location in question.

Exist is not alone in that respect. The same also holds for certain other 'stage-level' predicates, such as *recognize*:

(35) John recognized gold (in virtue of coming across some instances).

In order for John to recognize gold, he must have 'come across' an instance, though 'recognize' would not apply to that instance. *Recognize* applies to a kind rather directly, requiring a weaker condition on an instance, that of having 'come across' an instance.[16]

To conclude, some stage-level predicates, including *exist* and *recognize*, need not apply themselves to an instances; rather only a weaker condition than that expressed by the predicate itself may be applied to an instance.

There is another reason not to trace the existential reading of *exist* with kinds to a Carlsonian account of stage-level predicates with bare mass nouns or plurals in general. The reading of *exist* involving existential quantification over instances is equally available for certain other kind terms than bare mass nouns and plurals, in particular demonstrative kind terms of the sort *this flower* or *this animal*:[17]

(36) a. This flower exists in many countries in Europe.
b. This animal does not exist in this region anymore.

To summarize, space-relative *exist* can apply to kinds because of the particular nature of kinds, their ability to be completely present at different locations at once.

5 The Existence Predicate *obtain*

We have seen that location-relative *exist* expresses the condition of complete presence at all the relevant sublocations. The same condition is in fact expressed by location-relative *obtain*, even though *obtain* imposes different requirements on the entities it can apply to. *Obtain*, recall, is an existence

[16] Another example of a stage-level predicate applying to a kind 'directly' is *disappear*, as in Geach's (1968) example below:

(i) Dinosaurs have disappeared.

Here in fact no existential quantification is involved at all in the interpretation of the predicate.

[17] Obviously demonstrative kind terms like *this flower* behave differently in that respect from definite kind terms of the sort *the giraffe*, see Fn. 10.

predicate that applies to entities such as states, situations, conditions, and facts. It does not apply to material objects, persons, or events:

(37) a. The state / situation / condition / fact obtains.
b. *The house / The person / The event obtains.

The restriction imposed by *obtain* cannot be one to abstract objects: *obtain* does not apply, for example, to mathematical objects, properties, or propositions.

Obtain like *exist* is an abstract state verb. Moreover, it has a time-relative as well as a space-relative application, with entities such as states, situations, or conditions:

(38) a. The state / situation / condition still obtains.
b. The state of emergency / The same situation / The same condition obtains in Arizona.

Time-relative and space-relative *obtain* does not apply to facts, though. The reason clearly is that facts are themselves already location-wise complete.

What characterizes the entities to which *obtain* is restricted is that they are constituted by certain conditions holding, that is, by certain properties or relations holding of an object or a number of objects. Let me call those entities *condition-like entities* and the conditions in question *constitutive conditions*. Some condition-like entities go along with canonical descriptions, that is, descriptions that display exhaustively the nature of the entity in question. Facts have canonical descriptions of the form *the fact that* S, states have canonical descriptions of the form *the state of* NPs *being* VP, and similarly conditions have standard descriptions of the sort t*he condition of* NP's *being* VP. It is the canonical description that explicitly displays the property or relation whose holding is constitutive of the fact, state, or condition. The states will thus be abstract states as described earlier. In fact, the four kinds of entities to which *obtain* applies are precisely the kinds of entities for which a Kimean account would be suitable (that is, the account Kim originally proposed for events discussed earlier).[18] This account, recall, gives identity and existence conditions in terms of a property or relation holding of an object or a number of objects as well as possibly a location. (Of course the property of relation may itself be complex, involving connectives or quantifiers.)

[18] This implies a Strawsonian view of facts, on which facts are not in the world, but abstractions from things going on in the world (Strawson 1950), rather than an Austinian view (Austin 1979).

Time-relative and space-relative *obtain* involves as its application condition a condition that like the application condition of location-relative *exist*, is the condition of complete presence at the relevant sublocations of the 'strict location'. But in the case of *obtain*, the condition manifests itself in somewhat different ways. Obviously, for an entity e to 'obtain' at a time interval t, the constitutive conditions must hold of the objects in question at t, and in fact at all the moments of t. If not, the entity may not be a state, but rather a sort of event, involving a transition from one state to another, distinct state. Similarly, it is plausible that if *obtain* applies to an entity e relative to a strict spatial location l, this will require the fulfillment of the constitutive condition of e at relevant sublocations of l. Thus, the sublocation condition holds for location-relative *obtain* just as it did for location-relative *exist*.

It remains then the complete-presence condition. What could the complete presence of a situation, state or condition at a time or location consist in? That is, what could count as the parts of a condition-like entity? The objects and times from which condition-like entities are obtained (in the 'Kimean' way) certainly do not count as parts of such entities. This manifests itself in the fact that they are not treated as parts by part-related expressions of natural language: *part of the situation, part of the condition*, or *part of the state* can never 'mean' a participant or location of the situation, condition, or state. Furthermore, if the parts of condition-like entities include properties, it is hard to make sense of them being 'present' at a time. The only suitable candidates for involvement in the complete presence condition are in fact any constitutive sub-conditions. This corresponds well to the way the *part-of* construction is used in natural language: *part of the condition, part of state, part of the situation* can only make reference to constitutive subconditions. Thus, condition-like entities, unlike material objects, do not have spatial parts, and unlike events, they do not have temporal parts. Their only parts are constitutive subconditions. It is relative to them that complete presence at sublocations needs to be fulfilled when *obtain* applies. Thus for a situation, condition, or state e to obtain relative to a location means that all the constitutive subconditions of e are fulfilled at all the relevant sublocations of l. Because condition-like entities have neither temporal nor spatial parts they can be completely present, in the sense of complete obtaining, at different times as well as different places. In that sense, they 'endure' both throughout time and across space.

The closeness between *obtain* and *exist* manifests itself also in that *exist* can apply to all the entities to which *obtain* can apply. Thus, (39a) and (39b) (with location-relative *exist*) are fairly acceptable, unlike sentences with *exist* applying to events:

(39) a. The state / The situation / The condition / The fact exists.
b. The same state / situation / condition still exists in some countries.

Location-relative *obtain* thus shares the condition of complete presence at the relevant sublocations with location-relative *exist*. The way *obtain* differs from *exist* resides in its sortal restriction to condition-like entities as well as the particular notion of 'presence' it involves: *exist* requires presence in the sense of spatial or temporal location, whereas *obtain* requires presence in the sense of a property being true of an object relative to a location. (What makes *exist* in (39a) and (39b) acceptable is obviously that the presence condition imposed by *exist* is extended so as to cover the 'holding-at-a-location' condition as well.)

Condition-like entities raise the question on what grounds their constitutive conditions hold, be it at a time, at a place, or absolutely. There are in fact two fundamentally different kinds of condition-like entities: those based on empirical facts (about the time or spatial location, or the world), and those based on normative conditions or conditions resulting from 'declarations' (which may or may not be restricted to a time or a spatial location). The state of someone's mind or health is a state of the first kind, as are habits; a state of war, requirements etc are condition-like entities of the second kind. The first kind of state holds in virtue of what is taking place at the relevant location; the second kind of state holds by declaration or whatever may ground normative conditions. Thus for a condition-like entity to obtain at a location, either all the various things need not happen at the location in virtue of which the condition can be said to obtain or else the relevant condition, with all its subconditions needs to have been put into place for that location. Either way, the condition-like entity will need to enjoy endurance throughout the location as long as the constitutive condition holds. Note that both *obtain* and *exist* are applicable to normative condition-like entities, including laws:

(40) a. The law still obtains / exists in some countries.
b. The requirement for a president still exists / obtains in many countries.

6 Conclusion

Existence predicates in English, I have argued, form a clearly characterized semantic class of predicates. In their location-relative use, *exist* and *obtain* have a nontrivial meaning, specifying the complete presence of an entity at the relevant sublocations. *Occur*, by contrast, tracks the temporal locations of

subevents of an event, describing an event that reflects the mere temporal structure of the occurring event.

There is one remaining question, and that is: what is the meaning of location-independent uses of existence predicates? It is important to note that location-independent uses of existence predicates still impose the same sorts of restrictions on the kinds of entities they can apply to. Location-independent *exist* like location-relative *exist* is inapplicable to events. Location-independent *exist* is also applicable to mathematical and other abstract objects, unlike location-dependent *exist*. Location-independent *obtain*, unlike location-dependent *obtain*, is applicable to facts. But it is still inapplicable to entities other than condition-like objects. The preservation of the sortal restrictions is an indication that the location-independent meaning of existence predicates is derivative upon their location-relative meaning.

How can the location-independent meaning then be derived from the location-dependent one? Time-independent *exist* applying to abstract objects may be obtained from time-relative *exist* by universal quantification over times. That is, *exist* is true atemporally of an object o if it is true of o at all times (which means o is completely present at all times). *Exist* with that meaning could not apply to events: it would require the complete presence of an event at all times, which is impossible.

Can the time-independent use of *obtain* can be derived from the time-relative use in that way as well, namely by universal quantification over times? In the case of *obtain*, this should mean complete fulfillment at all times of the constitutive conditions of the condition-like entity. Facts that are constituted by the holding of a property of objects at a particular time could not fulfill this condition, though. Thus, the time-independent use of *obtain* must be derived differently for that case. It is plausible that condition-like entities that are complete regarding the parameters of the holding of the constitutive condition are completely present at any time (and any space). Time-independent *obtain* still presupposes that the entity it applies to be condition-like and that is because it is derived from location-relative *obtain*, which which specifically relates to the constitutive conditions of the entities it applies to.

Can space-independent *exist* be derived from space-relative *exist?* This would require complete presence everywhere of entities that exist space-independently. Complete presence everywhere is of course impossible for

material objects (which are extended in space). Perhaps space-relative *exist* is in fact itself derived from time-relative *exist* by form of analogy.[19]

Overall, we have seen that tied to the notion of existence is fundamentally that of complete presence throughout a location. This condition is inapplicable to some entities, such as events. It is in this sense that events might be said to have 'being' in a weaker sense. What is constitutive of objecthood is recurrence of the essential parts or features of an entity across locations, which is what the more fundamental notion of existence amounts to.

It has sometimes been argued that our linguistic intuitions about the verb *exist* should not be taken too seriously, for making either a semantic or a philosophical point, since *exis*t is a relatively recent verb and tied to a more 'technical' use in philosophical contexts.[20] I think this caution is unjustified. We have seen that our intuitions about the verb *exist* are in fact very systematic and allow for a natural explanation within a fairly well-established ontological view. Furthermore *exist* is not alone in displaying the relevant semantic behavior. In English, the existence predicate *obtain* behaves strikingly parallel to *exist*. The linguistic intuitions associated with *exist* thus are better viewed as displaying an important underlying concept of location-relative existence rather than peculiar features of a somewhat special lexical item.

References

Austin, J. L. 1979. 'Unfair to Facts'. *Philosophical Papers*. Oxford University Press, New York.

Carlson, G. 1977. 'A Unified Analysis of the English Bare Plural'. *Linguistics and Philosophy*, 413–457.

Carlson, G. / J. Pelletier 1995. *The Generic Book*. Chicago UP, Chicago.

Chierchia, G. 1998. 'Reference to Kinds across Languages'. *Natural Language Semantics* 6, 339–405.

Fine, K. 2006. 'In Defense of Three-Dimensionalism'. *Journal of Philosophy,* 699–714.

Frege, G. *Grundlagen der Arithmetik*. Olms, Hildesheim.

Geach, P. 1968. 'What Actually Exists'. *Proceedings of the Aristotelian Society*, Supp. Vol. 42, 7–16.

Hawley, K. 2001. *How Things Persist*. Oxford UP, Oxford.

[19] Other uses of *exist* applying to material objects may involve implicit existential quantification, as part of the interpretation of tense.

[20] See in particular Simons (2006).

van Inwagen, P. 1998. 'Meta-ontology'. *Erkenntnis* 48, 233–250.
Katz, G. 2003. 'Event Arguments, Adverb Selection, and the Stative Adverb Gap'. In E. Lang (eds.): *Modifying Adjuncts*, de Gruyter.
Krifka, M. et al. 1995. 'Genericity: An Introduction'. In Carlson / Pelletier (eds.).
Lewis, D.K. 1986. *On the Plurality of Worlds*. Blackwell, Oxford.
McGinn, C. 2000. *Logical Properties*. Oxford UP, Oxford.
Maienborn, C. 2007. 'On Davidsonian and Kimian States'. In I. Comorovski / K. von Heusinger (eds.): *Existence: Semantics and Syntax*. Springer, 107–130.
McDaniel, K. to appear a. 'A Return to the Analogy of Being'. *Philosophy and Phenomenological Research*.
McDaniel, K. to appear b. 'Being and Almost Nothingness'. *Nous*.
Miller, B. 1975. 'In Defense of the Predicate *Exist*'. *Mind* 84, 338–354.
Miller, B. 1986. '"Exists" and Existence'. *The Review of Metaphysics* 40, 237–270.
Miller, B. 2002. 'Existence'. *Stanford Encyclopedia of Philosophy*.
Parsons, T. 1980. *Nonexistent Objects*. Yale UP, New Haven.
Priest, G. 2005. *Towards Nonbeing*. Oxford UP, Oxford.
Russell, B. 1905. 'On Denoting'. Reprinted in R.C. Marsh (ed.): *Logic and Knowledge*. Allen & Unwin, London.
Salmon, N. 1987. 'Existence'. *Philosophical Perspectives* 1, 49–108.
Salmon, N. 1998. 'Nonexistence'. *Nous* 32.3., 277–319.
Sider, T. 2001. *Four-Dimensionalism*. Clarendon Press, Oxford.
Simons, P. 2006. 'Modes of Extension: Comments on Kit Fine's 'In Defence of Three-Dimensionalism'. *The Royal Institute of Philosophy* 83, p. 17–20.
Strawson, P. 1950. 'Truth', *Proceedings of the Aristotelian Society*, reprinted in Strawson 1971, *Logico-Linguistic Papers*, Methuen, London, 1971.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 55–77. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

How the Emergence of Propositions Separates Strict Interfaces from General Inference*

Tom Roeper
University of Massachusetts
roeper@linguist.umass.edu

Abstract. How does a child utilize inferences in acquisition and ultimately separate inferences from implicatures from semantic composition? How exactly does a child recognize a truth-functional proposition? It is argued that the child begins with rich, free inferences that are systematically replaced by syntax/semantics compositional rules. Strict syntax/semantics interfaces are discussed and linked to the syntax of subject auxiliary inversion and acquisition evidence of copying (*Is Bill is busy?*) and long-distance movement in opaque contexts (*What did she say she bought?*). A connection between Tense, propositions, and Phase boundaries is argued to be a critical syntax/semantics interface.

1 Acquisition Goals: the Syntax/Semantics Interface

While acquisition has been conceived of largely in syntactic terms, it is intuitively obvious that semantics and pragmatics motivates a child to unlock mysterious adult utterances, not just their unusual syntactic character. But what, actually, are the steps a child takes if syntax, semantics, and pragmatics converge upon her? Where does she begin and how can she simplify the process? The original notion of the *autonomy of syntax* offered an illusory image that the child could see through every linguistic situation to see the syntactic skeleton within. It cannot be so simple.

Our account will be deliberatively intuitive, dwelling upon imprecise notions of propositionality and presupposition, but it parallels in spirit the idea of compositionality: each syntactic step has a semantic and pragmatic consequence. The hope is that an intuitive discussion helps us see just where more rigorous formalization is appropriate and where it may not be.

* Acknowledgements: Thanks to the Sinn and Bedeutung audience and audiences at IASC: in Edinburgh, Assymmetry conference in Montreal, Information Structure conference at Potsdam, and the Ex-FA conference in Campinas, Harvard, and UMass where parts of this talk have been presented and to Cedric Boeckx, Seth Cable, Noam Chomsky, Jill deVilliers, Kyle Johnson, Wolfram Hinzen, Bart Hollebrandse, and Ian Roberts for helpful remarks. Errors are mine, not theirs.

1.1 Learnability

If an interaction with semantics and pragmatics is assumed to be relevant, then in classic terms, the set of possible grammars should go up exponentially and the learnability problem is then dramatically increased. The child must identify the optimal grammar not only in terms of syntactic derivation, but in terms of the set of meanings she map onto it as well. If structure X defines a set of possible *meanings* within the grammar, then each member of the set must be evaluated for presence in a particular grammar, not just the syntactic structure. It should be obvious that we must reverse that logic: the presence of semantic and pragmatic factors should serve to *constrain* the set of possible grammars, not expand them. How could that work? What prevents a child from making articles recursive: *the the hat*. One answer could be that syntax does not prevent this possibility, but that no semantics can be attached to a recursive article that would make sense: an object cannot be specific in two ways. In fact, a pragmatic meaning is not that far off: *the the hat I like* could mean *the hat of the hats that I like*. So we would want the exact semantics of the syntax – the semantics of recursion in fact – to be incompatible with this option.

If one takes the literature in formal semantics as a starting point, it is far from obvious how to make it work for the child. First we must see that there is a significant division between the inherent logic of cognition, and the special logic of a syntactic semantics. The difference is important if we wish to see exactly which acquisition hooks are actually used by the child. Formal semantics has not, to my knowledge, explicitly sought to articulate such a distinction.[1]

1.2 Interface Hypothesis

Let us begin then, with an interface hypothesis which serves as a motivating desideratum:

(1) **Strong Interface Hypothesis**: Every step in acquisition must satisfy syntactic, semantic, and pragmatic criteria.[2]

An acquisition pragmatic principle is a natural consequence:

(2) **Pragmatic Principle**: Connect to Context as quickly as possible.

From an acquisition perspective, we need an hypothesis of this kind to explain, for instance, the fact that small children can project and interpret single words.

[1] This article is written from an acquisition perspective and there well may be appropriate literature of which I am unaware.

[2] The hypothesis is surely too strong because there may be morphological or movement (scrambling) operations which fail to constitute a shift for each criterion.

Let us elaborate a simple example to see how pragmatics and semantics can participate in syntactic triggering. In an early approach to the interface question, Lebeaux (2000) argued that semantics served to *confirm* syntactic hypotheses which are derived from context. How does a child acquire the passive? If he can *independently* determine meaning from context, and then generate a syntax to match the meaning, then semantics/pragmatics confirms the syntax (as in Roeper (1982)). Suppose the child hears:

(3) The cheese was eaten by the mouse.

If the child knows semantically and pragmatically that *it must be the mouse who ate the cheese*, therefore *cheese* must be restored to a position after *eat* where that meaning is available. If UG syntax can find an operation – reverse object to subject movement – which restores *cheese* to the object position, then the meaning will be consistent with common sense. Once acquired, but only then, the syntax can become autonomous and can generate a meaning inconsistent with pragmatics (plausible real-world knowledge) such as:

(4) The mouse was eaten by the cheese.

The emergence of propositional representations can, as we shall see, be represented from this interface perspective. In broad terms, children first:

(5) Represent propositions as events.

In general, the emergence of propositional interpretations can be profoundly clouded by *general inference capacities*. For adults, strictly speaking, the inference is not warranted but often occurs. Ultimately, the child must separate *logical implicatures* from insecure situational inferences. That is, she must create an autonomous semantic space – constrained by syntax – which blocks the inappropriate use of general inference.

(6) Move from rich inference to constrained compositional readings.

The differences between inference, implicature, and syntactic compositional semantics are part of the acquisition challenge. The immediate relevance of inference is obvious to any parent whose child's first word is "no". It is often not clear exactly to what the "no" applies. When a child resists socks, does "no" mean:

(7) Don't put *any socks* on me or don't put *those socks* on me.

And the child is confronted with the same conundrum when the parent says "no!". We assume a situational salience of something in a "Common Ground", but it is not only unwarranted, but the failure of inference is a reasonable motivation for a child to acquire an articulated grammar.

2 How Do Propositions Emerge?

Propositions, as well as logical inferences and systematic implicatures, have a long history in philosophy and they are the subject of many definitions in Propositional Logic. At the same time, there are those (Hinzen 2007; Chomsky 2007) who have suggested that the notion *proposition* needs to be delicately introduced into linguistics and may not have a single logical definition. Our discussion will follow this tradition. Nonetheless one goal must ultimately be to say how a child arrives at a notion of proposition that is useful in traditional syllogistic reasoning:

(8) John is a man. All men are mortal. ⇒ Therefore John is mortal.

All indications are that this kind of explicit reasoning is far from nursery school children. At the same time, many implicit logical relations are undoubtedly present and a prerequisite for every stage of acquisition.

We should note that our approach is orthogonal to formal semantics. Many of the rich and detailed distinctions found in formal semantics are natural fodder for experimentation in the future. We aim to look at the "moving parts" in acquisition. This may leave the reader unsatisfied because we will avoid a rigorous treatment which may be found in philosophical discussions. Many interesting questions arise, for instance, whether and when children grasp upward and downward entailments for which there are ongoing experiments.

Nonetheless, the most primitive first stage kinds of initial entailments in language seem to refer to how thinking of any kind operates. What belongs to presuppositions or entailments about thought in general, and what calls for a special mapping onto linguistic structure? To trace the acquisition path wisely, we need to draw this line correctly. Our account builds from the point where a proposition is a syntactic projection that is distinct from a semantic primitive. Ultimately, it must all be embedded in a realistic version of children's pragmatic experience.

2.1 Syntactic Propositions and Deniability

Where should we begin to look for "moving parts"? One prominent feature of propositions is the notion of *deniability* which happens to be elicited precisely by syntactic movement, inversion:

(9) John is playing baseball ⇒ is John playing baseball

The movement of the Tensed element cancels the property of assertion and automatically introduces *deniability* via a yes/no question construction. Therefore our definition of propositions is:

(10) Propositions are deniable: True or False.

We argue, consistent with classic syntactic claims, that this property results from a *strict interface* between syntax and semantics which pivots upon this UG claim (Klein 2006; Schulz 2003):

(11) Universal Grammar: Tense projects a proposition.

This has led to concepts like "Propositional-Island Constraint" for tensed clauses. A child should, if UG is innate, grasp this notion of proposition, not immediately, but very early, as a UG *reflex* of the acquisition of Tense.
Yes/no questions via inversion give overt manifestation of this:

(12) John is singing ⇒ is John singing

Most of the meaning of yes/no questions, we claim, emerges automatically via a Strict Interface, and therefore predictably, emerges before other properties of propositions, clouded by inference, but after entailments that are direct reflections of cognitive organization. First we look at the child's semantic and pragmatic environment and the kinds of propositional distinctions, hanging in a world of inferences, that a child must ultimately master.

2.2 Non-Assertion Propositions

Other forms of meaning that are stateable as propositions include:

(13) Entailments Implicatures Presuppositions

Each of these properties is close to situational pragmatic reasoning that does not depend upon language (at least in my estimation). Entailments are not subject to deniablility (unless elevated to an overt assertion) – and they are prerequisite to the composition of any kind of meaning, linguistic or non-linguistic. Therefore I claim, that propositions are obscure, but in some measure they are part of any form of knowledge, as when we presuppose the existence of an object when we speak of it.

(14) **Hypothesis**: The capacity for "proposition" is innate and immediate, but not necessarily available to conscious deduction.

Presuppositions and their triggers are notoriously difficult to pin down, but they emerge as intuitively critical in what follows.[3]

2.3 Entailments

Such a notion of proposition is present in much of our thought, but not automatically subject to any other linguistic operation like: *denial*, *contrast*, or deductive *consequence*.
For example if:

(15) John has a blue car.

It entails the proposition: *John has a car*. A sentence like:

(16) John likes the car.

has the existential presupposition that:

(17) A car exists.

But we do not expect that children – nor probably animals – lack this mental capacity. It underlies not only language but many actions. It is plausible to argue that more sophisticated structures partake of this connection. For instance, understanding:

(18) John was sad that the Bruins lost.

involves *sad [clause]* where the truth of the complement is assumed ("Speaker-factivity"). It could, therefore, share a presuppositional basis with *blue car*. We predict therefore that adjective complements should be easier for cognitive reasons than attitude verbs that create opaque contexts. Thus:

(19) a. John was unaware that the Bruins lost.
b. John did not think that the Bruins lost.

(19a, b) might seem pragmatically close in content, but the grammar delivers the meaning of the complement in different ways, where (a) has speaker or Common Ground factivity, but (b) is marked without a fixed truth value. Legere (2008) has shown that this is true in acquisition. With sentences roughly like in a carefully controlled experiment, 92% of 5yr olds understood (20a), but only 62% understood (20b)

(20) a. She is happy she has a hat.

[3] See Beaver & Geurts (2010) for an overview.

b. She knows she has a hat.

This kind of data is consistent with diverse contexts under which presuppositions are triggered as the literature attests.

2.4 Implicatures

Linguistically-based *implicatures* involve derived propositions usually by contrast.

(21) a. John has some of the marbles.
b. ⇒ John does not have all of the marbles.

Linguistically-based *implicatures* involve derived propositions usually by contrast.

(22) a. John has *some* of the marbles.
b. ⇒ John does *not* have *all* of the marbles.

Nevertheless implicatures, at least some of those relating to quantification, appear to involve an extra semantic operation that takes more time and shows up later in acquisition (see work by Snedeker and colleagues (e.g. Panizza, Chierchia, Huang & Snedeker (in press) for recent discussion)). They occupy a different propositional corner.

2.5 Entwined Inferences

What stands in contrast to all of these forms of logical reasoning are rather similar *situational inferences*, which form a backdrop to all language and mingle in subtle ways with grammatical properties. Such inferences are ever-present but less constrained and not subject to logical verification. For instance, for (22), while *some* ⇒ *not all* is fixed, I might infer that someone other than John has a few marbles. But such an inference is insecure: some of the marbles could be under the couch, not in someone else's possession. In general we make what should be a virtually self-evident claim:

(23) Acquisition shifts, systematically, from an over-reliance upon inference to a reliance upon systematic semantics.

This view leads to the natural question: What is the system whereby the shift occurs: Does a child know when a situational interpretation corresponds to the grammar or when it is an inference that exceeds the meaning grammar carries? This is a significant acquisition problem whose solution will engage many dimensions of linguistic theory.

2.6 Inferences and Grammar

Before we proceed, we would like to demonstrate how intimately woven unsubstantiated inferences can compromise systematic semantics in the eyes of a child. They are immediately available to children and confound the acquisition path. One can easily conclude the truth of both (24b, c) from the observation of (24a).

(24) a. Situation: John observes Bill drinking beer.
b. John saw Bill drink beer. = Event
c. John saw that Bill drinks beer. = Proposition

The event seems to entail the proposition and the proposition seems to entail the event, although neither conclusion withstands careful scrutiny (Higginbotham 1983). But it is a part of how we commonly understand things, and court cases will show it. Imagine this scene:

(25) Mary said "Bill saw John drink beer."
Now if someone were asked in court:
"Did Mary say that John drank beer?"
Most people would in fact say "yes".

But linguists know that if you saw John drinking, but did not know what it was, someone might say: "You saw John drink beer – you just did not realize it was beer." And if you only saw empty bottles afterwards, you might say: "you saw that John drank beer" without entailing that you saw him drink beer.
Some constructions are ambiguous:

(26) She saw the boys drink beer. = Event perception
or Proposition = She saw (that) the boys drink beer.

If a child at first depends upon these inferences in the initial state (as do adults understanding children), they can be legitimately confused as to whether the construction they heard was the representation of an event in a small clause or a proposition.
This reasoning extends to False Belief environments that surround opaque utterances as well. We commonly allow inferences to overrule opacity in our understanding as well. Consider this scene:

(27) Grandma asks Dad: "What did Mom buy at the store?"
and he answers: "Plastic toys."
"How do you know?"
Dad: "I heard a friend talking to Mom on a cell phone at the store and

> I asked the friend: "What did Mom say she bought at the store?" and the friend said she had said "Plastic toys."

Although under two recursive verbs of "saying" the complement is opaque and technically Dad does not necessarily know what she bought, this inference is commonly accepted in normal communication as a basis of "knowing". Therefore it is something a child easily hears and must, ultimately, learn to qualify or discount in his construction of the sentence:

(28) What did Mom say that she bought __

Acquisition experiments aim very precisely at creating situations where adults will apply a notion of opacity to the complement of say, but in real life we are often entitled to make this inference.
Suppose again this were a court case, one could imagine a defense lawyer seizing upon the distinction and asking a witness, who is under oath:

(29)
A: "Do you know what she bought at the tobacco store?"
B: "Yes, I know she bought drug paraphernalia."
A: "How do you know?"
B: "She told me she bought drug paraphernalia."
A: "Has she ever lied to you?"
B: "Yes."
A: "Then she could have been lying?"
B: "She could have."
A: "Then in fact you do not know that she bought drug paraphernalia, because you never saw it and she might have been lying."

In a court, reasoning of this kind, pivoting on the illegitimacy of common inferences is a standard technique to downgrade the value of testimony. Here is a putative adult caught in the fact that his statements, under oath, depended upon an inference and not actual knowledge. What he actually knew was that she said she bought drug paraphernalia but this was allowed to shift to: *Know that she bought drug paraphernalia*. No one would be indicted for perjury for such an assertion: *He said he knew what she bought, but he didn't, therefore he lied.* Moreover, the information would not be disallowed as evidence. The fact that she said she bought drug paraphernalia could be legitimately relevant to the judgement, in a juror's mind, that she did buy drug paraphenalia.
If adults are easily uncertain about the boundaries of semantic meaning, then it must be a challenge for a child as well because his experience has inconsistent

information. Sometimes "saying that" can be relied upon to introduce a truth, and sometimes not. It is no wonder that children must learn to disentangle the meaning from the inferences when such inferences are a part of normal life. There is subtle naturalistic evidence that children may take the verb *say* to carry a factive complement. In the adult language factive complements for verbs like *know* are deletable (b) as opposed to non-factive verbs like *think* (c) with which we generate the opaque complement via verbphrase-prominalization with the word *so* (d):

(30) a. A: John went outside.
b. B: I know.
c. B: *I think.
d. B: I think so.

Children are known to do the same in conversation but with the non-factive *say* being treated like a factive, although adults do not do this:

(31) "Can we have cookies?"
"Yeah, Mom said."

In fact, the Childes database has examples with exclamations that feel non-adult, as if a factive complement has been deleted, which suggests that a child might first understand the word that way.

(32) "You said!"

We turn now to an examination of acquisition data. Much of this data can be regarded as experimental hints – in a way like "??" grammatical judgments – that need to be subject to more careful scrutiny, as do many grammaticality judgments, but which nonetheless carve out the terrain that needs exploration.

3 The Emergence of Tense and Propositionality

Where does a child begin? One-word utterances like

(33) "uh-oh", "no", "dat", "fish", "milk", "juice"

have the same variety of interpretations, expanded by intricate inferences that they do for adults who say:

(34) "John!", "No way!", "Beer!"

and leave it to speaker/hearer inferences to fill in the communication. Parent and child must both exercise inferential capacities, which often run awry, pre-

sumably providing the child with motivation to acquire more grammar in order to be clear. Nonetheless, the efficiency of such inferences must be present early on to make the utility of one-word utterances a good starting place for children. The child who says "milk" is, often but not always, trying to express an imperative like "please give me some milk". Early work in acquisition claimed that children had full sentences here, but there is no more reason to believe that than the notion that adult exclamatives should be expanded as full sentences.
Potts & Roeper (2005) argue that the same analysis holds for two-word utterances, which are like *expressives* for adults:

(35) **Exclamations**: You fool! You idiot! You jerk!

These utterances are not equivalent to a tensed sentence:

(36) You are an idiot.

The latter has a profoundly different force, just as a parent who screams at a child "You idiot!" is not dealing with the same meaning as a psychologist who solemnly pronounces:

(37) Your son is an idiot.

Where the tensed element implies reference to evidence like intelligence test scores.
Expressive exclamations cannot be cancelled or tagged or take articles:

(38) *You idiot, but it does not look that way.
*You idiot, aren't you.
?*You an idiot.

3.1 The Pre-Propositional Stage

A child utterances often seem to carry exclamative force:

(39) "it big" or "dat here" or "Mommy sock"

They are therefore plausibly using the syntax of expressives, though his communicative intent might be closer to an assertion, the notion that it is an assertion is then an inference.
Therefore we argue that they are *pre-propositional*. They show no indications of a proposition, like tense-marking, tag-questions or even proto-tag questions (as far as we know):

(40) *It big, isn't it?

*It big, huh?

What drives us – in particular children – to abandon these rich inferences in favor of grammar? We are left with many uncertainties in a world of pure indeterminate inference. We seek the precision and reliability of assertions that have an evidential relation to context.

3.2 The Semantic Side of Root Infinitives

What exactly happens when the child moves from (a) to (b):

(41) a. he big ⇒ b. he is big

He is taking both a big semantic and a big syntactic step. There is evidence very early that precisely its deniable propositional character is quickly recognized, when a child uses Verum Focus in a context where someone claims that something is *not* working:

(42) " it IS working!" (Danilo Azcarate 3,4yrs)

Thus we have early evidence that a putatively UG-mediated and innate connection falls into place easily and quickly, much like children once standing up quickly learn to walk.

A large literature on Root Infinitives argues specifically that children initially lack Tense (see Wexler (to app.) for a summary). What the literature fails to address is the fact that propositions are carried by tense. Therefore until the child can project a proposition – which we define as carrying deniability – the semantics as well as the syntax can be inhibiting the move from expressions like:

(43) a. Hände waschen [hands to wash]
b. wäscht die Hände [washes the hands]

The child who moves from (43a) to (43b), not only raises the verb and adds a tense-marking, but adds a deniable proposition as well. It is notable that an important form of language disorder is the failure to express tense. We take that to be not only a syntactic, but a semantic failure, and the step toward tense recognition to engage the strict interface between syntax and semantics.

A close look at a child's departures from the adult language indicate that the notion of proposition is psychologically present.[4] Why do we ask a yes/no

[4] We have undertaken no analysis of languages that lack Tense marking. It is perfectly possible that UG has a few innate avenues where propositionality is linked to syntactic markers or constructions.

question with inversion?[5] Why don't we just add a word that carries that meaning, like *whether*:

(44) a. Is John here?
b. *Whether John is here?[6]

It is really a strange fact that we can signal that a whole proposition is questionable by just moving an auxiliary. We argue that something deeper is at work: an operation on the notion proposition.
We argue that the interpretation arises from what we call a syntax/semantics *Strict Interface*. An application of this principle leads to Chomsky's Strong Minimalist Thesis:

(45) **Strong Minimalist Thesis** (SMT):
Each syntactic Phase undergoes semantic interpretation.
(Chomsky 2005, 2008)

It now becomes plausible that if something is removed from the Phase – like tense-marking – then it cannot be interpreted, which I call Vacate Phase. Thus if a clause is a Phase, then moving something out of it, blocks an interpretation. Movement is motivated to create new discourse meaning, like questions, but also to *avoid* meaning.
Consider the contrast between (46a) and (46b), two questions around the same proposition:

(46) a. Can you t play baseball?
b. You can play baseball, can't you?

In (46b) the proposition is advanced and then the tag asks for confirmation or disconfirmation. In (46a) the proposition is never assumed, although reconstruction allows the system to know what the proposition would be.
In other words, by movement out of the Phase, the pragmatic projection to a presupposition of a question, as in (b), does not occur. The *trace* of Aux-movement allows reconstruction of thematic meaning, but the proposition carried by tense is not projected if the tense is not pronounced in the Phase. This requires technical expression that differentiates Phase Head and Phase-

[5] See Roeper (2011) and deVilliers & Roeper (to appear) where a detailed minimalist syntactic account is provided.
[6] Note that it can be said in German (M. Zimmerman pc),
i. Ob er da ist [whether he here is]
but with some presupposition difference, as if the proposition is in the Common Ground, which is hard to pin down.

complement, limited reconstruction, and a relation between pronunciation and presupposition which we will not articulate here, but which Strict Interfaces allow (see Roeper (2011)):

(47)

[CP can	[IP you trace play baseball]
Phase-Head	Phase-complement

Only the Phase Complement is initially transferred to interpretation (Boeckx 2008). UG and a Strict Interface delivers, by movement out of the complement, a block on the propositional presupposition. By hypothesis:

(48) Strict Interfaces are a part of UG and therefore immediately available to a child.

Now the odd fact that inversion undoes a presupposition follows directly from Strict Interfaces and the seemingly natural *whether*-question option is automatically rendered superfluous.

If indeed, this is UG-derived, hence innate, then it should be available for children very early. In fact, Van Valin (2002), advocating a similar view of the role of Tense, shows that precisely overtly tensed elements invert first: "*Is*, *are*, *was*, *do*, *does*, *did*, *have*, *has* and *had* occur in inverted questions at the initial stage 67% of the time, while *can*, *could*, *may*, *might*, *shall*, *shoul*, *will* occur only 14%."

Moreover, further operations become quickly possible. As mentioned, young 3yr olds say things like:

(49) "it IS working" (Danilo Azcarate 3.4 years)

showing an awareness of Verum Focus, requiring Contrastive stress on the tensed element, presupposing the Tense-Proposition connection. In fact, we have explicit dialogues that reveal the presence of the presupposition when, via *copying*, the tense continues to be present in the clause for children:

(50) Father: Do you want to go outside?
Child: No.
Child (to friend): Do you don't want to go outside ?

The *copying*, by maintaining the auxiliary inside the Phase, preserves the presupposition and asks a question about it, while the inverted case not only lacks the presupposition, but acquires a suggestion reading:

(51) Don't you want to go outside?

Other examples include:

(52) a. " Where are we ARE?" (Danilo Azcarate 3.8 yrs)
b. = Where is it that we are?

which is uttered in a strange forest, with the meaning like a cleft (52) where the fact that we are somewhere is presupposed.
Now let us ask more carefully what the copying implies. It has been noted and debated for 40 years in the acquisition.[7] It occurs for a brief period of time, before tag-questions are available (Jesney 2007):[8]

(53)

"Is Bill is busy"	"Can you can do that"
"Is it's Stan's radio"	"Is this is the powder"
"Is that's a belt"	"why do you're going outside"
"why do you're giving juice"	"why do you're cutting the meat"
"what's he's doing"	"what's the mouse is doing"
"why is there's big tears"	"what is the woman is doing"
"why do deze don't unrase"	"why did you didn't want to go"

Under our hypothesis, the yes/no questions should have the meanings of tag-questions, not open yes/no questions, although the claim is hard to prove, and the *wh*-questions are like clefts with presupposed relatives (*why is it you're cutting meat*).
Under the Strict Interface, syntax and semantics converge. One reason that a child would use copying is precisely to preserve the presupposition. A second reason is that copying transformations can be first learned at phonetic operations with Total Reconstruction, thus the interpretation would involve treating both the copy and the trace as if it were the full tensed element.
This notion of Total Reconstruction has been articulated by Sauerland & Elbourne (2002) and Miyagawa (2005). If the child first does Total Reconstruction, then we predict that even non-copied inverted SAI questions initially are like tag questions. Here is a pilot experiment that goes in that direction. Consider the contrast between:

(54) a. anyone can lift a ball → exhaustive = *everyone*
b. can anyone lift a ball → Qp-neg → *anyone* = Free Choice (or exhaustive reading)

[7] See Guasti (2006); deVilliers, deVilliers & Roeper (2010) for some references.
[8] Fitzpatrick (2005) shows inversion changes presupposition in *wh*-questions too. Note the contrast: *why don't you go outside* (no required presupposition) and *how come you don't go outside* (necessary presupposition). Conroy (2006) shows that variation in inversion in *wh*-questions in children patterns with this distinction.

This Scene was given to a child and the child was asked:

(55) [insect, dog, fish, child]
Can anybody play with a ball?
→ adult: *yes*, the child or dog (yes-bias chooses)

An adult if asked, would give "no, not a insect or a fish" to a tag-question:

(56) Anybody can play with a ball, is that right?

If the child has a yes-bias (and because *anybody* has a person or personlike bias), we would expect "yes" for "Can anybody play with a ball" instead the 4yr old child gave a tag-like response:

(57) "no, not the fish or the insect"

Even for an adult, the copied version seems to prefer this Free Choice, not universal reading :

(58) → *Can* anybody *can* play with a ball?

To sum up, the experiment supports both the notion of Total Reconstruction and the presupposed proposition reading.
What can we conclude from the early evidence:

(59) a. early use of inversion
b. verum focus
c. copying to create tag-questions
d. disorder linked to Tense

We take this to reflect a mechanical and strict interface between syntax and semantics.

What is astonishing and critical is that this evolution happens very early with children in the 2-3 yr range, while the block of a presupposition under attitude verbs like *say*, *think*, *tell* which are not inherently more complex, is not worked out until several years later, to which we now turn.
We argue below that the presence of easy pragmatic inferences that overrule what strict syntactic/semantic connections require, like those courtroom confusions outlined above, are an important part of why some realizations of Strict Interfaces seem not strict to children and delay acquisition.

4 The Inference toward Default Tenselessness

Later stages, nonetheless, show an application of inferences to what may be a default Tenseless repesentation. Children show:

(60) Event interpreted as proposition.
Proposition interpreted as event.

In a pilot experiment conducted by Mary Wilson and associates at Laureate Learning Corporation, 6 children were given scenes and sentences like this:

5/6 answered "Amy" (or comparable for other stories) for "who heard that Jack played the trumpet in his room." None of the children did the reverse: took *heard Jack play the trumpet* to be "grandma". Therefore a tensed clause was taken to be, or entail, an untensed small clause event, but not the reverse. While the primary direction is: Proposition ⇒ Event, there is some evidence of the opposite as well.

While adults know when an inference from a proposition to an event is warranted, a child may not.

4.1 Inferences that Overrule Grammar

Inference, however, hangs in the air over many situations and is the motive for many statements. Thus the statement above:

(61) "Don't you want to go outside?"

is usually expressed as a *suggestion* not a request for a propositional judgement of truth or falsity equivalent to: 'Is it the case that you don't want to go outside." Because such pragmatic goals as *suggestion* are the purpose of the speech act, there is an understandable inclination to build this into the grammar directly. However, we believe it is of apiece with inferences that *overrule* the overt meaning of the grammar.
Schulz (2003) explored the contrast in a series of experiments with numerous similar stories like this one:

(62) Kermit went shopping and he was supposed to buy eggs.
Then in the evening, he got really hungry, but he said "I have nothing to eat in the house." He didn't remember the eggs.
Did he forget to buy eggs? ⇒ no
Did he forget that he bought eggs? ⇒ yes (Schulz 2003)

A group of 38 children 4-6 yrs made errors on both types. 82% of the children made errors on these sentences and Schulz states that "younger children treat factive verbs as non-factive." Consider the younger children who were most prone to take the non-factive and interpret it as factive: "Did he forget to buy eggs" to mean "did he forget that he bought eggs" and answer "yes".
Unlike the Strict Interface discussed above, verbs like *forget* are *negative implicatives* which means they do not carry a fixed truth, but rather an implication. The fact that he *forget to buy eggs* does not entail that he did not buy eggs strictly, just that he forgot the obligation at some point. Inference must be applied to know which implication to apply. Consider these more elaborate scenarios.

A boy is supposed to buy eggs to make omelettes. He forgets and brings no money to the store. When he comes home, his mother says, "Did you forget to buy eggs?". He says yes and quickly runs back to the store to get some eggs. His father comes home and says:

(63) "Did you forget to buy eggs?"

The natural, pertinent answer is "no" because he did eventually buy eggs, but he also had forgotten as well. Most adults would answer such a question with the most recent and relevant answer: No. Now consider an altered context: Suppose the father comes home, and says "Johnny is always forgetting things – I bet he forgot to buy eggs." "Did you forget to buy eggs?" Now the answer might be "Yes, even though he got them eventually." This answer would, in a

way, respond to both interpretations.
The conclusion is that the child must decide by a *broader situational inference* – which should not be collapsed with Conventional implicatures – to decide which event should be the basis of an answer. So we see that direct syntactic projections, implications, and inferences are all pertinent. It is possible, at early stages, that a child arrives at a neutral reading, which gives free rein to inferences? Suppose she deleted any tense marking and instead generated a gerund:

(64) Did he forget about buying eggs?

This could allow both meanings: *forget to buy* or *forget that he bought*. We consider this a plausible syntactic move. It is plausible in part because the act of deletion would signal (unconsciously) the fact that the grammar was incomplete. It is exactly what the children did in the *hear him play the trumpet* scenario.

4.2 False Belief

A great deal of work has surrounded the fact that children make errors in False Belief contexts. In deVilliers et al. (2010); Roeper (2011); deVilliers & Roeper (to appear) we have developed an approach that parallels our discussion of inversion at the syntactic level. Children allow Total Reconstruction to occur with respect to a syntactic chain which enables them to obey the Strong Minimalist Thesis. Children are known to give the wrong answer in this scenario ("birthday cake" instead of "paper towels"):

(65) This mother snuck out one night when her little girl was asleep and bought a surprise birthday cake. The next day the little girl saw the bag from the store and asked, "What did you buy?" The mom wanted to keep the surprise until later so she said, "Just some paper towels."
– What did the mom *say* she *bought*? ⇒ "a birthday cake"

We argue that when the *wh*-word is interpreted in the lower clause, the SMT demands interpretion there, and then they give a factive answer. Thus they put the what back into the second *trace* position:

(66) What did she say [(what) she bought *trace*.]

That position is inside the first Phase and therefore is interpreted there. The interpretation for the adult is ultimately altered by the impact of the higher verb allowing the lower CP to inherit a feature in syntax. The Total Reconstruction is exactly like what we saw with auxiliary inversion. In fact several other branches

of adult behavior coincide with this analysis to enhance its plausibility. First in French it has been argued that *wh*-in-situ, unlike the fronted case, entails a presupposed propositon:

(67) Il va où. vs. Où va-t'il.
he goes where *where goes he*

The first entails that one went somewhere, while the second might be answered with "nowhere". In addition, in German, it has been claimed that (substandard) partial movement where the *wh*-word is repeated requires factivity for some speakers (Herberger 2001):

(68) Was hat sie gesagt, was sie gekauft hat.
what has she said *what she bought had*

Although this is regarded as substandard and obscure, the effect is exactly what we find with children, who are also known, in a variety of languages, to spontaneously repeat (see deVilliers & Roeper (to appear)):

(69) "What did she say what she wanted for her birthday."

And finally when a *wh*-word is in-situ in English the "correct" reading emerges, as this contrast reveals:

(70) What did he guess t the number was t. [=what was his guess]
Did he guess what the number was. [=guess correctly or just make a guess]

Thus, looked at carefully, the child's decision falls within the options of UG and is shown in parallel adult behavior.

But why do children persist in this reconstruction so much longer than for yes/no questions? In our initial court cases, we discussed how we develop beliefs from imperfect verbal evidence. In these experiments, a story with two prongs is developed, both of which in the larger world of inferences is roughly plausible. The experiment, in effect, seeks to see when children are able to use a precise interpretation of grammar to see which is appropriate. Adults must likewise sense that this discrimination is called for. If adults also allow inferences to exceed what grammar allows, then why should children not do the same? If *say* often takes factive complements and if they are allowed to infer a proposition from a small clause with an event (see *John drink*), then the manner in which the child uses inference to expand, and overinterpret, then their maneuver is within the larger comprehension strategies available to human beings.

Ultimately, the child must grasp that the momentum of the story is precisely a call for the hearer to contrast *what was bought* with *what was said to have been bought*, and therefore the factive assumption must not be made.

5 Conclusions

The reasons, then, that children pass through the misanalysis of SAI years before they reliably handle such False Belief environments involves both the fact that UG favors an SMT analysis of clauses and that they must grasp the role of contrast in the story narrative.

We have allowed several ideas to circle around the Strict Interface that: Tense entails a proposition. We have argued that

1. it motivates the first major step to a transformation in the Root infinitive stage.
2. it promotes Total Reconstruction in order to maintain a tag-question meaning in early yes/no questions and in later long-distance questions, and
3. it allows deletion in some tensed clauses to fulfill pragmatically invited inferences.

This article seeks primarily to embed these syntactic options within a larger semantic and pragmatic context by showing that what children do largely remains in the repertoire of adult response to language as well.

What must the child do to become an adult? She must recognize certain contexts, particularly those where contrast is part of the rhetoric of a narrative, that calls for, in effect, blocking our usual broad inferences about the possible meanings of human utterances.

References

Beaver, David & Bart Geurts. 2010. Presupposition. Ms. `https://webspace.utexas.edu/dib97/sep-v3.2.pdf`.

Boeckx, Cedric. 2008. On the locus of asymmetry in UG. Harvard Manuscript.

Chomsky, Noam. 2005. Three factors in the language design. *Linguistic Inquiry* 36(1). 1–22.

Chomsky, Noam. 2007. Approaching UG from below. In Uli Sauerland & Hans-Martin Gärtner (eds.), *Interfaces + recursion = language? Chomsky's minimalism and the view from syntax-semantics* Studies in Generative Grammar, 1–29. Mouton de Gruyter.

Chomsky, Noam. 2008. On Phases. In Robert Freidin, Carlos P. Otero &

Maria Luisa Zubizarreta (eds.), *Foundational issues in linguistic theory* (Current Studies in Linguistics (CSLing) 45), 133–166. MIT Press.

Conroy, Anastasia. 2006. The semantics of *How Come*: A look at how factivity does it all. In Nina Kazanina, Utako Minai, Philip J. Monahan & Heather L. Taylor (eds.), *University of Maryland Working Papers in Linguistics* 14, 1–24. The University of Maryland Department of Linguistics.

deVilliers, Jill G., Peter deVilliers & Tom Roeper. 2010. What's in a phase. Unpublished.

deVilliers, Jill G. & Tom Roeper. to appear. The acquisition of wh-movement and linguistic theory. In Jill G. deVilliers & Thomas Roeper (eds.), *Handbook of generative approaches to language acquisition*, Springer.

Fitzpatrick, Justin. 2005. The *Whys* and *How comes* of presupposition and NPI licensing. In John Alderete, Chung hye Han & Alexei Kochetov (eds.), *Proceedings of the 24th West Coast Conference on Formal Linguistics* 24, 138–145. Cascadilla Press.

Guasti, María Teresa. 2006. *Language acquisition: The growth of grammar*. MIT Press.

Herberger, E. 2001. Paper on partial movement. Paper presented at LSA.

Higginbotham, James. 1983. The logic of perceptual reports: An extensional alternative to situation semantics. *The Journal of Philosophy* 80(2). 100–127.

Hinzen, Wolfram. 2007. *An essay on names and truth*. Oxford University Press.

Jesney, Karen. 2007. The acquisition of neg-cliticization and inversion. Manuscript Umass.

Klein, Wolfgang. 2006. On finiteness. In Veerle van Greenhoven (ed.), *Semantics meets acquisition* Studies in Theoretical Psycholinguistics, chap. 11, 245–272. Springer Verlag.

Lebeaux, David. 2000. *Language acquisition and the form of the grammar*. John Benjamins.

Legere, C. 2008. The acquisition of two types of factive complements. In Anna Gavarró & M. Joao Freitas (eds.), *Language acquisition and development. Proceedings of GALA 2007*, 337–346. Newcastle, UK: Cambridge Scholars Publishing.

Miyagawa, Shigeru. 2005. EPP and semantically vacuous scrambling. In Joachim Sabel & Mamoru Saito (eds.), *The free word order phenomenon: Its syntactic sources and diversity*, 181–220. Mouton de Gruyter.

Panizza, Daniele, Gennaro Chierchia, Yi-Ting Huang & Jesse Snedeker. (in

press). The relevance of polarity for the online interpretation of scalar terms. To appear in: The Proceedings of Semantics and Linguistic Theory (SALT) 19.

Potts, Christopher & Tom Roeper. 2005. The narrowing acquisition path: From expressive small clauses to declaratives. In Ljiljana Progovac, Kate Paesani & Eugenia Casiellesand Ellen Barton (eds.), *The syntax of nonsententials: Multi-disciplinary perspectives*, John Benjamins.

Roeper, Tom. 1982. The acquisition of gerunds. In Lila Gleitmann & Eric Wanner (eds.), *Language acquisition: The state of the art*, 3–48. Cambridge University Press.

Roeper, Tom. 2011. Vacate phase and a symmetrical theory of movement. Manuscript Umass.

Sauerland, Uli & Paul Elbourne. 2002. Total reconstruction, PF movement, and derivational order. *Linguistic Inquiry* 33(2). 283–319.

Schulz, Petra. 2003. Factivity: Its nature and acquisition. In *Linguistische Arbeiten*, Tübingen: Niemeyer.

Van Valin, Robert D. 2002. The development of subject-auxiliary inversion in english wh-questions: An alternative analysis. *Journal of Child Language* 29(1). 161–175.

Wexler, Kenneth. (to appear). Grammatical computation in the optional infinitive stage. In Jill G. deVilliers and Thomas Roeper: Handbook of Generative Approaches to Language Acquisition.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 79–100. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Appositives in Modal Contexts*

Kjell Johan Sæbø
University of Oslo
k.j.sabo@ilos.uio.no

Abstract. It has recently been argued (by Harris and Potts 2009: 523–552) that so-called non-speaker oriented readings of appositives are a matter of pragmatic perspective shift and thus do not show that appositives contribute to descriptive content. In contrast, I argue that appositives are indeed building blocks of propositions and that non-speaker oriented readings are *de dicto* readings of classical presuppositions (definedness conditions on concepts) in modal contexts. Downward entailing modal contexts, like surprise contexts, provide the key to this conclusion: here, appositives provide a useful means to ensure that an individual retains its relevant properties across the modal space.

1 Introduction

The question whether appositives, like ", a virgin," as in (1), are building blocks of descriptive meaning is answered in the negative by Harris and Potts (2009) (henceforth: HP) but in the positive by Schlenker (to appear).

(1) . . . she, a virgin, would have a child . . .

In particular, HP hold that 'non-speaker oriented' readings, as attested by (3) (from Amaral et al. 2007), as opposed to 'speaker oriented' readings as attested by (2) (from Potts 2005), are a matter of perspective shift: an appositive is usually used to implicate that the speaker is committed to the proposition that the referent has the property (in (2), that Chuck is a psychopath), but pragmatic factors can shift the attribution of that commitment to someone else, typically the holder of an attitude (in (3): Sheila).

(2) Sheila believes that Chuck, a psychopath, is fit to watch the kids.

(3) Sheila believes that Chuck, a sweetheart if ever there was one, is fit to watch the kids.

* I am greatly indebted to the members of the group *Meaning and Understanding across Languages* at the Oslo Center for Advanced Study 2010, particularly to Regine Eckardt, as well as to the audience at the lecture at *Sinn und Bedeutung* 15 in Saarbrücken in September 2010 on which this paper is based.

In contrast, I will argue that 'non-speaker oriented' readings of appositives are *de dicto* readings and that under such readings, appositives do contribute to descriptive content: they help build propositions in contexts like (4).

(4) Mary could not believe that she, a virgin, would have a child.

Generally, I will propose that appositives introduce 'classical' presuppositions, i.e., definedness conditions on functions from evaluation indices, starting with individual concepts and projecting to propositions. In extensional contexts and on *de re* readings in intensional contexts, they are "mere" presuppositions, but on *de dicto* interpretations in intensional contexts, they enter into the argument propositions, thus making a genuine contribution to truth conditions.

I thus follow Schlenker (to appear) in pursuing a semantic strategy for dealing with appositives generally and 'non-speaker oriented' interpretations particularly.[1] Our tactics are a bit different, though: while Schlenker uses facts about the French *subjonctif* and Sequence of tense to show that non-restrictive relative clauses can interact with mood and tense operators, concluding that they convey a mixture of assertion and presupposition, I will use facts about downward entailing intensional contexts to show that nominal appositives can interact with attitude predicates, constraining their argument propositions, and conclude that they convey more traditional presuppositions.

HP offer two major arguments in support of their pragmatic strategy. First, they present experimental evidence to show that non-speaker oriented readings are available outside intensional contexts. I try to counter this in part by arguing that their extensional contexts are intensional after all and in part by appealing to a mechanism of 'concealed quotation'.

Second, conducting a corpus study of appositives under attitude verbs, HP report a bias for speaker orientation. However, their attitude predicates are all upward entailing (if monotone). By contrast, in downward entailing attitude contexts, such as surprise contexts, there is a bias for non-speaker orientation. Thus there is no empirical basis for marginalizing this orientation.

I confront the arguments supporting HP's pragmatic account in Sect. 2. In Sect. 3, addressing the semantics of surprise predicates, I show how the bias for non-speaker orientation in such contexts provides indirect evidence that appositives contribute to propositions, and present direct evidence that they do, in terms of entailment patterns derived from standard analyses.

[1] A note on terminology: the term "appositive", or "apposition", is sometimes used to cover both nominal appositives like the indefinite descriptions in (1)–(4) and non-restrictive relative clauses (which form the main concern of Schlenker (to appear)), or even other forms of non-restrictive modifiers; though most of the points made in this paper are probably relevant for appositives in that broad sense, I will concentrate on nominal appositives in the form of indefinite descriptions.

In Sect. 4 I demonstrate how this contribution can be captured through classical presuppositions, i.e., definedness conditions on functions from worlds. The emerging picture is that when they are read *de dicto*, appositives provide a means to ensure that an individual referred to in a modal context retains its relevant properties across the modal space. Sect. 5 brings conclusions.

2 The Arguments for the Pragmatic Strategy

HP offer two major arguments in favor of their pragmatic theory of perspectival orientation for appositives. One is a finding that perspective shift, from speaker to non-speaker, occurs outside intensional contexts. The other is a finding that in intensional contexts, non-speaker orientation is relatively rare. In this section I examine this evidence and try to counter it.

2.1 Perspective Shift in Extensional Contexts?

HP present evidence from experiments eliciting informant judgments to show that non-speaker oriented interpretations are available even when appositives are in "matrix clauses" (pp. 530ff.). One of their cases is (5):

(5) I am increasingly worried about my roommate. She seems to be growing paranoid.
   a. The other day, she told me that we need to watch out for the mailman, a possible government spy.
   b. The other day, she refused to talk with the mailman, a possible government spy.

The idea is that in (5a), the appositive *a possible goverment spy* is in a modal context while in (5b) it is not. Schlenker (to appear) notes, however, that *refuse* may well be an attitude verb. To me, it is clear that it is. A test will be if we can detect a *de dicto* / *de re* ambiguity in a definite description in a *refuse* context, and it appears that we can. Consider (6):

(6) Goddess Parvati, wife of God Shiva, lonely during one of her husband's long absences, molds a son from mud. Ganesh grows up, and one day, Parvati tells him to guard the front door and not let anybody in while she bathes.
   a. Shiva returns home. Ganesh refuses to let his father in, and Shiva beheads him.
   b. Shiva returns home. Ganesh refuses to let the intruder in, and Shiva beheads him.

(6a) is true on a *de re* interpretation but false on a *de dicto* interpretation, while the converse holds of (6b). This strongly suggests that one of HP's key cases does not show what it is supposed to show, namely, that a non-speaker oriented interpretation is possible in an extensional context. But it is not their only case: they also report non-speaker oriented readings in one or two contexts which are much less clearly intensional, like (7):

(7) My brother Sid hates school.
He puts off his homework, a complete waste of time, to the last minute.

I see here two ways to salvage the semantic strategy, on which the orientation of the appositive *a complete waste of time* toward my brother Sid is a *de dicto*, intensional phenomenon: either

1. one can argue that *put off* is an attitude verb in disguise, or
2. one can argue that the appositive is a piece of quotation in disguise.[2]

Way 1 predicts that a non-speaker-orientation reading is unavailable if the verb cannot under any conditions be an attitude verb. (7a) seems to bear this out:

(7) a. ?My brother Sid hates school. His homework, a complete waste of time, earns him bad grades.

Way 1 also predicts that there can be a *de dicto* / *de re* ambiguity in a context under a transitive verb like *put off* – and (8) might seem to show that there can; the Senate might or might not subscribe to the characterization of the bill as the most important one ever presented to it.

(8) The Senate has postponed the most important bill ever presented to it.

Way 2 is to appeal to a mechanism of 'concealed quotation' which can affect descriptions generally, as, for example, in (9):

(9) The ship that could not sink sank on her maiden voyage in April 1912.

According to Geurts and Maier (2005), pieces of quotation create local *dicendi* contexts with contextually anchored sources (for (9) on a quotation-in-disguise analysis of the definite description, this source might be the White Star Line). On a piece-of-quotation-in-disguise analysis of the appositive, (7) will receive more or less the same interpretation as (7b).

(7) b. My brother Sid hates school. He puts off his homework,

[2] At a more general level, this has been suggested by Anand (2007).

"a complete waste of time", to the last minute.

The contextually anchored sources are subject to constraints, and presumably, one constraint would account for the mild infelicity of (7a) above. Anyway, if the mechanism of concealed quotation is otherwise freely available, it serves to create local attitude contexts with implicit attitude holders and thus to take the edge off the evidence adduced by HP against a semantic strategy.

2.2 A Bias for Speaker Orientation in Intensional Contexts?

HP report on a corpus study designed to measure the frequency of non-speaker oriented readings of appositives in embedded contexts, based on a sample of 31 embedding predicates; attitude predicates and verbs of saying (pp. 540–547). They discover a bias for speaker orientation; non-speaker orientation appears as an exception.

However, apart from non-monotone verbs like *ask*, the attitude verbs in HP's sample are all monotone increasing (upward entailing): *believe*, *claim*, *say*, etc. Once we turn to downward entailing attitude predicates like *surprised*, the picture actually seems to be reversed: there then appears to be a bias for non-speaker-oriented readings. (10a) is a case in point:

(10) a. Mary is surprised that John, a Laestadian, wears a necktie.

In Laestadianism, a conservative Lutheran revival movement centered in the extreme north of Scandinavia, men are (often) not supposed to wear neckties. Hence it is surprising if a Laestadian man does wear one.

So the appositive in (10a) seems to contribute to the argument proposition, constraining it; the intuition is that worlds where John is not a Laestadian are not to be counted when the predicate *surprised* is evaluated. True, in contrast to the case (3) in Sect. 1, with the non-factive, upward entailing predicate *believe*, the appositive is here not controversial: there is (due to the factive predicate) no conflict between the beliefs of the speaker and those of the attitude holder, but it is still evident that the appositive is an ingredient in the object of the attitude and hence that it is essentially oriented towards the holder of the attitude.

In fact, it is typical of appositives in surprise contexts that there is not that much of a difference between a conjoined predicate and an appositive:

(10) b. Mary is surprised that John is a Laestadian and wears a necktie.

To be sure, there is a difference; there is a partition into background and focus in (10a), corresponding to a distinction between 'old' and 'new' knowledge: the property expressed in the appositive seems to count as 'old knowledge' of John on the part of Mary, whereas the property expressed in the carrier clause

seems to count as a piece of knowledge just acquired, triggering the surprise.

Speaker-oriented readings are possible in surprise contexts, but rare:

(11) Mary is surprised that John, a notorious casanova, betrays her.

That John is a notorious casanova is something the speaker knows, not Mary; that she does not know it is the reason for her surprise.

The asymmetry between upward and downward entailing attitudes as to what is the 'normal' orientation – toward the speaker with the former, toward another individual with the latter – calls for an explanation. Could there be a pragmatic explanation? Well, one might think that the 'normal' orientation is what provides an explanation for the attitude in discourse relational terms – but note that while that is indeed the normal case under *surprised*, cf. (10a), it is the exceptional case under *believe*, cf. (3); in other words, non-speaker orientation is consistently what would go to explain the attitude.

Other pragmatic explanations may be conceivable, but in the next section I will suggest an explanation building on the semantics of surprise predicates, and also supply more concrete evidence that non-speaker oriented appositives under such predicates play a semantic role.

3 Appositives and the Semantics of Surprise

Below, I go into the semantics of surprise predicates and show that in regard to the inference patterns that standard analyses predict, appositives in embedded clauses commonly behave as if they were integral parts of those clauses. They pattern with conjoined predicates in expressing properties that are relevant for evaluating the surprise predicates, thus serving a significant semantic purpose.

3.1 Surprise Semantics and Contextual Perspectives

HP predict widely different inference properties for (10a) and for (10b): while according to their theory of pragmatic perspective shift, (10a) means the same as (10c) in the dimension of descriptive content and implicates (10d) in the dimension of expressive content, there is no prediction that (10b) entails (10c).

(10) a. Mary is surprised that John, a Laestadian, wears a necktie.
b. Mary is surprised that John is a Laestadian and wears a necktie.
c. Mary is surprised that John wears a necktie.
d. Mary believes that John is a Laestadian.

In fact, scholars who have analyzed predicates like *surprise* agree that clauses like (10b) do not entail clauses like (10c) but that clauses like (10c) together with clauses like (10d) do entail clauses like (10b). As acknowledged by those

scholars, our intuitions may not be so clear in these regards, and I will return to the reasons for that below; but note at once that (10a) does not seem to entail (10c) any more than does (10b). That is to say: contrary to what HP predict, in certain contexts, appositives are intuitively not more detachable from the descriptive content than conjoined predicates.

Asher (1987) identifies a class of 'negative factive' attitude verbs, obeying, i.a., the inference rule 'weakened downward entailment' (WDE) (a for the agent, α for the attitude predicate at issue, β for *believe*):

(12) Weakened downward entailment:
$a\,\alpha\,\phi \wedge [\![\psi]\!] \subseteq [\![\phi]\!] \wedge a\,\beta\,\psi \Rightarrow a\,\alpha\,\psi$

This class contains a variety of predicates, but the adjective *surprised* is usually considered as the paradigmatic case. Thus (10c) and (10d) are to jointly entail (10b), but (10b) is not to entail (10c).[3] There is a consensus on this: von Fintel (1999), Sharvit (2002), and van Rooij (2006) concur in predicting (12).

The reason that (weakened) downward entailment is predicted by all is that all assume the basic truth condition to be that the argument proposition is a subset of something (the 'unexpectation' worlds) or has an empty intersection with something (the 'expectation' worlds); cf., e.g., Sharvit (2002: 103):

(13) Semantics of Surprise according to Sharvit (2002: 103):
$[\![\,\textit{surprise}\,]\!](w)(P)(a) = 1$ iff $P(w) \subseteq \texttt{NONEXP}(a)(w)$

And that is of course easier the stronger the argument proposition, $P(w)$, is.

Reality is not quite so simple, though. It may often appear as if *surprised* fails to entail downward, or even as if it entails upward. (14) would provide a case in point for the former, (10b, c) might go to suggest the latter.

(14) John is surprised that Mary won a medal, but he is not surprised that she won a bronze medal.

(10) b. Mary is surprised that John is a Laestadian and wears a necktie.
c. Mary is surprised that John wears a necktie.

The customary way to account for the apparent failure of surprise predicates to entail downward, or their semblance of entailing upward, is to appeal to an implicit restriction, surreptitiously modifying (as the case may be, weakening or strengthening) the argument proposition in the putative conclusion.

[3] Strictly, (10c) and "Mary believes that John is a Laestadian and wears a necktie" are to entail (10b), but since (10c) presupposes that Mary believes that John wears a necktie, (10d) is enough.

To be specific, when we pass from (10b) to (10c) to test whether the latter follows from the former, it is very difficult to keep the context constant and not let the property explicitly ascribed to John in the complement of the premiss carry over, as an implicit restriction, to the complement of the conclusion. Thus premiss and conclusion are easily judged to be equivalent.

Kadmon and Landman (1993) call this implicit restriction a 'perspective' and propose to code it as a contextual parameter in the meaning of *surprised*:

> To be surprised that A is always relative to a certain perspective on A, a perspective that determines what it is about A that is surprising and in virtue of what it is surprising. The perspective is a contextually determined parameter in the interpretation of *surprised*, very much in the same way that a 'modal base' (Kratzer 1981) is a contextually determined parameter in the interpretation of modals. [...] The perspective enters into the semantics of *surprised* and affects the truth conditions of sentences containing it. (Kadmon and Landman 1993: 381)

Perspectives "can be at least partly specified by explicit linguistic text", e.g.:

(15) – I can't believe she's divorcing HIM.
– Yeah, such a rich man.
– No, such a KIND man!

von Fintel (1999) elaborates on Kadmon and Landman's proposal by providing "a semantics for the attitudes that is specifically sensitive to a shifting domain of ordered worlds". His (main) proposal for *surprised* is, slightly adjusted:[4]

(16) Semantics of Surprise according to von Fintel (1999: 122–125):
$[\![\textit{surprised}]\!]^{f,g}_w = \lambda p \lambda \alpha : \mathscr{B}_\alpha(w) \subseteq p,\ \mathscr{B}_\alpha(w) \subseteq f_\alpha(w),$
$f_\alpha(w) \cap p \neq \emptyset,\ f_\alpha(w) - p \neq \emptyset .\ \forall w' \in max_{g_\alpha(w)}(f_\alpha(w)) :\ w' \notin p$

Here f and g are parameters similar to the modal base and the ordering source in Kratzer's theory of modality, f assigning a set of worlds and g assigning a set of propositions to the subject of *surprised* and the current index of evaluation. The definedness conditions (between : and .) say that the subject of *surprised* believes the complement p and the set of relevant worlds $f_\alpha(w)$ and that the relevant worlds contain *p*- and *non-p*-worlds. The content proper is, in words, that in all the most expected of the relevant worlds, p is not true. Note that the logical structure of this definition is the same as that of Sharvit's definition (13); the two definiens clauses are contrapositions of each other, and the attitude is

[4] von Fintel does not actually define *surprised* but *sorry*, intending that definition to carry over to *surprised* "with suitable adjustments". I substitute a 'denotation equation' for his truth condition, and I omit his coindex on the attitude predicate and on the functions f and g on the understanding that f and g are here the functions fitting *surprised*.

downward entailing. The essential novel feature of von Fintel's definition is the relativization to a set of relevant worlds compatible with the subject's beliefs.

It is natural to think of $f_\alpha(w)$ as the intersection of a set of propositions, e.g., the proposition that Mary is a virgin, or that John is a rich man, or a kind man, or a Laestadian, – or that the topic time is Good Friday:

(17) Bjarne was in Hamburg on Good Friday in 1984 and was outraged that the brothels were open.

More generally, if the set $f_\alpha(w)$ is the intersection over a set of propositions Φ and p involves rigid or *de re* reference to an individual, with a name, a pronoun, or a definite description on a *de re* interpretation, it is reasonable to expect Φ to include the ascription of a property to that individual.

3.2 Surprise Semantics and Appositives

The way appositives function in the cases so far considered suggests that they provide a means to ensure that individuals referred to in intensional contexts retain their relevant properties across the possible worlds under consideration, making explicit what would otherwise have to be left implicit and ascertaining that certain properties are carried along throughout the modal space at issue. In short, they contribute content that can be much *at issue*. In the next section, I sketch a way to formalize this notion. But first, I will present evidence that appositives matter for the truth conditions of downward entailing attitudes, and provide an answer to the question why non-speaker oriented interpretations are not rare but frequent when appositives are in such contexts.

Consider (18a–c). (18a) contains two instances of complex appositives, appositives consisting of two predicates – *Jewish man*, *Samaritan woman*. In (18b), the second member of each pair is deleted, in (18c), the first member is.

(18) In John 4 Jesus spoke with a Samaritan woman and asked for a drink. She had two things against her: she was a woman, and a Samaritan.

a. She was surprised that he, a Jewish man, spoke to her, a Samaritan woman.
b. She was surprised that he, a Jew, spoke to her, a Samaritan.
c. She was surprised that he, a man, spoke to her, a woman.

There is a strong intuition here that (18a) entails neither (18b) nor (18c). That is to say, surprise contexts are not closed under the weakening of appositives. This is predictable if the appositives help to build the argument propositions, but not – or only with difficulty (see below) – if they do not.

So why does this case present a different picture from a case like (10a, c),

where the intuition that the first sentence fails to entail the second is weaker?

(10) a. Mary is surprised that John, a Laestadian, wears a necktie.
c. Mary is surprised that John wears a necktie.

Here, as with (10b) in relation to (10c) (see Sect. 3.1), it is difficult to blot out the property explicitly ascribed to the subject of the first complement clause; it easily influences the second as an implicit constraint on the relevant worlds. This source of error is evidently eliminated in (18a/b) and (18a/c), presumably because by explicating a property, we signal that implicit ones are not relevant.

Now if an appositive can never contribute to a proposition, the missing inferences in (18) are mysterious: (18a–c) should then be equivalent.

Note, in addition, that the appositives in (18a) represent *old information*, both in regard to the common ground and to the belief state of the experiencer: the context entails both that he was a Jew and a man and she a Samaritan and a woman and that she knew that. This makes a theory where appositives just describe separate, scopeless bits of expressive content not seem very plausible; in fact, they would appear to be superfluous in such cases. More clearly still, noone needs reminding that someone referred to with *she* or *Maria* is a female:

(19) She became accustomed to the double-takes from male firefighters who were surprised that she, a female, could head the station.

(20) Maria tells us that the students are surprised that she, a woman, talks to them about math and natural sciences.

Admittedly, one might try to account for the missing inferences in (18) while maintaining that (18a–c) are equivalent by appealing to *discourse relations*: it could be argued that experiencer-oriented appositives in attitude contexts are commonly intended as explanations; if the complex appositives in (18a) give full explanations, then the simple ones in (18b or c) cannot be expected to do so too. After all, the semantics of *surprised* refers to contextually determined relevant beliefs, and the appositives could be argued to supply those by general pragmatic principles. Hence it is difficult to actually prove that the appositives make a semantic contribution.

But if we do assume that they do, we are able to answer the question why subject-oriented readings are frequent in downward entailing attitude contexts although they are infrequent in upward entailing ones. If under such readings, appositives do restrict argument propositions, then there is a close analogue in determiner domain restriction, more noticeable, because it is more useful, with downward than with upward entailing determiners, cf. Heim (to appear):

> For all we can tell, every determiner may be construed with a covert restrictor in addition to its overt one and thus apply to an effectively narrowed set of contextually relevant or salient entities. We just don't see this as clearly with some determiners as with others. *the*, along with *every* ..., is not upward monotone, so covert restrictors weaken the presupposition or assertion, giving an otherwise truth-value-less or false claim a chance to be felicitous and true.

By analog, we can say that decreasing attitude contexts show a bias for subject-oriented readings because here, such readings serve to weaken the statement, giving an otherwise potentially false assertion a better chance to be true, while increasing attitude contexts show a bias for speaker-oriented readings because there, subject-oriented readings serve to strengthen the statement. If that is so, we would expect negated versions of increasing attitude predicates to show a propensity for subject orientation as well, and this seems to be borne out:

(4) Mary could not believe that she, a virgin, would have a child.

I conclude from the evidence that appositives *can* help build propositions. The question is now how.

4 Appositives as Definedness Conditions

Faced with a picture of appositives in different roles in different contexts – in nonmodal contexts or on speaker-oriented readings in modal contexts, they add information on referents in a *de re* mode, but on non-speaker-oriented readings in modal contexts, they add information on referents in a *de dicto* manner – I will attempt to unite these two roles by describing appositives as introducing definedness conditions on partial individual concepts, or more generally, as these project, on partial functions from worlds, ultimately partial propositions. This approach necessitates a method of intensional composition, roughly à la Beaver and Krahmer (2001), and I will now specify the necessary machinery.

4.1 From Appositives to Partial Propositions

At the bottom, I posit a silent appositive functor $\mathscr{A}$ whose meaning is:[5,6]

(21) $[\![\mathscr{A}]\!] = \lambda P_{e(st)} \lambda x_{(se)} \lambda w : x_w \in \mathrm{D}_e , P_w(x_w) . x_w$

Suppose we build the meaning of "surprised that Mary, a virgin, is pregnant". I consider the indefinite article in the appositive as spurious, i.e., disregard it.

(22) $[\![\mathscr{A}]\!]([\![\mathit{virgin}]\!]) = \lambda x_{(se)} \lambda w : x_w \in \mathrm{D}_e , \mathscr{V}_w(x_w) . x_w$

[5] This is the indefinite case, where the first argument is a function from individuals to propositions; a definite case, where this argument is an individual concept, is also definable.

[6] Notation: Stuff between : and . are definedness conditions. Convention: $f_w(g) = f(g)_w$.

This is the full appositive meaning, an operation on partial individual concepts. It carries two presuppositions (definedness conditions): one projected from its argument, the other coincident with its own content. ($\mathscr{V} = [\![virgin]\!]$.)

The proper name *Mary* is, standardly, taken to mean a constant, though in principle a partial, function from worlds to individuals.

(23) $[\![\mathscr{A}]\!]([\![virgin]\!])([\![Mary]\!]) = \lambda w : \mathscr{M}_w \in \mathrm{D}_e , \mathscr{V}_w(\mathscr{M}_w) . \mathscr{M}_w$

This is Mary with the definedness condition that she is a virgin.

For partial individual concepts like this to combine with properties like $[\![virgin]\!]$ or $[\![pregnant]\!]$, which are (as in Beaver and Krahmer 2001) functions from individuals to propositions, they are lifted to functions from such *e(st)* 'properties' to propositions by the abstract filter function $\mathscr{F}$:

(24) $[\![\mathscr{F}]\!] = \lambda f_{(se)} \lambda P_{e(st)} \lambda w : f_w \in \mathrm{D}_e . P_w(f_w)$

(25) $[\![\mathscr{F}]\!]([\![\mathscr{A}]\!]([\![virgin]\!])([\![Mary]\!])) =$
$\lambda P_{e(st)} \lambda w : \mathscr{M}_w \in \mathrm{D}_e , \mathscr{V}_w(\mathscr{M}_w) . P_w(\mathscr{M}_w)$

This lifted DP meaning can be used directly in subject position, applying to a property like $[\![pregnant]\!]$, resulting in (26), or more generally in a position hosting a DP after QR, maybe from object position. ($\mathscr{V} = [\![pregnant]\!]$.)

(26) $[\![\mathscr{F}]\!]([\![\mathscr{A}]\!]([\![virgin]\!])([\![Mary]\!]))([\![pregnant]\!]) =$
$\lambda w : \mathscr{M}_w \in \mathrm{D}_e , \mathscr{V}_w(\mathscr{M}_w) . \mathscr{P}_w(\mathscr{M}_w)$

This is the partial proposition that Mary, a virgin, is pregnant.

4.2 From Partial Propositions to Surprise

Now we need a meaning for *surprised* which can take partial propositions and project their definedness conditions appropriately. It is commonly assumed that *surprised* introduces the presupposition that the subject believes the argument proposition.[7] This will now incorporate the presuppositions brought along by the argument proposition, in particular, the one originating in the appositive, because what the subject must believe is not the partial argument proposition but its positive extension, the set of worlds where it is defined and not negative. By the same token, what must lie outside the subject's relevant expectations for the attitude predicate to hold of its two arguments is not the first argument itself but the set of worlds where it is true, which means that the definedness

[7] van Rooij (2006: 217), following Asher (1987), assume that such predicates introduce two layers of presupposition, the argument proposition itself and the proposition that the subject believes it; however, von Fintel (1999), following Heim (1992), only assumes the latter layer, as I will too.

condition (Mary is a virgin) and the content proper (Mary is pregnant) both contribute to define the set of worlds at issue.

(27) is an augmentation of (16) in Sect. 3.1, based on von Fintel (1999):

(27) $[\![\, surprised \,]\!]^{f,g} = \lambda\phi\lambda x\lambda w : \mathscr{B}_x(w) \subseteq \lambda w'\phi_{w'} = 1\,.$
$max_{g_x(w)}(f_x(w)) \cap [\lambda w'\phi_{w'} = 1] = \emptyset$

($max_{g_x(w)}(f_x(w))$ = those relevant worlds compatible with x's beliefs that x most expects)

(28), then, is the meaning of "surprised that Mary, a virgin, is pregnant".

(28) $[\![\, surprised \,]\!]^{f,g}([\![\mathscr{F}]\!]([\![\mathscr{A}]\!]([\![virgin]\!])([\![Mary]\!]))([\![pregnant]\!])) =$
$\lambda x\lambda w : \mathscr{B}_x(w) \subseteq \lambda w' \mathscr{M}_{w'} \in \mathrm{D}_e, \mathscr{V}_{w'}(\mathscr{M}_{w'}), \mathscr{P}_{w'}(\mathscr{M}_{w'})\,.$
$max_{g_x(w)}(f_x(w)) \cap [\lambda w' \mathscr{M}_{w'} \in \mathrm{D}_e, \mathscr{V}_{w'}(\mathscr{M}_{w'}), \mathscr{P}_{w'}(\mathscr{M}_{w'})] = \emptyset$

Applied to Joseph, this becomes the partial function from worlds to truth values that is defined iff Joseph believes that Mary is a virgin and pregnant and true iff it is defined and the worlds where Mary is a virgin and pregnant all lie outside the most expected relevant belief worlds of Joseph.

That may be a fair first attempt at a definition of the definedness and truth conditions of (29a), but note two problematic aspects of it:

1. The definition of the attitude in (27) fails to predict a difference between (29a) and (29b), that is, between appositives and conjoined predicates in embedded positions.

   (29) a. Joseph is surprised that Mary, a virgin, is pregnant.
   b. Joseph is surprised that Mary is a virgin and (is) pregnant.

2. It seems contradictory to say, for (30) for simplicity, on the one hand that for the proposition to be defined, the subject must believe that Mary is pregnant, and on the other that for it to be true, the set of worlds where she is must lie outside the subject's most expected relevant belief worlds.

   (30) Joseph is surprised that Mary is pregnant.

Now in fact, both problems can be tackled with one tool, by distinguishing in the definition of *surprised* between the intersection over x's 'old beliefs' in w, $\mathscr{B}_x(w)$, and the intersection over x's 'full beliefs' in w, $\mathscr{B}^+_x(w)$ (a subset of it). It is the old beliefs that x's most expected relevant worlds should be based on, before the new belief coming from the argument proposition is formed, and it is

the old beliefs that the presupposition inherited from the argument proposition, originating in the appositive, should be required to include. So I propose this amended definition (needless to say, to do a proper job of it, the notions of old and full beliefs should be defined in terms of eventualities of surprise):

(31) $[\![\, surprised \,]\!]^{f,g} = \lambda\phi\lambda x\lambda w : \mathscr{B}_x(w) \subseteq \lambda w'\phi_{w'} \in \mathrm{D}_t\,,$
$\mathscr{B}^+_x(w) \subseteq \lambda w'\phi_{w'} = 1\,.$
$max_{g_x(w)}(f_x(w)) \cap [\lambda w'\phi_{w'} = 1] = \emptyset$

($max_{g_x(w)}(f_x(w))$ = those relevant worlds from $\mathscr{B}_x(w)$ that x most expects)

This definition leads to the following revised definition of the definedness and truth conditions of "Joseph is surprised that Mary, a virgin, is pregnant", (29a):

(32) $[\![\, surprised \,]\!]^{f,g}([\![\mathscr{F}]\!]([\![\mathscr{A}]\!]([\![virgin]\!])([\![m]\!]))([\![pregnant]\!]))([\![j]\!]) =$
$\lambda w : \mathscr{B}_j(w) \subseteq \lambda w'\mathscr{M}_{w'} \in \mathrm{D}_e, \mathscr{V}_{w'}(\mathscr{M}_{w'})\,; \mathscr{B}^+_j(w) \subseteq \lambda w'\mathscr{P}_{w'}(\mathscr{M}_{w'})\,.$
$max_{g_j(w)}(f_j(w)) \cap [\lambda w'\mathscr{M}_{w'} \in \mathrm{D}_e, \mathscr{V}_{w'}(\mathscr{M}_{w'}), \mathscr{P}_{w'}(\mathscr{M}_{w'})] = \emptyset$

($max_{g_j(w)}(f_j(w))$ = those relevant worlds in $\mathscr{B}_j(w)$ that j expects the most.) There are two layers of definedness conditions here: Joseph must have believed and believe that Mary is a virgin and he must believe now that she is pregnant (to accord with the truth condition, this must be a new belief); by contrast, on the definition of the definedness and truth conditions of (29b), there is only one substantial level of presupposition: Joseph must believe that Mary is a virgin and (is) pregnant (and, sloppily, one of the two conjuncts must be a new belief). Thus we have now a reasonable truth condition and a distinction between an appositive and a conjoined predicate at the level of definedness conditions.

4.3 The Speaker Oriented Case: *de re*

How about speaker-oriented readings? Consider (33), akin to Potts' (2):

(33) Mary is surprised that John, a notorious casanova, betrays her.

Mary is not aware that John is a notorious casanova. I will treat this reading as a *de re* reading of the DP "John, a notorious casanova", employing a designated variable for the actual world – v – and an abstract actualizer operator – @:[8]

[8] There are of course various ways of construing *de re* interpretations (for recent surveys of the state of the art, see von Fintel and Heim (2009) and Schwager (to appear)); if @ as defined in (34) is considered the general method, it would seem to imply that only definite DPs, with individual concept, type $\langle se \rangle$, meanings, can have such readings; for indefinite descriptions, to the extent that

(34) $[\![@]\!] = \lambda f_{(se)} \lambda w \,.\, f_v$

In extensional contexts, this operator is redundant. To see this, consider (35) and its two semantic structures (36) and (37), one with, the other without @:

(35) Professor Duriarti, a notorious criminal, has escaped from prison.

(36) $[\![\mathscr{F}]\!]([\![\mathscr{A}]\!]([\![\textit{notorious criminal}]\!])([\![\textit{Duriarti}]\!]))([\![\textit{escaped}]\!])$
$= \lambda w : \mathscr{D}_w \in \mathrm{D}_e \,,\, \mathscr{NC}_w(\mathscr{D}_w) \,.\, \mathscr{E}_w(\mathscr{D}_w)$

(37) $[\![\mathscr{F}]\!]([\![@]\!]([\![\mathscr{A}]\!]([\![\textit{notorious criminal}]\!])([\![\textit{Duriarti}]\!])))([\![\textit{escaped}]\!])$
$= \lambda w : \mathscr{D}_v \in \mathrm{D}_e \,,\, \mathscr{NC}_v(\mathscr{D}_v) \,.\, \mathscr{E}_w(\mathscr{D}_v)$

The main difference is that the presupposition stemming from the appositive is on the construal in (37) anchored to *v*, the actual world. This does not make a difference once the sentence is evaluated, though. What has been built above, and all along, are not sentence denotations (truth values) but propositions. But when these are 'finished' and are to be used as assertions or more generally as representatives, they are applied to *v*, yielding a denotation, a truth value. And then the difference between (36) and (37) is levelled out.

Returning to (33) and the *de re* interpretation of the embedded appositive, when $[\![@]\!]$ applies to $[\![\mathscr{A}]\!]([\![\textit{notorious casanova}]\!])([\![\textit{John}]\!])$, the result is:

(38) $[\![@]\!]([\![\mathscr{A}]\!]([\![\textit{notorious casanova}]\!])([\![\textit{John}]\!])) =$
$\lambda w [\lambda w : \mathscr{J}_w \in \mathrm{D}_e \,,\, \mathscr{NC}_w(\mathscr{J}_w) \,.\, \mathscr{J}_w](v) =$
$\lambda w : \mathscr{J}_v \in \mathrm{D}_e \,,\, \mathscr{NC}_v(\mathscr{J}_v) \,.\, \mathscr{J}_v$

This is a partial constant function, defined if and only if the name *John* actually denotes an individual and this individual is actually a notorious casanova, and yielding, if defined, that individual no matter what. The partial proposition that John, a notorious casanova, betrays Mary (here the type *e(st)* property $\mathscr{B}^m$) is:

(39) $[\![\mathscr{F}]\!]([\![@]\!]([\![\mathscr{A}]\!]([\![\textit{notorious casanova}]\!])([\![\textit{John}]\!])))([\![\textit{betrays Mary}]\!])$
$= \lambda w : \mathscr{J}_v \in \mathrm{D}_e \,,\, \mathscr{NC}_v(\mathscr{J}_v) \,.\, \mathscr{B}^m_w(\mathscr{J}_v)$

So far, this is parallel to (37), and the actualizer is redundant. But when (39) is embedded in an intensional context, this changes. The full partial proposition that Mary is surprised that John, actually a notorious casanova, betrays her is:

(40) $\lambda w : \mathscr{B}_m(w) \subseteq \lambda w' \, \mathscr{J}_v \in \mathrm{D}_e, \mathscr{NC}_v(\mathscr{J}_v) \,;\, \mathscr{B}^+_m(w) \subseteq \lambda w' \mathscr{B}^m_{w'}(\mathscr{J}_v) \,.$

transparent evaluation readings are desired, one could consider a choice function analysis.

$$max_{g_m(w)}(f_m(w)) \cap [\lambda w' \mathscr{J}_v \in \mathrm{D}_e, \mathscr{NC}_v(\mathscr{J}_v), \mathscr{B}^m_{w'}(\mathscr{J}_v)] = \emptyset$$

There are two cases: either the name *John* actually denotes an individual and this individual is actually a notorious casanova, in which case the proposition is defined iff Mary believes that this individual betrays her and true iff she is also surprised that he does; or not, that is, John is not actually a notorious casanova; then the proposition is only defined if Mary believes the empty set of worlds. That may be thought to be possible; after all, one can have inconsistent beliefs. If we want the proposition to be plainly undefined in case John is not actually a notorious casanova, we could consider including the factive presupposition in the definedness condition introduced by the attitude: $\lambda\phi\lambda x\lambda w : \phi_w = 1 \ldots$.

Importantly, though, however the definedness conditions are dealt with, in contrast with the *de dicto* construal, on the *de re* construal the content of the appositive plays no role in the content of the clause (the second line in (40)) and so does not affect its truth conditions: if John is indeed a notorious casanova, the conjunct $\mathscr{NC}_v(\mathscr{J}_v)$ is superfluous.

4.4 Discussion

The analysis developed above has some welcome consequences but also some problematic features. First, since the actualizer can apply below an appositive, the analysis predicts that there can be *de re* readings of definite descriptions with appositives read *de dicto*, – and this seems to be borne out:

(41) Thoas wants Iphigenia to sacrifice her own brother, a stranger who has tried to steal the statue of Artemis.

Thoas is not yet aware that Orestes is Iphigenia's brother. But he is well aware that Orestes has tried to steal the statue of Artemis, and he is convinced that Orestes is a stranger. If this is a natural reading of (41), it is derivable.

By the same token, however, it is predicted that there cannot be *de dicto* readings of definite descriptions with appositives read *de re*, – and this question seems more open. To test it, we may consider cases like (42).

(42) ?Gloucester wants his loyal son, a traitor to him, to inherit his title.

The only sensible interpretation is that the son that Gloucester wants to inherit his title is Edmund, loyal in his belief worlds but actually a traitor. To the extent that this interpretation is unavailable, it serves to confirm the prediction that if the appositive is in the scope of @, so must the expression it applies to be. But it may not be obvious that (42) is dubious. (43) is predicted not to be dubious: the son that Gloucester wants to disinherit is Edgar, a traitor in his belief worlds but loyal in reality. It is not clear that this derivable reading is more accessible

than the intended but not derivable reading of (42).

(43) ?Gloucester wants to disinherit his loyal son, a traitor to him.

If (43) is indeed felt to be no more felicitous than (42), this reflects unfavorably on the formalism developed in this section.

Another, more general, point of discussion that should be raised concerns what Schlenker (to appear) terms the *epistemic status* of appositives in relation to the presupposition-as-definedness-condition that their contribution has been identified as. According to Schlenker, nonrestrictive relative clauses introduce conditions similar to presuppositions but special in being easy to accommodate (*translucency*). Thus their content, while not trivial, should be uncontroversial. The close parallel between (35) and (44) indicates that Schlenker would intend this characterization of nonrestrictive relatives to carry over to appositives.

(44) Professor Duriarti, who is a notorious criminal, has escaped from prison.

(35) Professor Duriarti, a notorious criminal, has escaped from prison.

The analysis proposed in this paper simply predicts that (35) lacks a truth value unless Professor Duriarti is actually a notorious criminal, and the question is how this definedness condition on the world of evaluation can be brought into accord with Schlenker's notion of a 'translucent' condition. On the face of it, the two notions seem very different; in particular, it seems too strong to deny (35) a truth value should the professor turn out not to be a notorious criminal.

The relevant notion of presupposition has been referred to as a 'classical' or 'traditional' notion, and my intention has been that this notion is appropriate for some but not all triggers and coexists with a context oriented conception, apt for triggers like *again* and *also*, *start* and *stop*, non-emotive factives, and anaphoric definite descriptions. In these and more cases, being entailed by the context is the ideal and accommodation is difficult. Appealing to a definedness condition for appositives or nonrestrictive modifiers more generally can be seen as a way to decrease the demands on the context and to allow for a comparative ease of accommodation, and thus as a way to emulate 'translucency'.

Thus as long as the information contained in the appositive, though new, does not conflict with the information state of the addressee, she will typically be willing to accept it on faith. Conversely, if that information does conflict with the addressee's information state, she may well be prepared to disregard it and still assess the information contained in the carrier sentence:

(36) It says here: "Professor Duriarti, a notorious criminal, has escaped

from prison." Since he is innocent, I am glad to learn that he is a free man.

The additional assumption needed is thus that (simplex) sentences containing nonrestrictive modifiers can still have a truth value even if the modifier should be false or undefined – and the need for such a notion of 'accommodation', consisting not in adding information but in disregarding it, is shared by other presupposition triggers which lend themselves to a definedness analysis, like referential definite descriptions, as in (45), or gender markers, as in (46).

(45) – Who is the man drinking a martini? (from Donnellan 1966)
– It's not a martini, but anyway, it's Smith.

(46) – Pirmins Mathelehrer ist ein pädagogisches Genie! (German)
Pirmin's mathteacher$_{\text{masc}}$ *is a pedagogical genius*

– Es ist eine Lehrerin, aber ja, genial ist sie.
it is a teacher$_{\text{fem}}$ *but yes genius is she*

On the whole, a critical point of discussion is whether and to what extent the analysis of appositives presented in this paper should be expected to extend to nonrestrictive modifiers such as those exemplified by (47)–(49):

(47) The pharmacist was surprised that this *old woman* was interested in condoms.

(48) My friends are surprised that *shy and sweet* me is learning self defense.

(49) She was startled to see the *devoted detective* Mickey Mouse shake hands with his ruthless rival Black Pete.

In all these cases, the italicized NP or AP is redundant in the sense that it does not contribute to the identification of the referent of the description it is part of. In (47), *this individual* would be sufficient for the identification of the referent, in (48), the pronoun *I (am)* would, and in (49), the name *Mickey Mouse* would (cf. Matushansky (2008: 595ff.) for a recent analysis of this last construction). All three descriptions are embedded in a downward entailing modal context, and seem to give the same interpretive effect as the above-studied appositives: they may not convey new, or even nontrivial, information, but the information that they convey plays a critical role for the evaluation of the modal predicate. What made it surprising to the pharmacist that this individual was interested in condoms was the property of being an old woman, etc. So at least with respect to the contexts in focus in this paper, a parallel treatment of several, if not all, sorts of nonrestrictive modifiers appears as desirable – and to the extent that the

different sorts turn out to display a different behaviour in other environments, for instance, in simplex sentences, it is to be hoped that this can eventually be described as a variation within the general frame of analysis developed above: Supplements, including nominal appositives, nonrestrictive relatives, and the types of nonrestrictive modifiers exemplified in (47)–(49), can contribute to the content of a clause because they introduce presupposition-like conditions.

5 Conclusions

The point of departure for this study was the following double claim made by Harris and Potts (2009) concerning the perspectival orientation of appositives:

1. Non-speaker oriented readings are independent of intensionality; they are possible even in extensional contexts.
2. However, speaker-oriented readings predominate even in intensional contexts.

I have disputed both claims, the first by arguing that the relevant extensional contexts are intensional after all, in the spirit of Hintikka (1973: 214):

> Surprisingly often modal notions are tacitly being considered in apparently non-modal contexts.

The second claim was countered by pointing out that the intensional contexts considered by Harris and Potts are not representative; in fact, once downward entailing attitude contexts are taken into consideration, non-speaker oriented readings predominate. In turn, this realization paves the way for a recognition that appositives are not generally vehicles of expressive meaning, orthogonal to descriptive meaning, but that they do sometimes help to build propositions. The prime piece of evidence for that consists in the observation that weakening appositives fails to preserve the truth of certain attitude ascriptions, primarily ascriptions of surprise. If a pharmacist is surprised that Mrs. Otis, an old lady, is interested in condoms, it does not follow that she is surprised that Mrs. Otis, a lady, is interested in condoms. Another fact which supports the 'semantic strategy' is that appositives in surprise contexts often represent old information.

The function that appositives fill in this type of context is best understood against the background of the theory of emotive factive attitudes like *surprised*. When we ascribe surprise to somebody at a certain individual having a certain property (like being pregnant or interested in condoms), we tacitly understand some additional relevant properties (like being a virgin or an old lady), and these are encoded in a contextual parameter providing a set of relevant ('old') belief worlds. If, for fear of being misunderstood because the context might not be sufficiently clear in this regard, we want to make a property explicit,

expressing it in the form of an appositive is a natural move.

Thus in modal contexts, appositives act as reminders of properties which are to follow an individual along through the set of worlds under consideration. They provide a means to ensure that a thing retains its relevant properties across the modal space. This task can be argued to be more important in downward entailing than in upward entailing modal contexts, and that could be the reason that (non-speaker oriented) appositives are more frequent there.

For modelling this behaviour of appositives in a way that also allows for speaker-oriented interpretations, in extensional as well as intensional contexts, a treatment in terms of partial meanings along the lines of Beaver and Krahmer (2001) commends itself. I hope to have shown how such an approach can yield coherent results in a fully compositional fashion: Starting from an abstract so-called appositive functor, appositives add definedness conditions to individual concepts, conditions that become definedness conditions on higher intensions, finally on propositions. When these propositions are embedded under attitudes, those definedness conditions (on the usual, *de dicto* construal) become integral parts of them (to be exact, their positive extensions), and thus the intuition that agent-oriented appositives convey attitude-relevant properties is accounted for.

As far as speaker-oriented interpretations are concerned, it is difficult to discern a decisive difference between a 'bidimensional' view of appositives as belonging to the dimension of implicature, to do with expressive meaning only, and a 'unidimensional' view where appositives give definedness conditions on partial concepts and propositions. Once we take non-speaker oriented readings seriously, however, not only in upward entailing but also in downward entailing modal contexts, it becomes clear that, at the very least, the two 'dimensions' should be able to communicate: the piece of content expressed in the appositive should be allowed to merge with the larger piece expressed in its local context. The present paper has presented one way to produce this effect.

References

Amaral, Patricia, Craige Roberts and E. Allyn Smith. 2007. Review of *The Logic of Conventional Implicatures* by Chris Potts. *Linguistics and Philosophy* **30**, 707–749.

Anand, Pranav. 2007. Re-expressing judgment. *Theoretical Linguistics* **33**, 199–208.

Asher, Nicholas. 1987. A Typology for Attitude Verbs and their Anaphoric Properties. *Linguistics and Philosophy* **10**, 125–197.

Beaver, David and Emiel Krahmer. 2001. A Partial Account of Presupposition Projection. *Journal of Logic, Language and Information* **10**, 147–182.

Donnellan, Keith. 1966. Reference and definite descriptions. *Philosophical Review* **75**, 281–304.

von Fintel, Kai. 1999. NPI Licensing, Strawson Entailment, and Context Dependency. *Journal of Semantics* **16**, 97–148.

von Fintel, Kai and Irene Heim. 2009. *Intensional Semantics*. Lecture Notes, MIT.

Geurts, Bart and Emar Maier. 2005. Quotation in Context. Philippe De Brabanter (ed.) *Hybrid Quotations* (= *Belgian Journal of Linguistics* **17**). Amsterdam: John Benjamins. 109–128.

Harris, Jesse Aron and Christopher Potts. 2009. Perspective-shifting with appositives and expressives. *Linguistics and Philosophy* **32**, 523–552.

Heim, Irene. 1992. Presupposition Projection and the Semantics of Attitude Verbs. *Journal of Semantics* **9**, 183–221.

Heim, Irene. to appear. Definiteness and Indefiniteness. Claudia Maienborn, Paul Portner and Klaus von Heusinger (eds.) *Semantics: an International Handbook of Natural Language Meaning*. Berlin: Mouton de Gruyter.

Hintikka, Jaakko. 1973. Grammar and Logic: Some Borderline Problems. Jaakko Hintikka et al. (eds.) *Approaches to Natural Language*. Dordrecht: Reidel. 197–214.

Kadmon, Nirit and Fred Landman. 1993. *Any*. *Linguistics and Philosophy* **16**, 353–422.

Matushansky, Ora. 2008. On the linguistic complexity of proper names. *Linguistics and Philosophy* **21**, 573–627.

Potts, Christopher. 2005. *The Logic of Conventional Implicatures*. Oxford Studies in Theoretical Linguistics. Oxford: Oxford University Press.

Schlenker, Philippe. 2010. Supplements within a Unidimensional Semantics I: Scope. Maria Aloni, Harald Bastiaanse, Tikitu de Jager and Katrin Schulz (eds.) *Logic, Language and Meaning* (17th Amsterdam Colloquium Revised Selected Papers). Lecture Notes in Computer Science 6042. Berlin: Springer. 74–83.

Schlenker, Philippe. to appear. Supplements within a Unidimensional Semantics II: Epistemic Status and Projection. Patrick Grosz, Irene Heim, Pritty Patel and Igor Yanovich (eds.) *Proceedings of NELS 40*. GLSA Publications, University of Massachusetts, Amherst.

Schwager, Magdalena. to appear. Speaking of Qualities. Satoshi Ito and Ed Cormany (eds.) *Proceedings of SALT 19*. Ithaca, New York: CLC Publications.

Sharvit, Yael. 2002. Embedded Questions and 'De Dicto' Readings. *Natural Language Semantics* **10**, 97–123.

van Rooij, Rob. 2006. *Attitudes and Changing Contexts*. Berlin: Springer.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 101–115. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

An Unaccusativity Diagnostic at the Syntax-Semantics Interface: *there*-Insertion, Indefinites and Restitutive *again*

Artemis Alexiadou
Universität Stuttgart
artemis@ifla.uni-stuttgart.de

Florian Schäfer
Universität Stuttgart
florian@ifla.uni-stuttgart.de

Abstract. This paper argues that the unaccusativity mismatch observed in the literature concerning the availability of *there*-insertion points to a syntactic difference between two classes of unaccusatives. The paper shows that the theme argument of change-of-location unaccusatives occupies Spec,ResultP, while that of change-of-state unaccusatives occupies Spec,vP. Insertion of *there* is blocked in the latter case, as the theme and the expletive compete for the same position.

1 Introduction

As is well known, *there*-insertion is possible in the context of *unaccusative verbs* but impossible with *unergative* and *transitive verbs*.[1] However, only a subset of unaccusative verbs allows *there*-insertion (Levin 1993), leading to an unaccusativity mismatch (1a vs. 1d).

(1) a. There arrived a man (in the garden) (unaccusative-1)
b. *There walked a man (in the garden) (unergative)
c. *There kissed a girl a boy (in the garden) (transitive)
d. *There broke a glass (in the kitchen) (unaccusative-2)

In this paper, we argue that this *unaccusativity mismatch* points to a syntactic difference between the two classes of unaccusatives. Building on the "low-*there*" hypothesis, recently proposed by Richards & Biberauer (2005), Richards (2007) and Deal (2009), we argue that the theme argument of the two classes of unaccusatives can occupy different structural positions within the vP, namely Spec,vP and Spec,ResultP, see (2a vs. 2b). Insertion of *there* is blocked, if the theme DP obligatorily occupies Spec,vP, because the two compete for the same position. This is the case for *break*-type verbs.

[1] We only discuss "presentational *there*", i.e. expletive *there* in the context of *lexical verbs*. We will not be concerned with expletive *there* in the context of the copula *be* (i.e. in progressives, passives and existentials); see Deal (2009) for a recent discussion within the "low-*there*"-hypothesis applied here.

(2) a. [$_{vP}$ *there* [$_{ResultP}$ *theme*]]
b. [$_{vP}$ **there/theme* [$_{ResultP}$]]

2 The Standard Account of *there*-Insertion: *there* in Spec,TP

Chomsky (1981, 1995 and subsequent work) proposes that *there* is externally merged in the derived subject position Spec,TP to satisfy the Extended Projection Principle (EPP) (i.e. to check the strong D-feature on T). On this logic, (1b, c) are ungrammatical for the following reason: in English, a language lacking Transitive Expletive Constructions (TECs), the subject and the expletive compete for a single specifier position, Spec, TP.[2] In TEC-languages such as Dutch in (3), the counterparts of (1b, c) are grammatical because these languages have two specifier positions available for subjects outside the vP.

(3) dat *er* iemand een appel gegeten heft (TEC)
that there someone an apple eaten has

Note that this standard analysis of *there*-insertion cannot account for the contrast in (1a, d) (cf. also Borer 2005, Deal 2009, Alexiadou 2011).

3 Against the Standard Analysis: *there* down in Spec,vP

The standard analysis of *there*-insertion has recently been challenged by Richards & Biberauer 2005, and Richards 2007 (see also Deal 2009) as it faces a number of problems which we can touch upon here only superficially.

In Chomsky (2000, 2001, 2004), *there* is a head with [uF] and probes from Spec,TP into TP and values T. This proposal faces a technical problem: only root nodes should probe. Since *there* in Spec,TP is not the root node (which is T), its probing is counter-cyclic. Moreover, it needs a number of extra assumptions to derive *Bure's Generalization*, i.e. the observation that TECs are available only in languages with Object Shift(OS)/Scrambling of full DPs. (Why should the availability of a second specifier in the TP-region be related to the availability of a derived object position? (Cf. Alexiadou & Anagnostopoulou 2001, 2007, Richards 2004).

As the aforementioned authors argued, for conceptual reasons, *MERGE-Expletive* should be a property of phase heads (C, v), i.e. expletives are externally merged either in Spec,CP or in Spec,vP. If an expletive occurs in

[2] A crucial assumption is that the subject must leave the vP (see Alexiadou & Anagnostopoulou 2001, 2007).

Spec,TP, it must have moved there. The consequence is that the EPP on T is checked only via *MOVE*.

In agreement with Richards & Biberauer (2005) and Richards (2007), we conclude that i) *there* is not a *probe* but a goal (like any other nominal category/DP); ii) it merges in Spec,vP where it is in the probe domain of T; iii) it has the interpretable but incomplete φ-feature set [person], rendered active via an unvalued Case feature.[3] It is probed by T and gets its case valued. T's φ-feature set remains unvalued as *there* is φ-incomplete. T therefore remains active for Agree with the associate DP. Afterwards, *there* moves to Spec,TP.

As *expletives* are dummies (they do not have reference and cannot bear a theta-role), they can merge (externally) only in *non-thematic specifiers*, i.e. as a) the specifier of a defective head $v_{passive}$; b) the specifier of a defective head $v_{unaccusative}$ or c) the outer specifier of thematic v/Voice (the OS-position).

The third option determines the availability of TECs; English lacks both TECs and OS as it has no outer Spec,vP/outer Spec,VoiceP (the complementarity between *Expl* and external arguments is due to the mutual exclusivity of thematic and non-thematic v in English).[4] It also explains the complementarity between *expletives* and raised internal arguments of unaccusatives in (4)-(5); both target the non-thematic specifier of $vP_{unaccusative}$. Note that under the traditional Expl-in-TP-approach (4c)/(5b) should be fine. It also explains why in languages that have both OS and TECs the former bleeds the latter (6): again, we have competition for the same position.

(4) a. *There seems [$_{TP}$ a man to be $t_{a\ man}$ in the garden]
b. There seems [$_{TP}$ to be a man in the garden]
c. *[$_{TP}$ There [$_{VP}$ a man [$_{VP}$ arrived $t_{a\ man}$]]]
d. There arrived a man

(5) a. dat *(daar) gister 'n skip gesink het (Afrikaans)
that (there) yesterday a ship sunk has
b. dat (*daar) 'n skip gister gesink het

[3] But see Deal (2009) for the claim that *there* must have *uninterpretable* φ-features and that it locally probes the associate DP. This, she claims, is necessary in order to avoid the "too-many-*theres*" problem (*There seemed there to arrive a train in the station). We do not discuss the feature content of *there* but concentrate on its configurational, i.e. external-merge properties.

[4] Something in addition has to be said about cyclic A'-movement of vP-internal elements which is, of course, possible in English.

(6) a. *dat er veel mensen dat boek gisteren gekocht hebbe
that EXPL *many people the book yesterday bought have* (Dutch)
b. dat daar baie mense baie/*die bier gedrink het (Afrikaans)
that EXPL *many people many/the beer drunk have*

The conclusion we can draw for English is that *there* is blocked if i) an external argument occupies the specifier of v/Voice or ii) an object raises to Spec,$v_{defective}$ in passive or unaccusative structures.

Now, recall our mismatch within the class of unaccusatives in (1a vs. 1d) replicated in (7):

(7) a. There appeared a man in the garden.
b. *There melted a lot of snow on the streets of Chicago.

The verb's influence on *there*-insertion holds also in raising constructions (Deal 2009).

(8) a. There seemed to appear a dagger in front of Macbeth.
b. *There seemed to melt a lot of snow on the streets of Chicago.

Ideally, we should be able to explain the contrast between the two classes of unaccusatives along the same lines as the contrast between e.g. transitives and passives. More concretely, *appear/arrive*-verbs should make available an empty Spec,vP where *there* can merge, while *melt/break*-verbs should not make available such an empty Spec,vP; it follows then that Spec,vP of *break*-unaccusatives must be occupied. The question then is: what is located in Spec,vP of *melt/break*-unaccusatives?

4 What Does *there* Correlate with? Two Classes of Unaccusatives

4.1 A Classification of Verbs Allowing *there*-Insertion

Levin (1993) characterizes the verbs allowing *there*-insertion roughly as *verbs of existence or appearance*. They can be broken down into the following subclasses (a-f) of unaccusatives. *Verbs of change of state* (g) do not permit *there* although they are unaccusatives too:[5]

[5] Levin (1993) points out that *verbs of manner of motion* also allow for *there* in the context of directional PPs, but they differ in that the subject must follow this PP.

(i) a. There arrived three gentlemen from Verona.
b. ??There arrived from Verona three gentlemen.
(ii) a. *There ran a raggedy looking cat into the room.
b. There ran into the room a raggedy looking cat.

(9) a. *Verbs of Existence*: blaze, bubble, cling, coexist, …
b. *Verbs of Spatial Configuration*: crouch, dangle, hang, kneel, …
c. *Meander Verbs*: cascade, climb, crawl, cut, weave, wind, …
d. *Verbs of Appearance*: accumulate, appear, arise, …
e. ?*Verbs of disappearance*: die, disappear, vanish, …
f. *Verbs of Inherently Directed Motion*: arrive, ascend, come, …
g. **Verbs of Change of State*: bend, break, chip, rip, shatter, split, …

4.2 Is there a Causative Event in Spec,vP (Deal 2009)?

Deal (2009) offers an account for the contrast between the two classes of unaccusatives concerning *there*-insertion that strongly influenced our analysis. Specifically, she proposes that *there* is inserted at the edge of a vP that lacks an external argument, i.e. into a non-thematic Spec,vP position. Unaccusatives rejecting *there* have Spec,vP already occupied by a causative event.

While we are sympathetic with her blocking account, her proposal faces a number of theoretical and empirical problems which we will not discuss here for reasons of space. Below, we make an alternative proposal about what blocks *there*-insertion at the edge of vP which, in turn, strongly builds on the work by Dobler (2008a, b).

4.3 Hypothesis: There Is an Internal Argument in Spec,vP

Hale & Keyser (2000) assume two different lexical syntactic representations for unaccusatives. With verbs such as *arrive, occur*, …, the theme is introduced within the complement of the verb, in the specifier of a small-clause headed by a (potentially covert) P-projection (10a). With verbs such as *break, open*, … the theme is introduced in the specifier of the verb that takes an adjective as its complement (10b). ((10b) is a composite dyadic lexical projection, also called a complex predicate; see e.g. Beck & Johnson 2004, Embick 2004, McIntyre 2004).

(10) a. $[_{vP}$ arrive $[_{PP}$ many guests $[P_{covert}$/in the garden $]]]$
b. $[_{vP}$ the sky $[v A_{clear}]]$

Hale & Keyser do not actually propose this solution, but with the background of the "low-*there*"-hypothesis discussed above, these structures

---

(iii) Suddenly there flew through the window [that shoe on the table]

Cases such as (iib) are called "outside verbals" in Deal (2009). Outside verbals do not obey the definiteness restriction (iii) and allow "a bewildery variety of verbs" (Milsark 1974). See Deal (2009) for an analysis of these cases. We concentrate here on "inside verbals".

could, in principle, explain the distribution of *there* in the context of unaccusatives. With *clear*-type predicates, Spec,vP is already occupied by the theme argument; with *arrive*-type predicates, Spec,vP is available. In the next section, we investigate whether this is the correct explanation for the unaccusativity mismatch observed with *there*.

5 Tracing the Position of Internal Arguments

Both structures in (10) above are bi-eventive/resultative. They differ concerning the position where the theme argument is merged; either it is merged as the argument of the lower-event small-clause or as the argument of the higher-event verb. Over the years, there has been a lot of discussion about the correct analysis of resultative structures. Some authors argued that the small-clause analysis is generally correct (e.g. Hoeckstra 1988), some claimed that the complex-predicate analysis is generally correct (e.g. Beck & Johnson 2004).

Dobler (2008a, b) discusses transitive, resultative constructions and concludes that both structures co-exist. The small-clause analysis is correct for transitive resultatives referring to a *change of location*, i.e. the position of the object in (11a) is similar to that of the theme argument in the unaccusative structure in (10a). The complex-predicate analysis is correct for transitive resultatives referring to a *change of state*, i.e. the position of the object in (11b) is similar to that of the theme argument in the unaccusative structure in (10b).

(11) a. Thilo sent the plane to Yubara .
b. He wiped the floor clean.

To determine this, she investigated whether an existential operator in object position can be part of the presupposition of *restitutive again*. In what follows, we summarize her argumentation.

5.1 The Interaction of *wieder/again* and Existential Operators in Object Position

Von Stechow (1996) argued in detail that the repetitive vs. restitutive interpretation associated with the adverb *again* is the result of a structural ambiguity. Evidence for this is provided by word order facts such as the ones in the German examples in (12), where the syntax disambiguates between the two interpretations. Von Stechow took this as evidence for the syntactic decomposition of the VP into a vP and a ResultP component.

(12) a. Thilo öffnet die Tür wieder

Thilo opened the door again
i) He had opened the door before (*repetitive &*
ii) The door used to be open *restitutive*)
b. Thilo öffnet wieder die Tür (*only repetitive*)

As is well known, German definite objects always leave the vP, cf. (13) (von Stechow 1996, Dobler 2008a, b modifying Webelhuth 1992). The examples in (14) show that if the adverb *again* precedes the theme, it has necessarily wide scope over vP and ResultP, leading to a repetitive reading. If the adverb follows the theme, the adverb might either outscope just the ResultP, leading to a restitutive reading, or once again both the vP and the ResultP leading to the repetitive reading.

(13) a. weil er (wohl) das Buch (wohl) gelesen hat
as he particle the book particle read has
b. weil er (wohl) [$_{vP}$ das Buch [$_{vP}$(wohl) [$_{vP}$ t_{subj} t_{obj} lesen]]

(14) a. weil er wieder die Tür geöffnet hat
as he again the door opened has
a'. *wieder*$_{repetitive}$ [die Tür [$_{vP}$ $t_{subject}$ v [$_{AP}$ t_{obj} offen
b. weil er die Tür wieder geöffnet hat
as he the door again opened has
b'. [die Tür [(*wieder*$_{repetitive}$) [$_{vP}$ $t_{subject}$ v [$_{AP}$ (*wieder*$_{restitutive}$) t_{object} offen

(15) shows that indefinite objects remain inside the vP (unless they get a strong interpretation). As shown in (16), this is compatible with both the small-clause analysis as well as the complex predicate analysis of resultatives, if we assume that the subject is introduced by an extra projection (VoiceP):

(15) weil er (wohl) ein Buch (*wohl) gelesen hat
as he particle a book particle read has

(16) [$_{VocieP}$ Subject *Voice* [$_{vP}$ (Object) *v* [$_{ResultP}$ (Object) *state*]]]

Von Stechow (1996) only discusses the interaction of definite DPs and *again*. Nissenbaum (2006) investigates scope-interactions between *again* and indefinites. In (17), we get different readings, depending on where the indefinite is interpreted, within the vP or in the IP.

(17) Someone is sneezing again
a. again [∃x.x is sneezing] (different person)
b. ∃x [x is sneezing] (same person)
c. [$_{IP}$ Someone$_i$ is [[$_{vP}$ t_i sneezing] again]

In German, the readings are determined once again by the surface order:

(18) a. weil [wieder [$_{\text{VoiceP}}$ jemand [$_{\text{vP}}$ nießt (different person)
b. weil [$_{\text{VoiceP}}$ jemand [$_{\text{vP}}$ wieder nießt (same person)
as (again) someone (again) sneezes

Dobler (2008a, b) uses the scope-interaction between *restitutive again* and an indefinite object to investigate the position of the internal argument in transitive resultative constructions. The main goal of her investigation is to determine whether the internal argument is an argument of the result state (*small-clause (SC) analysis*) or of the verb (*complex-predicate (CP) analysis*). Importantly, only the small-clause analysis predicts that the existential operator can be interpreted inside the result-state clause, i.e. inside the presupposition triggered by restitutive *again* (cf. 19).[6]

(19) [$_{\text{VoiceP}}$ Subject *Voice* [$_{\text{vP}}$ (Object$_{\text{indef}}$) *v* [again$_{\textit{rest}}$ [$_{\text{RP}}$ (Object$_{\text{indef}}$) *state*]]]]
| |
same potentially different

Dobler argues that the following interpretative picture emerges (in both, English and German):

(20) *Change of state:*
Pandora scrubbed a donkey clean again
a. #again [∃x.x is a donkey and x is clean] (SC-analysis)
b. ∃x.x is a donkey and again [x is clean] (CP-analysis)

(21) *Change of location*:
Pandora put a donkey in her stable again
a. again [∃x.x is a donkey and x is in Pandora's stable] (SC-analysis)
b. ∃x.x is a donkey and again [x is in Pandora's stable] (CP-analysis)

Dobler concludes that the theme is (syntactically) the argument of the verb (vP) in change-of-state resultatives, while it is the argument of the secondary predicate (ResultP) in change-of-location resultatives. In the latter case, it can, of course, move out of the scope of *again* yielding reading (21b).

Below we list some further examples provided by Dobler (2008a) which test whether the relevant reading (restitutive *again* outscopes the indefinite theme) is available or not in English and German. (22)-(23) illustrate the situation with change-of-state predicates, (24)-(25) illustrate it with change-

[6] The #-sign indicates that a reading 'restitutive *again* > indefinite theme' is not available.

of-location predicates. The contexts given before the test sentences are meant to exclude an irrelevant repetitive reading and force a restitutive reading:[7]

(22) a. Context*: Sally owns a brown mouse and a great number of white mice. While she is gone, Harry takes care of them and the brown mouse dies. Harry is freaked out and wants to cover up the loss…*
b. #Er färbt wieder eine Maus braun.
c. #He dyes a mouse brown again.

(23) a. Context: *Yesterday, Sally visited a popsicle factory. There she had the opportunity to taste the popsicle mixture before it was frozen. She really loved it*.
b. #Daheim angekommen hat Sally wieder ein Eis am Stiel geschmolzen.
c. #Once she was home, Sally melted a popsicle again.

(24) a. Context: *Until about 200 years ago, bears used to live in the Alps*.
b. Gestern haben Biologen wieder Bären in den Alpen angesiedelt.
c. Yesterday, scientists put bears in the Alps again.

(25) a. Context: *The island had a mountain that practically disappeared in the course of an earthquake*.
b. Die Bewohner der Insel haben wieder einen Berg errichtet.
c. The inhabitants constructed a mountain again.

5.2 Conclusion

To conclude, Dobler (2008a, b) shows that there are two classes of transitive bi-eventive verbs that differ in whether the indefinite/existential object can be in the scope of restitutive *again* or not. Below, we list some further verbs of these two classes:

Group A: #restitutive *again* > existential operator

[7] The repetitive reading (repetitive *again* > indef) is available in English and German but it is irrelevant for the present argumentation. The sentences in (22b, c) have therefore the following interpretative properties:

(i) a. again [∃x.x is a mouse and x is brown]
→ *impossible reading (restitutive)*
→ There is a brown mouse and there was a (different) brown mouse.
b. again [∃x.x is a mouse and x is dyed brown]
→ *possible reading (repetitive)*
→ A mouse is (being) dyed brown and at a previous time, there was a (different) mouse that was (being) dyed brown.

melt, freeze, cool, warm, empty, fill, open, close, paint (in) pink, dye brown, …

Group B: restitutive *again* > existential operator
put, place, donate, construct, build, …

At first sight, it seems that group A contains verbs undergoing the causative alternation. However, this does not seem to be the correct generalization, as group B contains such verbs too (e.g. German *(sich) ansiedeln* and its English counterpart *settle*). Group A contains de-adjectival verbs, but we get the same result if we replace for example "paint pink" with "paint in pink". The correct generalization is a division into *change of state verbs* and *change of location verbs* (as well as *creation verbs* ≈ cause to be in a location (see Dobler 2008a, b for detailed discussion)).

To explain these differences, we conclude with Dobler (2008a, b) that the direct object of change-of-state predicates is necessarily located outside of the Result phrase (when scope is computed). With change-of-location predicates, we note the reverse situation; the direct object can be located inside of the Result phrase (when scope is computed). Following Hale & Keyser (2000), we assume the structures in (26) for these two types of (transitive) verbs/predicates. (For structural variants of (26a, b) which are, in principle, compatible with the above findings, see Beck & Johnson (2004), von Stechow (2007), Dobler (2008a, b) or Ramchand (2008)).

(26) a. [$_{\text{VoiceP}}$ subject *Voice* [$_{\text{vP}}$ object *v* [$_{\text{RP}}$ *Result*]]] (*change-of-state*)
b. [$_{\text{VoiceP}}$ subject *Voice* [$_{\text{vP}}$ *v* [$_{\text{RP}}$ object *Result*]]] (*change-of-location*)

6 On the Position of the Subjects of Unaccusatives; Are They Blocking *there*-Insertion in Spec,vP?

Dobler (2008a, b) investigated transitive constructions while we are interested in unaccusatives. Many of the verbs in Group A discussed in Dobler's work express a change of state and have an unaccusative counterpart. If the widely held assumption is correct that the object of transitives has the same syntactic base position as the sole argument of unaccusatives, we expect that the unaccusative counterparts of these verbs should behave alike in terms of scope interaction between an indefinite theme argument and restitutive *again*. The transitives in Group B are change-of-location verbs. As noted in 4.1, the unaccusatives allowing *there*-insertion also express a change of location (come into existence ~ come to be in a location). We thus predict that these verbs should behave like transitive change-of-location verbs as far as scope interaction between an indefinite theme argument and restitutive *again* is

concerned. In other words, if the argument of change-of-state unaccusatives is responsible for the blocking of *there*-insertion, it should necessarily be located outside the ResultP in the specifier of the un-accusative vP and it should never occur inside the scope of restitutive *again*. On the other hand, the argument of change-of-location un-accusatives should be located inside the ResultP and thus inside the scope of restitutive *again*; if it stays there, it does not block *there*-insertion in Spec,vP.

These predictions are indeed borne out, as shown in the following two sub-sections.[8]

6.1 Verbs of Change of Location

Unaccusative verbs of appearance (27) and unaccusative verbs expressing an inherently directed motion (28) both allow, as predicted, the relevant reading where the indefinite/existential theme argument is in the scope of restitutive *again.*[9]

(27) a. Context: *Until about 200 years ago, bears used to live in Bavaria, but they were completely wiped out by the inhabitants in the 19th century*.
b. Letzten Sommer ist wieder ein Bär in Bayern aufgetaucht/erschienen.
c. Last summer, a bear appeared in Bavaria again.

(28) a. Context: *Until about 200 years ago, bears used to live in Bavaria, but they were completely wiped out by the inhabitants in the 19th century.*
b. Letzten Sommer ist wieder ein Bär nach Bayern gekommen.
c. Last summer, a bear/bears came to Bavaria again.

6.2 Verbs of Change of State[10]

Unaccusative verbs of change of state, on the other hand, do not allow the relevant reading; their indefinite/existential theme argument cannot be

[8] We would like to thank Eva Dobler (German), Andrew McIntyre, Walter Pederson, Marc Richards and Mike Putnam for their judgements.

[9] Levin (1993) notes that *verbs of disappearance* allow *there*-insertion marginally. Deal (2009) argues that these verbs do not allow *there*-insertion. We do not discuss this class here, as it is hard to test (see also footnote 10).

[10] There is a general complication with change-of-state verbs. Many of these verbs express "the disruption of material integrity" (Levin 1993). Since we are interested in a restitutive reading, these verbs are complicated to test; how can something start out broken, become united and break again?

interpreted as being in the scope of restitutive *again*. (Repetitive *again* can outscope the indefinite theme but this reading is irrelevant for the argument.)

(29) a. Context: *Yesterday, Sally visited a popsicle factory. There she had the opportunity to taste the popsicle mixture before it was frozen. She really loved it*.
b. #Daheim angekommen ließ sie wieder ein Eis am Stiel schmelzen.
c. #Once she was at home she made/let a popsicle melt again.

(30) a. Context: *Many years ago, a type of squirrel existed which was yellow. Unfortunately, they all died due to a mysterious infection*.
b. #Forscher haben es geschafft, dass sich in einem Labor wieder ein Eichhörnchen gelb gefärbt hat.
c. #Scientists working in a Swiss laboratory managed to bring it about that a squirrel turned yellow again.

6.3 'Verbs of Change of State' under a 'Come into Existence' Reading

In addition to its use as a verb of change of state, the verb *break* also has a use as a verb of coming into existence, as in "*The war broke (out)*". Similarly, the verb *open* has an appearance sense which can be paraphrased as 'become visible' or 'come into existence' in addition to its change-of-state sense. The question then is whether this difference is relevant for the availability of *there*-insertion. The judgements of our four informants shown in (31a, b) vs. (31c, d, e) suggest that such an effect indeed exists at least as a general tendency (1[(very good] - 5[very bad]).

(31) a. There broke a vase in the living room 5 4 4 4
b. There opened a window in the living room 5 4 3 5
c. During the spring, there suddenly broke (out) a war in west India 5 2 2.5 2
d. Suddenly, there opened a cavity underneath their feet 1 2 2 3
e. Suddenly, there opened a gap in the middle of the street 3 1 4 3

Crucially, and in accordance with our overall proposal, the '*come into existence*' reading of these basically change-of-state verbs makes available the scope $again_{\text{restitutive}}$ > indefinite:

(32) a. Context: *For hundreds of years, people could get into the mountain through a small hole/crack. After a strong earthquake, this entrance was blocked. But after a long period of rain,*
b. A hole opened in the rock again which allowed people to enter.

c. Im Laufe der Zeit hat sich aber wieder eine Lücke geöffnet.

(33) a. Context: *When we started here, all the walls were covered with numerous gaps and holes which we closed with great effort*.
b. But during the storm, a huge gap opened again.
c. Durch den Sturm hat sich plötzlich wieder ein Spalt in der Wand geöffnet.

This suggests that the relevant parameter is not strictly syntactic/categorial (adjectival vs. prepositional), but semantic/conceptual (change-of-state vs. change of location/existence). However, this semantic parameter is syntactically reflected in the position available for the theme.

We thus conclude that the theme of change-of-location verbs originates inside the Result phrase where it can stay in principle. The theme of change-of-state verbs is obligatorily located in Spec,vP, not in the Result phrase. *There*-insertion is blocked in the latter context as it competes with the theme argument, see (34).

(34) a. [$_{vP}$ *there* [$_{ResultP}$ *theme*]] vs. b. [$_{vP}$ *theme*/**there* [$_{ResultP}$]]

7 Conclusion

In this paper, we argued that the *unaccusativity mismatch* observed in the literature concerning the availability of *there*-insertion points to a syntactic difference between two classes of unaccusatives. We showed that the theme argument of change-of-location unaccusatives occupies Spec, ResultP, while that of change-of-state unaccusatives occupies Spec,vP. Insertion of *there* is blocked in the latter case, as the theme and the expletive compete for the same position.

References

Alexiadou, Artemis. 2011. Post-verbal nominatives: an unaccusativity diagnostic under scrutiny. In R. Folli & C. Ulbrich (eds.), *Interfaces in Linguistics: New Research Perspectives*. Oxford: Oxford University Press, 56–77.

Alexiadou, Artemis & Elena Anagnostopoulou. 2001. The subject in situ generalization, and the role of Case in driving computations. *Linguistic Inquiry* 32, 193–231.

Alexiadou, Artemis & Elena Anagnostopoulou. 2007. The subject in situlenageneralization revisited. In H.-M. Gärtner & U. Sauerland (eds.), *Interfaces + Recursion = Language*. Berlin: Mouton de Gruyter, 31–60.

Beck, Sigrid & Kyle Johnson. 2004. Double objects again. *Linguistic Inquiry* 35:1, 97–124.

Borer, Hagit. 2005. *Structuring sense, Vol. II. The normal course of events*. Oxford University Press.

Chomsky, Noam. 1981. *Lectures on government and binding*. Dordrecht: Foris.

Chomsky, Noam. 1995. *The Minimalist program*. Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: The framework. In R. Martin, D. Michaels & J. Uriagereka (eds.), *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*. Cambridge: MIT Press, 89–155.

Chomsky, Noam. 2001. Derivation by Phase. In M. Kenstowicz (ed.), *Ken Hale: A Life in Language*. Cambridge, MA: The MIT Press, 1–52.

Chomsky, Noam. 2004. Beyond Explanatory Adequacy. In A. Belletti (Ed.), *Structures and Beyond: The Cartography of Syntactic Structures, Vol. 3*. Oxford, Oxford University Press, 104–131.

Deal, Amy Rose. 2009. The origin and content of expletives: evidence from "selection". *Syntax* 12:4, 285–323.

Dobler, Eva. 2008a. 'Again' and the structure of result states. In *Proceedings of ConSOLE XV*.

Dobler, Eva. 2008b. Creating as putting something into the world. In *Proceedings of ConSOLE XVI*.

Embick, David. 2004. On the structure of resultative participles in English. *Linguistic Inquiry* 35.3, 355–392.

Hale, Ken & Samuel Jay Keyser. 2000. *There-insertion unaccusatives*. Ms., MIT.

Hoekstra, Toen. 1988. Small clause results. *Lingua* 74:101–139.

Levin, Beth. 1993. *English verb classes and alternations: a preliminary investigation*. Chicago: University of Chicago Press.

McIntyre, Andrew. 2004. Event Paths, Conflation, Argument Structure and VP Shells. *Linguistics* 42:3, 523–571.

Milsark, Gary. 1974. *Existential sentences in English*. Ph.D. dissertation, MIT.

Nissenbaum, Jon. 2006. *Decomposing resultatives: two kinds of restitutive readings with 'again'*. Poster presented at NELS 37, University of Illinois, Urbana-Champaign, October 2006.

Ramchand, Gillian. 2008. *Verb meaning and the lexicon: a first phase syntax*. Cambridge University Press.

Richards, Marc. 2007. On object shift, phases, and transitive expletive constructions in Germanic. In P. Pica et al. (eds), *Linguistic Variation Yearbook* 6. Amsterdam, John Benjamins, 139–159.

Richards, Marc & Theresa Biberauer. 2005. Explaining Expl. In M. den Dikken & C. Tortora (eds.), *The function of function Words and functional categories*. Amsterdam: John Benjamins, 115–153.

Richards, Norvin. 2004. *A distinctness condition on linearization*. Ms, MIT.

von Stechow, Arnim. 1996. The different readings of *wieder* 'again': a structural account. *Journal of Semantics* 13, 87–138.

von Stechow, Arnim. 2007. *Syntactic and lexical causativization: BECOME and CAUSE again*. Talk presented at ConSOLE XV, Brussels.

Webelhuth, Gert. 1992. *Principles and parameters of syntactic saturation*. Oxford University Press.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 117–132. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Optatives: Deriving Desirability from Scalar Alternatives*

María Biezma
UMass Amherst
maria@linguist.umass.edu

Abstract. A compositional analysis of *optative* sentences is challenging for at least two reasons: they encode desirability without having any overt marker, and they are *if*-clauses with or without consequents, raising the question of whether they are actually conditionals. In this paper I argue that optatives are conditionals even when they do not have overt consequents. With respect to desirability, I argue that in optatives modality is pragmatically derived. The investigation of optatives sheds light on the interaction between syntax, pragmatics and discourse.

1 Introduction: Where Does Desirability Come from?

Structures like (1) are known as *optatives* in the literature, and they present challenges in several respects.

(1) If only I had been taller*, I would have played in the NBA*.

The utterance of an optative like (1) signals the speaker's desires, and yet there is no lexical item encoding desirability. Notice that what is desired when a conditional optative is uttered is not the antecedent proposition, i.e. that the speaker were taller. What the speaker desires is the consequent, (2).

(2) A: If only I had been taller, I would have played in the NBA.
B: That would not have been necessary, you were such a great player! What would have made a difference was if you had been in a better college team.
A: Yeah. . . !, you are right. . . , If only I had played for UCLA, I would have played in the NBA.

The dialogue in (2) illustrates that what is really desired is not being taller or having played for UCLA. What the speaker really desires at the time of utterance is to have played in the NBA. The antecedent proposition is not desired *per se* but just as means to bring about the consequent, i.e to have played in the NBA.

* I would like to thank Rajesh Bhatt, Lyn Frazier and Chris Potts for comments and help. Also thanks to the audience of Sinn und Bedeutung 15, especially Cleo Condoravdi, Sven Lauer and Malte Zimmermann.

The main question this paper addresses is where desirability comes from. I will propose that the modal meaning in optatives comes about pragmatically. It arises from the discourse assumptions leading to the utterance of the optative, and is revealed by the topic-focus structure in optatives and the semantics of conditionals. Optatives illustrate the importance of investigating meaning within the larger context provided by discourse and paying attention to pragmatic meanings derived from different components.

Overview: in §2 I investigate the syntax of optatives, in §3 I argue that all optatives are conditionals, in §4 I show that optative conditionals differ with respect to topicality, in §5 I argue that the reversal of topicality brings about desirability by constraining the questions that license optatives in the discourse.

2 Scope and Structure

I will adopt the view that *if*-clauses restrict the domain of quantification of a modal (Lewis-inspired proposal by Kratzer 1977). For a conditional to bring about optativity, there must be a focus adverb in the antecedent that obeys certain distributional restrictions. Let us consider the contrast between (3) and (4).

(3) Optatives
If only I had left earlier/ If only he didn't have a gun/ If I had only left earlier/ If he had only always acted honorably/ If he only didn't have a gun/ If a hurricane only had razed the city/ If he had only not had a gun/ Had I only read a letter

(4) Not Optatives (ungrammatical or not optative meaning)

a. If he had always only acted honorably.
b. *If he did only not have a gun.
c. If he didn't only have a gun.
d. If he hadn't only had a gun.
e. *Had only I read a letter. (Rifkin 2000)

Only is an adverb, and can attach at any level in the structure that is semantically permitted. The data in (4) shows that in order to obtain an optative meaning, the adverb must adjoin higher than *v*P. In (4a) there is no optative meaning and *only* has attached either at the *v*P level or at the VP level (*always* is adjoined at the *v*P level and *only* adjoins below it). The same is illustrated by (4c) and (4d), in which negation is constituent negation at the *v*P level. The structure below offers a summary of the positions where *only* may show up with an optative interpretation (see Biezma in progress for details regarding

the structures).

(5) $[_{CP}[_{TP}$ only $[_{TP}[_{\overline{T}}$ only $[_{\overline{T}}\ [_{PerfP}$ only $[_{PerfP}\ [_{vP}\ldots\ ]]]]]]]]$

To sum up so far, we have seen that the syntax of conditional optatives involves a focus adverb scoping over a clause denoting a proposition (*v*P or TP). In what follows I argue that it also needs to associate with the entire proposition.

If *only* does not associate with the proposition there is not optativity, (6b).

(6) a. If only mom invited grandpa, he wouldn't come.
b. If only $[_{F}$ MOM] invited grandpa, he wouldn't come.

The sentence in (6a) has an optative meaning, i.e. it is inferred that the speaker wants grandpa not to come. The contrast in (7) illustrates the meaning of (6a):

(7) a. I wish so much to see grandpa, # If only mom invited grandpa, he wouldn't come.
b. I do not want to see grandpa this weekend, $\surd$ If only mom invited grandpa, he wouldn't come.

I assume that the intonation in (6a) is just neutral intonation and as we see in (7), with neutral intonation there is optative meaning. (6b), however, is not an optative, i.e. it is not understood that the speaker does not want grandpa to come. In (6b) the small caps on *mom* indicate emphatic intonation. In this case, *only* associates with *mom*, and the optative meaning disappears.

(8) A: Grandpa is getting old. He only travels when the whole family tries to convince him to get together.
B: Well, there is a possibility that mom ask him to visit us next week.
A: Don't be stupid! If only $[_{F}$MOM] invited him, he wouldn't come.

In (8) the conditional does not carry an optative meaning even though there is a focus adverb in the antecedent. The meaning of A's utterance is that *were mom to be the only person inviting, he would not feel compelled to visit at all*.

A second related argument to claim that optativity arises only when the focus adverb associates with the entire proposition comes from the possibility of having silent consequents.[1] When the focus adverb does not associate with the entire antecedent propositions, the absence of the consequent is ungrammatical.

[1] In §3 I argue that optatives with and without spelled-out consequents are indeed conditionals.

(9) a. If only mom invited grandpa.
b. *If only MOM invited grandpa.

If we use the strategy of placing emphasis on a constituent to mark focus, (9b), thus forcing the association of *only* with something that is not a proposition, the result is a regular conditional and the consequent needs to be spelled out. If there is no special intonation, (9a), and *only* can associate with the entire proposition, it's understood as an optative and the consequent can be silent.

In this section we have seen that optativity only arises when there is a focus adverb c-commanding a proposition level constituent, and associating with the entire proposition. In the next section we will see that, despite the absence of consequents in some cases, optatives are always conditionals.

3 Optatives Are Conditionals

One of the main characteristics of optatives is that they are fine with a consequent that is not spelled out. Indeed, this is even preferred and has been taken to cast doubt on their characterization as conditionals. In what follows I review Rifkin's (2000) arguments against the view that optatives without consequents (*if only!*[2]) are conditionals, showing that a closer look at the data undermines Rifkin's conclusions. The main claim made in this section is that in spite of appearances, *if only!* constructions have a conditional structure (cf. Rifkin 2000). We do not see a conditional because the structures denote properties of propositions with a variable ranging over propositions that have been abstracted over.[3]

(10) Proposal: *if only!* constructions are abstractions over propositions
$\overline{\lambda p.q \Rightarrow p}$ (where '$\Rightarrow$' stands for the semantics of the modal)

In order to support the proposal in (10) I offer arguments to show that *if only!* constructions do not denote propositions, but denote instead properties of propositions, and to show that *if only!* constructions are conditionals. Arguments of the first kind are presented in §3.1 and §3.2, of the second kind in §3.3.

3.1 Embedding

Rifkin (2000) argues against *if only!* optatives being conditionals by showing that they cannot be embedded, whereas regular conditionals can.

(11) a. Avi thinks that if it would snow, things would be good.
b. *Avi thinks that if only it would snow.

[2] I adopt Rifkin's (2000) label for optatives without spelled-out consequents in the rest of the paper.
[3] See Biezma (in progress) for details.

c. Avi thinks that if only it would snow, things would be good.

The data in (11a) illustrates a regular embedded conditional. (11b) shows that *if only!* constructions cannot be embedded. The example in (11b) contrasts with (11c), in which an optative spelling out the consequent can be embedded. According to Rifkin, if *if only!* constructions were conditionals without consequents they should behave like regular conditionals, but they don't.

Rifkin's (2000) observations regarding embeddability actually lend support for the view presented above according to which *if only!* constructions do not denote propositions. This is the reason why they cannot be embedded in the same way as optatives in which the consequent is spelled out, which do denote propositions. The predicate *think* takes a proposition as argument, and *if only!* constructions are not of the right type to instantiate this argument.

3.2 Conjunction

Rifkin (2000) claims that if *if only!* constructions were conditionals, they should behave as conditionals across the board, and signals (12) as a counterexample.

(12) a. *If only Sue had money and if she had time, she would ski Mt. McKinley
b. *If Sue had money, she would ski Mt. McKinley, and if only she had money
c. If Sue had money, things would be good, and if she had time, she could ski Mt. McKinley (Rifkin 2000: ex. (31), (33) and (32))

Rifkin (2000) uses the data in (12) to argue that *if only!* constructions do not behave like regular antecedents of conditionals with respect to coordination. In principle we could conjoin two conditionals without *only*, (12c), but we cannot conjoin one with *only* and one without *only*, (12a) and (12b).

However, Rifkin himself points out that it is possible to conjoin two antecedents with *only*.

(13) I can't believe the picnic went so poorly!
a. If only Meg had brought a corkscrew and if only Jim had made a decent salad
b. If Meg had only brought a corkscrew and if Jim had only made a decent salad (Rifkin 2000: footnote 5, ex. (iv))

Rifkin's (2000) observations regarding coordination also provide support for the view according to which *if only!* constructions are properties of propositions. The contrast between (12a), (12b) and (13) is perfectly explained once

we consider that *if only!* constructions are properties of propositions and not propositions. The ungrammaticality of (12a) and (12b) is explained by the general impossibility of conjoining two objects of different semantic types (propositions, in the case of regular conditionals, and properties of propositions in the case of *if only!* constructions). This problem does not arise in (12c), since the two conjuncts are regular conditionals (and hence of the same type), and does not arise either in (13), where we have two *if only!* optatives conjoined.

3.3 Recovering the Consequent

Even though *if only!* constructions denote properties of propositions, they are used in contexts in which it is possible to recover a consequent, thus supporting the claim that they are conditionals. Example (14), where B's response shows that B has worked out the silent constituent in A's statement, illustrates this:

(14) A: If only I were taller.
B: Then your desires wouldn't have become true either.[4]

(14) illustrates that we process A's statement as giving sufficient conditions for a desired consequence to be brought about. After the utterance of an *if only!*, we accommodate a consequent. In the most general case, as in (14), such consequent is merely that the consequences of the antecedent being true are desired.

The fact that we can take B to be contradicting A's claim is important because B's claim is itself an overt conditional. The proform in B's statement provides the antecedent for the modal 'would'. In this context, it picks out the same antecedent as the one in A's statement. What follows in B's claim is the negation of the implicit consequent in A's claim, and thus we understand that B is disagreeing with A.[5] The shape of B's disagreement provides support for the view that upon hearing A's utterance, we process a conditionalized claim.

3.4 Summary and Further Data

In this section we have seen arguments that support the view that *if only!* constructions are conditionals and we have proposed that in these cases the consequent is a silent pronoun that is abstracted over to generate a property of propositions. With these ingredients we have been able to review Rifkin's (2000) original arguments and show that the data does not actually argue against a view of *if only!* constructions as conditionals. There are further arguments that can be provided to support the view that conditionals and optatives have the same underlying logical form (contra Rifkin 2000). These include the fact that

[4] I thank a Sinn und Bedeutung 15 anonymous reviewer for this data.
[5] B's utterance form is very telling since it is *if* $\alpha \Rightarrow \neg\beta$, the negation of the conditional statement.

counterfactuality is not obligatory in optatives, the fact that the same questions follow up conditionals and optatives, and the behavior of stacked antecedents. This discussion cannot be included for reasons of space (see Biezma in progress).

4 Reversed Topicality

In this section, we turn to the issue of why the consequent can remain silent in *if only!* constructions and take the first steps towards explaining desirability. It has been argued in the literature that the antecedents of conditionals are topics (Haiman 1978).[6] In the kind of regular conditionals that interest us here, the antecedent is an *aboutness* topic (Reinhart 1981).[7] When the conditionals are optatives, however, topicality is reversed. Since in optatives the focus adverb scopes and associates with the antecedent proposition, α, it is the antecedent proposition that is the focus. In these structures, the consequent, β, is now the topic. Recall that it is crucial for optativity that the focus adverb scopes and associates with the entire antecedent proposition. It is this that allows the (sentence level) information structure to be reversed in this type of conditional (we can also have focused elements in topic constituents, as in (6b) above, while the constituent itself remains the sentence topic).

The fact that the consequent in optatives is the topic, thus treated as discourse old, explains why it can remain silent. The possibility of not spelling out the consequent in optative conditionals is the result of *topic drop* (and this also explains why speakers actually prefer not to spell out the consequent).[8]

The presence of focus adverbs in optatives plays a crucial role in explaining the reversal in topicality. So far we have only considered optatives containing *only* in the antecedent, but optativity can arise with other adverbs too:[9]

(15) a. English
If *at least* I had been taller, I would have played in the NBA.

b. Spanish
Si (*tan*) *siquiera* / *tan sólo* hubiera sido más alto, habría
if (as) least as only had been more tall would have

[6] Indeed, antecedents of conditionals can constitute topics of different kinds. See Ebert, Endriss & Hinterwimmer (2008) a.o.

[7] See Biezma (in progress) for arguments on this respect.

[8] Notice that in regular conditionals, in which the antecedent is the topic, the antecedent can remain silent (see Kasper 1992). This is the opposite of what we find in optatives, since in optatives information structure is reversed.

[9] Below there is data from English, Spanish and German. My account is meant to explain the case of English and Spanish. Further research would be needed to discuss the German data.

jugado en la NBA.
played in the NBA

c. German (optatives are preferred without a spelled-out consequent)
? Wenn er nur/ mal/ doch hier wäre, würden wir Fisch essen.
if he PRT PRT PRT *here be.subj would we fish eat*
√ Wenn er nur/ mal/ doch hier wäre.
if he PRT PRT PRT *here be.subj*

What about desirability? Where does this come from? The data in (15) shows that there is a range of focus adverbs whose presence in the conditional antecedent brings about desirability, (with the constraints in §2). Given that on the surface, optatives differ from conditionals only regarding the presence of a focus adverb in the antecedent, but do not depend on the semantics of that particular focus adverb (there are several that do the trick), desirability needs to be derived from the mere presence of a focus adverb, not from its truth conditions. In what follows I argue that desirability arises from the interaction between the types of interpretations associated with focus adverbs and the Immediate Question Under Discussion.

5 Deriving Desirability

In this section we will finally tackle the issue of how desirability arises in optatives. We have reached the following important conclusions: (i) in optatives a focus adverb scopes over and associates with a proposition, §2; (ii) optatives are conditionals that spell out the antecedent, §3; (iii) information structure in optative conditionals is reversed with respect to regular conditionals, §4. We will now bring these ingredients together to argue that desirability in optatives arises because the focus adverb appeals to a scale setting up discourse licensing conditions such that the question under discussion can only be a *goal oriented* question. Desirability is analyzed as an implicature arising from the discourse given an (implicit) *goal oriented* question.[10]

To reach this conclusion I proceed by first giving a brief overview of Roberts's (1996) discourse model, §5.1. Then I discuss the questions under discussion that license optatives, §5.2. Afterwards I establish a link with the scales in optatives, §5.3. Finally I show how desirability is derived, §5.4.

[10] I am using the term *goal oriented* in a very broad sense. *Goal oriented* is meant to indicate that the question inquires about how to bring about the desired state of affairs, without implying agentivity.

5.1 Topicality and the IQuD

Roberts' (1996) theory of discourse is devoted to the recognition of the interlocutor's intentions in understanding the meaning of the utterance. Roberts provides a framework for discourse as a sequence of intentional actions structured with a given goal. Following Stalnaker, Roberts considers that the main goal of a discourse is the communal inquiry to discover what the actual world is like. During discourse, the participants' goal is to reduce the context set (a set of possible worlds) characterized by the Common Ground (CG).

Roberts takes questions to be the obvious counterpart of an inquiry and uses them as the formal objects reflecting interlocutor's goals. In Roberts' system, we can track the speaker's intentions by assuming that every utterance is either an answer (*pay-off move*) to an (implicit) question that the speaker accepts to address (the *immediate question under discussion* (IQuD)), or a question itself (*set-up move*). Assertions are pay-off moves because they choose between the alternatives proffered by a set up move. In this system the interpretation of every move involves two aspects: (i) the presupposed content, which constrains the contexts in which an utterance can be made, and (ii) the proffered content, which corresponds with what is asserted (in assertions) and the non-presupposed content of questions and commands.

Besides recognizing that the primary goal of every discourse is a communal inquiry, Roberts also recognizes the existence of more particular goals, *domain goals*. These particular goals are ultimately what lies behind the type of conversational inquiry conducted by the speaker. In the next section I explore what are the domain goals behind the utterance of an optative (i.e. the IQuD).

5.2 Mention-Some and the IQuDs in Optatives

In this section we will discuss the role of optatives in the discourse. Our goal is to identify the IQuDs that can be answered (*paid off*) with an optative. This is important because my objective is to link desirability in optatives to the IQuD. Let us start by noting that, in general, in answers we find focus on the elements that are under question, (16).

(16) A: What did Lauren buy?
B: Lauren bought [$_F$ BANANAS]

Even if B's utterance is not preceded by an explicit question, we can assume, given the structural characteristics of B's utterance (syntax and intonation), that the utterance is answering the question *what did Lauren buy?*. This follows from the fact that the question under discussion has to be congruent with the utterance. So, in order to find out the IQuD in optatives, we first need to

understand the semantics of the conditional, since the implicit question has to be congruent with this too. A conditional *if* α, β claims (roughly) that *in the most similar worlds to the actual world in which* α *is true,* β *is true* (*à la* Lewis-Stalnaker). With this semantics in hand, and considering the information structure of regular conditionals as discussed above (α is the topic), the IQuD when a regular conditional is uttered would be as in (17).

(17) What does α bring about? *or* What would α have brought about?

The conditional uttered as answer to the question in (17) provides the answer via the consequent, β, which bears focus.

(18) A: What would happen after the fall of the dictatorial Government?
B: If the Government fell, a democratic system would be established.

The consequent proposition, *a democratic system is established*, is the answer.

As argued above, however, in optatives (*if only* α, β) topicality is reversed and β does not bear focus. The sentence focus is α, the antecedent, whereas β, the consequent, is now the topic. Given this, and considering the semantics of conditionals, I claim that the (implicit) IQuD for optatives is (19).

(19) How do we bring β about? or How would we have brought β about?

The IQuD when an optative is uttered asks what are sufficient conditions to bring about the consequent (the topic).

Notice that the questions in (19) are a special kind of question. They are *goal oriented* questions. We understand that the speaker wants to know about the *best* way to bring about β. In the case of *goal oriented* questions, we do not ask about all the alternatives that bring about the truth of the embedded proposition (β), but about the best alternative that the addressee is aware of.

The questions in (19) have another important characteristic, they imply that the proposition embedded in the question is desired by the speaker. To see that this is so, let us consider the questions in (20).

(20) a. How do I get to the supermarket?
b. How do I get to play in the NBA?
c. How do I get to die?

The question in (20a) implies that the questioner wants to get to the supermarket and asks about the best way to get there that the addressee is aware of, (21).

(21) John is walking on the street and John asks a passer-by a question.
John: How would I get to the supermarket?
Bill: Walk south and turn right on the next street.

If after Bill's directions John starts walking north, Bill would be perplexed, since he would wonder why he is going in the opposite direction to that of the supermarket. He would be even tempted to call him out and indicate that he is just walking opposite to what he indicated, south is in the other direction. This is because John's utterance implied that he wants to go to the supermarket. The same strategy would show that in (20b) it is implied that the speaker wants to play in the NBA. And (20c) is odd in most contexts because it implies that the speaker wants to die and that is an odd desire to have.

If the IQuD when an optative is uttered is a *goal oriented* question, this would provide us with an explanation for why we understand that optatives convey the desirability of the consequent: the IQuD asks how to bring the consequent about and implicates that the consequent is desired. However, we still need to provide arguments to support the claim that the IQuD addressed by an optative is of the kind in (19), i.e. *goal oriented*.

Notice that the claim that it is *goal oriented* questions that license optatives is not trivial. If we just consider the semantics of conditionals and their information structure, other types of questions may be expected to serve as IQuDs leading to optatives. Paying attention only to the semantics of conditionals and the reversal in information structure, one could also argue that (22) could serve as an IQuD licensing an optative answer.

(22) What are the circumstances that would bring about β?

Given (22), a conditional in which the antecedent is the sentence focus would be an appropriate answer, and this is exactly what we find in optatives given the presence of a focus adverb. But, of course, if the IQuD were something like (22), we would not explain desirability in optatives. (22) is not a *goal oriented* question and we do not understand that the embedded proposition is desired.

Why can't (22) be the IQuD for an optative? The important difference between the questions in (19) (*goal oriented*) and questions like (22) is that they privilege different readings. The questions in (19) privilege a *mention-some* reading, whereas in (22) a *mention-all* reading is prominent.[11] In the *mention-some* readings, the answerhood conditions for a question require that the answer meet the questioner's goals. The relevant answer is then the one

[11] How to account for these two readings in a theory of questions is a debate far from settled and beyond the scope of this paper.

indicating the best alternative for achieving the goal (*mention-some* questions are *goal oriented* questions). It has been argued that some questions are specialized for *mention-some* readings (e.g. Asher & Lascarides 1998) argue that *how* and *where* questions give rise to a *mention-some* reading in most of the cases). In what follows I argue that the IQuD in optatives has to be a question with a *mention-some* reading. Since such questions are typically *goal oriented* questions this explains the desirability effects in optatives. In my explanation I will appeal to the semantics of focus particles present in optatives. In the next sections I will argue that certain aspects of the semantics of the focus adverbs in optatives are crucial in establishing the IQuD addressed by an optative. In particular, I will appeal to the fact that these adverbs are scalar.

5.3 The Scale in Optatives

In this paper I adopt Beaver & Clark (2008) analysis of *conventionally focus sensitive* expressions (like *only* and *at least*). This analysis argues that such expressions encode a dependence on the IQuD. As these authors point out, their proposal is not the first proposal claiming that there is a relation between focus sensitive expressions and the IQuD. Other authors already established such link with the discourse topic or the IQuD (von Fintel 1994; Roberts 1996). However, Beaver & Clark (2008) go a step further and claim that this relationship is encoded in the meaning of the expressions and that these *must* comment on the IQuD. In what follows I focus on *only* and conditional optatives containing this adverb. According to Beaver & Clark (2008), "the function of exclusives like *only* is to say that the strongest true answer to the IQuD is weaker than some expected answer." Thus, utterances containing *only* trigger a partial rank of alternatives (the possible answers) ordered according to a contextually provided scale (see Beaver & Clark 2008 for details).[12] According to these authors, utterances containing *only* carry the presupposition that "the strongest true alternatives in the IQuD are *at least* as strong as the prejacent",[13] and that the descriptive content of utterances with exclusives indicates that "the strongest true alternatives in the IQuD are *at most* as strong as the prejacent". With the previous background in hand, let us see now how *only* works in optatives. Consider the optative in (23).

(23) John had a job interview this morning. He drove there but his car broke down. John called Tom, a mechanic friend, but by the time he got the car running it was too late for John to make it.

[12] The ordered alternatives do not need to logically entail alternatives lower in the scale.

[13] The prejacent of an utterance containing *only* is the proposition denotated by the sentence in which the exclusive is not present.

Tom:If *only* I had arrived earlier

In order to make use of Beaver & Clark's (2008) proposal, we need to adapt it to the case of conditionals. The optative uttered by Tom is "If only I had arrived earlier, John would have gotten to his interview on time". With the assumption that the antecedent proposition is focused, the prejacent itself is X. In the context of the optative conditional, we obtain (24):

(24) If X, John would have gotten to his interview on time.
(Where X= Tom arrives on time and repairs John's car)

The alternative values for X are presented in (25). The alternatives in (25) are ordered according to a scale provided by what could intuitively be thought of as *likelihood* (factors like the degree of deviation from the history of the actual world, the effort required to bring about the truth of the proposition, and plausibility can all play a role here). The strongest alternatives are the most likely ones, while the weakest alternatives are the ones that require more effort, are more implausible given the history of the world, etc.

(25)

$+(likely)$	John drove his car more carefully
	Tom arrived earlier and fixed the car
	Tom fixed the car faster
$-(likely)$	John went out and bought a new car

In (25) we find a variety of alternatives. The order is provided by likelihood and the amount of effort required to bring each about. Suppose that John is actually a careful driver and Tom is habitually late. It would have been more likely/easier for John to drive even more carefully than he actually did than for Tom to arrive on time. John is actually rather poor, so the amount of effort it would have taken for him to buy a new car, and the unlikelihood of that happening, is much greater than for the alternative of Tom arriving on time.

I will follow Beaver & Clark (2008) with respect to the presuppositions and descriptive content associated with *only*. Since we are dealing with alternatives that are antecedents of (counterfactual) conditionals, we cannot ask for the strongest true alternative. Instead, in the context of a conditional, we will look for the strongest sufficient alternative. When Tom utters the optative in (23), he presupposes that the strongest sufficient alternatives are at least as strong as the antecedent proposition. The descriptive content associated with Tom's claim is that the strongest sufficient alternatives are at most as strong as the antecedent.

Let us examine the predictions made by this proposal with respect to (23). Tom's utterance carries the presupposition that the sufficient alternatives are at least as strong as the chosen alternative. This is true, since the only other suffi-

cient alternative (that Tom fixed the car more quickly) is as strong as the chosen alternative (the other sufficient alternatives are weaker). The descriptive content associated with Tom's utterance is that the strongest sufficient alternatives are at most as strong as the chosen alternative. This is true given our scale, since the stronger alternatives are not sufficient (the car breaking down had nothing to do with John's driving style).

The proposal above makes correct predictions regarding unacceptable optatives in this context. Imagine that in the scenario above, Tom had uttered *If only you had driven more carefully!*. This would have been deviant in the context, since driving more carefully would not have had any useful consequences. We would be surprised by Tom's utterance. The deviancy is predicted. The descriptive content associated with such a claim would have been false. This is not the strongest sufficient alternative. Indeed, this is not a sufficient alternative at all. With the assumption (following Beaver & Clark 2008) that *only* marks the strongest sufficient condition, this optative is predicted to be deviant.

Let us turn now to another deviant optative. Suppose that in the scenario above, Tom had uttered *If only you had bought another car*. This optative would also have been deviant. John would have felt that Tom's utterance was a bit exaggerated. This is also predicted by the proposal above. The presuppositions associated with Tom's utterance would not be respected. There are sufficient alternatives that are stronger than the chosen alternative. Again, the proposal predicts that this optative is deviant.

The role of *only* in an optative is to signal the position that the antecedent proposition occupies on a scale. We have followed Beaver & Clark (2008) with respect to the presuppositions and descriptive content associated with *only*. Given that our interest lies in *only* in the antecedent of conditionals, we have not relativized the scale to truth, but to the sufficiency of the proposition to bring about the consequent. The scales we have adopted order the alternatives in terms of *likelihood*, with the most likely being considered stronger. This has the result that propositions that are harder to bring about, or wildly implausible, are characterized as weaker. This may appear rather unintuitive, but, as we have seen, this scale fits our intuitions regarding the acceptability of optatives.

We have not discussed Beaver & Clark's (2008) claim that *only* weakens salient or natural expectations. A discussion of this point remains for future work. It is worth noting that the case of conditionals is different from the case of assertions discussed in Beaver & Clark (2008). It is unclear how expectations would work in the antecedent of (counterfactual) conditionals. Notice that in Beaver & Clark's (2008) example *Brad only got a Soames*, getting a Soames is understood as being 'less' than was expected/hoped for. However, in the context of a conditional *If only Brady had gotten a Soames!* the judgment

disappears. Expectations seem to work differently in the case of conditionals, but this discussion lies outside the scope of the current work.

An optative provides the best/strongest alternative that a speaker knows would bring about the desired consequent. If an optative is considered a pay-off move, it requires an IQuD that asks for the best strongest alternative that brings about the consequent. These are *goal oriented /mention-some* questions.

5.4 Desirability Derived!

When uttering an optative the speaker indicates that he is answering a *mention-some/goal oriented* question. This is because of the congruence requirement between the optative and the IQuD. Optatives require a IQuD that asks about the *best* alternative amongst the set, and *mention-some/goal oriented* questions do exactly that. Since only *mention-some/goal oriented* questions can license optatives and these questions imply that the embedded proposition[14] is desired, we understand that the consequent in optatives is desired.

6 Conclusion

In this paper I have proposed an analysis of optatives that draws heavily on the interaction between syntax, semantics, pragmatics and discourse to explain the meaning of the construction. The focus of the paper has been the expression of desirability in optatives. I have shown that the modal meanings associated with desires can be derived pragmatically. There isn't a "desirability modal" in optatives. There is, however, a focus adverb that appeals to ordered alternatives and invokes a question under discussion with desirability implicatures.

References

Asher, Nicholas & Alex Lascarides. 1998. Questions in dialogue. *Linguistics and Philosophy* 23(3). 237–309.

Beaver, David I. & Brady Z. Clark. 2008. *Sense and Sensitivity: How focus determines meaning*. Malden, MA: Wiley-Blackwell.

Biezma, María. in progress. *Anchoring pragmatics in syntax and semantics*. Amherst, MA: University of Massachusetts Amherst dissertation. Ms.

Ebert, Christian, Cornelia Endriss & Stefan Hinterwimmer. 2008. A unified analysis of indicative and biscuit conditionals as topics. In T Friedman & S Ito (eds.), *Proceedings of semantics and linguistic theory 18*, Ithaca: Cornell University.

von Fintel, Kai. 1994. *Restrictions on quantifier domains*: University of Mas-

[14] The embedded proposition in the question is also the (implicit) consequent in the optative conditional.

sachusetts Amherst dissertation.

Haiman, John. 1978. Conditionals are topics. *Language* 54(3). 564–589.

Kasper, Walter. 1992. Presuppositions, composition, and simple subjunctives. *Journal of Semantics* 307–331.

Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1. 337–355.

Reinhart, Tanya. 1981. Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* 27. 53–94.

Rifkin, Jay I. 2000. If only *if only* were if plus only. In *Cls 36*, 369–383. Chicago, Il: Chicago Linguistics Society.

Roberts, Craige. 1996. Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics. In *OSU Working papers in linguistics 49: papers in semantics*, 91–136.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 133–147. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On French *un même* and Antispecificity

Isabelle Charnavel
University of California, Los Angeles/Institut Jean Nicod, Paris
icharnavel@gmail.com

Abstract. In this paper, I examine the definiteness problem raised by sentence-internal *même* 'same' in French, as in this language (*vs.* English), *même* does not only combine with the definite determiner (*le même*), but also with the indefinite article (*un même*). Even if *le même,* like *the same,* does not behave like typical definite descriptions do, it contrasts with *un même* with respect to definiteness and distribution: *un même* is more indefinite than *le même* in that it does not trigger any presupposition at all; moreover, *un même* is more restricted in distribution than *le même* in that it only exhibits sentence-internal readings in antispecific contexts. I hypothesize that both *le même* and *un même* are quantifiers over a plural event that has been distributed, but also contain a domain variable: that of *un même* has to be quantificationally bound while that of *le même* can also be identified by the context.

1 Introduction

Sentence-internal *same* (like *different*) poses a problem of compositionality that aroused the interest of several linguists (Carlson 1987, Moltmann 1992, Barker 2007, Brasoveanu 2009, ...): due to its meaning involving comparison, the interpretation of *same* relies on the presence of a licenser (underlined in 1) that does not directly combine with the DP containing *same*. Under the sentence-internal reading, (1) means that there exists some book x such that Mike read x and Sue read x (while the sentence-external reading depends on identifying some contextually salient book).

(1) Mike and Sue read the **same** book.

But in this paper, I will focus on another related issue raised by sentence-internal *same*: even if DPs with sentence-internal *same* do not behave the way typical definite descriptions do, *'a same'* is ungrammatical in English; C. Barker (2007: 428) formulates this definiteness puzzle as follows:

> Why does *same* require the definite determiner? (Baker 2007: 428)

However, French equivalent of 'same' *même* interestingly combines either with the definite (*le/la/les même(s)*) or the indefinite (*un/une/de même(s)*)

article. Moreover, *le même* behaves like *the same* in that it also presents indefiniteness effects. *The same* can always be translated by *le même*, but also by *un même* in certain cases; in other cases, *un même* cannot be translated by *the same* without changing the meaning.
The main issue is thus to understand in which cases *un même* is licensed if *le même* already behaves like an indefinite. My goal is to describe the semantics and the distribution of *un même* and examine the theoretical implications with respect to definiteness and specificity. To this end, I will first compare *le même* and *un même* with respect to definiteness, then with respect to distribution, and I will finally suggest an hypothesis about the antispecificity of *un même*: I will propose that *un même* and *le même* are quantifiers containing a variable that gets interpreted in different ways.

2 *Le même*, *un même* and Definiteness

2.1 *Le même* and Indefiniteness Effects

Sentence-internal *même* differs from other terms expressing identity and difference with respect to determiner use.

(2) a. Julie et Paul ont lu le même livre/#le livre différent/similaire.
'Julie and Paul read the same/#the different/#the similar book.'
b. Julie et Paul ont lu ??un même livre/un livre différent/similaire.
'Julie and Paul read ??a same/a different/a similar book.'

Moreover, *le même* exhibits indefiniteness effects. First, it does not trigger a presupposition of unique existence as typical definite descriptions do (cf. Barker 2007: 428). This is shown in (3) presenting basic tests for presuppositions: even if the sentence is negated or questioned, the existence of a unique book that Luc and Flore read is not presupposed, but this is precisely what is at issue here.

(3) a. Luc et Flore ont lu le même livre.
'Luc and Flore read the same book.'
b. Est-ce que Luc et Flore ont lu le même livre?
'Did Luc and Flore read the same book?'
c. Luc et Flore n'ont pas lu le même livre.
'Luc and Flore did not read the same book.'

Also, *le même* can introduce a new discourse referent like indefinites (cf. Novelty Condition) as opposed to standard definites.

(4) A: Pourquoi tu penses que Luc et Flore ont des goûts similaires?
B: Pendant les vacances, ils ont lu le même livre.
'A: Why do you think Luc and Flore have similar tastes?
B: They read the same book during the holidays.'

Furthermore, *le même* can occur in existential constructions unlike typical definites.

(5) a. Il existe le même problème dans ces trois pays.
'There exists the same problem in these three countries.'
b. * Il existe le/ce problème dans ces trois pays.
'*There exists the/this problem in these three countries.'

Finally, *le même* can be non specific as exemplified in (6). This is not predicted based on Enç (1991) who argues that specificity corresponds to an inclusion relation in a contextually determined set; since the linking relevant for definite DPs is the identity relation and identity of referents entails inclusion, all definites are expected to be specific.

(6) Claire et Anne ont acheté la même robe.
'Claire and Anne bought the same dress.'
a. Specific: there is a particular dress that the speaker has in mind that Claire and Anne each bought.
b. Non specific: there exists a unique dress – whatever it is, the speaker does not know which one – that Claire and Anne each bought.[1]

So *le même* behaves like an indefinite in several respects.

2.2 *Un même* more Indefinite than *le même?*

If *le même* has the properties of an indefinite, how can *un même* contrast with *le même*?

First, *le même* unlike *un même* triggers what I call a global presupposition of unique existence. As seen above, (3) does not presuppose the existence of a unique book that Luc and Flore read (usual presupposition of existence), but it presupposes that Luc and Flore each read a unique book (global presupposition of existence), as shown by Solomon (2009) for *same*. This idea is corroborated by the following examples: the infelicitousness of (7) points to a global existence presupposition, while that of (8) indicates the existence of a global uniqueness presupposition.

[1] Note that specificity cannot be determined by scope when *same* is involved: because of its meaning, narrow scope of *same* does not entail covariation.

(7) Est-ce que Luc et Flore ont lu le même livre? #Non, Luc n'a pas lu de livre.
'Did Luc and Flore read the same book? #No, Luc didn't read any book.'

(8) ??Luc et Flore ont lu le même livre pendant les vacances, et Luc a également lu *les Misérables* et *Madame Bovary*.
'??Luc and Flore read the same book during the holidays, and Luc also read *les Misérables* and *Madame Bovary*.'

On the other hand, *un même* does not trigger any presuppositions at all: when *un* 'a' is used, (9) does not presuppose that the children eat round a table, and (10) does not presuppose that each country only has one enemy.

(9) Dans la plupart des familles nombreuses, les enfants ne mangent pas autour de la/une même table.
'In most large families, the children do not eat round the/UN same table.'

(10) Quand deux pays ont le/un même ennemi, ils s'allient.
'When two countries have the/UN same enemy, they form an alliance.'

Furthermore, *un même* has to be non specific (what I call antispecificity) while *le même* can be either specific or non specific. (11) illustrates that *un même* unlike *le même* cannot be used when the referent can be identified by the context.

(11) a. Dans chaque système planétaire, toutes les planètes tournent autour de la/une même étoile.
'In each planetary system, every planet revolves around the/UN same star.'
b. Dans le système solaire, toutes les planètes tournent autour de la/*une même étoile.
'In the solar system, every planet revolves around the/*UN same star.'

So the semantic difference between *un même* and *le même* pertains to presuppositions and specificity.

3 *Le même*, *un même* and Distribution

It appears that *un même* can always be replaced by *le même*, but the reverse does not hold. What is then the contrast between *un même* and *le même* with respect to distribution?

3.1 DP-internal Distribution of *même*

First, let's note that *même* does not exhibit the DP-internal distribution of standard adjectives, which supports the hypothesis that *le même* and *un même* are actually complex determiners.
In fact, *même* cannot be used predicatively.

(12) a. Ces livres sont *(les) mêmes.
'These books are *(the) same.'
b. *Je ne le trouve pas même aujourd'hui.
'*I don't find him same today.'

Secondly, the only determiners compatible with sentence-internal *même* are the definite determiner *le/la/les*, and the indefinite one *un/une/de*.

(13) a. lire *quelques/*divers/*certains/*plusieurs/*trois/de/les même livres.
'to read *some/*various/*certain/*several /*three/ø/the same books.'
b. lire un/*leur/#ce/le même livre.
'to read a/*their/#this/the same book.'[2]

Thirdly, *même* cannot be modified by adverbs.

(14) Luc et Flore ont lu le (*vraiment/*très/*presque/*tout) même livre.
'Luc and Flore read the (?really/very/?almost/very) same book.'

Finally, *même* cannot be coordinated with any adjective.

(15) Luc et Flore ont acheté le (*petit et/*premier et/*seul et) même livre.
'Luc and Flore bought the (*small and/*first and/*only and) same book.'

Based on these data, I hypothesize that *le même* and *un même* are complex determiners. This is supported by crosslinguistic evidence: Braseovanu (2009) shows that in Romanian, while singular and plural 'different' are adjectival in nature (*alt* and *diferit*, respectively), 'same' is a determiner – the so-called demonstrative article (or pronoun) of identity *acelaşi* (agreeing in gender and number), which is the counterpart of the English 'the+same' rather than just 'same'.

3.2 Only one Reading for *un même*

But there are several distributional differences between *un même* and *le même*. First, *un même* unlike *le même* only has sentence-internal readings.

[2] # indicates that the sentence-external reading is possible, but not the sentence-internal reading that concerns us here.

In fact, *le même* appears in three kinds of contexts: it can have sentence-internal readings (cf. 3); but it can also exhibit sentence-external-readings that depend on identifying some contextually salient book, whether deictically (16) or anaphorically (17); and it can occur in comparative constructions (18).

(16) Regarde! Luc et Flore ont lu le même livre.
'Look! Luc and Flore read the same book.'

(17) J'ai lu *Germinal* pendant les vacances. Luc et Flore ont lu le même livre.
'I read *Germinal* during the holidays. Luc and Flore read the same book.'

(18) Luc et Flore ont lu le même livre que toi/l'année dernière/celui que tu as emprunté à la bibliothèque.
'Luc and Flore read the same book as you/last year/the one you borrowed from the library.'

On the other hand, *un même* only presents sentence-internal readings (19): it cannot appear in comparative constructions (20) and cannot have sentence-external readings whether anaphorically (21) or deictically (22) constructed.

(19) Une même expression peut avoir plusieurs sens.
'UN same phrase may have several senses.'

(20) On ne peut jamais employer *une/la même expression que Paul.
'One can never use *UN/the same phrase as Paul.'

(21) Paul a choqué l'assistance en employant une expression très familière. Ses collègues ne pourraient pas employer *une/la même expression.
'Paul shocked the audience by using a very colloquial phrase. His colleagues could never use *UN/the same phrase.'

(22) Ecoute ça! On employait *une/la même expression il y a dix ans.
'Listen to that! One used *UN/the same phrase ten years ago.'

So *un même* is more constrained than *le même* in that it only presents sentence-internal readings.

3.3 The Distributional Constraints on *un même*

Furthermore, the sentence-internal reading of *un même* is itself more constrained. To realize that, we need to first identify the distributional constraints common to *le même* and *un même.*

Le/un même requires distributive licensers, whether obligatorily distributive (some quantifiers, cf. 23a) or optionally distributive (plurals and conjunctions, cf. 23b).

(23) a. Chaque enfant doit lire le/un même livre.
'Each child has to read the/UN same book.'
b. Ces enfants/Luc and Flore doivent lire le/un même livre.
'These children/Luc and Flore have to read the/UN same book.'

Conversely, elements that cannot be distributive (singulars or collectives cf. 24a, mass nouns cf. 24b) cannot license *le/un même*.

(24) a. Luc/la classe doit lire #le/*un même livre.
'Luc/the class has to read #the/*UN same book.'
b. Le riz coûte #le/*un même prix.
'Rice costs #the/*UN same prize.'

Moreover, the relation between the licenser and *le/un même* resembles the relation between two scope-taking quantifiers. Thus, *le/un même* does not need to be c-commanded by its licenser as opposed to anaphors.

(25) Le/un même joueur peut remporter tous les tournois.
'The/UN same player may win every tournament.'

Also, *le/un même* is sensitive to island constraints (adjunct constraint (26), coordination constraint (27), extraction constraints related to non-bridge verbs (28), wh-islands (29), subject islands (30)).

(26) a. Aucune région n'est en colère parce que #le/*un même nombre de députés a démissionné.
'No region is angry because #the/*UN same number of deputies resigned.'
b. Aucune région ne peut élire le/un même nombre de députés.
'No region can elect the/UN same number of deputies.'

(27) a. Chaque électeur peut voter pour ce président et #le/*un même trésorier.
'Each voter can vote for this president and #the/*UN same treasurer.'
b. Chaque électeur peut voter pour le/un même trésorier.
'Each voter can vote for the/UN same treasurer.'

(28) a. Si tous les habitants chuchotent que #la/*une même personne a commis le crime, il n'y a pas d'espoir.

'If every inhabitant whispers that #the/*UN same person committed the crime, there is no hope.'

b. Si tous les habitants accusent la/une même personne, il n'y a pas d'espoir.
'If every inhabitant accuses the/UN same person, there is no hope.'

(29) a. Quand Anne et Flore se demandent où #la/*une même personne ira, elles finissent par le savoir.
'When Anne and Flore wonder where #the/*UN same person will go, they end up finding it out.'

b. Quand Anne et Flore critiquent la/une même personne, elles n'ont pas de pitié.
'When Anne and Flore criticize the/UN same person, they have no pity.'

(30) a. Qu'un individu commette #le/*un même acte peut constituer un crime contre l'humanité et un crime de guerre.
'That an individual commits #the/*UN same act can constitute a crime against humanity and a war crime.'

b. Le/un même acte peut constituer un crime contre l'humanité et un crime de guerre.
'The/UN same act can constitute a crime against humanity and a war crime.'

Furthermore, *le/un même* is not only licensed by distributive DPs, but also by conjoined PPs, conjoined Ps, conjoined VPs, conjoined APs and possibly conjoined Advs, as observed for *same* and *different* by Carlson (1987) and Moltmann (1992), who based on such data proposed an analysis of *same* in terms of events.

(31) a. Le/un même homme peut composer des opéras et jouer au football.
'The/UN same man may compose operas and play soccer.'

b. Le/un même homme peut aimer peindre dans son atelier et à l'extérieur.
'The/UN same man may like painting in his studio and outside.'

c. Le/un même homme peut voter pour et contre un projet de loi.
'The/UN same man voted for and against the bill.'

d. On peut peindre le/un même jouet en rouge et en bleu.
'One may paint the/UN same toy red and blue.'

e. On peut cuisiner le/un même plat joyeusement et tristement.
'Luc cooked the/UN same meal joyfully and sadly.'

I showed in Charnavel (2011) that moreover, *le/un même* is also licensed by several possible aspectual notions, such as frequentativity, iterativity (32, 33) or continuativity, durativity (34, 35), which can be expressed by several categories (verbs, adverbs, preverbs, nouns, adjectives).

(32) Lire le/un même livre plusieurs fois est instructif.
'Reading the/UN same book several times is instructive.'

(33) La répétition de la/une même erreur n'est pas acceptable.
'The repetition of the/UN same mistake is not acceptable.'

(34) Il est difficile de continuer à travailler dans la/une même entreprise quand on aime le changement.
'It is hard to keep working in the/UN same company when one likes changes.'

(35) Une habitation prolongée dans le/un même logement peut poser problème.
'Extended habitation in the/UN same housing may pose problems.'

In all these cases, a plural event is involved, which is distributed over the overall running time in several ways depending on the aspect that is expressed. So I hypothesize that *le/un même* is an existential quantifier over a plural event (see Charnavel 2011 for more details); this event needs to have independently been distributed through participants or times as formalized below: *le/un même* takes two arguments, its restriction Y and the event predicate Z, and says that for every event e_n part of this (obligatorily) plural event, there is a corresponding individual x_n in e_n part of the restriction set, and all these individuals x_n are identical:

(36) $[\![$ *le/un même* $]\!] = \lambda Y_{<et>}.\lambda Z_{<e,vt>}.\ \exists x_1, x_2 \ldots x_n \leq x\ (e_{n-1} \neq e_n$; n is a positive integer and $n \geq 2$) such that $Y(x_n)=1$ and $Z(x_n)(e_n)=1$, and $x_{n-1}=x_n$

This is illustrated in (37). In (a), the event has been distributed through participants (possibly through a silent distributive operator): for every subevent e_1 (Luc reading) and e_2 (Flore reading), there is a book x_1 and a book x_2, such that x_1 is identical to x_2. In (b), the event has been distributed through times by the adverbial quantifier: for every subevent e_1 (Flore reading at time t_1) and e_2 (Flore reading at time t_2), there is a book x_1 and a book x_2, such that x_1 is identical to x_2.

(37) a. Luc et Flore ont lu le même livre.
'Luc and Flore read the same book.'
b. Flore lit toujours le même livre.

'Flore always reads the same book.'

Besides, *un même* has further distributional constraints (note that in the previous examples, these additional constraints were fulfilled so that the constraints common to *le même* and *un même* could be independently examined). The presence of a plural event is a necessary, but not sufficient condition for licensing sentence-internal *un même*, which is only licensed by the following contexts: inside a DP (38), in the context of modality and genericity (39), in the context of arbitrary PRO (40), or in the context of hypotheses (41).

(38) a. Quatre générations sous un/le même toit
'Four generations under UN/the same roof.'
b. Ces quatre générations ont vécu sous ??un/le même toit.
'These four generations lived under ??UN/the same roof.'

(39) a. Un/le même mot peut avoir plusieurs sens.
'UN/the same word may have several senses.'
b. Un/le même mot a (généralement) plusieurs sens.
'UN/the same word (generally) has several senses.'
c. Dans ce texte, ??un/le même mot a plusieurs sens.
'In this text, ??UN/the same word has several senses.'

(40) a. Utiliser un/le même mot de passe pour différents services, ordinateurs et sites internet augmente les risques de se faire voler des informations personnelles.
'Using UN/the same password for different services, computers and websites increases the risks of having personal informations stolen.'
b. J'ai utilisé ??un/le même mot de passe pour différents services, ordinateurs et sites internet.
'I used ??UN/the same password for different services, computers and websites.'

(41) a. Si un/le même joueur fait plus de 5 fautes, il est disqualifié.
'If UN/the same player makes more than 5 mistakes, he gets disqualified.'
b. ??Un/Le même joueur a fait plus de 5 fautes.
'??UN/The same player made more than 5 mistakes.'

So the intuition is that *un même* is licensed in contexts presenting a flavor of generality, i.e. when multiple situations are involved: it is unfelicitous as soon as a particular situation is at stake (antispecificity).

To sum up, I have proposed several hypotheses concerning both *le même* and *un même*: based on the fact that *même* does not exhibit the standard distribution of an adjective, I have hypothesized that *un même* and *le même* are complex determiners. Based on the observation that *un même* and *le même* require distributive licensers (individuals or times) and that they are sensitive to island constraints, I have proposed that *un même* and *le même* are quantifiers over a plural event. Furthermore, I have observed that *un même* has a more constrained distribution than *le même*: *un même* only exhibits sentence-internal readings in antispecific contexts. The question is now to know how to analyse the antispecificity of *un même*.

3 *Un même* and Antispecificity

Let's review in which sense *un même* is antispecific as opposed to *le même*. First, *un même* cannot be used when the speaker has an individual in mind as its referent.

(42) Dans le système solaire, toutes les planètes tournent autour de la/*une même étoile.
'In the solar system, every planet revolves around the/*UN same star.'

Secondly, *un même* is not licensed if the referent of its DP has a linking relation with an antecedent, as shown by the absence of sentence-external readings with *un même*. According to Enç (1991), nonspecifics require that their discourse referents not be linked to previously established discourse referents, while specifics exhibit an inclusion relation or any other association with an antecedent.

(43) Paul a choqué l'assistance en employant une expression très familière. Ses collègues ne pourraient pas employer *une/la même expression.
'Paul shocked the audience by using a very colloquial phrase. His colleagues could never use *UN/the same phrase.'

Thirdly, *un même* does not trigger any presupposition of existence.

(44) Dans la plupart des familles nombreuses, les enfants ne mangent pas autour de la/une même table.
'In most large families, the children do not eat round the/UN same table.'

Finally, *un même* requires variability of situations.

(45) Utiliser un/le même mot de passe pour différents services, ordinateurs et

sites Internet augmente les risques de se faire voler des informations personnelles.
'Using UN/the same password for different services, computers and websites increases the risks of having personal informations stolen.'

(46) Quatre générations sous un/le même toit
'Four generations under UN/the same roof.'

(47) Un/le même mot peut avoir plusieurs sens.
'UN/the same word may have several senses.'

(48) Si un/le même joueur fait plus de 5 fautes, il est disqualifié.
'If UN/the same player makes more than 5 mistakes, he gets disqualified.'

(49) a. Dans chaque système planétaire, toutes les planètes tournent autour de la/une même étoile.
'In each planetary system, every planet revolves around the/UN same star.'
b. Dans le système solaire, toutes les planètes tournent autour de la/*une même étoile.
'In the solar system, every planet revolves around the/*UN same star.'

Thus in (49), the plurality of planets illustrates the requirement for *même* that there be several events: *même* expresses uniqueness across multiple events; furthermore, the plurality of planetary systems in (a) illustrates the requirement for the indefinite article combined with *même* that there be several situations: *un même* requires a covarying interpretation and expresses uniqueness relativized to a situation.

Based on Von Fintel (2004)'s idea that quantifiers have a hidden domain argument, I propose that *un même* is not only a quantifier over a plural event, but also contains a domain variable (resource situation pronoun) whose value has to be quantificationally bound; it cannot be identified by a contextually supplied situation. That's why *un même* is licensed by contexts which contain a quantifier over situations or worlds.

(50) [Dans chaque système planétaire]$_i$, toutes les planètes tournent autour d'une$_i$ même étoile.
'In each planetary system, every planet revolves around UN same star.'

On the other hand, the variable contained in *le même* can be either bound by the same operators (non specific reading) or identified by the context

(specific reading). This is formalized below. In the case of *un même* expressing uniqueness relativized to a situation, s needs to be quantificationally bound, but since *le même* expresses uniqueness either relativized to a situation or in a particular context, s is either quantificationally bound or contextually supplied in this case.

(51) $[\![$*le/un même*$]\!] = \lambda\mathbf{s}.\lambda Y_{<et>}.\lambda Z_{<e,vt>}.\ \exists x_1, x_2 \ldots x_n \leq x\ (e_{n-1} \neq e_n$; n is a positive integer and $n \geq 2)$ such that $Y(x_n)(s)=1$ and $Z(x_n)(e_n)(s)=1$, and $x_{n-1}=x_n$ **in s**.

The contrast between *un même* and *le même* is parallel to other phenomena. First, it is reminiscent of Florian Schwarz's dissertation (2009) concerned with the description and analysis of two semantically different types of definite articles in German (weak and strong).

(52) a. Hans ging zum Haus. (Schwarz 2009: 12)
Hans went to-the$_{weak}$ house
'Hans went to the house.'
b. Hans ging zu dem Haus.
Hans went to-the$_{strong}$ house
'Hans went to the house.'

The weak article encodes uniqueness (relativized to a situation); the strong article is anaphoric in nature (dependent on a antecedent). The interpretation of the weak article definite depends on the interpretation of its situation pronoun, which can stand for the topic situation or a contextually supplied situation, or be quantificationally bound.

So, *le même* contrasts with *un même* like the strong article with the weak article in that it has an anaphoric capacity that *un même* lacks as shown in sentence-external readings. Like the weak article, *un même* expresses uniqueness relativized to a situation, which can be analyzed by use of a resource situation pronoun.

Nevertheless, the empirical divisions between the weak/strong articles and *un/le même* are different: the resource situation pronoun of the weak article can also stand for the topic situation or a contextually supplied situation while that of *un même* cannot: it has to be quantificationally bound.

Moreover, the contrast between *le même* and *un même* is the reverse of the contrast observed by Beghelli and Stowell (1995) between *each* and *every*: the set variable of *each* must be identified by the context, while the set variable of *every* can also be bound by operators.

(53) a. Every dog has a tail. (Beghelli and Stowell 1995: 32)
b. Each dog has a tail.

(53a) can be construed as a claim about dogs in general, whereas (53b) must be construed as a claim about a particular set of dogs previously mentioned in the discourse. Thus, the sentence with *each* means that there is a particular situation s, a set X of all dogs in s, such that all the members of X have a tail, while the sentence with *every* means that in the default situation s where X is the set of all dogs in s, all members of X have a tail. When *every*-DPs occur in generic contexts, they are interpreted as though they were universal-generic quantifiers because they contain restricted variables (ranging over sets) bound by a silent generic quantifier. When *every* occurs in a context associated with reference to a single situation time, it acquires its contextualized universal-distributive reading because it is bound by a silent definite quantifier (existential quantifier ranging over situation-time (existential counterpart of GEN)).

Note that Beghelli and Stowell distinguish quantifiers ranging over situation-times from quantifiers ranging over events. This fits the present analysis since *un même* and *le même*, being quantifiers over events, could not be bound by quantifiers over events themselves, but can only be bound by hierarchically higher operators like quantifiers over situations.

	Domain variable bound by operators	Domain variable contextually supplied
le même	x	x
un même	x	
every	x	x
each		x

4 Conclusion

To summarize, *même* presents two main puzzles: a compositionality problem and a definiteness issue. Concerning the first one, I hypothesized that *le même* and *un même* are existential quantifiers over an event that has been distributed over participants or times. As for the second problem which was my main concern here, I observed that French *un même* documents the availability of the indefinite determiner with *same*, even if *le même* already presents indefiniteness effects. The distribution of *un même* shows its antispecificity and therefore questions the following generalization: definites are assumed to be specific while indefinites are specific or non specific; but

actually, *le même* is specific or non specific while *un même* is non specific (antispecificity). To account for that, I proposed that *un même* introduces a variable that has to be bound by operators over situations, while the variable introduced by *le même* can also be contextually supplied. I believe it would be worth further investigating this phenomenon and similar ones, as it may be fruitful to relate definiteness and specificity with the interpretation of domain variables in quantifiers.

References

Barker, Chris. 2007. Parasitic Scope. *Linguistic and Philosophy* 30. 407–444.

Beghelli, Filippo & Tim Stowell. 1997. Distributivity and Negation: the Syntax of *each* and *every*. In Szabolcsi (ed.), *Ways of Scope Taking*. 71–109. Kluwer.

Brasoveanu, Adrian. 2009. Sentence-internal *different* as Quantifier-internal Anaphora. In *Proceedings of the 27th West Coast Conference on Formal Linguistics*. 72–80.

Carlson, Greg. 1987. *Same* and *Different*: some Consequences for Syntax and Semantics. *Linguistics and Philosophy* 10.

Charnavel, Isabelle. 2011. On the Sentence-internal Reading of French *le même*. In *Proceedings of the 20th Semantics and Linguistic Theory Conference*.

Enç, Mürvet. 1991. The Semantics of Specificity. *Linguistics Inquiry* 22 (1). 1–25.

Fintel, von, Kai. 2004. A Minimal Theory of Adverbial Quantification. In Barbara Partee & Hans Kamp (eds), *Context Dependence in the Analysis of Linguistic Meaning*, Volume 11 of *Current Research in the Semantics/Pragmatics Interface*. 137–175. Elsevier.

Moltmann, Friederike. 1992. Reciprocals and *same/different*: towards a Semantic Analysis. *Linguistics and Philosophy* 15. 411–462.

Solomon, Mike. 2009. Partitives and the Semantics of *same*. *Sinn und Bedeutung 14* handout.

Schwarz, Florian. 2009. *Two Types of Definites in Natural Language*: Umass PhD. Thesis.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 149–164. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Performative Verbs and Performative Acts*

Cleo Condoravdi
Palo Alto Research Center &
Stanford University
condorav@parc.com

Sven Lauer
Stanford University
sven.lauer@stanford.edu

Abstract. Searle (1989) posits a set of adequacy criteria for any account of the meaning and use of performative verbs, such as **order** or **promise**. Central among them are: (a) performative utterances are performances of the act named by the performative verb; (b) performative utterances are self-verifying; (c) performative utterances achieve (a) and (b) in virtue of their literal meaning. He then argues that the fundamental problem with *assertoric* accounts of performatives is that they fail (b), and hence (a), because being committed to having an intention does not guarantee having that intention. Relying on a uniform meaning for verbs on their reportative and performative uses, we propose an assertoric analysis of performative utterances that does not require an *actual* intention for deriving (b), and hence can meet (a) and (c).

Explicit performative utterances are those whose illocutionary force is made explicit by the verbs appearing in them (Austin 1962):

(1) I (hereby) promise you to be there at five. (is a promise)

(2) I (hereby) order you to be there at five. (is an order)

(3) You are (hereby) ordered to report to jury duty. (is an order)

(1)–(3) look and behave syntactically like declarative sentences in every way. Hence there is no grammatical basis for the once popular claim that **I promise/ order** spells out a 'performative prefix' that is silent in all other declaratives. Such an analysis, in any case, leaves unanswered the question of how illocutionary force is related to compositional meaning and, consequently, does not explain how the first person and present tense are special, so that first-person present tense forms can spell out performative prefixes, while others cannot. Minimal variations in person or tense remove the 'performative effect':

(4) I promised you to be there at five. (is not a promise)

(5) He promises to be there at five. (is not a promise)

An attractive idea is that utterances of sentences like those in (1)–(3) are *asser-*

* The names of the authors appear in alphabetical order.

tions, just like utterances of other declaratives, whose truth is somehow guaranteed. In one form or another, this basic strategy has been pursued by a large number of authors ever since Austin (1962) (Lemmon 1962; Hedenius 1963; Bach & Harnish 1979; Ginet 1979; Bierwisch 1980; Leech 1983; among others). One type of account attributes self-verification to meaning proper. Another type, most prominently exemplified by Bach & Harnish (1979), tries to derive the performative effect by means of an implicature-like inference that the hearer may draw based on the utterance of the explicit performative.

Searle's (1989) Challenge

Searle (1989) mounts an argument against analyses of explicit performative utterances as self-verifying assertions. He takes the argument to show that an assertoric account is impossible. Instead, we take it to pose a challenge that can be met, provided one supplies the right semantics for the verbs involved.

Searle's argument is based on the following desiderata he posits for any theory of explicit performatives:

(a) performative utterances are performances of the act named by the performative verb;
(b) performative utterances are self-guaranteeing;
(c) performative utterances achieve (a) and (b) in virtue of their literal meaning, which, in turn, ought to be based on a uniform lexical meaning of the verb across performative and reportative uses.

According to Searle's speech act theory, making a promise requires that the promiser *intend* to do so, and similarly for other performative verbs (the *sincerity condition*). It follows that no assertoric account can meet (a-c): An assertion cannot ensure that the speaker has the necessary intention.

> "Such an assertion does indeed commit the speaker to the existence of the intention, but the commitment to having the intention doesn't guarantee the actual presence of the intention."
>
> Searle (1989: 546)

Hence assertoric accounts must fail on (b), and, *a forteriori*, on (a) and (c).[1]

Although Searle's argument is valid, his premise that for truth to be guaranteed the speaker must have a particular intention is questionable. In the following, we give an assertoric account that delivers on (a-c). We aim for an

[1] It should be immediately clear that inference-based accounts cannot meet (a-c) above. If the occurrence of the performative effect depends on the hearer drawing an inference, then such sentences could not be self-verifying, for the hearer may well fail to draw the inference.

account on which the assertion of the explicit performative *is* the performance of the act named by the performative verb. No hearer inferences are necessary.

1 Reportative and Performative Uses

What is the meaning of the word **order**, then, so that it can have both reportative uses – as in (6) – and performative uses – as in (7)?

(6) *A* ordered *B* to sign the report.

(7) [*A* to *B*] I order you to sign the report now.

The general strategy in this paper will be to ask what the truth conditions of *reportative* uses of performative verbs are, and then see what happens if these verbs are put in the first person singular present tense. The reason to start with the reportative uses is that speakers have intuitions about their truth conditions. This is not true for performative uses, because these are always true when uttered, obscuring the truth-conditional content of the declarative sentence.[2]

An assertion of (6) takes for granted that *A* presumed to have authority over *B* and implies that there was a communicative act from *A* to *B*. But what kind of communicative act? (7) or, in the right context, (8a-c) would suffice.

(8) a. Sign the report now!
b. You must sign the report now!
c. I want you to sign the report now!

What do these sentences have in common? We claim it is this: In the right context they *commit A to a particular kind of preference* for *B* signing the report immediately.

If *B* accepts the utterance, he takes on a commitment to act as though he, too, prefers signing the report. If the report is co-present with *A* and *B*, he will sign it, if the report is in his office, he will leave to go there immediately, and so on. To comply with an order to *p* is to act as though one prefers *p*. One need not *actually* prefer it, but one has to act as if one did. The authority mentioned above amounts to this acceptance being socially or institutionally mandated.

Of course, *B* has the option to *refuse* to take on this commitment, in either of two ways: (i) he can deny *A*'s authority, (ii) while accepting the authority, he can refuse to abide by it, thereby violating the institutional or social mandate. Crucially, in either case, (6) will still be true, as witnessed by the felicity of:

[2] Szabolcsi (1982), in one of the earliest proposals for a compositional semantics of performative utterances, already pointed out the importance of *reportative* uses.

(9) a. (6), but *B* refused to do it.
b. (6), but *B* questioned his authority.

Not even uptake by the addressee is necessary for **order** to be appropriate, as seen in (10) and the naturally occurring (11):[3]

(10) (6), but *B* did not hear him.

(11) He ordered Kornilov to desist but either the message failed to reach the general or he ignored it.[4]

What *is* necessary is that the speaker *expected* uptake to happen, arguably a minimal requirement for an act to count as a communicative event.

To sum up, all that is needed for (6) to be true and appropriate is that (i) there is a communicative act from *A* to *B* which commits *A* to a preference for *B* signing the report immediately and (ii) *A* presumes to have authority over *B*. The performative effect arises precisely when the utterance itself is a witness for the existential claim in (i).

There are two main ingredients in the meaning of **order** informally outlined above: the notion of a *preference*, in particular a special kind of preference that *guides action*, and the notion of a *commitment*. The next two sections lay some conceptual groundwork before we spell out our analysis in section 4.

2 Representing Preferences

To represent preferences that *guide action*, we need a way to represent preferences of different *strength*. Kratzer's (1981) theory of modality is not suitable for this purpose. Suppose, for instance, that Sven desires to finish his paper and that he *also* wants to lie around all day, doing nothing. Modeling his preferences in the style of Kratzer, the propositions expressed by (12) and (13) would have to be part of Sven's bouletic ordering source assigned to the actual world:

(12) Sven finishes his paper.

(13) Sven lies around all day, doing nothing.

But then, Sven should be equally happy if he does nothing as he is if he finishes his paper. We want to be able to explain why, given his knowledge that (12) and (13) are incompatible, he works on his paper. Intuitively, it is because the preference expressed by (12) is *more important* than that expressed by (13).

[3] We owe this observation to Lauri Karttunen.
[4] `https://tspace.library.utoronto.ca/citd/RussianHeritage/12.NR/NR.12.html`

Preference Structures

Definition 1. *A **preference structure** relative to an information state W is a pair $\langle P, \leq \rangle$, where $P \subseteq \wp(W)$ and $\leq$ is a (weak) partial order on P.*

We can now define a notion of consistency that is weaker than requiring that all propositions in the preference structure be compatible:

Definition 2. *A preference structure $\langle P, \leq \rangle$ is **consistent** iff for any $p, q \in P$ such that $p \cap q = \emptyset$, either $p < q$ or $q < p$.*

Since preference structures are defined relative to an information state W, consistency will require not only *logically* but also *contextually* incompatible propositions to be strictly ranked. For example, if W is Sven's doxastic state, and he knows that (12) and (13) are incompatible, for a bouletic preference structure of his to be consistent it must strictly rank the two propositions.

In general, bouletic preference structures need not be consistent, and they often will not be. We assume that the desires, preferences, and obligations of various kinds of an agent A are represented by a set $\mathbb{P}_w(A)$ of preference structures, some of which may be inconsistent, internally or with each other.

A consistent preference structure will give rise to a partial order $\prec$ among worlds. There are various ways to define this partial order, but for the present paper, we leave it open which definition is most appropriate. Nothing in what follows hinges on the choice. The basic intuition is that $\prec$ should be 'lexicographic': lower-ranked propositions in the preference structure should only make a difference for the ranking of two worlds w and v if they are on equal footing with respect to all the higher-ranked propositions.

Consolidated Preferences

Given the multitude of preference structures influencing an agent's decisions, if an agent wants to *act*, he has to integrate these structures into a global one, resolving any conflict. Thus, a rational agent A in world w has a distinguished, consistent preference structure $\langle P_w(A), \leq_{P_w(A)} \rangle$. We call this *A's effective preference structure* in w.

We require that $P_w(A) \subseteq \bigcup \mathbb{P}_w(A)$ and also that if $p, q \in P_w(A)$ such that there is $\langle P, \leq_P \rangle \in \mathbb{P}_w(A)$ and $p <_P q$ and there is no $\langle P', <_{P'} \rangle \in \mathbb{P}_w(A)$ such that $q \leq p$, then $p <_{P_w(A)} q$, ensuring that no spurious goals are introduced into the effective preference structure and rankings that are consistent are retained.

In w, A's induced preference order $\preceq_{P_w(A)}$ will partially[5] determine the agent's behavior: If A has the choice between w_1 and w_2 (as continuations of w differing in what action, if any, A performs), and $w_1 \prec w_2$, then A will choose

[5] Only partially, as an agent may be genuinely indifferent between two possible courses of affairs.

w_2. That is, the definition of $\preceq$ is a first step to defining a non-probabilistic kind of *Decision Theory*,[6] with preference structures corresponding to utility functions in classical decision theory, while information states correspond to subjective probability distributions.

We propose the following desiderata for a more developed version of such a theory:[7]

Positive introspection for effective preferences If an agent *a* effectively prefers *p*, he believes that he does.

Negative introspection for effective preferences If an agent *a* believes that he effectively prefers *p*, he does effectively prefer *p*.

3 Commitments

The idea that a main effect of utterances is to modify the commitments of the interlocutors is an old one, going back at least to Hamblin (1971). More recently, it has been fruitfully developed by Gunlogson (2008) and Davis (2009), who take utterances to update *commitment states*, typically modeled as sets of propositions.

Commitments as Restricting Future States of the World

Hamblin and Gunlogson only model *discourse commitments*, that is, commitments that constrain the linguistic actions of the interlocutors in the future of the present discourse. This enables them to characterize commitments simply as a set of 'legal' (Hamblin) or 'expected' (Gunlogson) future discourse states: If the discourse ends up in a state that is not in this set, something is off.

While such a model may be sufficient for what these authors were after, it is not quite enough in general. Commitments arising by linguistic means also constrain *non*-linguistic actions and actions that are performed after the discourse has ended. Promises and orders are particularly obvious examples.

In order to capture this more general notion of commitment, we can think of the taking on of a commitment as excluding *possible future states of the world*, thereby making certain future states of the world *impossible*. Given this conception, we cannot just specify a set of 'good' futures (in which all commitments are honored), for, of course, taking on a commitment does not exclude the possibility of violating it. However, we can think of commitments as excluding those futures in which the agent does not act according to the com-

[6] By 'decision theory,' we mean any theory that models how agents choose actions on the basis of their beliefs and preferences. We use the term 'classical decision theory' for what is called 'decision theory' in mathematics and economics.

[7] It should be kept in mind that what we want to model are *conscious* preferences. Thus, these desiderata are appropriate even though an agent may be influenced by factors he is not aware of.

mitment, yet is not at fault. Before the commitment was taken on, this kind of future was possible, afterwards it is impossible.

Consider the simple case of an agent committing himself to raise his hand when prompted the next time. There are three kinds of possible futures:

(i) futures in which the agent is prompted and raises his hand
(ii) futures in which the commitment is voided, either by being rescinded before the agent is prompted, or because it becomes evident that the agent will not be prompted
(iii) futures in which the agent is prompted and does not raise his hand, but the commitment was not voided before he was prompted.

Taking on the commitment excludes those futures of type (iii) in which the agent does not count as having violated a commitment.

Keeping a Commitment

In the (somewhat contrived) example above, it is clear what 'acting in accordance with the commitment' amounts to (raising the hand when prompted), and also at which time the commitment has to be voided so as to not count as violated (before the prompting).

In general, matters are more complicated. If I promise to meet you at the airport at noon tomorrow, what is required of me is not only to be at the airport at noon. Rather, what is required is a complex ensemble of actions that result in me being at the airport at noon. Suppose the trip to the airport takes an hour, and I sleep in until 11:30. I am at fault, even if you call at 11:35 to tell me that your flight has been delayed by several hours and so I do not have to meet you at noon. You may never *know* that I violated my commitment, but I did violate it. On this conception, there is not only a *time when the commitment was kept*, there is also a *time when the commitment was (first) violated*: The (first) time I fail to act in a way that would ensure my being at the airport at noon.

Commitments are always *commitments to act*. When we say 'an agent is committed to believing the proposition *p*', this is short for 'the agent is committed to act as though he believes *p*'. Similarly, 'an agent is committed to an (effective) preference for *p*' is short for 'an agent is committed to act as though he (effectively) prefers *p* to be actualized.' This is exactly the right notion of commitment for promises and the like. In the example above, what I am committed to is to *act as though* I effectively prefer to be at the airport at noon. Some of the required actions have to happen quite sometime before noon.

So we can characterize the notion of 'taking on a commitment' as follows:

(14) If an agent *a* takes on a commitment, he thereby excludes possible future states in which
   a. the agent does not act according to the commitment AND
   b. the commitment is not voided before the agent fails to act according to the commitment AND
   c. the commitment does not count as violated.

Construing commitments as *commitments to act* means that the features of the decision theory from the last section get 'lifted' to the respective commitments:

Positive introspection for preference commitment If an agent is committed to an effective preference for p, he is also committed to act as though he believes he is committed to an effective preference for p.

Doxastic reduction for preference commitment If an agent is committed to act as though he believes that he is committed to an effective preference for p, he is also committed to act as though he effectively prefers p.

Positive introspection for doxastic commitment If an agent is committed to act as though he believes that he is committed to act as though he believes that p, he is committed to act as though he believes that p.

We end this section by introducing the following bit of notation (omitting, for simplicity, a necessary temporal parameter, introduced later):

Definition 3. *We let*

$$PEP_a(p) := \left\{ w \in W \;\middle|\; \begin{array}{l} p \text{ is a maximal element of } a\text{'s public} \\ \text{effective preference structure in } w \end{array} \right\}$$

(Where p is a maximal element of a's public effective preference structure iff a is committed to act as though p is a maximal element of his effective preference structure.)

Assertions and Public Commitments

We use a deliberately weak notion of assertion: All that it takes to assert is to (sincerely) utter a declarative sentence. We characterize assertions in terms of their *minimal effect* in the sense of Zeevat (2003). With Gunlogson (2003) and Davis (2009), we take this effect to be the coming about of a doxastic commitment on the part of the speaker. Additional properties of assertions can arguably be explained as pragmatic inferences on the basis of this speaker commitment.[8]

[8] A prominent example of such a secondary effect is that it becomes *common ground* that p. We follow Gunlogson and Davis in assuming that an assertion becomes part of the common ground

(15) An *assertion* of a declarative ϕ in context C adds $[\![\phi]\!]_C$ to the public beliefs of the speaker, thereby publicly committing the speaker to *act as though he believes* $[\![\phi]\!]_C$.

Assertions are, of course, communicative events. Let the totality of the doxastic commitments of a speaker S resulting from a communicative event u be designated as $PB_S[u]$ and PB^t_S stand for the set of beliefs of S that become publicly manifest at time t. We do not identify $PB_S[u]$ strictly with the truth-conditional content of u. Rather, the commitment can come about as a result of the meaning of the utterance plus information available in the context in which it is made.[9]

Part of what it means to say that a commitment results from an event is that the commitment comes about at the very end of the event. We hence assume the following principle, where t_u is the final instant of the runtime of u:

(16) $p \in PB_S[u] \Leftrightarrow (p \in PB^{t_u}_S) \in PB_S[u]$

Analogously, we let $PEP_S[u]$ and PEP^t_S refer to the set of preferences resulting from u and that become publicly manifest at t, respectively, and assume

(17) $p \in PEP_S[u] \Leftrightarrow (p \in PEP^{t_u}_S) \in PB_S[u]$

4 Explicit Performatives as Self-Verifying Assertions

In this section, we present our assertoric analysis of explicit performatives using the three verbs **claim**, **promise** and **order**, which are representative, in Searle's (1975) classification, of ASSERTIVES, COMMISSIVES and DIRECTIVES, respectively. What performative verbs have in common is that they all report *communicative events*. In the following, we conceive of these events as *concrete particulars*, and hence take every communicative event u to be associated with a unique context $c(u)$ whose speaker is the agent of u and whose time is the runtime of u. The shape of the argument that the utterance ensures the performative effect will be the same in all three cases, but the lexical semantics for the verb will get progressively more complex. What we have to show in each case is that an utterance of a sentence S with an explicit performative verb is self-verifying, i.e., for any world w, if u is an utterance of S in w, then $w \in [\![S]\!]_{c(u)}$.

only as a secondary effect, after the hearer has accepted the assertion.

[9] We leave it open here whether the commitments a speaker takes on with an utterance can be identified with Gricean speaker meaning.

Commitment to a Belief: 'I claim that *p*'

The problem posed by assertive performative verbs like **claim** and **assert** is nicely illustrated by what has come to be known as *Cohen's problem* (Lycan (1999), based on Cohen (1964)). On the one hand, **claim** is 'truth-conditionally transparent': the speaker of (18) cannot react to the continued absence of rain by saying 'Well, I only said I *CLAIMED* that it was going to rain'. On the other hand, **claim** obviously contributes to truth conditions: For example, (18) entails that somebody claims that it is going to rain.

(18) I claim that it is going to rain.

Cohen's problem can be solved by analyzing **claim** as a performative verb. The content of (18) is just a statement about what the speaker claims, but there is also a performative effect, through which the speaker also becomes committed to the complement of **claim** in the way we demonstrate below.

The Reportative Use

What has to be the case for (19) to be true?

(19) Peter claimed that it was going to rain.

There must have been a communicative event u from Peter (to someone). What kind of sentence out of Peter's mouth could verify (19)? (18) would do, but so would any utterance that, in its context, commits the speaker to the belief that it is going to rain.

(20) $w \vDash claim(u, a, p)$ iff

a. u is a communicative event from a: $w \vDash CE_a(u)$
b. in $c(u)$, u commits a to the belief that p: $w \vDash p \in PB_a[u]$.

(18) and the plain assertion of (21) will bring about the required commitment in any context in which they are sincerely uttered.

(21) It is going to rain.

However, recall that the commitments resulting from an utterance can go beyond its truth-conditional content, hence, (19) can be supported by utterances of sentences that have (21) as a contextual implication.

The Performative Use

The goal is to explain why, by virtue of uttering (18), a speaker is doxastically committed to (21). Let u^* be an utterance of (18) in context C^* and world w^*. The truth-conditional content of (18) is given in (22), where the identification

of the run time τ of the two utterance events is contributed by the simple present tense. Given the semantics of **claim** in (20), (22) is equivalent to (23).

(22) $\{w \,|\, w \vDash \exists u : \tau(u) = \tau(u^*) \wedge claim(u, S, Rain)\}$,
where $Rain = [\![\text{it is going to rain}]\!]_{C^*}$

(23) $\{w \,|\, w \vDash \exists u : \tau(u) = \tau(u^*) \wedge CE_S(u) \wedge Rain \in PB_S[u]\}$

u^*, as an assertion, commits the speaker to the belief in (22)/(23). The speaker is therefore committed *to the belief in the existence of a communicative event that commits him to the belief that it is going to rain*, i.e.

(24) $w^* \vDash (23) \in PB_S[u^*]$

Therefore, at the final instant t^* of $\tau(u^*)$, we have:

(25) $w^* \vDash \left\{ w \,\middle|\, w \vDash Rain \in PB_S^{t^*} \right\} \in PB_S^{t^*}$

Given positive introspection for doxastic commitment, (25) reduces to (26):

(26) $w^* \vDash Rain \in PB_S^{t^*}$

(24) and (26) together imply (27), which by postulate (16) reduces to (28).

(27) $w^* \vDash (Rain \in PB_S^{t^*}) \in PB_S[u^*]$

(28) $w^* \vDash Rain \in PB_S[u^*]$

This means that u^* satisfies the conditions in (23) and hence $w^* \in (23)$, in other words, an utterance of (18) is necessarily self-verifying.

Commitment to an Effective Preference: 'I promise to *p*'

Moving to commissives, what has to be the case for (29) to be true?

(29) Peter promised (Mary) to get the tickets.

Once again, there has to have been a communicative event from Peter (to Mary) that creates a particular kind of commitment. And again a number of sentences could have been uttered in order to make (29) true:

(30) a. I promise you to get the tickets.
b. I will get the tickets.
c. You will have the tickets tomorrow.

We propose the following semantics for **promise**:[10]

(31) $w \vDash promise(u, a, b, p)$ iff
  a. u is a communicative event from a to b: $w \vDash CE_{a \to b}(u)$
  b. in $c(u)$, u commits a to $PEP_a(p)$: $w \vDash p \in PEP_S[u]$

Thus, any utterance that verifies (29) publicly commits its speaker Peter (to Mary) to effectively prefer to get the tickets. As before, (30b,c) will bring about the requisite commitment only if the context is right, while the explicit performative (30a) will create it in any context in which it is sincerely uttered.

The Performative Use

An utterance u^* of (30a) to addressee A in context C^* and world w^* commits the speaker S to acting as if he believes the proposition in (32):

(32) $\{w \,|\, w \vDash \exists u : \tau(u) = \tau(u^*) \wedge CE_{S \to A}(u) \wedge Tickets \in PEP_S[u]\}$,
where $Tickets = [\![S \text{ will get the tickets}]\!]_{C^*}$

The derivation of the performative effect is as follows:

(33) $w^* \vDash (32) \in PB_S[u^*]$

(34) $w^* \vDash \left\{ w \,\middle|\, w \vDash Tickets \in PEP_S^{t^*} \right\} \in PB_S^{t^*}$

Given doxastic reduction for preference commitment, (34) reduces to (35):

(35) $w^* \vDash Tickets \in PEP_S^{t^*}$

(33) and (35) together imply (36), which by postulate (17) reduces to (37).

(36) $w^* \vDash (Tickets \in PEP_S^{t^*}) \in PB_S[u^*]$

(37) $w^* \vDash Tickets \in PEP_S[u^*]$

We have thus derived that the assertion of (30a) is a witness for its own truth—and hence, an utterance of (30a) is necessarily self-verifying.

Commitment to an Effective Preference for an Effective Preference: 'I order you to *p*'

Finally, what has to be the case for (38) to be true?

(38) Mary ordered Peter to sign the report immediately.

[10] The semantics we give only spells out the truth-conditional part of the meaning of **promise**. There is a presuppositional part, as well. The presupposition, roughly, is that a presumed that b has a stake in p.

As before, there must have been a certain kind of communicative event from Mary to Peter. In the right context, an utterance of (7) or any of the sentences in (8) will suffice.

(7) I order you to sign the report immediately!

(8) a. Sign the report immediately!
b. I want you to sign the report immediately!
c. You have to sign the report immediately!

In section 1, we said that **order** requires that the event commit the speaker to a certain kind of preference. We can now refine this claim. The event in question must commit the speaker to effectively prefer that the hearer commit himself to effectively prefer that he signs the report immediately.[11]

(39) $w \vDash order(u,a,b,p)$ iff
a. u is a communicative event from a to b: $w \vDash CE_{a\to b}(u)$
b. in $c(u)$, u commits a to $PEP_a(PEP_b(p))$: $w \vDash \mathbb{P}_b(p) \in PEP_a[u]$, where $\mathbb{P}_b(p) = \{w \,|\, w \vDash \exists t > \tau(u) : \ p \in PEP_b^t\}$

The Performative Use

An utterance u^* of (7) to addressee A in context C^* and world w^* commits the speaker S to believe the proposition in (40):

(40) $\{w \,|\, w \vDash \exists u : \tau(u) = \tau(u^*) \wedge order(u,S,A,Sign)\}$,
where $Sign = [\![A \text{ signs the report immediately}]\!]_{C^*}$

The derivation of the performative effect is like that for **promise** except that, given the lexical semantics we propose for **order**, the equivalent of (33) is (42):

(41) $\{w \,|\, w \vDash \exists u : \tau(u) = \tau(u^*) \wedge CE_S(u) \wedge \mathbb{P}_A(Sign) \in PEP_S[u]\}$

(42) $w^* \vDash (41) \in PB_S[u^*]$

From this, we can derive

(43) $w^* \vDash \mathbb{P}_A(Sign) \in PEP_S[u^*]$

As before, this means that $w^* \in [\![(7)]\!]$, i.e. (7) is self-verifying.

[11] Again, **order** also carries a presupposition, namely that a presumes to have authority over b with respect to p, i.e. that b is socially or institutionally obligated to take on the commitment effectively preferred by a.

Features of the Analysis

Which verbs give rise to explicit performative utterances? Our analysis predicts that it is those verbs that denote communicative events and whose truth-conditional content is fully specified in terms of speaker commitments. While this is the case for verbs like **claim**, **promise**, or **order**, it is not the case for verbs like **insult**, **annoy**, or **frighten**.

Our account, unlike some of its assertoric predecessors, derives the self-verification of explicit performative utterances without assuming that they are self-referential. They can be *made* self-referential, though, by the use of **hereby**, which on the present analysis is best seen as an adverbial modifier that requires the identification of the described event with the utterance event.

Another central issue about explicit performatives that our analysis can explain is their interaction with the progressive. A well-known generalization is that utterances in the progressive cannot (usually) be used performatively. Our account plus the assumption that performative verbs are accomplishments implies that the utterance of a performative progressive sentence does not commit the speaker to the existence of a commitment. This is so because progressive sentences describing accomplishments do *not* entail the culmination of the described event.

Our proposal is similar in several respects to two recent, independently developed accounts by Eckardt (2009) and Truckenbrodt (2009). We cannot undertake a detailed comparison here but we note that it differs in (a) how it derives the self-verifying property of performative utterances, (b) the lexical meaning it assumes for assertives, commissives and directives, (c) in the explanation of how performative utterances restrict possible future states of the world.

5 Concluding Remarks

Searle's argument against assertoric accounts relies on the assumption that an *intention* is required for a speech act to happen. We circumvent the problem by requiring only that the speaker be *committed to having a belief or an intention* (in our terms, an effective preference). On our view, what matters for speech acts, or at least the truth conditions of performative verbs, is *public facts*.

Our analysis can also readily meet a challenge brought up by Jary (2007). He argues that explicit performatives cannot be assertions because their content gets added to the common ground automatically, rather than being conditioned on the acceptance of the addressee, as is the case for run-of-the-mill assertions. However, as Jary himself notes, *the fact that the assertion happened* always automatically enters the common ground. Our account then predicts Jary's ob-

servation. Since the utterance itself is a witness for its own truth, the content of the assertion is entailed *by the fact that the assertion happened*, and so this content will become part of the common ground automatically.

References

Austin, J. L. 1962. *How to do things with words*. Cambridge, MA: Harvard University Press.

Bach, K. & R. M. Harnish. 1979. *Linguistic communication and speech acts*. Cambridge, MA: MIT Press.

Bierwisch, Manfred. 1980. Semantic structure and illocutionary force. In John R. Searle, Ferenc Kiefer & Manfred Bierwisch (eds.), *Speech act theory and pragmatics*, 1–35. Dordrecht: Reidel.

Cohen, L. Jonathan. 1964. Do illocutionary forces exist? *The Philosophical Quarterly* 14(55). 118–137.

Davis, Christopher. 2009. Decisions, dynamics, and the Japanese particle *yo*. *Journal of Semantics* 26(4). 329–366.

Eckardt, Regine. 2009. Integrated speech acts. Manuscript, University of Göttingen.

Ginet, Carl. 1979. Performativity. *Linguistics and Philosophy* 3(2). 245–265.

Gunlogson, Christine. 2003. *True to form: Rising and falling declaratives in English*. New York: Routledge.

Gunlogson, Christine. 2008. A question of commitment. *Belgian Journal of Linguistics* 22(1). 101–136.

Hamblin, C. L. 1971. Mathematical models of dialogue. *Theoria* 37(2). 130–155.

Hedenius, I. 1963. Performatives. *Theoria* 29. 115–136.

Jary, Mark. 2007. Are explicit performatives assertions? *Linguistics and Philosophy* 30(2). 207–234.

Kratzer, Angelika. 1981. The notional category of modality. In H. J. Eikmeyer & H. Rieser (eds.), *Words, worlds, and contexts. New approaches in word semantics*, 38–74. Berlin: de Gruyter.

Leech, Geoffrey N. 1983. *Principles of pragmatics*, vol. 30 Longman linguistics library. London and New York: Longman.

Lemmon, E. J. 1962. On sentences verifiable by their use. *Analysis* 22(4). 86–89.

Lycan, William G. 1999. *Philosophy of language: A contemporary introduction*. Routledge.

Searle, John R. 1975. A taxonomy of illocutionary acts. In K. Gunderson (ed.), *Language, mind, and knowledge*, Minneapolis: University of Minnesota

Press.

Searle, John R. 1989. How performatives work. *Linguistics and Philosophy* 12(5). 535–558.

Szabolcsi, Anna. 1982. Model theoretic semantics of performatives. In *Hungarian and general linguistics*, 515–535. John Benjamins.

Truckenbrodt, Hubert. 2009. Performatives and agreement. Manuscript, ZAS, Berlin.

Zeevat, Henk. 2003. The syntax semantics interface of speech act markers. In *Proceedings Diabruck, 7th workshop on the semantics and the pragmatics of dialogue*, Wallerfangen.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 165–179. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Identity and Definiteness in Chinese *wh*-Conditionals

Stephen Crain
Macquarie University
stephen.crain@mq.edu.au

Qiong-Peng Luo
Macquarie University
qiong-peng.luo@mq.edu.au

Abstract. Previous studies of Chinese *wh*-conditionals leave several issues unresolved, including (i) definiteness effects; (ii) apparent violations of the novelty condition and (iii) accounting for the range of readings of Chinese *wh*-conditionals. We attempt to resolve some of these issues by analysing *wh*-indefinites as *unique* indefinites and *wh*-conditionals as special instances of topic-comment structures (i.e. *wh*-conditionals are topic-comment structures with an identity relation). Chinese *wh*-conditionals can refer to either a single situation or multiple situations, leading to either a definite interpretation or a generic interpretation respectively.

1 Introduction

For several decades, the semantics of *wh*-indefinites and *wh*-conditionals in Chinese has been a topic of debate for Chinese linguistics. In this study, we offer a somewhat novel analysis for *wh*-conditionals. A typical *wh*-conditional always contains a pair of matching *wh*-phrases, one in the antecedent clause and the other in the consequent clause. The *wh*-phrases in the antecedent and consequent clauses must be identical in number, form and reference. We add one more observation: Chinese *wh*-conditionals sometimes have an additional flavour of definiteness, semantically akin to free relatives in English.

Several accounts of Chinese *wh*-conditionals have been advanced in the literature. The most frequently cited account, by Cheng and Huang (1996), treats *wh*-indefinites as recurring indefinite expressions, but this appears to violate the novelty condition, which requires indefinites to introduce novel entities into the domain of discourse. To circumvent this problem, Chierchia (2000) proposes that *wh*-indefinites in Chinese are indefinite pronouns (i.e. pronominals), thus they can appear in the consequent of *wh*-conditionals without violating the novelty condition. However, Chierchia's account does not explain why ordinary *wh*-indefinites display Principle C effects, a finding that seems to indicate that *wh*-indefinites are R-expressions rather than pronominals. We propose to reconcile the tension inherited from previous research by analyzing *wh*-conditionals as identity statements, which are not

subject to the novelty condition. On the present account, Chinese *wh*-conditionals are ambiguous between being correlatives and conditionals. On one hand, when definiteness is added into the equation, *wh*-conditionals can be seen to share properties with free relatives in that they refer to a particular (unique) individual in a particular situation. When the context/antecedent establishes a plurality of situations, the unique individuals picked up by *wh*-phrases get relativised to situations, and the identity of the referent is not known, or not relevant. This reading is semantically akin to–*ever* free relatives in English. This reading involves universal quantification over situations. Therefore, the intuitive insight in Cheng & Huang (1996) is intact on the current account; *wh*-conditionals are donkey conditionals and have a generic interpretation.

2 Chinese *wh*-Conditionals: Definiteness Effect

The seminal Cheng & Huang (1996) summarize the typical properties of *wh*-conditionals as follows (Cheng & Huang 1996:132):

(1) Properties of *wh*-conditionals
   a. The (donkey) anaphor must take the form of a *wh*-word
   b. The (donkey) *wh*-word must be identical to the *wh*-word in the antecedent clause
   c. There must be an element in the consequent clause referring back the *wh*-word in the antecedent clause

What appears mysterious here is that unlike donkey conditionals in English, where the anaphors always take the form of a pronominal, Chinese *wh*-conditionals take an identical *wh*-word as the donkey anaphor. This is the notorious 'matching effect': *wh*-phrases in the antecedent and consequent clauses of *wh*-conditionals must be identical in number, form and reference. Even minor variations are unacceptable. Example (2) below illustrates a typical *wh*-conditional in Chinese, while (3) illustrates the matching effect:

(2) Shei xian lai, shei xian chi.
who first come who first eat
Lit.: 'If X comes first, X eats first'

(3) *Shei xian lai, shenme ren /tongyang de ren xian chi.
who first come what person the-same DE *person first eat*

Cheng & Huang analyse the *wh*-conditionals as a case of 'unselective binding' a la Heim (1982) and Kamp (1981). They treat *wh*-phrases in *wh*-conditionals as indefinites (i.e. variables) that are unselectively bound by a

default universal necessity operator. The implicit operator provides universal quantificational force for *wh*-conditionals. Their semantic representation for (2) are provided as (4) below:

(4) $\forall_x$ (x come first → x eats first) (Cheng & Huang 1996:132)

According to Cheng & Huang, (2) means *everybody who comes first eats firs*t. This semantics has a plurality commitment. It is committed to multiple comers and eaters. However, intuitively, (2) is true if for one particular situation, say, Ann's birthday party tonight, there turns out to be *exactly one* individual who comes first and eats first. It is semantically odd to say *everybody in the room studies the kangaroo* if there is *exactly one* man in the room. If this is the case, it shows (2) has a *unique* reading in the sense of Kadmon (1990).

The *unique* reading of *wh*-conditionals correlates with the definiteness effect of *wh*-conditionals, an observation missed in Cheng & Huang (1996). The definiteness effect of *wh*-conditionals can be illustrated by example (5), which shows that the *wh*-indefinite in the antecedent clause can be referentially linked to a *partitive* expression in the consequent clause:

(5) Shenme ban biaoxian hao,
what class perform well
shenme ban de sanfenzhiyi jiu keyi dedao jiangli.
what class DE *one third then can get reward*
'One third of whatever class that perform(s) well will get a reward'

Example (5) casts doubt on Cheng & Huang's claim that *wh*-indefinites in Chinese *wh*-conditionals are genuine indefinites, because the *wh*-phrase is used as the complement of a partitive with the form 'NP of *wh*-NP'. An ordinary indefinite cannot be used as the complement DP in a partitive. It is well-known that the partitives with the form 'NP of DP' are subject to the Partitive Constraint (Jackendoff 1972, Barwise & Cooper 1981).

If we take a stand that *wh*-indefinites in *wh*-conditionals are *definite description*-like expressions, we may be able to capture both the uniqueness and the definiteness effect.

3 The Novelty Condition and Principle C

Cheng & Huang treat *wh*-indefinites as Heimian indefinites (e.g. *a farmer*, *a donkey*, etc.), but this runs into a problem with the novelty condition. Ordinary indefinites are subject to the novelty condition (cf. Heim 1982, 365f):

(6) * If a man$_i$ comes first, a man$_i$ eats first.

As example (6) indicates, ordinary indefinites are required to introduce novel entities into the discourse. If *wh*-phrases are like indefinites, they should each introduce a novel entity to the discourse. This prediction hasn't been borne out, because in Chinese *wh*-conditionals, the *wh*-phrase in the antecedent and the one in the consequent are identical in reference. In other words, the *wh*-phrase in the consequent of a conditional introduces a familiar referent rather than a novel one. As Chierchia (2000:17) puts, this represents a very bizarre picture:

(7) a. *wh*-words must introduce a novel variable in the antecedent of a conditional
b. *wh*-words must introduce a non-novel variable in the consequent of a conditional

Chierchia has convincingly shown that if (7) is right, then we no longer have a predictive theory of indefinites. The question is why Chinese *wh*-conditionals bluntly violate this novelty condition, which is supposed to be obeyed by indefinites generally.

To solve this problem, Chierchia proposes that *wh*-indefinites in Chinese are indefinite pronouns (i.e. pronominals). This explains why *wh*-indefinites can appear in the consequent clause of *wh*-conditionals without violating the novelty condition. A pronominal can be used as a discourse anaphor. A simple example would illustrate this idea:

(8) If a man$_i$ comes first, he$_i$ eats first.

At first glance, this seems to be a reasonable solution. Some issues need to be addressed, however. First, if *wh*-phrases in Chinese are indeed indefinite pronouns (i.e. pronominals), we expect they should always introduce a familiar discourse referent in the antecedent of a conditional, as pronominals (and definite descriptions) always do. But a *wh*-phrase in the antecedent of a conditional, however, doesn't require a linguistic antecedent. One might wonder why the familiarity condition doesn't apply here. The second problem is more severe. On Chierchia's account, *w*h-phrases are expected to be subject to Principle B (because they are pronominals) and pattern with ordinary pronouns. However, *wh*-phrases in Chinese display Principle C effect, a fact unexpected on Chierchia's analysis. Consider the following examples:

(9) a. Shei$_i$ shuo ta$_i$ xihuan wo?
who said he like me

'Who said he likes me?'
{John$_i$ said he$_i$ likes me, Peter$_j$ said he$_j$ like me, …}

b. *Ta$_i$ shuo shei$_i$ xihuan wo?
he said who like me
'Who did he say likes me?'
{he$_i$ said John$_i$ likes me, he$_j$ said Peter$_j$ likes me, …}

(9b) is a strong crossover case. The contrast between (9a) and (9b) indicates Chinese *wh*-phrases are not like pronominals but R-expressions. The following examples adopted from Tran & Bruening (2006) constitute another supporting observation:

(10) a. *Ta$_i$ shuo shei$_i$ xihuan wo meimei?
he said who like my sister
'Who did he say like my sister?'

b. Ta$_i$ zongshi shuo *shei$_i$ / ta$_i$ xihuan wo meimei.
he always said who he/she like my sister
'He$_i$ (always) says *who$_i$/ he$_i$ likes my sister'

c. Shei$_i$ (yaoshi) shuo ta$_i$ /*shei$_i$ xihuan wo meimei, wo jiu zou ta.
who if say he who like my sister I then hit he
'If somebody$_i$ says he$_i$/*who$_i$ likes my sister, I will hit him'

As all the examples under (10) clearly indicates, Chinese *wh*-phrases stand with R-expressions rather than pronouns. We face a paradoxical dilemma here. On one hand, if Chierchia's proposal is indeed right, then we have to explain why *wh*-phrases display Principle C effect everywhere else. On the other hand, if *wh*-phrases are not pronominals, why can they appear in the consequent clause and remain anaphorically linked to the *wh*-phrase in the antecedent in *wh*-conditionals?

4 Indefinites and Uniqueness

The definite reading of *wh*-conditionals is most ready when a unique referent is being established. To consider:

(11) A: (Zai zheci xuanju zhong), Zhang San bu xihuan shei?
(in this election,) *Zhang San* NEG*like who*
'Whom doesn't Zhang San like (in this election)?'

B: Shei bu tou Wang Wu de piao,
who neg vote Wang Wu DE *vote*
Zhang San jiu bu xihuan shei.
Zhang San then NEG*like who*

'Who doesn't vote for Wang Wu, Zhang San then doesn't like who.'

When uttered out of the blue (i.e. in a neutral context), (11B) can mean Zhang San hates *whoever* that doesn't vote for Wang Wu. If there is more than one event involving voting for or against Wang Wu, then Zhang San would have correspondingly more than one (possibly different) persons to dislike. This reading is akin to general statement about Zhang San's personal disposition. However, when the antecedent establishes some unique referent, like in (11A) above, (11B) is true in the situation that there is *exactly one* person, say, Li Si, who doesn't vote for Wang Wu, and Zhang San dislikes Li Si. However, (11B) also allows a multiple-individual reading. Suppose there are three persons, Li Si, Ma Liu and Zhang Qi, who decide not to vote for Wang Wu, then (11B) is true only when Zhang San dislikes *all* the persons that don't vote for Wang Wu (in this case, they are Li Si, Ma Liu and Zhang Qi).

The *exactly one* reading is the *uniqueness* reading. But what is *uniqueness*? How can an indefinite generate a *unique* interpretation? In the literature, it has been reported that an indefinite *under certain circumstances* can have a unique reading (cf. Evans (1980), Kadmon (1990), Heim (1990), among others). There are multiple ways to encode the uniqueness into semantic representations. We follow Brasoveanu (2007, 2008), who adopts a Russellian treatment. The Russellian semantics of definites consists in *existence*, *maximality* and *singleton* presuppositions. This can be demonstrated below:

When the wh-phrase denotes a singleton:

(12) Shei xian lai
$\underline{\exists X\,[X \neq \varnothing}$ & $\underline{X = \{y: \text{person}(y) \,\&\, \text{first\_come}(y)\}}$ & $\underline{\#X=1]}$
existence maximality singleton
uniqueness

When the wh-phrase denotes a plurality:

(13) Na-xie ren xian lai
which-cl (pl.) person first come
$\underline{\exists X[X \neq \varnothing}$ & $\underline{X = \{y: \text{person}(y) \,\&\, \text{first\_come}(y)\}}$ & $\underline{\#X>1]}$
existence maximality plural

When the *wh*-phrases denote a plurality, we assume there is a maximality operation in the sense of Link (1983) and Grosu & Landman (1998) that turns the plurality into a maximalized individual. In lattice-theoretic terms, if a and b are individuals, then the sum of a and b (written as a $\oplus$ b) is also an

individual. The technical details of this lattice-theoretic approach to plurality are immaterial here. We entertain here the maximal individual of a poset <X, ≤> is the least upper bound of X.

The MAX operation always returns a plural individual. In this sense it is still *singular*, and the *wh*-phrases remain *unique*. Kadmon (1990) has another example that shows uniqueness is related to maximal collections. In the following (14), *they* /*three of them* refer to the maximal collection of the chairs that Leif owns.

(14) Leif has four chairs. They / Three of them are in the kitchen. (ex. 24)

This uniqueness-based account offers a straightforward explanation for the definiteness effect, for both the *singular-individual* reading and the *multiple-individual* reading. Our analysis predicts that the following sentence is ambiguous between distributive and collective interpretations:

(15) Shenme ban biaoxian hao,
what class perform well
shenme ban de sanfenzhiyi jiu keyi dedao jiangli.
what class DE *one-third then can get reward*
'One third of whatever class(es) that perform well get(s) a reward'

The sentence allows both the distributive reading and collective reading. On the distributive reading, it means for *each* class that performs well, one third of its members will be rewarded. The other reading, i.e. collective reading is compatible with the situation that for some class, none of its members get rewarded, while for some other classes, all of the members get rewarded. While this ambiguity can be attributed to a lack of number specification in nominal quantification in Chinese, the definiteness/uniqueness plays an essential role here.

5 *Wh*-Conditionals as Identity Statements

We have shown that the definiteness effect that remains elusive on the previous accounts can be captured by assuming *wh*-indefinites encode uniqueness. The uniqueness effect shows up when anaphora is attempted. However, there is a notable difficulty with this claim. While a unique indefinite is always referred back by a pronoun (e.g. *Leif has a chair. **It** is in the kitchen*), in *wh*-conditionals, the anaphor is an identical *wh*-phrase rather than a pronoun. How to account for this matching requirement in *wh*-conditionals?

A straightforward solution to this problem is to treat *wh*-conditionals in Chinese as identity statements. If *wh*-conditionals are treated along with identity statement, we will also be able to reconcile the tension between the novelty condition and Principle C. It is well-known that overt identity statements are immune to the novelty condition:

(16) A man who drinks alcopops is a man who gets a hangover.

In (16), the indefinite *a man* doesn't c-command the other one. However, the novelty condition doesn't apply here, and the indefinite expressions are happy to remain identical in reference. We assume in identity statements like (20), the novelty condition is being *overridden* here. It is being overridden because there is an overt identity operation that forces the indefinite expressions to pick up the same referent. In another word, the novelty condition is an *Elsewhere Condition* (EC) which applies only when it can. If Chinese *wh*-conditionals are subject to a similar identity operation, then we find a way to reconcile the tension between the novelty condition and Principle C. But how could this be achieved?

On the present account, *wh*-indefinites are subject to a σ-operation, where σ should be understood to stand for uniqueness:

(17) Shei xian lai, shei xian chi.
The antecedent: ⟦ shei xian lai ⟧ = σx. **person**(x) & **first_come** (x)

The issue here is how the *wh*-indefinite in the consequent clause is being interpreted. We assume there is a covert *identity* operation:

(18) Shei xian lai, shei xian chi
[who first come]$_x$ λx [first eat [σy [**person** (y) & y=x]]]

On this account, the antecedent *wh*-indefinite *shei xian lai* 'who comes first' binds the variables *x* by λ-abstraction. The *wh*-anaphor is interpreted as a definite description, introducing a variable that is identical to the one previously introduced, which is *x* in the antecedent.

It is been proposed, since Cooper (1979), that donkey anaphors should be interpreted as generalized D-type pronouns (cf. also Heim & Kratzer 1998, Elbourne 2005, among others). The D-type pronouns contain both a definite description and a free relation variable R which helps fix the referent of the definite description. Cooper assumes R is provided by pragmatic saliency. This idea has been challenged by Heim (1990), who notices that donkey anaphora is subject to a condition which she dubs as Formal Link Condition, that is, the donkey anaphor requires an explicit linguistic antecedent (e.g. *every man who has a wife is sitting next to her* vs. $^{*/??}$*every married man is*

sitting next to her). Chinese *wh*-conditionals may constitute another supporting evidence for the D-type pronoun analysis for donkey anaphors. Instead of looking for **any** linguistic antecedent, the *wh*-anaphor looks for an **identical** antecedent to fix its referent. R in this case is always provided by an explicit linguistic antecedent. And 'identity' is to be understood in Leibniz's way (i.e. 'x =y' is true iff for any predicate P, P(x) **if and only if** P(y)). This treatment yields the correct semantics for *wh*-conditionals:

(19) a. the antecedent: ⟦shei xian lai ⟧ = σx. [**person** (x) & **first_come** (x)]
b. the *wh*-anaphor: ⟦shei (xian chi) ⟧= σy.[**person** (y) & y=x & **R**(y))]
c. R → λx. **first_come** (x)
d. the *wh*-anaphor: ⟦ shei (xian chi) ⟧ = σx. [**person** (x) & **first_come** (x)]
e. the consequent:λz. **first_eat** (z) (σx. [**person** (x) & **first_come** (x)])
= **first_eat** (σx. (**person** (x) & **first_come** (x)))
g. ⟦shei xian lai, shei xian chi⟧=1 iff the individual who comes first is the individual who eats first.

On this account, *wh*-conditionals are semantically akin to free relatives in English. Despite the structural differences, it is easy to see Chinese *wh*-conditionals and English free relatives may share a common semantics, since all English free relatives can be translated as identity statements (cf. Moltmann (2010)):[1]

(20) Whoever comes first eats first
= the first comer is the first eater
I don't like whatever you bought
= the thing(s) you bought is(are) the thing(s) I don't like

The *matching requirement* provides another independent evidence for this analysis. We assume without the copula to mark identity in Chinese *wh*-conditionals, identity of form is a prerequisite to identity of reference (see (3)). Not surprisingly, we find the same form-matching restriction is also operative in English identity statements. Consider the following examples:

(21) */? A man who drinks alcopops is someone / the same person / the man

[1] The structural differences between Chinese *wh*-conditionals and English free relatives may turn out to be superficial. Citko (2001) proposes that in a simple free relative like *John ate what Mary cooked*, the single instance of *what* is an argument of both *ate* and *cooked*. However, due to *Deletion under Identity*, the lower copy *what* gets deleted at PF. The only difference between Chinese and English, viewed in this light, is unlike English, the two copies of the *wh*-indefinite must stay at PF in Chinese.

who gets a hangover.

To summarize, it is the identity relation that is responsible for the identity in reference between the *wh*-indefinites and the inapplicability of the novelty condition in *wh*-conditionals. This identity reading renders *wh*-conditionals semantically akin to identity statement.

The above discussion results in a novel syntactic analysis for *wh*-conditionals. That is, *wh*-conditionals are topic-comment structures like correlatives (cf. Bittner 2001, Dayal 1997, among others), in which the antecedent *wh*-indefinite is topical, which is commented by the consequent *wh*-clause. We believe this analysis is on the right track, for several reasons. First, to treat *wh*-conditionals as topic-comment structures, we can derive the identity in reference between the *wh*-indefinites effortlessly. All we need to do is to assume the relationship between the topic and comment is that of identity. Second, the analysis suggests a more motivated explanation for the matching requirement in *wh*-conditionals. On this analysis, the *wh*-indefinite antecedents are *topics*, and we cannot mark an indefinite as topical (by means of *wh*-morphology) and not comment about it: 'the intuitive idea is that topic-comment sequencing presupposes that the comment is about the topic. It requires … every topical discourse referent introduced in the topic updated to be picked up by an anaphoric element in the comment update' (Bittner 2001). We believe this move (i.e. to treat *wh*-conditionals as topic-comment structures) is welcome. Recently, it has been frequently proposed that conditionals are topic-comment constructions (cf. Lewis 1973, Bittner 2001, Schlenker 2004, Ebert, Endriss & Hinterwimmer 2008, among others).

6 On the Generic Interpretation of *wh*-Conditionals

In addition to the definite interpretation, *wh*-conditionals can also be used as general statements and are open to a generic interpretation. This interpretation has ignorance, indifference and free choice implications.

6.1 The Ignorance Implication

Wh-conditionals have some ignorance implications (i.e. the speaker/agent's epistemic uncertainty about identity of the referent denoted by the *wh*-phrase, or more plainly, the speaker/agent doesn't know *who* has the property P). So (22a) has some implication as (22b):

(22) a. Shei xian lai, shei xian chi.
who first come who first eat

b. *The person who comes first eats first, but I don't know who will be the one that comes first*

6.2 The Indifference Implication

Wh-conditionals also have indifference implications (i.e. the speaker/agent's intentional or unintentional indiscriminateness with respect to the identity of the referent denoted by the *wh*-phrase, or more plainly, the speaker/agent doesn't care *who* has the property P). (23a) has some implication as shown by (23b):

(23) a. Shei zuihou lai wanhui, shei xi wan
who last come party who wash dish
b. *the person who arrived last for the party washes the dishes*
Counterfactual implication: it could be anyone else that washed the dishes if he was the last person for the party

6.3 Free Choice Implication

Wh-conditionals also have some free choice implication *under certain circumstance*. To consider:

Context: the university requires 50 credits for a bachelor's degree, and Mary has already got 47 credits. To fulfill the university's requirement, Mary has to get 3 more credits. There are three courses Mary can register for this purpose. Each course has 3 credits. The following sentence is felicitous:

(24) Ni xuan na-men kecheng, na-men kecheng jiu keyi
you choose which-CL *course which*-CL *course then can*
rang ni biye.
let you graduate
'Whichever course you take can let you graduate'

6.4 Deriving the Generic Interpretation

These observations bring *wh*-conditionals semantically closer to *–ever* FRs in English. Dayal (1997) argues that *–ever* FRs in English always involve some universal quantification over identity alternatives to the worlds of evaluation. Following Dayal, we assume the generic reading of Chinese *wh*-conditionals are derived in a similar way. The *wh*-conditionals contain a null adverbial quantifier GEN over world variables. And *wh*-phrases are concepts, i.e. from possible worlds to individuals:

(25) ⟦ shei xian lai ⟧ = λi. σx[**first-come** (x)](i)

(26) GEN ⇒ λPλQ.∀i-Alt∈f(w)(s)){P(i),Q(i)}, where
(i) f(w)(s) is the set of worlds the speaker's belief hold and
(ii) a world w'∈f(w)(s) is an i-alternative iff there exists some w'' such that σx[P(w')(x)]≠σx[P(w'')(x)]

This semantics captures the modal implications (i.e. the ignorance, indifference and free choice implications) by treating them as *presuppositional* content of *wh*-clauses and attributes the generic reading to a generic context.[2] The *unique* referent denoted by the *wh*-phrase is being relativised to worlds, i.e. for each world, there is a *unique* individual involved in it. And quantification is over the worlds rather than individuals. We arrive at the following truth conditions for the generic reading:

(27) a. [[shei xian lai, shei xian chi]] = 1 iff
∀i∈f(w)(s)){**first_eat** (i) (σx (**person** (x) & **first_come** (x) (i))}
b. As far as the speaker's belief is concerned, the first comer is the first eater

7 Are Chinese *wh*-Conditionals Ambiguous?

The previous discussion unambiguously leads to an ambiguous end, namely, that Chinese *wh*-conditionals are ambiguous. Semantically, Chinese *wh*-conditionals are akin to English FRs, which have two varieties: plain FRs and *–ever* FRs. English plain FRs are argued to have a prima facie definite/unique interpretation, while *–ever* FRs have some universal quantification interpretation (cf. Jacobson (1995), among others). Dayal (1997) proposes the universal quantificational force of *–ever* FRs is contributed by *ever*, which adds some modality to the semantic representation and renders FRs to be interpreted *attributively*.[3] A plausible assumption extending to Chinese *wh*-conditionals is that Chinese *wh*-conditionals conflate this distinction (between plain FRs and –ever FRs) and are always open to two interpretations. Chinese lacks a lexical item like *ever* for the generic interpretation, and sometimes only the context/pragmatics can tell which reading is the most salient one.

At this moment, we should give some credit to Cheng & Huang (1996), who analyse *wh*-conditionals on a par with donkey conditionals in English. The ambiguity between definite and generic readings of *wh*-conditionals is also present in English donkey conditionals. Kadmon (1990) observes that donkey conditionals have both an absolute unique (definite) reading and a universal reading. She distinguishes one-case conditionals from multi-case conditionals (e.g. **one-case conditionals**: *If there is a doctor in London and*

[2] For a slightly different version about the modal flavour of *–ever* FRs please see von Fintel (2000). Limit of space prohibits a fuller comparison and implementation of those ideas.
[3] Donnellan (1966) distinguishes two uses of definites: referential vs. attributive. According to Dayal, the primary semantic function of *ever* is to force the FRs to be read attributively. Otherwise, FRs always receive a referential /absolute unique reading.

he is Welsh, then we are all set vs. **multi-case conditionals**: *If a semanticist hears of a good job, she applies for it*).

We propose the choice between the two interpretations is regulated by context in Chinese. When the context is unspecified about the fixation of the referent, it has a generic reading, whereas when the context imposes some *absolute* uniqueness requirement of the referent, it has a definite reading:

(28) Wo wangji ni jie-le ji-ben shu gei wo le
I forget you lend-ASP *how-many*-CL *book to me* ASP
Danshi, ni jie-le shenme gei wo, wo jiu huan-gei ni
But you lend-ASP *what to me I then return-to you*
shenme le.
what ASP
I don't remember how many books you lent me, but
I've returned to you whatever books you lent me
✓*I've returned to you the books you lent me*
✓*I've returned to you all the books you lent me*

In (28), when the antecedent specifies a particular case/situation (i.e. book-lending by you to me), the generic reading is no longer the preferred one. And the ignorance and indifference implications also disappear. (28) simply expresses the speaker has returned *all* the books the addressee lent to him.

Semantically, the difference between the definite vs. universal readings of Chinese *wh*-conditionals boils down to a difference in *granularity level* of the quantification (see Brasoveanu 2007). The quantification can be *coarse-grained*, i.e. we 'collectively' quantify over topical cases/situations, which boils down to quantifying over topical individuals – and the consequent clause is predicated about these individuals. This yields the definite /unique reading. Alternatively, the quantification can be *fine-grained*, i.e. we 'distributively' quantify over the topical cases/situations introduced by the antecedent – and the consequent clause is predicated of each of such cases/situations. This yields the universal interpretation.

References

Bhatt, Rajesh & Roumyana, Pancheva. 2006. Conditionals. In Martin Evearert *et al*. (eds.), *The Blackwell Companion to Syntax I*, 638–687. Oxford: Blackwell.

Bittner, Maria. 2001. Topical referents for individuals and possibilities. In R. Hastings *et al*. (eds.), *Proceedings of SALT 11*, 36–55.

Bruening, Benjamin & Tran, Thuan. 2006. *Wh*-conditionals in Vietnames and Chinese: Against unselective binding. Paper presented at Berkeley Linguistic Society 32. University of California at Berkeley.

Cheng, Lisa & Huang, James. 1996. Two types of donkey sentences. *Natural Language Semantics* 4. 121–163.

Chierchia, Gennaro. 2000. Chinese conditionals and the theory of conditionals. *Journal of East Asian Linguistics* 9. 1–54.

Citko, Barbara. 2001. Deletion under identity in relative clauses. In M. Kim & U. Straus (eds.), *Proceedings of NELS 31*, 131–145. GLSA: University of Massachusetts, Amherst.

Cooper, Robin. 1979. The interpretation of pronouns. In F. Heny and H. Schnelle (eds.), *Syntax and Semantics 10*, 61–92. New York: Academic Press.

Dayal, Veneeta. 1997. Free relatives and *–ever*: identity and free choice reading. In A. Lawson & E. Cho (eds.), *Proceedings of SALT 7*, 99–116. CLC Publications.

Donnallan, K. 1966. Reference and Definite Descriptions. *Philosophical Review* 75. 281–304.

Ebert, Christian, Endriss, Cornelia and Hinterwimmer, Stefan. 2008. Topics as speech acts: an analysis of conditionals. In Natasha Abner and Jason Bishop (eds.), *Proceedings of the 27th West Coast Conference on Formal Linguistics*, 132–140. Somerville, MA: Cascadilla Proceedings Project.

Elbourne, Paul. 2005. *Situations and Individuals*. Cambridge, Mass.: The MIT Press.

Evans, G.. 1980. Pronouns. *Linguistic Inquiry* 11. 337–362.

von Fintel, Kai. 2000. Whatever. In *Proceedings of Semantic and Linguistic Theory* 10, 27–39.

Grosu, Alexander & Landman, Fred. 1998. Strange relatives of the third kind. *Natural Language Semantics* 6. 125–170.

Gu, Chloe. 2008. Maximalization and the definite reading in Mandarin *wh*-conditionals. Paper presented at NELS 40. MIT.

Heim, Irene. 1982. *The semantics of definite and indefinite noun phrases*: Umass at Amherst Phd. Thesis.

Heim, Irene. 1990. E-type Pronouns and donkey anaphora. *Linguistics and Philosophy* 13. 137–177.

Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cam, Mass.: The MIT Press.

Jacobson, Pauline. 1995. On the quantificational force of English free relatives. in E. Bach, E. Jelink, A. Kratzer and B. Partee (eds.), *uantification in natural language*, 451–486. Dordrecht: Kluwer.

Kamp, Hans. 1981. A theory of truth and semantic representation. In J. Goenendijk et al (eds.), *Formal Methods in the Study of Language*, 277–322. Amsterdam: Mathematical Center Tracts.

Kadmon, N.. 1990. Uniqueness. *Linguistics and Philosophy* 13. 274–324.

Kratzer, Angelika & Heim, Irene. 1998. *Semantics in generative grammar*. Cam, Mass.: The MIT Press.

Lewis, David. 1973. *Counterfactuals.* Harvard University Press.

Li, Y.-H. Audrey. 1992. Indefinite *wh* in Mandarin Chinese. *Journal of East Asian Linguistics* 1. 125–156.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In R. Bäuerle et al (eds.), *Meaning, Use and Interpretation of Language*, 302–323. Berlin: Walter de Gruyter.

Moltmann, Friedericke. 2010. Identificational sentences and the objects of direct perception. Ms. IHPST, Paris.

Neale, Stephen. 1990. *Descriptions*. Cam., Mass.: The MIT Press.

Schlenker, Philippe. 2004. Conditionals as definite descriptions (a referential analysis). *Research on Language and Computation* 2. 417–462.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 181–192. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Total vs. Partial Adjectives: Evidence from Reduplication*

Mojmír Dočekal
Masaryk University
docekal@phil.muni.cz

Ivona Kučerová
McMaster University
kucerov@mcmaster.ca

Abstract. This paper provides evidence for a structural difference between two classes of antonym adjectives, namely, total and partial adjectives, for example, *clean* and *dirty* (Yoon 1996; Rotstein & Winter 2004). Based on data from morpho-phonological processes in Czech we argue that only total adjectives have their standard value represented in the derivation. In contrast, the standard value of the partial adjectives is determined pragmatically. Furthermore, we argue that antonym adjectives must be at least sometimes represented by overlapping scales. A consequence of the proposed analysis is that an empirically adequate account of antonym adjectives must supply a part of the denotation from lexical semantics and part from the context.

1 Introduction

Czech, West Slavic, has a productive system of a *semantically* driven morpho-phonological reduplication (Marantz 1982; Inkelas & Zoll 2005). One such example comes from the morphological marking of aspect. The imperfective verbal morpheme *-va-* is often called habitual since it may encode iterativity if reduplicated, as in (1). The effect of reduplication is indeed semantic and as such has truth-conditional effects: the reduplicated form may be used in habitual or generic sentences, as seen in (2a), but it is incompatible with episodic sentences, as can be seen in (2b).

(1) a. praco-**va**-l
work-IMPERF-PP.M.SG.
'he worked' *Imperfective/generic*

b. praco-**vá-va**-l
work-IMPERF-IMPERF-PP.M.SG.
'he used to work' *iterative*

c. praco-**vá-vá-va**-l
work-IMPERF-IMPERF-IMPERF-PP.M.SG.

* We would like to thank Chris Kennedy, Henk Zeevat and the audiences at the Szklarska Poreba 2010 worhshop and the SuB conference. The authors are happy to acknowledge that MD was financially supported by GAČR (grant 405/09/0677).

'he used to work' *iterative (emphatic)*

(2) a. Petr každé ráno čistí-**vá**-**va**-l okno.
Petr every morning clean-IMPERF-IMPERF-PP.M.SG. *window*
'Peter used to clean the window every morning.' ✓*habitual/generic*

b. *Petr včera ráno čistí-**vá**-**va**-l okno.
Petr yesterday morning clean-IMPERF-IMPERF-PP.M.SG. *window*
'Peter used to clean the window yesterday in the morning.' **episodic*

This paper focuses on another type of semantically driven reduplication, namely, reduplication in antonym adjectives. Czech gradable antonym adjectives may contain a degree morpheme which meaning roughly corresponds to English *very*. If the degree morpheme undergoes a process of reduplication, the resulting meaning of the adjective may be paraphrased as 'very, very…(clean)', i.e., emphasizing the standard value of the adjective. Native speakers characterize the resulting interpretation as that of reaching the absolute degree of adjectiveness (for example, of cleanness).

The fact that interests us here is that not every gradable antonym adjective may undergo the reduplication process. Even though any gradable antonym adjective may contain a degree morpheme, the morpheme may be reduplicated only in so-called *total* adjectives, never in their *partial* counterparts, following the terminology of Yoon 1996. The contrast is shown in (3) and (4). Here, the adjectives *čistý* 'clean' and *zavřený* 'closed' provide an example of total adjectives and the adjectives *špinavý* 'dirty' and *otevřený* 'open' provide an example of partial adjectives.

(3) *čistý* 'clean' vs. *špinavý* 'dirty'

a. čistý → čisťounký → čisťou**li**nký → čisťou**lili**nký… ✓reduplication

b. špinavý → špinavou**li**nký → *špinavou**lili**nký… *reduplication

(4) *zavřený* 'closed' vs. *otevřený* 'open'

a. zavřený → zavřeňou**li**nký → zavřeňou**lili**nký ✓reduplication

b. otevřený → otevřeňou**li**nký → *otevřeňou**lili**nký… *reduplication

For presentational purposes we demonstrate the reduplication process in stages. First, we observe that for the degree morpheme to be inserted the stem of the adjective need to be modified. The change of the stem is independently motivated by phonotactic constraints on this type of morphological formation and does not directly concern us here. Once the morpheme – in our case, an in-

fix *-li-*, meaning roughly 'very' – is inserted, the morpheme may be reduplicated without any further phonological or morphological change of the stem. In contrast, as the (b) examples show, even though the partial adjectives *špinavý* 'dirty' and *otevřený* 'open' may be modified by the same degree morpheme, reduplication of this morpheme is impossible. Further examples demonstrating the contrast are given in (5).

(5) *Some further examples (source: the Czech National Corpus):*

čistý (*clean*)	čisťou**lili**nký
zavřený (*closed*)	zavřeňou**lili**nký
zdravý (*healthy*)	zdravou**lili**nký
rovný (*straight*)	rovňou**lili**nký
tenký (*thin*)	tenou**lili**nký
jemný (*slight*)	jemňou**lili**nký
chabý (*faint*)	chabou**lili**nký
křehký (*fragile*)	křehou**lili**nký
špinavý (*dirty*)	*špinavou**lili**nký
otevřený (*open*)	*otevřeňou**lili**nký
nemocný (*ill*)	*nemocňou**lili**nký
zahnutý (*bent*)	*zahňutou**lili**nký
tlustý (*thick*)	*tlusťou**lili**nký
hrubý (*rough*)	*hrubou**lili**nký
pevný (*solid*)	*pevňou**lili**nký
nerozbitný (*unbreakable*)	???

The observed restriction on reduplication is rather puzzling since it does not hold for its semantically closest variant, i.e., adverbial modification by *velmi* 'very', as can be seen in (6). Similarly, the closest English paraphrase (the repetition of 'very') is compatible with both total and partial adjectives as well, as in (7).

(6) *No restriction on adverbial modification:*

a. velmi čistý
very clean

b. velmi špinavý
very dirty

(7) *No restriction on English adverbial modification:*

a. very very very clean

b. very very very dirty

Crucially, the restriction on reduplication cannot be explained in phonological or morphological terms either because neither semantic class of the adjectives forms a phonological or morphological natural class. Furthermore, if there were any phonotactic restrictions they should be equally resolved within the morpho-phonological changes accompanying the primary modification by the degree morpheme.

The rest of the paper provides evidence that the restriction on reduplication stems from distinct semantic properties of the two classes of adjectives. Concretely, we will argue that the reduplication process refers to a meaning component that is structurally present only in total adjectives. The corresponding meaning component in partial adjectives is never present in the derivation. Instead, it is supplied by the context. Consequently, it cannot serve as an anchor for morpho-phonological processes. We will outline our semantic assumptions and present the actual proposal in section 2. Section 3 investigates English adverbial modification by *almost* and compares it with the Czech reduplication case. As we will see, there is a sharp contrast between English and Czech: while the English type of modification is sensitive to the context, this pragmatic strategy fails to rescue reduplication of Czech partial adjectives thus providing further evidence for the present proposal. Section 4 concludes.

2 Proposal

We assume scalar semantics for adjectives, i.e., the positive form of an adjective denotes a subinterval of the scale S_A where the subinterval depends on a standard value d_A in the scale and where the scale is ordered by a relation R_A defined with respect to the standard value $d_A \in S_A$ (Cresswell 1977; von Stechow 1984; Bierwisch 1989; Klein 1991). Furthermore, we assume that the standard value variable d_A is context dependent.[1] The denotation of the positive form of an adjective can be formalized as in (8) (after Rotstein & Winter 2004: ex. (18)):[2]

(8) $\quad [\![A]\!] \stackrel{def}{=} \{x \in S_A : R_A(d_A, x)\}$

The complete lexical semantics of the adjective like *long* can be then formalized using λ-abstraction as follows:

(9) $\quad [\![long]\!] = \lambda d_A \lambda x.long(x) \geq d_A$

[1] For example, the standard value for *big* is set differently in *a big house* than in *a big mouse*.

[2] Notice the denotation of an adjective in (8) must be mapped on the set of entities for the degree of *A*-ness to be included in $[\![A]\!]$ otherwise the intersection interpretation of the *AP* within an *NP* yields a type-mismatch.

In the function talk – the denotation of an adjective like *long* is a function from a context set degree d_A and an individual x which yields truth value 1 if and only if the degree of the length of the individual x exceeds the degree d_A.[3] Degree d_A can be given explicitly (in most cases by a noun which is modified by the adjective) or implicitly. The relation $\geq$ is supplied by an invisible operator *pos* which operates on the adjective and assigns truth value 1 only to those individuals (when the adjective is used predicatively) which exceed the average degree for the comparison class. Von Stechow (1984: R6) defines *pos* in the following way:

(10) *Positive*
Let A^0 be any adjective meaning, C be any appropriate property, x be any appropriate individual and w be any world. Then $w \in [\![pos]\!]$ iff $(\exists d)$ [d is an A^0-degree & $d >$ average [A^0,C] & x has d in w & $w \in$ C(x)].

A sentence like *Ferda is a big cat* is true in a world w iff Ferda has a degree of bigness which exceeds the average degree of bigness for cats in the world of evaluation.

Here we are concerned with two basic types of antonym adjectives: partial and total adjectives.[4] We semantically represent total and partial adjectives by a scale and a standard value. A partial adjective indicates *some* amount of the relevant property (moisture, dirt, sickness etc.), while a total adjective indicates *no* amount of such property (e.g., a dirty object has some degree of dirtiness, but it is not necessarily free of cleanliness; in contrast, a clean object is free of dirtiness). As for their semantic denotation, we follow Rotstein & Winter (2004) in formalizing total v. partial adjectives as overlapping scales, schematized in Figure 1.

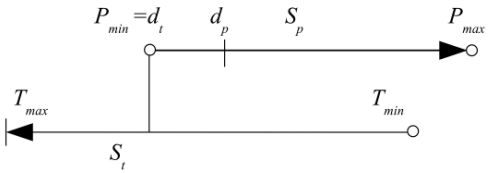


Figure 1: Total and Partial adjective scales

[3] Notice that the type of the adjective is not a predicate, $\langle e,t\rangle$, but a function from degrees into a function from individuals to truth values: $\langle d,\langle e,t\rangle\rangle$.

[4] We put aside so-called relative adjectives. In relative adjectives, no member of an antonym pair has it standard value set independently of the context (Kennedy & McNally 2005; Kennedy 2007).

In Figure 1, S_P is a partial scale, without a fixed standard value (context-dependent). S_T is a total scale; its standard value is fixed as the lower bound of its partial counterpart (a healthy man is a man that lacks any illness). Crucially, S_T and S_P are ordered inversely and S_P *may* partially overlap with S_T. What this means is that some amount of the relevant partial property does not exclude some amount of the complementary total property. For instance, if a coat is dirty it can mean that it is stained on sleeves but the rest of the coat is clean.

Following von Stechow (2007); Heim (2008), among others, we represent antonym adjectives as complements/negations of each other, the denotation of adjectives like *clean* and *dirty* are related by the operation of being a complement of each other's respective scales. We thus follow a linguistic tradition which treats antonyms as lexically related instead of being syntactically decomposed in syntax.[5]

More formally, we define the relation between partial and total adjectives with respect to the standard value of the total adjective represented as the lower bound of its partial counterpart (following Rotstein & Winter 2004 contra Kennedy & McNally 2005). Crucially, the scales may partially overlap and the impression of their antonymous interpretation (not clean $\Vdash$ dirty) comes from an interaction of their interval boundaries and their standard values. As for the denotation of partial adjectives, their standard value is determined *contextually*. Consequently, the standard value of a partial adjective has *no* structural representation:

(11) $d_P \in \overline{S_P}; \overline{S_P}$ ... closure of the partial scale

In contrast, the denotation of a total adjective defines the standard value of the total member of an adjectival pair as the lower bound of its partial counterpart:

(12) $d_T = P_{min} \in \overline{S_T}; \overline{S_T}$ ... closure of the total scale

With the formal semantics of antonym adjectives in place we can approach the question of the denotation of reduplication. The intuition is that reduplication corresponds to semantic modification, i.e., adjectives with reduplicated morphemes denote some interval close to the standard value. Since this is semantic modification, it depends on the type of the scale in the denotation of the adjective with which it combines. More formally, we argue that the denotation of reduplication corresponds to a limit function where the limit is defined as the standard value of the total adjective. Thus, our first step to the

[5] Heim (2008) provides an argument that antonyms are not decomposed in syntax contra Büring (2007a,b).

formalization can be captured as follows:

(13) $[\![\text{-li-li-}]\!] \approx d_T$

The resulting denotation corresponds to approaching the standard value of the adjective. If we apply the denotation of the reduplication to a total adjective, for example, to *čistý* 'clean', we get the following outcome:

(14) $[\![\text{ čist'ou-li-li-...nký }]\!] = \lambda x \exists d[d \approx d_T \wedge clean(d)(x)]$

The formalization captures the fact that the denotation of a total adjective is not a function from degrees and individuals to truth values, but instead it is a function from individuals to truth values. This stems from the fact that the degree d_A is not a context dependent variable,[6] but instead the variable is existentially closed and its value approaches the standard value of its total counterpart. Consequently, the denotation of a reduplicated adjective is not dependent on a context fixation of the standard value d_A anymore.

After we further abstract over the adjective, we end up with the following denotation:

(15) $[\![\text{ -li-li-...}]\!] = \lambda G \lambda x \exists d[d \approx d_T \wedge G(d)(x)]$

We speculate that the reduplication takes place instead of the invisible operator *pos* which can be found in relative adjectives. There are two differences between *pos* and reduplication morpheme: First, since the reduplication morpheme replaces *pos*, it does not need any comparison class from the linguistic or extralinguistic context, consequently, a reduplicated adjective is not dependent on the context. Second, the relation between the degree and an individual is a limit function, instead of $\geq$.[7] Even if both *pos* and the reduplication morpheme existentially close the degree variable, they do it in a different way – the operator *pos* makes the denotation of the adjective dependent on a comparison class C but the reduplication is not dependent on any comparison class at all.[8]

The proposed formalization makes certain predictions about interactions between different types of adjectives and reduplication. First of all, since redu-

[6] As it is the case in the denotation of relative adjectives.

[7] We put aside any relativization to possible worlds because we use a purely extensional framework in this paper.

[8] We assume that different speaker standards for total adjectives come from extralinguistic factors and not from the semantics itself – e.g. if we consider the sentence *The dishes are clean*, which can be true for one speaker and false for another one depending on their personal standard, one might think that the interspeaker disagreement comes from a semantic context dependency. However, we believe this type of difference in speakers judgements come solely from extralinguistic factors and does not need to be represented in semantics proper.

plication is a morpho-phonological process, it may only apply to a material present in the derivation.[9] What this means with respect to our data is that reduplication is possible only if the standard value is structurally represented. Consequently, we predict that reduplication applies only to total adjectives since only total adjectives have their standard value structurally represented as some value in the closure of the total scale. In contrast, the standard value of a partial adjective is determined contextually and may fall anywhere within the interval. What this means is that there is no structural representation of the standard value. Consequently, there is no material that could be used for reduplication. Thus, we have successfully derived the contrast between partial and total adjectives with respect to reduplication.

3 Further Evidence: Context and the Standard Value

Interestingly, English adverbial modification by *almost* shows similar properties to the Czech adjectival reduplication. As can be seen in (16), *almost* usually combines with total adjectives but not with partial adjectives. This restriction is parallel to the restriction observed for the Czech reduplication paradigm and as such invites the question of whether we deal with the same phenomenon.

(16) (from Rotstein & Winter 2004: ex. (9))

a. The work is almost complete/*incomplete.
b. The patient is almost dead/*alive.
c. The explanation is almost clear/*unclear.

The basic observation about *almost* is that *almost* cross-categorically denotes negation of the denotation of the constituent it modifies:

(17) a. John almost passed the exam $\rightsquigarrow$ John didn't pass the exam
b. Almost every student passed the exam $\rightsquigarrow$ Not every student passed the exam
c. John is almost healthy $\rightsquigarrow$ John isn't healthy

In order to account for the semantics of English *almost*, Rotstein & Winter (2004) proposed that the interval associated with the phrase *almost A* denotes degrees that are adjacent to the standard value of *A* and are in the opposite direction from the ordering of the scale associated with the adjective *A*. If we apply this denotation to our semantics of total and partial adjectives, the in-

[9] We believe this claim is fairly theory neutral. At least, we are not aware of any generative model of morpho-phonology where this reasoning wouldn't apply. In fact, this type of dependency can be easily reformulated in representational terms as well, yielding the same result.

compatibility of *almost* and partial adjectives can be derived in the following way. First, recall that under our semantics for total and partial adjectives, if the standard value of a partial adjective equals the standard value of a total adjective (just on the opposite scale), then the adjectives are complementary. Consequently, the partial adjective cannot be modified by *almost* because there is no complement interval between d_P and 0.

There is an interesting prediction stemming from this formalization. One of the crucial distinctions between total and partial adjectives lies in the way their standard value is represented. While the standard value of a total adjective is structurally fixed as the lower bound of its partial counterpart, the standard value of a partial adjective is not fixed in the structure but instead it is contextually dependent. What this amounts to is that in a neutral context English speakers tend to fix the standard value of a partial adjective as the minimum. However, this is not necessary. If we create an appropriate context, the standard value can be shifted further up the scale. If this happen, we create a non-empty interval between d_P and 0. Such a shift is schematically shown in Figure 2. If such an interval exists, then it should be able to feed into the denotation of *almost*. Consequently, if such modification is possible, a partial adjective should become modifiable by *almost*. This prediction is indeed borne out as observed by Kennedy (2007). Examples in (18) and (19) demonstrate the shift.

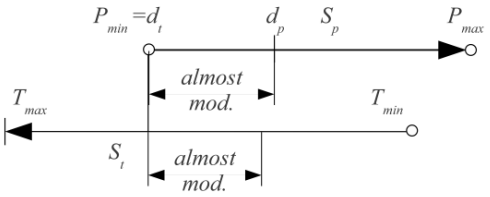


Figure 2: Modification by *almost*

(18) (from Kennedy 2007)

a. We need a rod that is bent in an angle of 90 degrees. Let's pick up that rod over there and bend it a little: it should be easy, as it's *almost bent* already.

b. We consider a glass dirty and wash it as soon as there are five spots on it. This glass is now *almost dirty* – it has four spots on it.

(19) (from Kennedy 2007)

a. We need a TALL basketball player – one whose height is at least 1.95 meters. But we cannot take John, who is 1.90 meters – he's

just *almost tall*.

b. The publisher considers a book long if it's 300 pages or more. This book is *almost long* – it's 298 pages.

In the previous section we have proposed that the impossibility of reduplication of partial adjectives is a direct consequence of their standard value not being structurally present. We have argued that the restriction has nothing to do with the actual position of the standard value on the scale but instead it results from the lack of a structural material available for the morpho-phonological process of reduplication. Could it be the case that in fact the denotation of the process of reduplication should be stated in terms of a complement interval exactly as the denotation of English *almost*? These two hypotheses make distinct predictions. If we follow the denotation for English *almost*, we predict that exactly as in English, reduplication of partial adjectives should improve in a context that pushes the standard value of a partial adjectives further away from the minimum. In contrast, our structural hypothesis predicts that the distance between the standard value and the minimum should not make any difference: if reduplication depends on the standard value being structurally fixed, it should not matter whether or not the standard value is distinct from the minimum value. The reason is that the contextual fixation happens only later in the derivation (in the semantics/pragmatics component) and as such it cannot affect the morpho-phonological process that necessarily takes place before the pragmatic component sets the standard value. Thus, the prediction of our proposal is that even if we modify the context, reduplication of Czech partial adjectives should still fail. Interestingly, this prediction is indeed borne out, as examples in (20), modelled after Rotstein & Winter (2004), show. No matter how hard we try to modify the context, what we see is that reduplication in Czech partial adjectives, unlike *almost*-modification in English, cannot be improved.

(20) a. This glass is certainly not clean, since it has several big spots on it and I am not willing to drink from it even if you insist. The glass is simply…
*špinavou**lili**nká 'very very dirty'

b. This glass is certainly not dirty, since it has absolutely no dirty spots on it. The glass is simply…
✓čisťou**lili**nká 'very very clean'

4 Conclusion

We have examined a surprising contrast between partial and total adjectives that emerges in a semantically driven morpho-phonological process of redupli-

cation in Czech. While total adjectives can be reduplicated, partial adjectives cannot. This is unexpected because a formally distinct but semantically parallel process of adverbial modification does not show any such restriction. We have argued that the pattern can be explained if we adopt Yoon's and Rotstein & Winter's account of total and partial adjectives. According to them, there is a *structural* difference between partial and total adjectives: Only total adjectives have their standard value represented in the derivation, the standard value of partial adjectives is derived from the context. Furthermore, we have argued that antonym adjectives cannot be represented by adjacent scales but instead they must be allowed to partially overlap (in agreement with Rotstein & Winter 2004 and contra Kennedy & McNally 2005; Kennedy 2007). Crucially, we have argued that the semantics of antonym adjectives must be formalized as a combination of grammatically encoded (semantics) and contextually-determined (pragmatics) meanings. Thus, in our model, the proper formalization of these two types of adjective must be represented in two components of the grammar. As we have seen in our case study, the different representations are empirically testable.

References

Bierwisch, Manfred. 1989. The semantics of gradation. In Manfred Bierwisch & Ewald Lang (eds.), *Dimensional adjectives*, 71–262. Berlin: Springer-Verlag.

Büring, Daniel. 2007a. Cross-polar nomalies. Paper presented at Semantics and Linguistics Theory 17.

Büring, Daniel. 2007b. *More* or *less*. Paper presented at the Chicago Linguistic Society Annual Meeting.

Cresswell, Maxwell J. 1977. The semantics of degree. In Barbara Partee (ed.), *Montague grammar*, 261–292. New York: Academic Press.

Heim, Irene. 2008. Decomposing antonyms? In Atle Grønn (ed.), *Proceedings of SuB12, Oslo*, 212–225. Oslo: ILOS.

Inkelas, Sharon & Cheryl Zoll. 2005. *Reduplication: Doubling in morphology*. New York: Cambridge Univ Press.

Kennedy, Christopher. 2007. Vagueness and grammar: the semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30. 1–45.

Kennedy, Christopher & Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81(2). 345–381.

Klein, Ewan. 1991. *Semantik: Ein internationales Handbuch der Zeitgenössischen Forschung* chap. Comparatives, 673–691. Walter de Gruyter.

Marantz, Alec. 1982. Re reduplication. *Linguistic inquiry* 13(3). 435–482.
Rotstein, Carmen & Yoad Winter. 2004. Total adjectives vs. partial adjectives: Scale structure and higher-order modifiers. *Natural Language Semantics* 12(3). 259–288.
von Stechow, Arnim. 1984. Comparing semantic theories of comparison. *Journal of Semantics* 3. 1–77.
von Stechow, Arnim. 2007. The temporal degree adjectives früh(er)/spät(er) 'early(er)'/'late(r)' and the semantics of the positive. In A. Giannakidou & M. Rathert (eds.), *Quantification, definiteness and nominalization*, 214–233. Oxford: Oxford University Press. 2009.
Yoon, Youngeun. 1996. Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics* 4(3). 217–236.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 193–208. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Focus Marking via Gestures*

Cornelia Ebert
University of Stuttgart
cornelia.ebert@
ling.uni-stuttgart.de

Stefan Evert
University of Osnabrück
stefan.evert@uos.de

Katharina Wilmes
University of Amsterdam
K.Wilmes@
student.uva.nl

Abstract. This paper contributes to the recent investigations of speech-accompanying gestures under a formal semantic view. We show that gestures can serve to disambiguate a sentence with respect to its possible focus domains. We provide a statistical evaluation of data gained from a corpus annotated with gestures and information structure. The language under investigation is German. We argue that a sentence that, in isolation, is ambiguous concerning the extension of its focus domain is disambiguated via speech-accompanying gestures. Gesture thus is a means to mark information structure next to intonation and word order.

1 Introduction

It is widely known that gestures are temporally aligned with the speech signal, in particular it has often been claimed that the *stroke*, i.e. the main part of a gesture where the actual gesture movement takes place, falls together with the main accent of the gesture-accompanying sentence (McNeill 1992 among many others). The relationship of complete gestures or *gesture phrases* and foci, however, has not been investigated systematically yet. We want to fill this gap by showing that the possible focus projection of a focus exponent is restricted by the point of time at which a speech-accompanying gesture starts. Gesture thus serves as a means to mark focus domains. Consider the following example for illustration (the main accent is indicated by capital letters):

(1) I ate baNAnas.

* First and foremost, we would like to thank Hannes Rieser and Florian Hahn for giving us access to the gesturally annotated SAGA-corpus of the University of Bielefeld. This work would not have been possible without the possibility to access and make use of the accurate and fine-grained gestural annotations of the SAGA-corpus. We would also like to thank Hannes Rieser and Florian Hahn for their constant help with technical and other questions of all sorts as well as for numerous valuable discussions about gestures and information structure.

The sentence in (1) with the given intonation pattern can be read as an answer to the two questions in (2), each inducing a different focus-background structure.

(2) a. What did you do?
b. What did you eat?

(2a) is a VP-focus invoking question, while (2b) requires narrow focus on the direct complement. Following (2a), (1) allows for the focus pattern in (3a); if (1) follows (2b) on the other hand, the focus pattern is the one of (3b).

(3) a. I [ate baNAnas]$_F$.
b. I ate [baNAnas]$_F$.

In the following we will defend the hypothesis in (4).

(4) Hypothesis (Focus-gesture alignment):
How far a focus projects is determined by the onset of the accompanying gesture (if one exists).

In other words, the onset of a speech-accompanying gesture indicates the left border of the focus phrase (independent of the type of gesture – be it a beat, a deictic or an iconic gesture or any other kind of gesture). A speech-accompanying gesture can thus serve to disambiguate an information-structural ambiguity in a sentence towards a certain focus-background pattern. Simplifying matters for now, we expect the patterns in (5). ($|_G$ marks the hypothesized onset of the speech-accompanying gesture.)

(5) a. I $|_G$[ate baNAnas]$_F$.
b. I ate $|_G$[baNAnas]$_F$.

Although (1) is ambiguous with respect to the underlying information structure, $|_G$ disambiguates the sentence towards one of the focus-background patterns in (3).

In order to test the hypothesis in (4), we looked at the temporal occurrences of gestures and foci. We therefore annotated the multimodal Bielefeld Speech-And-Gesture-Alignment (SAGA) corpus with focus features – in addition to the existing gestural annotation – and marked the nuclear accents of certain intonation units. A subsequent statistical analysis confirmed our hypothesis that the onsets of focus and gesture align indeed – with a systematic shift, however: on average gestures start about 0.3 seconds earlier than the corresponding focus phrases. That is, there is a certain time lag between the onset of a gesture and its associated focus.

In this paper, we mostly present material that has also been discussed in Wilmes (2009). We re-evaluate some of the results of Wilmes (2009) and further elaborate on various aspects. The remainder of this paper is structured as follows: Section 2 sets the stage and discusses the relevant findings from the gesture literature that will be needed in the remainder of the paper. Section 3 presents the methodology underlying our investigations. Here, we explain what the data set that our study is based on looks like, how we annotated these data and how we finally investigated the temporal interdependence of gestures and foci. Section 4 then presents the results of a statistical investigation of the temporal occurrences of gestures and foci. In section 5, we evaluate and discuss these results. Section 6 discusses some controversial issues and loose ends. And finally, section 7 concludes the paper.

2 Speech-Accompanying Gestures

It is a widely held view that gesture is a distinct mode of expression and that the study of gestures can tell us more about language than one might think at first sight (see e.g. Kendon 1972, 1980 and Loehr 2004 and references therein). We subscribe to this view and we will argue in particular that for a comprehensive view of focus phenomena it is inevitable to take speech-accompanying gestures into account.

To set the stage, we will have a look at some important findings concerning the interpretation of speech-accompanying gestures. First of all, one has to define what a gesture phrase is, i.e. where it starts and where it ends. In order to determine which movements can be considered to contribute to a particular gesture, Kendon (1972, 1980) identified a certain structure that can be found for gestures quite generally. The smallest unit of a gesture is its main element, i.e. the minimally required element for being reckoned as a proper gesture: the *stroke*. The stroke can be identified with the strongest movement within the gesture. A stroke is usually preceded by a *preparation phase* and followed by a *retraction phase*, for the hands must be brought into an appropriate position for the stroke to be executed and back into the resting position. Taken together, these three phases constitute the gesture phrase[1]. Preparation and retraction are optional, so a gesture phrase may consist of nothing but a stroke. Between preparation and stroke and stroke and

[1] This notion of a gesture phrase cannot be applied to all kinds of gestures. So-called beats are only biphasal, i.e. they consist of two movement phases, constituting a repeated movement pattern, like up and down or in and out.

retraction *holds* may occur, which are termed *pre-* or *postholds*, respectively. These are considered to enhance timing between speech and gesture (cf. McNeill 1992, Lascarides and Stone 2009).

Importantly, it has been argued that gesture and speech can work together to convey one single thought (McNeill 1992, Kendon 1980) and hence that the semantic content of speech-accompanying gestures is intertwined with the semantic content of the speech signal. What is especially important for our purposes is that speech-accompanying gestures are known to be temporally aligned with the speech signal. It has been argued that speech and gesture synchronise in that the stroke of the gesture falls together with the main accent of the gesture-accompanying utterance (see among others: Pittenger, Hockett, & Daheny 1960; Kendon 1980; McNeill 1992; Loehr 2004; Jannedy & Mendoza-Denton 2005). The general claim is that the stroke occurs just before or at the same time as (but not later than) the nuclear accent. Although there are very few empirical studies that back this claim (see Loehr 2004 for a recent study), this is a fairly established finding in gesture theory.

What has been far less investigated is the interaction of entire gesture phrases and speech. In the literature one can find only a few hints and claims concerning their interdependence and there seems to be no general agreement. Kendon (1972: 184) suggests that gesture phrases align with so-called '*tone units*' (i.e. '*the smallest grouping of syllables over which a completed intonation tune occurs*', cf. Loehr 2004). Loehr (2004) on the other hand argues that gesture phrases and '*intermediate phrases*' in the sense of Pierrehumbert (1980) align. We want to add to this list and argue that it is actually focus phrases that gesture phrases align with. Hence, while Loehr (2004) and Kendon (1972) argue that the temporal occurrence of gesture phrases is mainly triggered by intonational aspects, we think that gesture phrases rather synchronise with focus phrases, which means that their temporal appearance is determined by information structure. While there is, of course, a clear connection between intonation and focus, we still believe that the alleged interdependence between gesture phrases and whichever kind of intonationally motivated category is – at best – an epiphenomenon of the gesture-focus alignment for which we argue.

3 Methodology

To verify our hypothesis in (4) that (the onsets of) gesture phrases align with (the left border of) focus domains, we investigated the temporal interdependence of gesture phrases and focus domains. In addition, we also

looked at the timing of stroke and nuclear accent. Our study is one of the very few empirical studies about the interplay between gesture and intonation; to the best of our knowledge, it is the first empirical study of the interplay between gesture and focus. We analysed a 20-minute video sequence with 275 gestures, which makes this study the most extensive empirical study on gesture and speech (cf. Loehr 2004: Condon & Ogston 1966: 5 sec; Kendon 1972: 90 sec; McClave 1991: 125 gestures; Loehr 2004: 164 sec and 147 gestures).

3.1 Data

For our study, we worked with one sequence of the Bielefeld SAGA-corpus (Lücking et al. 2010), which is a multimodal corpus (video and audio) that collects dialogues from an experiment where one subject (the *router*) gives directions to another subject (the *follower*) for navigation through a dynamic virtual world (see Lücking et. al 2010 for details). While talking, the movements of the subjects' hands were recorded by sensors attached to the hands and fingers. Three video cameras recorded the scene from different angles. Sound was also recorded.

From this corpus we selected a 20-minute sequence with two male participants. Gestures were already annotated, including gesture type (e.g. iconic or deictic) and duration of gesture phases (i.e. preparation, stroke, holds and retraction).

3.2 Annotation

For our purposes, it was necessary to add information-structural annotation (accent and focus) to the existing gestural annotation of the selected video. Our annotation was entirely based on the audio material, which had already been transcribed (but not annotated with parts of speech or other morpho-syntactic information). The information-structural annotation was carried out without reference to the video and its gesture annotations in order to exclude a possible bias. We annotated nuclear accents and distinguished two types of foci: *new-information* and *contrastive*. All annotations were based on the recommendations of Dipper et al. (2007) (in particular Chapters *Phonology and Intonation* (Féry et al. 2007) and *Information Structure* (Götze et al. 2007)). We treated as *new-information focus* those cases where information is provided which is new and/or carrying the discourse forward. Here, we predominantly found rather broad focus domains: whole sentences (all-focus sentences), e.g. if these sentences were text-initial or answers to polar questions, and VP-foci. However, our data also contain narrow foci such as

DP- or AdjP-foci. An expression was tagged as *contrastive focus* if it overtly contrasted with other elements in nearby utterances.
We kept track of all pitch accents in the data, i.e. the points of highest or sometimes lowest pitch that make syllables intonationally salient (*X** in the ToBI framework[2]) and filtered out the nuclear pitch accents among them. There was always one unique nuclear accent for each new-information focus domain. For reasons of space, we cannot go into the details of the annotation procedure and refer to (Wilmes 2009: 26-31) for further information.

3.3 Data Extraction

To verify hypothesis (4), i.e. to show that gesture phrases and focus phrases align in fact, we investigated the temporal interdependence of focus phases (*FocPs*) and gesture phrases (*GPs*). This left us with the following task:

(6) Verification Task (Focus-gesture alignment):
For each gesture phrase, find the corresponding focus phrase and compare the temporal position of the two.

For each gesture, we had a look at the associated speech (not the other way round).[3] Making use of the result from the literature that nuclear accents and strokes align, we associated a gesture phrase with a focus phrase if the nuclear accent of the focus phrase overlapped with the gesture phrase's stroke (see *Figure 1* for an example). In the few cases where there was no main accent coinciding with the gestural stroke, we considered a focus phrase overlapping with at least the stroke phase to be associated with the gesture, unless the overlap was very small and a close investigation of the gesture-focus pair made an association implausible (because there was another focus that was more likely to associate with the gesture). This was the case for only two gestures. Moreover, there were eight cases of strokes that did not overlap with any focus. In one case, an entire gesture did not coincide with any focus at all and for seven gestures, though they overlapped with a focus in some parts, it was not the stroke that overlapped with the focus. We excluded these ten gestures and strokes from our statistical evaluation.

Figure 1 illustrates an example that shows how gesture time and focus time can be compared. Time differences are assessed by subtracting focus

---

[2] TOBI stands for Tone and Break Indices. The system is based on work by Pierrehumbert (1980). In our study, we did not distinguish between different kinds of pitch accents like *high* (*H**), *low* (*L**) or *rising* (*L+H**).
[3] Thus, if there is no gesture there is also no need to identify a focus to verify our hypothesis. However, in most cases we found a one-to-one mapping of focus phrase and gesture phrase.

times from gesture times (e.g. start difference = gesture start – focus start). The corresponding sentence from the corpus is given in (7):

(7) Ja, also die Busfahrt, die hat äh fünf Stationen, die auf jeden
Yes so the bus tour RP has eh five stops that on every
Fall angefahren werden müssen.
case approached will must
'Yes, so on the bus tour there are five stops that have to be approached in any case.'

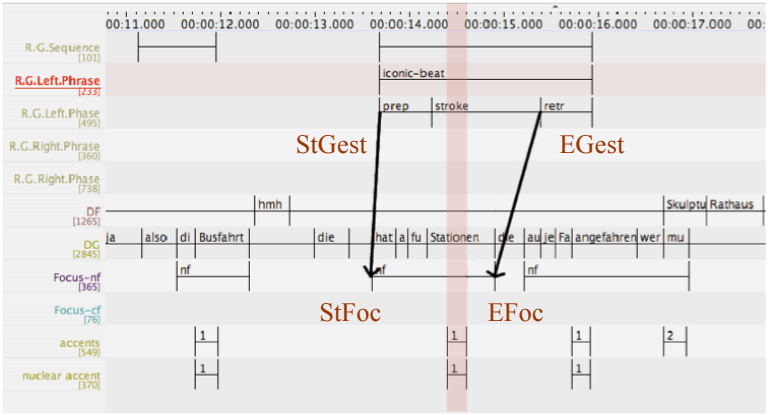


Figure 1*: Comparison of focus and gesture times*

The onset time of the focus phrase (*StFoc*) is subtracted from the onset time of the associated gesture phrase (*StGest*), i.e. the onset of the preparation phase (or the stroke if there is none). The time when the focus phrase ends (*EFoc*) is subtracted from the time when the stroke ends (representing the end of the gesture phrase, hence *EGest*). We treat the end of the stroke and not the end of the retraction phase as the end of a gesture for two reasons: First, according to McNeill (1992: 29) the retraction phase is 'semantically neutral' and second, Loehr (2004) discusses the possibility to disregard retractions and post-holds in his statistical evaluation as well, because they seem to have a different status as the other phases of a gesture phrase.[4]

[4] Cf. Loehr (2004: 117): 'Typically, an entire g-phrase [CE/SE/KW: gesture phrase] aligned with an intermediate phrase. Occasionally, however, it was clear that a g-phrase aligned with an intermediate phrase only when disregarding post-stroke holds, [or] retractions [...] within the g-phrase. These internal components are included within g-phrases by definition, following

As a base for comparison, we also studied the temporal occurrences of nuclear accents (*NAcc*) and strokes in order to verify the by now well-established claim from the literature that nuclear accents and strokes align (cf. section 2). For each stroke, we considered a nuclear accent that overlapped with the stroke as associated with the stroke. If there was no such accent, we took the nearest nuclear accent. Time differences were again calculated by subtracting accent time from stroke time (e.g. start difference = stroke start – accent start).

4 Results

In the following we present our results on the hypothesized gesture-focus alignment and our reassessment of the question whether stroke and main accent align, as has been claimed in the literature. Statistical analysis was carried out with the R environment for statistical computing (R Development Core Team 2005).

4.1 Alignment of Main Accent and Stroke

In total, we analysed 275 stroke-accent pairs. In the majority of cases (209 pairs) the stroke began earlier than the main accent (versus 66 pairs where accent began earlier). Similarly the stroke ended later than the main accent for 183 pairs (versus 92 pairs where the accent ended later). In 124 cases, the stroke encompassed the main accent, in 100 cases stroke and main accent overlapped in some other way, and in 51 cases they did not overlap at all.

Figure 2 shows a histogram for the time difference between the onsets of nuclear accents and the corresponding strokes.

As can be seen, the distribution is approximately Gaussian (the solid line shows the empirical distribution, the dashed line a Gaussian approximation). On average, the stroke starts 0.36s earlier than the corresponding nuclear accent. The standard deviation is about 0.55s. We interpret this as a tendency for gestures to precede the corresponding accent (though there are a

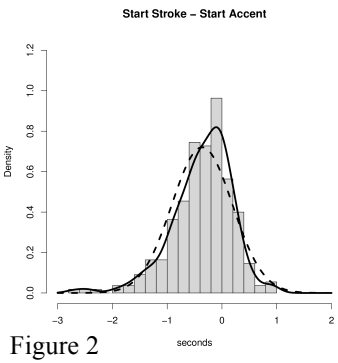


Figure 2

Kendon's hierarchical packaging. However, there may be some different quality about these post-stroke components. Occurring after the heart of the gesture, they may have a less important status in terms of timing with speech.'

considerable number of cases where the gesture starts later).

For comparison, the offset differences have a mean of 0.53s (i.e. stroke usually ends later than the accent) and a standard deviation of 1.25s (*Figure 3*). It is obvious that the onsets align much better than the offsets: their standard deviation is considerably smaller. On the whole, we take our results to show that there is indeed an alignment between the beginning of the stroke and the beginning of the main accent, as claimed in the literature.

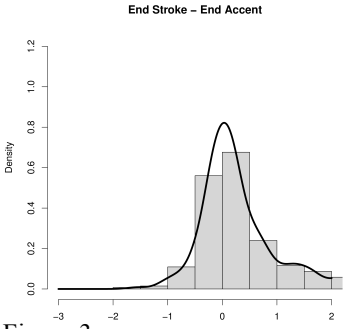


Figure 3

4.2 Alignment of Focus and Gesture

Having obtained experimental confirmation for the alignment of nuclear accents and strokes, we now turn to our hypothesis that gesture phrases and focus phrases are also synchronised. We found that contrastive foci and new-information foci behave somewhat differently with respect to their accompanying gestures, so we evaluated the two types of foci separately. We analysed 260 new-information focus–gesture pairs and 56 contrastive focus-gesture pairs. As pointed out above in Section 3.3, ten gestures were excluded from the analysis because no focus could be associated with them.

4.2.1 New-Information Focus and Gesture

Figure 4 shows the distribution of the onset differences of gesture and new-information focus (we refer to *new-information focus* simply as *focus* in the following), which corresponds almost perfectly to a Gaussian distribution. With 0.41s, the standard deviation is rather small. Again we find a systematic shift: gestures start on average about 0.31s earlier than foci, and there are only few cases where focus precedes gesture. While there is thus a certain time lag, most gesture-focus pairs are within less than one second of each other and can be considered to be aligned. A one-sample t-test shows that the time lag effect is genuine ($t=12.41$, $df=259$, $p < .001$; H_0: mean time lag = 0). The corresponding

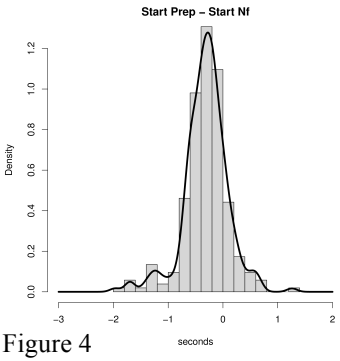


Figure 4

95%-confidence interval places the true mean time lag between gesture and focus in the range from 0.264s to 0.363s.

We consider these results as a confirmation of our hypothesis (4) that gestures and foci align in their onsets.

For the offsets, the situation is not as clear. *Figure 5* shows the distribution of the time differences between the end of a gesture (i.e. the end of the stroke) and the end of the corresponding new-information focus. With a mean of –0.15s, there is no evidence for a systematic shift. The standard deviation of 1.24s, however, is comparatively huge, and some gestures end several seconds after the corresponding focus phrase. On the basis of our data, offsets of gestures and foci thus do not seem to synchronise.

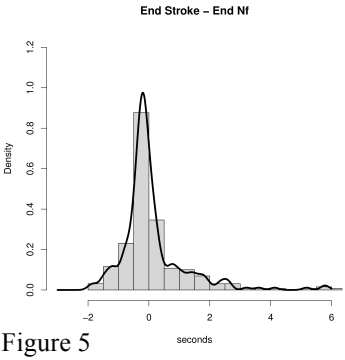


Figure 5

4.2.2 Contrastive Focus and Gesture

For contrastive foci and the accompanying gestures, the alignment was not as neat as for the new-information foci. *Figure 6* shows a histogram of the onset differences between gestures and contrastive foci. With 0.70s the standard deviation is rather high. The mean is –0.77s, so gestures have a clear tendency to start earlier than the corresponding foci. We interpret these data to show that there is no tight alignment between the onsets of contrastive foci and those of the associated gestures. We also tested whether contrastive foci align with the stroke rather than the entire gesture. The histogram for the onset differences of contrastive foci and strokes is given in *Figure 7*.

Again, the standard deviation is quite large (0.75s), but in this case there is no evidence of a systematic shift (mean lag = –0.11s). With such high variability, it is impossible to interpret these results as evidence for an alignment of contrastive foci and strokes.

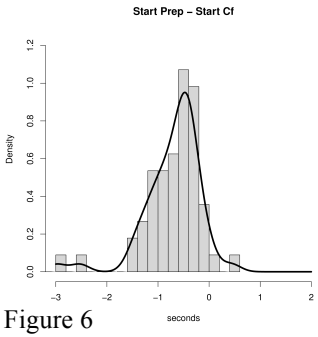


Figure 6

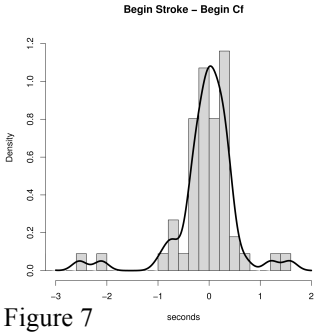


Figure 7

To conclude, we have not found any focus-gesture or focus-stroke alignment effects for contrastive foci. One has to keep in mind, though, that our data set of contrastive foci is rather small. We therefore leave a detailed investigation of contrastive foci and their accompanying gestures for future research, which will need to build on larger amounts of empirical data in order to draw any reliable conclusions.

5 Discussion

In the following we will briefly discuss and evaluate the results that we presented in Section 4. Since our data set for contrastive foci is too small to draw reliable conclusions, we limit our discussion to the comparison of new-information foci and gestures as well as nuclear accents and strokes.

5.1 Shift Effect

As indicated above, our observation that strokes usually start 0.36s earlier than the corresponding nuclear accents is entirely in line with the claims from the literature, where it has been noted that a stroke usually coincides with or starts earlier than its corresponding nuclear accent, but in general does not start later than the accent (Kendon 1980, McNeill 1992). We found the same type of shift for gesture phrases and focus phrases, too. Gestures usually start 0.31s earlier than the corresponding focus domains. We believe that this significant time shift may have its roots in the fact that it allows the hearer to draw attention to the upcoming focus phrase, as its occurrence is made predictable by the preceding gesture. Moreover, it is plausible to assume that gesture production is faster than speech production and that the time lag between the onsets of speech and gesture is due to this difference in generation complexity (cf. also Loehr 2004: 29).

5.2 Alignment

We interpret our results above as support for hypothesis (4), i.e. they show that gesture phrases and (new-information) foci align (with a certain time lag). We still need to clarify what exactly counts as '*alignment*', though. Our main arguments supporting the gesture-focus alignment hypothesis are as follows. First and foremost, we take the stroke-accent alignment, which is a well-established effect from the literature, as a point of reference. The onset differences between nuclear accents and strokes have a mean of –0.36s and a standard deviation of 0.55s. Our results show a considerably better gesture-focus alignment, with a similar shift of –0.31s and smaller standard deviation (0.41s). Compare the corresponding histograms in *Figures 2* and *4*: the better alignment of gesture and focus is immediately obvious.

There is a second argument to support the interpretation of our results in favour of hypothesis (4). As to our knowledge, there is one empirical survey that our study can directly be compared with (Loehr 2004). When interpreting his results, Loehr (2004) was confronted with the same problem, i.e. to define what exactly can be considered as an alignment. He found that the so-called *apex* (the peak of a stroke) and the main accent coincide with a standard deviation of 0.27s (and without any significant shift). He interpreted this as showing that there is a tight alignment of apex and nuclear accent. Furthermore, he also suggested that there is an interdependence of Pierrehumbert's (1980) intermediate phrases and gesture phrases. Similar to our results for gesture phrases and focus phrases, he found that gesture phrases usually start before the corresponding intermediate phrases. The standard deviation for the onset differences between intermediate phrases and gesture phrases was 0.55s. As Loehr (2004) interpreted his results as evidence for a genuine alignment, we think that our study (with standard deviation of only 0.41s) can safely be interpreted to show an alignment of gesture and focus, too.

We did not find evidence for a corresponding alignment of the offsets of gestures and focus phrases. With 1.24s, the standard deviation was very large (recall that the end of a gesture is defined as the end of the stroke). Looking at the histogram in *Figure 5*, however, it seems that for some gestures there is a good alignment (the main peak of the histogram), while for others the stroke is held much longer (the long right-hand tail of the histogram). This suggests that there may be two different types of gestures – one that aligns well with the focus of the accompanying speech signal and another type that does not. We have not investigated this possibility in depth yet, but it would be worthwhile for future research to examine whether there are certain types of gestures (e.g. beats, deictics and iconic gestures) whose purpose it is to structure information and which thus align better with the speech signal than others (e.g. discourse gestures) that might serve a different purpose.

Finally, let us briefly point out once again that we did not reach a conclusion with respect to contrastive foci. We would need more data in order to see how they relate to the accompanying gestures (see Section 4.2.2 for a discussion) and we hope that future research will shed light on this question.

6 Further Issues

Some issues are still open for discussion and call for further research. In the following, we address some of these topics. In particular, we want to point

out that the alignment of focus phrases and gesture phrases is 'real' and not merely an epiphenomenon of some underlying alignment effect of a different nature.

6.1 A Qualitative Argument

It has been proposed in the literature that gesture phrases align with 'tone groups' (Kendon 1972) or 'intermediate phrases' (Loehr 2004), cf. section 2. We have now added another suggestion: gestures align with focus phrases. However, it is possible that none of these claims are true, and that gestures are simply synchronised with certain syntactic categories, e.g. entire sentences or VPs. As our corpus predominantly consists of all-foci sentences and VP-foci, this possibility cannot be excluded without further inspection. Unfortunately, the SAGA corpus is not syntactically annotated, so a quantitative evaluation of how well different kinds of syntactic categories align with gestures cannot easily be carried out without time-consuming manual work. However, we attempted a qualitative assessment of this question. We took a closer look at narrow foci and foci that begin a considerable time later than the corresponding utterance and checked how well they align with an accompanying gesture. We found that if a focus does not begin at the start of the utterance, the corresponding gesture also begins at some later point in nearly all cases. In (8) we give some examples in point:

(8) a. genau äh also [e|$_G$rst Kreisverkehr]$_F$
exactly eh so first roundabout
'exactly, eh, first the roundabout'

b. die haben beide |$_G$[dieselben Türen und dieselben Fenster]$_F$
they have both the same doors and the same windows
'they have both the same doors and the same windows'

c. rechts von dieser Kap|$_G$elle [ist ein großer Laubbaum]$_F$
right of this chapel is a big broadleaf tree
'to the right of this chapel there is a big broadleaf tree'

In all three example cases, the gesture starts near the start of the focus phrase and not at the beginning of the utterance. The gesture phrase thus seems to be aligned with the focus phrase and not with the entire utterance. Furthermore, we found no evidence for a general alignment of gesture phrases with any syntactic categories such as sentences or VPs (see Wilmes 2009 for details).

6.2 A Quantitative Argument

Here, we attempt to show that the alignment of gesture phrase and focus phrase cannot be a secondary effect of the well-known stroke-accent

alignment and the fact that the initial part of the focus phrase (up to the main accent) and the preparation phase have similar lengths. Note that the time difference Δt_F between onset of gesture and focus phrase is the sum of the time difference Δt_A between onset of nuclear accent and stroke and the length difference Δl between preparation phase of the gesture and focus phrase up to the main accent. Assuming that Δt_A and Δl are independent alignment effects, we would expect the standard deviation of the resulting gesture-focus alignment Δt_F to be greater than the standard deviations of Δt_A and Δl. This is not the case: the standard deviation of Δt_F was only 0.41s in our study, whereas the expected standard deviation would be 0.82s (see Wilmes 2009 for details on this calculation). Moreover, we would then expect a strong correlation between the time differences Δt_F and Δt_A as well as Δt_F and Δl, while Δt_A and Δl themselves should be independent or weakly correlated. Our data show an opposite effect: there is only a weak correlation between Δt_F and Δt_A (Pearson's $r \leq 0.219$), but a very strong correlation between Δt_A and Δl (Pearson's $r = 0.759$). From these results and the pairwise correlation plots (omitted for lack of space), we conclude that the length differences arise from two independent alignment effects for stroke and main accent, and for gesture and focus phrase.

7 Conclusion

In our study, we were able to verify claims from the literature that gestural strokes and nuclear accents align (albeit with a systematic shift). We also found a clear, but shifted alignment for the onsets of gesture phrases and (new-information) foci. We interpret these results to show that gestures are a means of marking information structure next to intonational and syntactic means, i.e. speech-accompanying gestures can indicate focus domains.

Furthermore, we were able to show that gestures can serve to disambiguate. A sentence that is information-structurally ambiguous in isolation can be disambiguated by its accompanying gestures. This is yet another observation suggesting that ambiguity might be less of a problem for natural language than was originally thought. While many sentences (e.g. simple SVO sentences with two quantifiers) that seem ambiguous at first sight are disambiguated via intonation in natural speech, we showed that sentences that seem ambiguous even when intonation is taken into account are in fact disambiguated by accompanying gestures.

We hence support the view of Lascarides and Stone (2009) that a formal semantic model should represent not only the usual semantics of linguistic

expressions, but also take care of the semantic contribution of their accompanying gestures.

References

Condon, William & W. Ogston. 1966. Soundfilm analysis of normal and pathological behavior patterns. *Journal of Nervous and Mental Disease* 143. 338–347.

Dipper, Stefanie, Michael Götze & Stavros Skopeteas. 2007. Information structure in cross-linguistic corpora: Annotation guidelines for phonology, morphology, syntax, semantics, and information structure. ISIS 7. 147–187.

Jannedy, Stefanie & Norma Mendoza-Denton. 2005. Structuring information through gesture and intonation. *Interdisciplinary Studies on Information Structure*, 3. 199–244.

Kendon, Adam. 1972. Some relationships between body motion and speech: An analysis of an example. In A. Siegman & B. Pope (Eds.), *Studies in dyadic communication*. New York: Pergamon Press.

Kendon, Adam. 1980. Gesticulation and speech: Two aspects of the process of utterance. In Mary Ritchie Key (Ed.), *The Relationship of Verbal and Nonverbal Communication*. The Hague: Mouton.

Lascarides, Alex & Matthew Stone. 2009. A formal semantic analysis of gesture. *Journal of Semantics*. 1–57.

Loehr, Daniel. 2004. *Gesture and Intonation*. PhD thesis, Georgetown University, Washington, DC.

Lücking, Andy, Kirsten Bergman, Florian Hahn, Stefan Kopp & Hannes Rieser. 2010. *The Bielefeld Speech and Gesture Alignment Corpus (SaGA).* In M. Kipp, J.-C. Martin, P. Paggio & D. Heylen (eds.), LREC 2010 Workshop: Multimodal Corpora–Advances in Capturing, Coding and Analyzing Multimodality.

McClave, Evelyn. 1991. *Intonation and Gesture*. Doctoral Dissertation, Georgetown University, Washington DC.

McNeill, David. 1992. *Hand and Mind: What gestures reveal about thought.* The University of Chicago Press, Chicago and London.

Pierrehumbert, Janet B. 1980. *The Phonology and Phonetics of English Intonation*. PhD dissertation, MIT. [IULC edition, 1987].

Pittenger, R., Hockett, C. & Danehy, D. 1960. *The first five minutes: A sample of microscopic interview analysis*. Ithaca, NY: Paul Martineau.

R Development Core Team. 2005. R: A language and environment for statistical computing, reference index version 2.x.x. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org

Wilmes, Katharina A. 2009. *Focus marking by speech-accompanying gestures*. Bachelor Thesis. University of Osnabrück. Germany.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 209–223. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Imperatives as Future Plans

Regine Eckardt
University of Göttingen
regine.eckardt@phil.uni-goettingen.de

Abstract. Disjoint imperative sentences like (*Nimm die*) *Hände hoch, oder ich schiesse!*, literally (*take your*) *hands up, or I'll shoot!* intuitively present the addressee with all her alternatives for action. The speaker informs that all future worlds, as far as the speaker can forsee, are such that the addressee raises her hands or gets killed. I propose a semantic/pragmatic analysis for sentences in the imperative mood that adopts this exhausitve description of future alternatives as a semantic backbone. Different contextual instantiations of alternatives capture a wide range of uses of sentences in imperative mood, as well as coordinations of imperative and declarative sentences, in a uniform way.

1 Some Observations about Imperatives

1.1 Variety

It has frequently been noted that sentences in imperative mood (S_{imp}) can express a wide variety of speech acts, some directive, some not. I will take my starting point from the following range of examples.

(1) Leave my garden! *(command/request)*

(2) Lend me your bike, please!*(plea)*

(3) Take a cookie! (offer, invitation)

(4) Take an umbrella with you! *(advice)*

(5) Ok. Go kill yourself. Smoke! *(concession, „giving in")*

(6) Get well soon! *(well-wish)*

(7) Come and take the ball (if you dare)! *(dare)*

These are part of the agenda set by Condoravdi & Lauer (C&L, 2010a, b) in a recent series of talks, drawing on earlier literature (e.g. Schwager 2006a,

2008, Donhauser 1986, Bybee, Pagliuca & Perkins 1994).[1] It would be desirable to derive the different types of act compositionally from the literal content of the sentence, the semantics of mood, and knowledge in context that pertains to the interpretation of imperatives. Such an approach would certainly be preferable over stipulating a range of speech act operators and leave the choice of the correct operator subject to a holistic, noncompositional evaluation of the overall utterance situation (Searle 1969). An operator approach would, for instance, force us to postulate categorical distinctions between different act types where in practice, we find a gradual continuum between e.g. command and request, request and plea, request and advice and so on. Schwager (2006) and Portner (2007) have led the way in demonstrating how compositional semantics for imperative mood in speech acts can look like.

1.2 Conjoining S_{imp} and S_{decl}

S_{imp} can be conjoined with sentences in declarative mood S_{decl}. The result are speech acts of different natures, including anti-directive acts such as threats, like in (10).

(8) Clean your room, and I will take you to the movies.
(request + incentive)
(9) Open the newspaper, and you will find the king's picture on page 2.
(conditional)
(10) Touch this glass, and I will kill you. (threat + sanction)

Sometimes, the speaker wants the addressee to act as required by the imperative (*Do!*) but sometimes he aims to avoid exactly that, practically intending to say *Don't!* (Schwager 2006a, Russell 2007, van Rooij & Franke 2010, Bolinger). A commonality of examples like (8) to (10) seems to be that they all can equivalently be expressed by a conditional ('*If you clean your room, then I will take you to the movies'* etc.). This is why scholars have proposed to class S_{imp} as pseudo-imperatives here and propose a common *conditional* meaning for the construction. It would be attractive to have an analysis that relates the meaning of (8) to (10) to the interpretation of "normal" imperative sentences in a transparent manner.

1.3 Disjunctions S_{imp} *or* S_{decl}

S_{imp} can likewise enter disjunctions with a "face the consequences" clause, like in the following example.

[1] Two more types of act that they include, namely WISH and ILL-WISH, will only be touched later in this paper.

(11) Freeze! or I'll shoot you.

These intuitively present the addressee with all her alternatives for action. The speaker informs that all future worlds are such that the addressee raises her hands or gets killed. It is not possible to add a disjunct that describes more promising alternative prospects, in order to prohibit the addresse from acting as specified by S_{imp} (Russell 2006, van Rooij & Franke 2010 a.o.).

(12) Go on fighting, or you'll get chocolate.
≠ 'If you stop fighting, you'll get chocolate' (ironically?)

Whenever the speaker seriously attempts to motivate the addressee to act according to S_{imp}, it is standardly possible to spell out his underlying incentives by an *or*-clause. Hence, while conjunctions like in 1.2 might be viewed as a deviant case, the use of disjunctions frequently just explicates the reasoning behind a typical directive uses of S_{imp}.[2] Again, it would be appealing to read that off directly from the semantics of imperative mood.

2 Modal Theories for Imperatives

2.1 Earlier Theories

I agree with earlier authors on imperatives who assume that literal meaning and speech act should be captured in one integral overarching theory. This leads naturally to analyses of S_{imp} that play on their semantic closeness to deontic necessity. A recent prominent example is Schwager (2006a, b and subsequent). We will generally assume that the sentential root $[\![S_{imp}]\!]$ denotes a property which gets instantiated by the addressee A to yield $[\![S_{imp}]\!](A)$.

$$[\![\textit{Freeze!}]\!]^{\text{Schwager}} = \forall w \, [\text{ “BEST-WORLDS}(w, w_o)\text{”} \rightarrow \text{FREEZE}(A, w)) \,]$$

I use BEST-WORLDS as a cover term for factors that determine the domain of quantification. These include the choice of a modal base (FUTURES which are CIRCUMSTANTIALLY POSSIBLE) and a partial ordering of the worlds which, among other criteria, refers to what ACCORDS.WITH.SPEAKERS.DESIRES(w_o,w). Schwager proposes that this is further specified by context (*"In what sense does the speaker want this to happen?"*) which leads to different flavours of imperatives. The modal quantification is contributed by an imperative mood operator, and finally the scope of this quantification is contributed by the content $S_{imp}(A)$ (following Kratzer 1981, 1991). Schwager's analysis is attractive because it shows tight fit with necessity modals, it can be naturally

[2] See Schwager 2006a, 2008 for a very lucid discussion of the relation between sentence mood and *typical* associated speech acts.

extended to conditionals, and it has a smooth semantics-speech act interface. The theory doesn't need extra components or ontology like TO-DO-lists, plans, action schemes or the like.

Another, more recent proposal in a similar line was issued by Condoravdi and Lauer (C&L, 2010a, b). They suggest that S_{imp} expresses the desire of the SPEAKER that the ADDRESSEE commits herself to act as if she (= A) preferred $[\![S_{imp}(A)]\!]$ (Condoravdi & Lauer 2010a: 10). Like Schwager, they assume that the information content of imperatives alone is sufficient to predict its speech act qualities, and envisage a smooth semantics – speech act interface. Portner's (2007) analysis will be disregarded here because it stipulates the use of an extra list of propositions called the TO-DO LIST.[3]

2.2 Coverage of Observations

Variety is accounted for by both approaches, where both fit more naturally for some cases than for others. Specifically, as both analyses rest on speaker desires, they will need to ascribe the speaker strangely desinterested and altruistic desires in some cases. Schwager captures flavours by different specific ACCORDS.WITH.SPEAKERS.DESIRES properties (capturing offer, warning, advice, wish, and several "deviant" uses). C & L (this volume) likewise attempt to derive known examples from their intricate mix of speaker and hearer preference, which I will discuss in section 4.

The **coordination** cases can not be captured easily by a naive extension of the modal analyses (Schwager, 2006a); perhaps to the exception of the S_{imp} *and* $S_{decl,good}$ cases. In view of the obvious problems that arise, Schwager (2006a) proposes very different, and much more sophisticated ways to interpret the respective conjunctions and disjunctions. The coordination S_{imp} *and* S_{decl} is simply interpreted as conditional. The imperative operator will contribute the modal quantification scheme:

$$\forall w\, [\, \text{FUTURE}(w_o,w) \wedge \text{CIRC}(w_o,w) \wedge \ \ldots\ P(w)\ \ldots \ \ \rightarrow Q(w)\,]$$

In non-coordinate imperatives, the syntax-semantics interface instantiates P(w) with speaker-desire, and Q(w) is instantiated by S_{imp}(A). In the conjunctive case, however, P(w) gets instantiated by the speaker's desires *plus* the content of imperative (*if you do* S_{imp}*...*) whereas Q(w) instantiated by *and*-clause (*…then* S_{decl} *will happen*). The result is descriptively adequate, but the semantic derivation of dubitable legitimation. (It is claimed that a topical status of the imperative leads to its analysis in the restrictor of some

[3] While the components of Portner might be reconstructed in terms of the other two competing theories, a full comparison is beyond the scope of the present paper.

quantifier; the topical status is attributed to the imperative on basis of prosodic cues that are inconclusive.) According to Schwager on S_{imp} *or* S_{decl}, the idea that '*or*' could mean Boolean disjunction has to be radically denied. Her treatment of S_{imp} *or* S_{decl} rests on Geurts (2005) who proposes that '*or'* denotes a conjunction of modal quantifications where background and propositional slots get instantiated by the sentence to be interpreted. C_i are contextually given sets of worlds; $M_i \in \{\Diamond,\Box\}$ and P_i = disjuncts.

(14) $C_1\, M_1\, P_1 \wedge C_2\, M_2\, P_2$

Schwager makes use of this scheme in a sophisticated way, assuming that C_1 = CG (common ground); $M_1\, P_1 = \Diamond S_{imp}(A) \wedge [\![S_{imp}\, !]\!]$, second context C_2 = CG \ $S_{imp}(A)$ and finally $M_2\, P_2 = \Box\, [\![S_{decl}]\!]$. The result can be spelled out as "*It is possible that* S_{imp}*; and in all speaker-desirable worlds,* S_{imp} *actually happens; and in all worlds where it does not happen,* S_{decl} *will necessarily be true.*" This leads to a descriptively adequate semantic representation. However, Geurts' background theory and the cases at hand do not yet match perfectly. The first conjunct doesn't unify well with Geurts' scheme (14), likewise Geurts does not discuss changes between modal bases extensively (e.g. from epistemic to buletic to future-no-matter-what).[4] Condoravdi & Lauer do not address coordinate constructions with imperatives. I will come back to their proposal and undertake a more detailed comparison once the Hands-Up theory has been presented.

3 Hands-Up Theory for Imperatives

3.1 The Backbone

I propose two kinds of imperative construction operators [!] and [¡], each with syntactic requirements, denotation and presupposition. Given that I will not deal with conflicting desires or obligations explicitly, I will notate modal quantification in an entailment format. FUTURE, CIRC, DEONT etc. are intended to deliver the future, circumstantial etc. alternatives of w_o and LEWIS-SIM is used to remind us of the fact that we want to exclude the more obscure of all logical possibilities sometimes. The notation should be reversible to one based on modal base and ordering source.

[!]: Syntax:
one obligatory argument: finite sentence in imperative mood S_{imp}

[4] Schwager herself comments on the analysis in much the same spirit. It should be kept in mind that all simpler mappings from syntax to semantics were inevitably bound to yield wrong results, so this analysis constitutes true progress.

one optional argument: *or*-phrase with *or*-P → '*or*' S_{decl}
Semantics:
$\lambda p \lambda q \forall w$[FUTURE($w_o$,$w$)∧CIRC($w_o$,$w$)∧LEWIS-SIM($w_o$,$w$) → $p(w) \vee q(w)$]
Presupposition:
the speaker believes that the addressee, taking a choice in all life future options
λw.Future(w_o,w)∧Circ(w_o,w)∧Lewis-Similar(w_o,w)
prefers *p*-worlds to *q*-worlds.

[¡]: Syntax:
first obligatory argument: finite sentence in imperative mood S_{imp}
second obligatory argument: *and*-phrase with *and*-P → *'and'* S_{decl}
Semantics:
$\lambda p \lambda q \forall w$ [FUTURE(w_o,w)∧CIRC(w_o,w)∧LEWIS-SIM(w_o,w) →
$p(w)$; $q(w) \vee C(w)$]
Pragmatics:
C propositional variable to be instantiated in context
$C \subseteq \neg p$ and $C \cap \neg q \neq \emptyset$ (hence *C*-worlds might avoid the consequences presented in second conjunct[5])

The coordinations *and* and *or* do not enter semantic composition but are interpreted syncategorematically. Coordinating *and* is reflected as narrative sequencing; as in DRT. Usually, S_{imp} and S_{decl} are tightly linked anaphorically under conjunction. I will not go into the details of ⟦ S_{imp};S_{decl} ⟧ which would require dynamic lambda logic. The disjunction is strengthened to exclusive disjunction in most cases. I will in one case below refer to this strengthening. Finally note that the approach once again stipulates a semantic difference between *and*-coordinations and *or*-disjunctions. Unlike other analyses, the one defended here treats the two cases maximally parallel, differing only in how the same semantic parameters get instantiated in either case, and in the presence or absence of one presupposition.

3.2 Examples of [!]-Imperatives

I will now survey how the analysis can treat various kinds of uses of the imperative. Different types of propositional OR arguments yield different flavours of imperatives. I assume throughout that if the second argument of [!] is not overtly realised, it will be instantiated in context. Let us start with *Command*, the most prototypical use of imperative mood.

(16) Remove your car!

[5] Thanks to Sven Lauer who suggested this specific version of restriction.

The first argument of the [!] operator λ*w*[REMOVE(A, CAR-OF-A, *w*)] is provided by the imperative sentence. The hearer understands the presupposition that the speaker believes that the addressee will prefer *REMOVE-CAR*-worlds to *q*-worlds. Depending on the situation at hand, the hearer might guess that leaving the car will cause trouble with the police, e.g. she will get a ticket. Hence, the overall proposition conveyed is this:

$$\forall w[\text{FUTURE}(w_o,w) \wedge \text{CIRC}(w_o,w) \wedge \text{LEWIS-SIM}(w_o,w) \rightarrow [\text{REMOVE}(\text{A}, \text{CAR-OF-A}, w)] \vee \text{TICKET}(w)]$$

The utterance presupposes that REMOVE-worlds are better than TICKET-worlds. The "force" of the command derives from the threatening nature of the alternatives. The more likely the speaker holds the TICKET case, and the less she is inclined to loose money, the more likely will she comply to the command. — Next, consider *Warning/Advice*, like in (17).

(17) Wear a raincoat!

The speaker in (17) need not have a personal desire for the addressee to comply. (Theories that rephrase imperative sentences as reports about the speaker's desires will find such examples worrisome.) The present analysis predicts that [!] will take λ*w*[WEAR(A, RAINCOAT, *w*)] as its first argument. The second derives from common knowledge about the current weather, the health state of the addressee; let us assume a simple *q* = 'you will get wet'. The speaker conveys, and the hearer accepts the presupposition: RAINCOAT-worlds are better for the hearer than WET-worlds.

$$\forall w[\text{FUTURE}(w_o,w) \wedge \text{CIRC}(w_o,w) \wedge \text{LEWIS-SIM}(w_o,w) \rightarrow [\text{WEAR}(\text{A}, \text{RAINCOAT}, w)] \vee \text{WET}(\text{A}, w)]$$

In giving desinterested advice, the speaker points out certain facts and leaves it to A to act in the most reasonable way. We'd expect, however, that the speaker does not *mind* if A reacts in the indicated manner—or else, the speaker would not have pointed out these facts in the first place. We will come back to this fact.

The analysis can nicely reflect speaker's Authority and, more interestingly, the Lack of Authority. Consider the unspecific request in (18).

(18) *Be quiet!* (or ... ?)

$$\forall w[\text{FUTURE}(w_o,w) \wedge \text{CIRC}(w_o,w) \wedge \text{LEWIS-SIM}(w_o,w) \rightarrow [\text{QUIET}(\text{A}, w)] \vee \text{PUNISHMENTS}(\text{A}, w)]$$

The hearer could draw on knowledge about speaker like "wow, this speaker is a fierce guy who could earlier think of nasty PUNISHMENTS". The speaker

conveys the presupposition: "I, the speaker, believe that you'll like the QUIET-worlds better than PUNISHMENT-worlds". Drawing on earlier knowledge, the hearer will believe this presupposition and accordingly hold her mouth. Speakers with little authoritative force lead to a different kind of hearer knowledge, e.g. "this speaker's PUNISHMENTS are not severe". Again, the speaker conveys the presupposition that 'he believes that the hearer finds QUIET-worlds are better than PUNISHMENT-worlds'. The addressee, however, might disagree with the speaker and therefore opt for the worlds where $\lambda w.\neg$[QUIET(A, w)]. We see that Authority can be based on the experience that S was able to think about drastic measures in the "*or*"-case on earlier occasions. I will next address Permissions like the *cookie* invitation.

(19) Take a cookie!
$\lambda q \forall w$[FUTURE(w_o,w)$\wedge$CIRC(w_o,w)$\wedge$LEWIS-SIM(w_o,w)$\rightarrow$
[TAKE(A, COOKIE, w)] $\vee$ q(w)]

(19) suggests that—contrary to earlier belief of A—it is not forbidden to take a cookie. Why? The speaker conveys the presuppositions that the addressee will prefer COOKIE-worlds to NO-COOKIE-worlds. If the speaker can be trusted, this includes a commitment to not punish Addressee if she takes a cookie. (19) is typically understood as a permission in contexts where the only disadvantage of NO-COOKIE-worlds for A is that she does not get a cookie (which the speaker should believe a desirable thing to have). Consequently, the addressee can decide to decline this offer—for instance if she is on a diet or does not like cookies very much. Hence, permissions arise as one possible instantiation of q. — Let us finally look at Concessives. I will use an example in a naturally sounding prediscourse.

(20) a. Don't smoke (, or you'll die young)!
b. (nag nag nag) — Well, then do smoke! Kill yourself!

Intuitively, (20) shows that speaker and addressee disagree in certain respects. This is reflected in the presuppositional discourse record. (20a) entails that the Speaker believes that Addressee prefers NON-SMOKE-worlds (= LIVE-LONG-worlds) to DIE-YOUNG-worlds (= SMOKE-worlds). In (b), [!] takes a first argument λw[SMOKE(A, w)] with the second argument missing. With the presupposition conveyed in (b), the Speaker acknowledges that Addressee prefers SMOKE-worlds (= DIE-YOUNG-worlds) to NON-SMOKE-worlds (= LIVE-LONG-worlds). As part of the discourse record, however, the speaker has made it clear that she does not share this preference and does not think it reasonable. This also leads to an ironic undertone.

I will leave the remaining cases to the reader. PLEAS are characterized by the moral pressure of the 'or'-alternative. The speaker hopes that the addressee will prefer making her happy to making her miserable. WELL-WISHES straightforwardly acknowledge addressee's preferences without that either addressee or speaker can do anything to drive the course of events towards such happier alternatives. DARE! cases, finally, convey an intricate conditional preference of the addressee: *If* A 'dares', i.e. overcomes her fear of bad consequences, then she will prefer worlds where she takes the ball (ex. 7) to worlds where she doesn't take it. 'Daring' is tantamount to 'countering the situation with enough strength and energy so as to overcome the obviously threatening dangers'. We find a continuum of attitudes between the encouraging "*come, take the ball if you dare"* by the provocative coach and evident threats as *Dare! (and you will see what happens)*. As the present analysis assumes that the flavour of imperatives derives from contextual instantiation of the 'or'-cases, we'd expect such a continuum.

3.3 Examples of [¡]-Imperatives

I will now turn to the conjunction S_{imp}-*and*-S_{decl} which are analysed with [¡]. Recall that the second argument is obligatorily instantiated (i.e. we overtly see the *and* clause) and there is no presupposition as to what is good or bad for the addressee. The content of the second argument alone determines whether the worlds where $S_{imp}(A)$ is true are better or worse for A.

(21) Come in, and you will get coffee.

[¡] = $\lambda p \lambda q \forall w$[FUTURE($w_o$,$w$)∧CIRC($w_o$,$w$)∧LEWIS-SIM($w_o$,$w$) → $p(w)$;$q(w)$ ∨ $C(w)$] will apply to the first argument λz.COME-IN(A, z) and the second argument by dynamic update: λz.GET(A, COFFEE, z). Pragmatics requires that C is a proposition to be instantiated in context where $C \subseteq$ [[NOT S_{imp}]] = $\lambda z.\neg$ COME-IN(A, z) and moreover $C \cap$ [[NOT S_{decl}]] = $C \cap \lambda z.\neg$GET(H, COFFEE, z) ≠ Ø. The elsewhere-case C describes a missed occasion: Speaker believes that Addressee prefers COFFEE-worlds to NO-COFFEE-worlds.[6] As in the cookie example, the "force" of the offer depends on the addressee's eagerness not to miss an occasion to get coffee. Note that it is incoherent to combine motivational conjuncts and threatening disjuncts.

(21) a. #Come in, and you will get coffee, or I won't talk to you for days.

[6] In a richer account, the not-getting coffee needs to be tied to a limited interval of time; the time that would correspond to the time after the non-occurring entry.

This is captured by the syntactic (raw) analysis. Given that the coordinate clause S_{imp}*and/or*S_{decl} as a whole does not count as $S_{imp,}$ the structure is not recursive. More interestingly, perhaps, is what happens in the Threat case.

(22) Touch this cookie, and I will kill you.

(22) a. first argument of [¡]: $\lambda z.$TOUCH(A, COOKIE, z)
second argument of [¡], dynamic update: $\lambda z.$KILL(S, A, z)
Psp. for alternatives *C:* (i) $C \subseteq \lambda z.\neg$TOUCH(A, COOKIE, z)
(ii.) $C \cap \lambda z.\neg$KILL(S, A, z) $\neq \emptyset$

The speaker assumes that Addressee prefers not being killed to being killed. The imperative informs her that if she avoids touching the cookie there is a chance to stay alive.

Earlier theories interpret S_{imp}-*and*-S_{decl} as conditionals. The present analysis treats S_{imp}-*and*-S_{decl} maximally similar to other imperative clauses but it predicts that S_{imp}-*and*-S_{decl} entail conditional statements. The example in (23) is a typical conditional case, but the reasoning holds for all examples.

(23) Open the newspaper, and you'll see the king on page 2.
first argument of [¡]: $\lambda z.\exists x$(NEWSPAPER(x) $\wedge$ OPEN(A, x, z))
second argument of [¡]: $\lambda z.$SEE(A, KING, PAGETWOOF(x), z)
Presupposition: C in context,
(i) $C \subseteq \lambda z.\neg\exists x$(NEWSPAPER($x$) $\wedge$ OPEN(A, x, z))
(ii.) $C \cap \lambda z.\neg\exists x$(NEWSPAPER($x$)$\wedge$SEE(A, KING, PAGETWOOF($x$), z)) $\neq \emptyset$
i.e. there is a chance for A to see the photo of the king.

The instantiation of C is restricted to sets of worlds where A doesn't open a newspaper. The overall modal quantification states that all future courses where newspapers get opened by A are such that the king's picture is on p.2. This entails the conditional "*If you open the newspaper, you'll see the king*". Admittedly, the entailment is again hard-wired in the interpretation of [¡] and maybe therefore no less stipulative than in competing analyses. However, the stipulation here echoes the strengthening of disjunction in the plain imperative case. [!]-imperatives typically inform the addressee what happens if, and what happens if she does not engage in certain actions (e.g. freezes). In the simple case, this dichotomy can be modeled by exclusive disjunction. In the [¡] case, exclusive disjunction will not be sufficient to maintain this division of worlds into cases. The condition that $C \subseteq \neg p$ therefore simply transfers exclusivity of cases to the [¡] denotation.

This concludes the discussion of examples. What is missing so far are ill-wishes like *"Die!"*, *"Eat shit!"*. These obviously rest exclusively on what is

desirable for the speaker. They do not fit into the basic version of the analysis and will be touched in section 4.2.

4 More Ties to Earlier Literature

4.1 Van Rooij and Franke, 2010

In making the assumption that there are two imperative operators [!] and [¡], I stipulate a fundamental difference between *and* and *or* in imperatives. Of course, it would be desirable to derive the different behaviours from more basic facts about imperatives and coordination. In a recent paper, van Rooij & Franke propose that it can be predicted on a game theoretic basis. They address the fact that only *and* can be used to "reverse" the intention of an imperative, as illustrated again in (24). Only (24b) conveys a serious invitation to eat spinach.

(24) a. *Don't eat your spinach, or I will give you a dollar.
b. Leave your spinach, and I will beat you.

R&F's idea is simply this: Both imperatives in (24a) and (24b) state what the speaker wants *not* be done. Both erroneously prime the listener to not eat spinach. (24a) counteracts by promising a reward for the elsewhere case; (24b) counteracts by promising a punishment in the imp! case. Now the reward case competes with other ways to call out similar rewards, e.g. (25).

(25) If you eat your spinach, I will give you a dollar.

Van Rooij and Franke argue that the reward in (25) can be somewhat lower than the one in (24a) because in (25), it only needs to overcome the addressees reservations against spinach whereas (24a) has to overcome these *plus* the additional linguistic priming to not eat spinach, caused by the imperative. Therefore (25) systematically wins over (24a).
In principle, the dual threat in (24b) faces a similar competition. The speaker likewise could decide to say '*If you eat your spinach, I will not beat you.'* or such. And again, cheaper threats are required here because priming of the unwanted action has been avoided. However, van Rooij and Franke say, a costly punishment is not as binding a social commitment as a costly reward. Society will sanction those who promise big rewards and do not pay. In contrast, society rather rewards those who lower punishment. Therefore, false priming is not equally uneconomic when it only raises punishment costs: You can always lower your costs again by simply not punishing so badly.
This argument would certainly be appealing, but there are parallel examples where speakers indeed offer promising vs. unpromising alternatives in those

costly ways that R&F want to exclude. This is possible both with disjoint declaratives and with disjoint imperatives. (26) demonstrates the strategy in a common parent-child interaction (the parent wants actually to get home).

(26) You can either stay on the playground longer, or we'll have time to have an ice cream on our way home.[7]

(27) is to be understood in a context which advertises cosmetic surgery. (Of course, I do not submit to the argument.)

(27) It's your decision: Remain an unremarkable average person for the rest of your life, or make an appointment with Dr. Knock's cosmetic surgery clinics today!

Such examples show that speakers are indeed willing to make suggestions in ways where priming has to be countered with higher rewards, even suggestions that are worded in the imperative mood. The pattern is just conventionally not available for the S_{imp} *or* S_{decl} coordination. I therefore conclude that the asymmetric behaviour of *and/or* coordination is a conventional part of the pragmatics of S_{imp} *coord* S_{decl} and needs to be coded in grammar.

4.2 Condoravdi and Lauer, again

C&L (2010a, b, 2011) argue in favour of a general model for speech acts in terms of public beliefs and commitments. Specifically, they propose that "the utterance of an imperative *p*! commits the speaker to act as if he had a preference for the hearer committing himself to act as if he preferred *p*" (C&L, 2010b). They assume that commitments are part of public beliefs in common ground update (Stalnaker, 2002). Public commitment to *p* will add *p* to a (public) list of the agent that reveals his preferences that drive his decisions for action. Preference lists feed modal quantification and offer a natural link to statements like '*I must p*' that are entailed by imperatives. General public will watch whether the agent's behaviour accords with his public commitments. If discrepancies get too large, the general public can decide on sanctions, thereby taking responsibility for the 'elsewhere' worlds that are part of the imperative's meaning in the Hands Up! approach.

C&L's analysis is a sophisticated variant of a speaker-buletic modal. It is therefore ideally suited to analyse imperative uses for wishes, including ill-wishes. These are hard for my own proposal, according to which the speaker basically asserts that it would be in the hearer's own interest to take a certain action. Arguably, this does not fit the *'drop dead'* example.

[7] Thanks to Manfred Sailer who brought up this type of example.

(28) *Please, be blond!* (wish in absence of addressee)
Drop dead! (ill-wish)

For the same reason, however, C&L's analysis has problems with imperatives used for desinterested ADVISE, cookie INVITATIONS, CONCESSIVES and DARE! imperatives. They do not discuss the use of imperatives in threats of the S_{imp} *and* S_{decl} form, but given that the speaker will not have an interest for the listener to follow S_{imp}! in these cases either, these coordinations should be extremely problematic in that approach. The appealing vision in C&L's approach is that ordering sources in modal semantics can be reconciled with preference lists in action planning. In accepting an imperative *p!*, the addressee is assumed to rank *p* high on his list of preferences. The actual ranking of preferences will not be fully determined by the imperative utterance, because the hearer could have other aims that he pursues with even higher priority. This underspecification is certainly adequate.

The Hands Up! analysis, in contrast, contributes in a more local, but also more explicit way to the facts that determine the addressees actions. Take the drastic initial *Freeze, or I will kill you!* Before hearing and believing the content of this imperative, the addressee A might have planned (= preferred with high priority) to not freeze but have a coffee. By learning that his next future options are either to freeze or to get killed, A does not simply demote his earlier plan '*I will now have a coffee'* to a somewhat lower rank. What A indeed faces is a quite drastic belief revision: He learns that the coffee plan is not part of any possible future at all, and that his choice is a quite different one.

4.3 Ross' Paradox

Let me finally show how Ross' paradox can be avoided. Ross (1944) is quoted as the first to observe that simple-minded modal analyses of imperatives carry the danger of falsely predicting that (29) entails (30).

(29) Come!
(30) Come, or stay!

The problem arises due to the fact that any world that has property *p* also has the weaker property $p \vee q$. The Hands-Up! analysis does not predict this false entailment: In the following, I will use the proposition SANCTIONS as a cover predicate for contextually given sanctions that the hearer could understand.

(29') $[\![[\ !\ ]\ \textit{Come!}\ ]\!] = [\ !\ ]\ (\lambda w.\textsc{Come}(A,w))\ (\lambda w.\textsc{Sanctions}(A,w))$
$= \lambda z.\forall w[\textsc{Future}(z,w) \wedge \textsc{Circ}(z,w) \wedge \textsc{Lewis-Sim}(z,w)$
$\rightarrow$ Come(A,*w*) $\vee$ Sanctions(A,*w*)]

Presupposition: Speaker believes that A will like worlds in λw.COME(A, w) better than worlds in λw.SANCTIONS(A, w).

(30') ⟦[!] *Come, or stay!* ⟧
= [!] (λw.COME(A, w) ∨ STAY(A, w)) (λw. SANCTIONS (A, w))
= λz. $\forall w$(FUTURE(z, w) ∧ CIRC(z, w) ∧ LEWIS-SIM(z, w)
→ (Come(A, w) ∨ Stay(A, w)) ∨ Sanctions(A, w))

Presupposition: Speaker believes that A will like worlds in λw[COME(A, w) ∨ STAY(A, w)] better than worlds in λw.SANCTIONS(A, w).
There are two ways to avoid Ross' paradox. The first way is to assume, as we did in earlier places, that the *or* which separates the sanction case from the Imp! cases is an exclusive *or* $\vee_e$. With this assumption, (29') no longer entails (30'): Assume that there is a world which is both a STAY(A)-world and a SANCTION-world. Then (29') can be true but (30') will be false. Hence, (30') is not entailed by (29').

Exclusive disjunction: ($\phi(x) \vee_e \xi(x)$) $-\times\rightarrow$ (($\phi(x) \vee \psi(x)$) ∨ $\xi(x)$)

The second way to block the inference from (29) to (30) will leave us the option for inclusive 'or' in the representation of imperatives in the Hands Up! format. It argues via presuppositions. (29) presupposes that the speaker believes that the addressee prefers worlds in λw.COME(A, w) over worlds in λw.SANCTIONS(A, w). (30) presupposes that the speaker believes that the addressee prefers worlds in λw(COME(A, w) ∨ STAY(A, w)) over worlds in λw.SANCTIONS(A, w). We can model these preferences by universal statements of the following kind: All worlds in λw(COME(A, w) ∨ STAY(A, w)) are better than any world in λw.SANCTIONS(A, w). With this explication of preferences, the person who utters (29) will not be committed to the content of the presupposition of (30) because s/he believes that some STAY worlds are also SANCTION worlds and therefore not any better than other SANCTION worlds. The details of weighing worlds against worlds would need to be worked out in detail, but the approach opens up another way to avoid Ross' paradox in the Hands Up! theory.

References

Austin, J. 1972. *How to Do Things With Words*. Edited by J.O. Urmson, M. Sbisà. Cambridge, Harvard University Press.

Bach, K. & R. M. Harnish. 1979. *Linguistic Communication and Speech Acts.* Boston: MIT Press.

Bybee, J, W. Pagliuca & R. Perkins. 1994. The Evolution of Grammar: Tense, Aspect and Modality in the Languages of the World. Chicago: Chicago University Press.

Condoravdi, C. & S. Lauer. 2010a. Imperatives and Public Commitments. Handout, 11th *Annual Semantics Fest*, Stanford, March 2010.

Condoravdi, C. & S. Lauer. 2010b. Performative Verbs and Performative Acts. Handout, *Sinn und Bedeutung 15*, Saarbrücken, September 2010.

Donhauser, K. 1986. *Der Imperativ im Deutschen*. Hamburg, Buske.

Geurts, B. 2005. Entertaining alternatives: disjunctions as modals. *Natural Language Semantics* 13. 383–410.

Jary, M. 2007. Are explicit performatives assertions? *Linguistics and Philosophy* 30. 207–234.

Kratzer, A. 1981. The Notional Category of Modality. In *Words, Worlds, and Contexts. New Approaches in Word Semantics*, edited by H. J. Eikmeyer & H. Rieser. 38–74. Berlin: de Gruyter.

Portner, P. 2007. Imperatives and Modals. *Natural Language Semantics* 15. 351–383.

van Rooij, R. & M. Franke. 2010. Promises and Threats with Conditionals and Disjunctions. Ms., University of Amsterdam.

Ross, A. 1944. Imperatives and logic. *Philosophy of Science* 11: 30–46.

Russell, B. 2007. Imperatives in Conditional Conjunction. *Natural Language Semantics* 15. 131–166.

Schwager, M. 2006a. *Interpreting Imperatives*. Dissertation, UFrankfurt.

Schwager, M. 2006b. Conditionalized Imperatives. In: C. Tancredi et al. (eds.) *Proceedings of SALT 16.* CLC Publications.

Schwager, M. 2008. Optimizing the Future. Course material at the *20th ESSLLI summer school*, Bordeaux.

Searle, J. 1969. *Speech Acts.* Cambridge: Cambridge University Press.

Searle, J. 1989. How Performatives Work. *Linguistics and Philosophy* 12. 535–558

Stalnaker, R. 2002. Common Ground. *Linguistics and Philosophy* 25. 701–721

Truckenbrodt, H. 2009. *Speech Acts and Agreement.* Draft, HU Berlin

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 225–239. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Focus Influences the Presence of Conditional Perfection: Experimental Evidence

Marie-Christine Farr
Goethe University Frankfurt
Marie.C.Farr@gmail.com

Abstract. This contribution tests whether focus has a determining influence on the occurrence of Conditional Perfection. Two off-line experiments support this hypothesis. Conditional Perfection occurs significantly more often if the antecedent of the conditional is focused compared to the non-focused case. Additionally, in contrast to the scalar implicature associated with *or* (Zondervan 2009), Conditional Perfection occurs only infrequent if the antecedent is not focused. The second experiment suggests that this distinct behavior is due to different properties of the scalar implicature and the implicature associated with Conditional Perfection.

1 Introduction

Conditional Perfection (CP) describes the phenomenon that speakers interpret conditional sentences, under certain conditions, as biconditionals. The phenomenon was given its name by Geis & Zwicky (1971), who observed that their students extended or "perfected" the meaning of conditionals. Consider Geis & Zwicky's original example:

(1) a. If you mow the lawn, I'll give you five dollars.
b. If you don't mow the lawn, I won't give you five dollars.
c. Only if you mow the lawn, I'll give you five dollars.

As McCawley (1993) points out, "Only if p, q" can be paraphrased as "If not p, not q". So examples (1b) and (1c) should be regarded equivalents. CP thus described the inference from (1a) to (1b) or (1c). Geis & Zwicky note that perfection of conditionals is clearly wrong from a logical viewpoint. The utterance of a sentence like (1a) does not exclude the possibility that the hearer gets a reward for some other effort, for example, for cleaning the living room. Still they affirm that many speakers interpret conditionals in exactly this way and that CP is "highly regular" (Geis & Zwicky 1971: 564). This paper addresses the conditions that influence the occurrence of CP.

2 Conditional Perfection Is a Pragmatic Phenomenon

Standard approaches analyze conditionals within the framework of possible worlds semantics, as in (2):

(2) "*If p, q*" is true in w if and only if:
$\forall\, w'$ *such that* $w' \in C(w)$ & $p(w') : q(w')$
with w being the actual world and $C(w)$ being the set of possible worlds accessible from w.

A conditional "If p, q" is considered to be true in w, if for all possible worlds that are accessible from w and in which p is true q is also true. No information is incorporated in the conditional meaning about what will be the case if p does not hold. So if we want to keep the semantics for conditionals unchanged, we must assume that CP is pragmatic. To affirm this claim, conditionals that do not allow perfection offer convincing support. If CP was contingent upon the semantics it must arise with all conditionals. *Biscuit Conditionals*, as the standard example taken from Horn (2000), belong to this group:

(3) a. If you're thirsty, there's some beer in the fridge.
b. If you're not thirsty, there's no beer in the fridge.

The conditional in (3a) clearly does not invite the inferences in (3b). The reason for this is that the two propositions are conditionally unrelated. Further evidence in favor of a pragmatic analysis of CP provides the fact that the inference is usually cancelable. That is, it can be "taken back" by adding additional information. The following example illustrates this (van Canegem-Ardijns & van Belle 2008):

(4) If you mow the lawn, I'll give you five dollars.
But also if you paint the garage.

Through adding the additional condition under which five dollars will be paid, the CP inference that mowing the lawn is the only possible way to earn the money is canceled.[1] Another feature suggesting a pragmatic account of CP is expressed by Boër & Lycan (1973). They support the idea that not all conditionals, in all situations are perfected and give the following counterexample:

(5) If John quits, he will be replaced.

[1] As discussed in van Canegem-Ardijns & van Belle (2008: 371 ff.), this cancels just the "Only if p, q" inference. Canceling the "If not p, not q" inference is often not possible for speech acts like promises, threats or warnings. This might indicate that the two inferences "If not p, not q" and "Only if p, q" are indeed not equivalent. Still, we will stick to this assumption.

Here, according to Boër & Lycan, CP does not arise, because common sense inhibits the implication that *if John does not quit his job, he won't be replaced*. It is easily imaginable that John will be replaced, e.g. because his work lacks quality or because he does not get along with his colleagues. This constitutes the main argument of Boër & Lycan. CP does not arise because of the special form or intrinsic features of conditionals but simply because of additional information like world or common-sense knowledge.
All this provides convincing evidence that CP is a pragmatic rather than a semantic inference.

3 Conditional Perfection Is not a Scalar Implicature

Originally, Geis & Zwicky claimed that it is difficult to explain CP in terms of implicatures (cf. Grice 1989) and that the inference is clearly not a conversational implicature. They argue that Grice, when characterizing conversational implicatures

> looks for general principles governing the effects that utterances have, principles associated with the nature of the speech itself. CP is, in some sense, a principle governing the effects that utterances have (...) but it is in no way that we can see derivable from considerations having to do with the nature of the speech act. (Geis & Zwicky 1971: 565)

Later in their squib, Geis & Zwicky relativize this claim and state that an explanation of CP in terms of conversational implicatures is not *easily* establishable. Unfortunately they conclude without further elaboration or clarification. Despite this rejection, it is the most popular assumption today to explain CP with respect to conversational implicatures. One particularly favored approach is to analyze CP in terms of *Scalar Implicatures* (SI). The general idea of a SI is that an inference can be drawn based on the amount of information that is expressed. As Grice's first maxim of Quantity advises, speakers should make their contribution as informative as required. Thus, very simplified, if we know that more informative statements than the one actually made exist (and some further assumptions hold (cf. e.g. Geurts 2010)) we can argue that the speaker does not believe that the more informative statements are true. For this reason, *Horn Scales* are created to order terms according to their information content. In the following, three scales will be introduced that were suggested to account for CP.

3.1 Attempt 1: Atlas & Levinson (1981)

Atlas & Levinson (1981) discuss the following scale:

if and only if p, q
↑ *if p, q*

There are two problems with this scale: First and most important, this scale is inadequate to explain CP. As mentioned above, by uttering a weaker statement the speaker expresses that he does not believe that the stronger statement holds. Thus an effect opposing CP arises. Uttering a conditional would always imply that *p* is only one among more conditions which will bring about *q* (Horn 2000). Atlas & Levinson assumed that this scale does not elicit SIs, hence they did not see this problem. They argued that the scale is not well-formed because the two terms are not lexicalized to the same degree. This is why the unwanted SI does not arise. However, this restriction does not hold, as will be discussed below. The second deficiency of the above scale is pointed out by van der Auwera (1997,b). The element at the top of the scale is just the literal meaning plus the SI which is expected. It is clear that this combination will always be more informative than the literal meaning on its own. Since a construction of this type is excluded with respect to other scalar terms like <some, some but not all>, it should also be excluded for CP. A related weakness is the complexity of the statement at the top of the scale. A restriction which is often proposed for potential alternatives is that they must not be considerably longer or more complex than the statement made. In these cases, the speaker could just choose the shorter statement in order to be brief. However, this restriction does indeed not hold. As Matsumoto (1995) points out, more informative statements need to be asserted if they contain relevant information and even if they are of a greater complexity. Therefore, the above scale does elicit the unwanted SI. However, the scale can be ruled out due to other reasons such as the above-mentioned deficiencies and additional constraints on monotonicity.[2]

3.2 Attempt 2: van der Auwera (1997b)

Van der Auwera (1997; 1997b) assumes the following scale for his approach:

...
if p, q and if r, q and if s, q
if p, q and if r, q
↑ *if p, q*

If someone utters "If p, q" the comparably stronger statements such as, e.g., "If p, q and If r, q" are automatically denied and hence the speaker expresses that *p*

[2] Horn scales must not include items of different monotonicity behavior. (cf. e.g. Matsumoto 1995).

is the only condition that will bring about q. The weakness of van der Auwera's scale is that he has to assume an infinitely large expression at the very top of the scale that incorporates all possible antecedents. Only if the statement "If p, q" negates *for all* other antecedents r that "If r, q" is true, CP arises. The problem of this account is the reference to particular antecedents. Someone who hears a conditional like (1a) would have to reason for all possible antecedents that they will not bring about q. This however, does not seem appropriate to represent the reasoning involved in CP. It is implausible and probably impossible that someone who hears a conditional has an infinitely long list of possible antecedents in mind (Horn 2000; von Fintel 2001).

3.3 Attempt 3: Horn (2000)

Horn (2000) suggests yet another approach. He believes that the CP effect is due to pragmatic strengthening and suggests the following scale:

$$\begin{array}{l} q\ /Whatever\ the\ case,\ q \\ \uparrow if\ p,\ q \end{array}$$

Unfortunately, a proposal like Horn's is also not sufficient to derive CP, as von Fintel (2001) notes. Uttering "If p, q", and thereby negating the simple statement $q/whatever\ the\ case$, q, does not mean that p is the only necessary and sufficient condition under which q will occur. It only elicits the much weaker implicature that q is not unconditionally true. Whether only one or several conditions exist that render q true cannot be decided at that point. Thus Horn's account is missing an important step towards CP. Still, following Horn, CP is derivable under his account (Horn 2000, 2004). Horn performs a reduction of Grice's maxims which is motivated by the desire to be in accordance with the idea of a dualistic functional model which guides conversation. This model assumes that utterances are subject to two forces. All of Grice's maxims and submaxims, except for the maxim of Quality which remains unchanged, can be reduced to express just these two forces. Horn ends up with the following two principles (Horn 1993):

- **Q Principle**: Make your contribution sufficient. Say as much as you can, given quality and the R Principle.
- **R Principle**: Make your contribution necessary. Say no more than you must, given the Q Principle.

The **Q** Principle embodies the first maxim of Quantity and the first two submaxims of Manner. It corresponds to a lower bound on information content. Within the **R** Principle the maxim of Relation, the second maxim of Quantity and the third and fourth submaxims of Manner are collected. This principle

constitutes an upper limit on the form of the utterance.
Under these prerequisites uttering "If p, q" implies that the speaker does not believe that *q* is unconditionally true. Given the **R** Principle, this contribution must be more relevant to the conversation than uttering *q* alone. This is why CP arises. As Horn puts it: "what could make such a condition [i.e. "If p"] more relevant than its necessity?" (Horn 2000: 310). Thus, CP occurs naturally and regularly due to systematic strengthening which is evoked by the **R** Principle.
A serious problem of Horn's account is that it would never be relevant to claim that *p* is just a sufficient condition. This is however, wrong. With *mention-some* questions it is typically sufficient to provide only the most relevant out of several conditions (cf. von Fintel 2001).
The attempts to explain CP as a SI have not been satisfactory. The next section discusses the possibility to analyze CP still as a *Quantity Implicature* (QI) but not as a SI.

4 Conditional Perfection as Quantity Implicature

The basic idea, following von Fintel (2001), is that CP is a QI[3] which arises as a by-product of an exhaustive interpretation. The following examples, taken from von Fintel (2001) and Groenendijk & Stokhof (1984) illustrate exhaustive interpretations.

(6) a. Q: Who left the party early?
A: Robin and Hilary left the party early.
b. Robin and Hilary but no one else left the party early.

(7) a. Q: Who walks?
A: John and Mary walk.
b. John and Mary but no one else walk.

If the answers in (6a) and (7a) are interpreted exhaustively, they corresponds to (6b) and (7b). These inferences are thought to be QIs. However, they cannot be derived by the "standard procedure" introduced for SIs, i.e. by negating stronger statements. The problem is the set of relevant alternatives. In order to infer "John and Mary but no one else walk" from "John and Mary walk" an infinitely large set of more informative statements needed to be rejected, as illustrated below:

- John, Mary and Peter walk.

[3] Although QIs entail SIs, I use QI in the following to refer to all kinds of QIs except for SIs.

- John, Mary, Ann and Peter walk.
- ...

This is again very implausible.
Van Rooij & Schulz (2004) and Schulz & van Rooij (2006) provide an account of exhaustive interpretation which overcomes these problems. Their theory of exhaustification captures the intuition that exhaustive reasoning is based on the *closed world assumption*. Details of their theory are not important for our purpose; what is important is that they explain exhaustification with the use of minimal models. An exhaustive interpretation corresponds to a minimal model. Consider the following models for example (7a).

M_1	M_2
Individuals =	Individuals =
{Robin, Ben, John, Mary}	{Robin, Ben, John, Mary}
$[\![walk]\!]^{M_1}$={Robin}	$[\![walk]\!]^{M_2}$={Ben}

M_3	M_4
Individuals =	Individuals =
{Robin, Ben, John, Mary}	{Robin, Ben, John, Mary}
$[\![walk]\!]^{M_3}$={John, Mary}	$[\![walk]\!]^{M_4}$={John, Mary, Ben}

Table 1: The table presents four potential models for example (7a)

Exhaustification arises with a model that makes the answer true and in which the extension of the predicate in question is minimal. From the above given examples M_3 is the model leading to an exhaustive interpretation. The others either make the answer false (M_1 and M_2) or the extension of *walk* is not minimal (M_4). An important feature of this account is that the focus-background partitioning determines the predicate in question that gets minimalized. Therefore, minimalization and hence exhaustification applies only to focused terms. In this regard Rooth (1996) makes an interesting observation with respect to focus and the nature of question-answer pairs. When we consider question-answer pairs, the position of focus in the answer corresponds to the wh-constituent in the question. Examples (8a) and (8b) illustrate this.[4]

[4] Boldness equals focus in this and further examples.

(8) a. Q: Who walks?
A: **John and Mary** walk.
b. Q: What do John and Mary do?
A: John and Mary **walk**.

Due to the different focus-background partitioning, different models will be minimal. For (8a) a model in which only John and Mary walk is minimal, but for (8b) a model where John and Mary do nothing else but walk is minimal.

4.1 Predictions for Conditional Perfection

Based on what we have seen so far, CP can be explained in terms of exhaustification which in turn can be explained by the selection of a minimal model. Since exhaustification is sensitive to focus, the same conditional can be interpreted exhaustively and non-exhaustively dependent on the question of the contexts and the predicate it specifies. Consider the following examples:

(9) A: What happens if I sell an eel?
B: If you sell an eel, **you get 2.50 euros**.

(10) A: When/Under which conditions do I get 2.50 euros?
B: **If you sell an eel**, you get 2.50 euros.

Again, depending on the question different parts of the conditional are focused. In the first case, where the consequent is focused, a minimal model is one in which selling an eel results in nothing else than getting 2.50 euros. Hence, CP is not expected. With focus on the antecedent, as in dialogue (10), a minimal model is one where the only condition under which 2.50 euros are received is if an eel is sold. CP is expected to arises.

5 Experimental Investigations

The purpose of the experimental investigations was to test whether the predictions with respect to the influence of focus on CP are right. To investigate this six minimal context pairs were created that differed only in the question asked. The question was either of the type *what-if-p* or *when-q*. The answer to either question was a conditional of the form "If p, q". Thus, questions of the type *what-if-p* put focus on the consequent of the conditional. Questions of the form *when-q* on the contrary, put the antecedent in a focus position. An alternative formulation for *when-q* would be *under-which-conditions-q* (cf. (10)). However, it was argued in the literature that questions with the Dutch equivalent are necessarily understood to ask for an exhaustive answer (cf. van Canegem-Ardijns & van Belle 2008: footnote 12). If this was also the case for the German

counterpart (the experiment was conducted in German) the questions would be useless to investigate the influence of focus. Thus we choose the *when-q* formulation. It is also known that for when-sentences a difference between a conditional and a temporal reading exists. In this study, we examined the conditional reading. To promote a conditional reading, we did not include terms referring to temporal aspects within the contexts of the test items. This was meant to ensure a conditional reading and with that bring about the effect that the answer "If p, q" rather than "When p, q" was not surprising or unintuitive. The task of the participants was then to judge in either case, whether the answer provided by the conditional was sufficient. Hence, felicity judgements rather than truth value judgements were collected. It is expected that a felicity judgement task (FJT) is more adequate to investigate whether implicatures were calculated (cf. Papafragou & Musolino 2003). The test items always specify two conditions that lead to a particular consequent (cf. 2). Thus participants are expected to rate the conditional answer as insufficient when CP occurred. If focus influences CP we expect that subjects rate the conditional answer more often as insufficient in the *when-q* condition than in the *what-if-p* condition.

Monika sells seafood on the market. She gets 1 euro for a crab, 2.50 euros for an eel, 15 euros for a lobster and 2.50 euros for a pike. Kerstin, an employee of Monika, cannot remember the prices. Since she does not want to ask Monika again, she asks Sahra, who also works for Monika. Sahra knows the prices exactly.	
what-if-p	*when-q*
Kerstin: What happens if I sell an eel?	Kerstin: When do I get 2.50 euros?
Sahra: If you sell an eel, you get 2,50 euros. Did Sahra answer Kerstin's question sufficiently? [Yes] [No]	

Table 2: The table presents a sample item with both *what-if-p* and *when-q* questions.

For elicitation of the data a repeated-measures design was used with the question type as independent variable. Thus subjects were confronted with both types of questions, but never for the same context. The investigations were conducted in paper-and-pencil form and the questionnaire consisted of six test items and six fillers. Three out of the six test items contained *what-if-p* questions and the other three *when-q* questions. Each questionnaire contained three fillers that tested whether participants were in general able to understand conditionals as answers to questions. These *conditional fillers* were very similar

to the test items, but they specified only one antecedent for each consequent. Within a true conditional filler, the conditional answer corresponds to what has been described in the context. False conditional fillers provide the wrong antecedent for a consequence. Furthermore the questionnaires contained three fillers which tested whether subjects were sensitive for exhaustification. Like the test items, these fillers specified two conditions which will lead to the same consequent. Contrary to the test items, the answer in the dialogue was not given in conditional form, but was a simple statement starting with *only*. Answers of true *exhaustification fillers* provided both conditions that were specified by the context. The false exhaustification filler gave only one of these. Thus, if participants are in fact sensitive to exhaustification they should rate the response sufficient in the *true* condition and insufficient in the *false* condition. The partitioning was balanced over all six fillers, so that in total three were of the *true* condition and three of the *false* condition. Two versions of the questionnaire were used and items and fillers were presented in a pseudo-random order. No more than two test items were presented in a row. The same was ensured for the fillers. The second version of the questionnaire contained in each case the other condition of items and fillers and in the inverse order as in version one.

5.1 Procedure

The experiment was conducted in German. Participants received a paper copy of the questionnaire with written instructions on the first page. Before the questionnaires were handed out, participants also received oral instructions that summarized the written ones. Within the questionnaire, three items or fillers were printed on one page. At the end of the questionnaire participants were asked to provide some information about their background knowledge of logic and pragmatics. Additionally, space for comments was provided. The participants took about 15 minutes to fill out the questionnaire.

5.2 Participants

Participants were 50 students from an introductory linguistics class of the University of Frankfurt. Two subjects were excluded, prior to analysis, because they did not provide correct answers to three or more fillers. Hence, the data of 48 participants was evaluated.

5.3 Results

Negative answers, signaling CP, occurred in 89.2 % of the *when-q* contexts and in 16.3 % of the *what-if-p* contexts. An analysis of variance showed that over items as well as over subjects there was a main effect of question type (*when-q* vs. *what-if-p*) on the occurrence of CP, $F(1,5) = 145.93$, $p < 0.001$ and $F(1,47) = 309.93$, $p < 0.001$ respectively. Most participants also showed

a consistent behaviour over all test items. 61 % of the subjects labeled the answer as insufficient only with *when-q* and never with *what-if-p* questions. 33 % labeled the answers more often as insufficient in *when-q* contexts than in *what-if-p* contexts. Only 3 participants said that the answers are equally frequent insufficient in both question conditions. Moreover, nobody's answers signaled that CP occurred more often or even exclusively in *what-if-p* contexts.

5.4 Discussion

The results clearly indicate that focus has an effect on the occurrence of CP. This effect was highly significant over subjects as well as over items. We found that the percentage of *no*-answers, signaling CP, was high in *when-q* contexts and comparably low in *what-if-p* contexts. These results indicate that von Fintel's theory, together with Schulz & van Rooij's account on exhaustive interpretation, is adequate to account for CP. Focus seems to be the decisive factor for the occurrence of this inference.

However, the results are important in another respect. Zondervan (2009) investigated the effect of focus on the SI associated with *or* (the inference from "A or B" to "A or B but not both"). He also found more SIs when *or* was in a focus-position but the effect, though significant, was much smaller than expected. Zondervan found that the SI occurred in 77 % of the focused cases, versus 51 % of the non-focused cases. In contrast, the present study reflects a partitioning closer to the expected one. The main problem of Zondervan's results was the high amount of implicatures in the non-focus condition. This could be due to the fact that a different paradigm was used. As described, the present study used a FJT while Zondervan used a truth-value judgement task (TVJT) in his study. Within the TVJT, participants had to label the target sentences *true* or *false*. The underlying assumption is that a sentence like "A or B" is considered *false* in the case that the subjects calculated the SI ("A or B but not both") and indeed A and B holds. However, this appears to be rather a strong claim. The statement is clearly inappropriate if the SI is calculated but does that lead to falsehood? To judge this could be a problematic task for participants, so that the responses might not reflect natural understanding. Judging whether an answer is suitable or sufficient might be more natural. Additionally, labeling an utterance as *false* does not automatically mean that an implicature arose. As Zondervan (2006) discusses, a *false* answer can be interpreted in two ways: Either the subject calculated the implicature and thus labels the target sentence *false* in a situation where both A and B were the case. Or alternatively, the subject did not calculate an implicature but noticed that in the situation where both A and B are the case *and* would be more suitable than *or* and thus labels the target sentence *false*. So in addition to the problem that labeling sentences

true or *false* might be unnatural for participants, interpreting the results is difficult. Furthermore, the different results for the non-focus condition in this and Zondervan's study could be due to different properties of *or* and *if*. It could be the case that for *if* the occurrence of QIs is more dependent on focus, while *or* also elicits the inference regularly when not located in a focus position (for whatever reason). To investigate which of these two factors was decisive for the different results in Zondervan's and the present study a follow-up experiment was conducted.

6 Follow-up Experiment

The follow-up experiment replicated the first experiment with the exception that a TVJT was used. If this experiment yields the same results as the first experiment we can conclude that *if* and *or* behave differently when located in focus. If however, Zondervan's results are replicated we can conclude that the different paradigm was responsible for the response pattern.

6.1 Material

Test and control items were the same as in the previous experiment, with the only difference that the question "Did X answer Y's question sufficiently?" was changed to "Is the answer of X true?" This was done for test as well as control items.

6.2 Procedure

The procedure, the instructions, oral and written, and the design were identical to the first experiment.

6.3 Participants

36 students from an introductory linguistics class of the University of Frankfurt participated in the experiment. Two participants were excluded prior to analysis, because they stated having substantial knowledge of implicature theory. Additionally, one participant was excluded because she did not provide correct answers to three or more fillers. Thus, the data of 33 participants was evaluated.

6.4 Results

Within *when-q* context negative answers, signaling CP, occurred in 56.6 % of the cases and they occurred in 11.1 % of the *what-if-p* contexts. The effect was again significant over subjects, $F(1,32) = 58.175$, $p < 0.001$, as well as over items, $F(1,5) = 50.845$, $p < 0.001$. 52 % of the participants labeled the answer only in *when-q* contexts as insufficient. One half of the remaining participants labeled more answers insufficient in *when-q* contexts. The other half said that the answers are equally often insufficient in *when-q* and *what-if-p* contexts.

Nobody's answers signaled that CP occurred more often or even exclusively in *what-if-p* contexts.

6.5 Discussion

The results indicate once more that focus influences the emergence of CP and furthermore that this is independent of the paradigm used. The amount of CP was again significantly higher in the *when-q* condition than in the *what-if-p* condition. This holds over subjects as well as over items. The percentage of *no*-answers, indicating CP, is overall lower when a TVJT is used compared to the FJT. This may either indicate that felicity judgements are indeed more adequate to detect implicatures or that the FJT overestimates the amount of implicatures. However, what is interesting with respect to Zondervan is that using a TVJT also lowers the percentage of CP in the non-focus condition. This signals that the high percentage of implicatures which Zondervan found in the non-focus condition was due to properties of *or* rather than due to the TVJT.

7 Conclusion

This contribution provides evidence that von Fintel's (2001) theory together with the account of Schulz & van Rooij makes right predictions for the occurrence of CP. The experiments showed that focus influences whether an answer is interpreted exhaustively, i.e. whether CP arise. The amount of CP was significantly higher when the antecendent was in a focus position. We also found that the high amount of implicatures which Zondervan found in his study on *or* in non-focus conditions was probably not due to using a TVJT rather than a FJT. For the case of *if* the amount of CP was even lower in the non-focus condition when a TVJT was used.

As mentioned in the literature, not all implicatures behave the same (cf. Papafragou & Musolino (2003) on numerals and other scalar terms, Geurts & Pouscoulous (2009) on different embeddings and Chemla (2009) on scalar terms and free choice inferences). Geurts (2010: 122 ff.) makes an interesting observation with respect to potential differences of SIs and QIs that seems relevant for the different behavior of *or* and *if*. Even though Geurts proposes one account to derive both inferences he clearly distinguishes between the two types of implicatures. While we have a well-defined, closed set of potential alternatives for SIs such as, e.g., *all*, *most* and *many* for the scalar term *some*, this is not the case for QIs as those involved in exhaustive interpretation. For an answer like "Robin and Hilary left the party early" (example (6a)) no such clearly defined set of alternatives exists. We rather have to deal with an open-ended, possibly infinitely large set of alternatives. This core difference seems to play

an important role for the different experimental results found by Zondervan and my study. Zondervan investigated the SI associated with *or*, so a well-defined set of alternatives was present, namely *and*. Since CP as analyzed here is not a SI but a QI, an open set of alternatives exists which cannot be clearly defined. This difference appears to be crucial for the reasoning of the participants. As Zondervan had argued, labeling a target sentence *false* might not mean that the SI was calculated but only that the stronger lexical item would be more adequate. So maybe the amount of SIs is overestimated in the non-focus condition and possibly also in the focus condition. It is reasonable that with a finite and reasonably small set of alternatives, participants think about whether one of the alternative statements might have been more suitable. This could lead to the high amount of *false* ratings in the non-focus conditions. Within the present experiments on CP there are no concrete alternatives which could detract the participants and lead to a large amount of *no* answers in the non-focus condition. So answering *no* seems to be more clearly traceable to the emergence of the QI.

If this difference was indeed crucial for the different results for *or* and *if*, we could conclude that for the case of *or* the SI is also not elicited regularly in the non-focus condition. Rather the clear awareness of the better alternative statement *and* interferes and leads the subjects to conclude that the sentence is false. Furthermore, this predicts that items that are assumed to produce SIs (e.g., *some*) reproduce Zondervan's results, whereas items associated with QIs (e.g., the exhaustive interpretation in (6a)) should reproduce the results of the current study.

References

Atlas, Jay David & Stephen C. Levinson. 1981. If-clefts, informativeness, and logical form. In Peter Cole (ed.), *Radical pragmatics*, 1–61. Academic Press.

van der Auwera, Johan. 1997. Pragmatics in the last quarter century: The case of conditional perfection. *Journal of Pragmatics* 27. 261–274.

van der Auwera, Johan. 1997b. Conditional perfection. In Angeliki Athanasiadou & Rene Dirven (eds.), *On conditionals again*, 169–190. John Benjamins Publishing Company.

Boër, Steven E. & William G. Lycan. 1973. Invited inferences and other unwelcome guests. *Papers in Linguistics* 6. 483–505.

van Canegem-Ardijns, Ingrid & William van Belle. 2008. Conditionals and types of conditional perfection. *Journal of Pragmatics* 40. 349–376.

Chemla, Emmanuel. 2009. Universal implicatures and free choice effects: Ex-

perimental data. *Semantics and Pragmatics* 2. 1–33.
von Fintel, Kai. 2001. Conditional strengthening.
Geis, Michael L. & Arnold M. Zwicky. 1971. On invited inferences. *Linguistic Inquiry* 2. 561–566.
Geurts, Bart. 2010. *Quantity implicatures*. Cambridge University Press.
Geurts, Bart & Nausicaa Pouscoulous. 2009. Embedded implicatures?!? *Semantics and Pragmatics* 2. 1–34.
Grice, Paul. 1989. *Studies in the way of words*. Harvard University Press.
Groenendijk, Jeroen A.G. & Martin J.B. Stokhof. 1984. *Studies on the semantics of questions and the pragmatics of answers*: University of Amsterdam dissertation.
Horn, Laurence R. 1993. Economy and redundancy in a dualistic model of natural language. In Susanna Shore & Vilkuna Maria (eds.), *Sky 1993: Yearbook of the linguistic association of Finland*. 33–73.
Horn, Laurence R. 2000. From if to iff: Conditional perfection as pragmatic strengthening. *Journal of Pragmatics* 32. 289–326.
Horn, Laurence R. 2004. Implicature. In Laurence R. Horn & Gregory Ward (eds.), *The handbook of pragmatics*, Blackwell.
Matsumoto, Yo. 1995. The conversational condition on horn scales. *Linguistics and Philosophy* 18. 21–60.
McCawley, James D. 1993. *Everything that linguists have always wanted to know about logic ... but were ashamed to ask*. University of Chicago Press 2nd edn.
Papafragou, Anna & Julien Musolino. 2003. Scalar implicatures: Experiments at the semantics-pragmatics interface. *Cognition* 86. 253–282.
van Rooij, Robert & Katrin Schulz. 2004. Exhaustive interpretation of complex sentences. *Journal of Logic, Language and Information* 13. 491–519.
Rooth, Mats. 1996. Focus. `http://www.ims.uni-stuttgart.de/ mats/`.
Schulz, Katrin & Robert van Rooij. 2006. Pragmatic meaning and non-monotonic reasoning: The case of exhaustive interpretation. *Linguistics and Philosophy* 29. 205–250.
Zondervan, Arjen. 2006. *The question under discussion focus condition for scalar implicatures*. Universiteit Utrecht MA thesis.
Zondervan, Arjen. 2009. Experiments on QUD and focus as a contextual constraint on scalar implicature calculation. In Ulrich Sauerland & Kazuko Yatsushiro (eds.), *Semantics and pragmatics: From experiment to theory*, Palgrave Macmillan.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 241–257. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Stative Passives and Event Kinds*

Berit Gehrke
Universitat Pompeu Fabra
berit.gehrke@upf.edu

Abstract. Motivated by particular restrictions on event-related modification with German stative passives, this paper proposes that stative passives instantiate a consequent state kind of an event kind. The participle in such constructions has to be derived from a verb whose event structure contains a consequent state, represented by an event-semantically interpreted BECOME component. Event-related modifiers with BE-passives modify either the event kind argument or the state itself, and are therefore semantically licensed.

1 Introduction

German morphologically distinguishes between so-called eventive (or verbal) and stative (or adjectival) passives (Kratzer 1994, 2000; Rapp 1996; Maienborn 2007a: among others). In particular, a past passive participle combines with *werden* 'become' in eventive passives (1a) and with *sein* 'be' in stative passives (1b) (examples after Kratzer 2000).

(1) a. Die Reifen werden aufgepumpt.
the tires become up-pumped
'The tires are (being) inflated.'
b. Die Reifen sind aufgepumpt.
the tires are up-pumped
'The tires are inflated.'

The semantics of sentences like (1b) is the main topic of this paper, and throughout, I will employ the descriptive labels BECOME- and BE-passives to distinguish between these two constructions in German.

According to the traditional view, going back to at least Wasow (1977), stative passives are copula-adjective constructions, eventive passives periphrastic verb forms. Nevertheless, an underlying event is still accessible in BE-

* This paper benefitted greatly from comments at various stages and locations by many people, in particular Sascha Alexejenko, Boban Arsenijević, Helga Gese, Claudia Maienborn, Louise McNally, and Carla Umbach. All errors are mine. This work was supported by the grant HUM2007-60599 from the Spanish Ministry of Education and Science and by an award from the Fundació ICREA to Louise McNally.

passives, given the (albeit restricted) availability of event-related modifiers (2).

(2) a. Der Brief ist mit roter Tinte geschrieben.
the letter is with red ink written
b. Das Haar war schlampig gekämmt.
the hair was sloppily combed

Kratzer (1994, 2000) and Rapp (1996) therefore propose that it is possible to adjectivise not just verbs but also verb phrases (VPs). Schlücker (2005) and Maienborn (2007a), in contrast, argue that such modifiers are merely pragmatically licensed. In this paper, I will argue, contra the latter, that the particular modifiers available with BE-passives are semantically licensed.[1]

The paper is organised as follows. In section 2, I will outline the general semantics associated with BE-passives, its input requirements, as well as the more restricted availability of event-related modification with this construction. Section 3 proposes a semantic account of BE-passives based on the difference between event kinds and tokens. Section 4 addresses the availability of one type of event-related modifier, *by*-phrases, and shows how the facts are accounted for by the proposal. Finally, section 5 concludes.

2 German BE-Passives

In the literature on German, the view prevails that the participle in BE-passives is adjectival (Kratzer 1994, 2000; Rapp 1996; von Stechow 1998; Maienborn 2007a), and that it expresses the result or outcome of an event. If BE-passives are copula-adjective constructions, their semantics has to be the one commonly assumed for such constructions: A stative property is ascribed to an individual.

However, BE-passives co-exist with 'true' copula-adjective constructions that employ primary adjectives (3) (examples from Maienborn 2009).

(3) a. Die Schublade ist geöffnet / offen.
the drawer is opened / open
b. Die Schublade ist geleert / leer.
the drawer is emptied / empty

This suggests that there has to be some difference between the two, and it is natural to assume that the difference is to be found in the nature of the underlying verb in BE-passives. The following sections discuss the contribution of

[1] For reasons of space, this paper will leave aside issues concerning the syntax-semantics interface, including whether or not phrasal adjectivisation of VPs exists. It can also not provide a deep comparison to existing approaches, but see Gehrke (to appear).

the verb in BE-passives, their input requirements and semantic peculiarities, as well as restrictions on the availability of event-related modification.

2.1 The Role of the Underlying Verb in BE-Passive Constructions

The stative property, as a rule, is ascribed to the internal (theme) argument of the underlying verb. The external argument, on the other hand, is completely absent, as illustrated by the unavailability of purpose clauses and depictives (4).[2]

(4) a. ??? Der Reifen war aufgepumpt, um die Fahrt
the tire was inflated in order the journey
fortzusetzen.
to continue

b. ??? Das Buch war mit Absicht / betrunken geschrieben.
the book was with purpose / drunk written

A first attempt at stating the input requirements for a BE-passive is based on the assumption that the stative property has to be recovered from the event structure licensed by the underlying verb. This means that only verbs which license an event structure with a stative component should be able to derive BE-passives. This is basically the hypothesis defended in Rapp (1996).

Indeed, the data show that BE-passives are fully acceptable with transitive verbs that have a lexically specified consequent state (in the sense of Moens & Steedman 1988) ((1b), (5)), i.e. with accomplishments and achievements.

(5) a. Die Tür ist geöffnet / geschlossen.
the door is opened / closed

b. Der Antrag ist eingereicht.
the application is submitted

c. Die Lampe ist repariert.
the lamp is repaired

With other verbs, BE-passives are acceptable only in certain contexts ((6)-(8), b. examples from Maienborn 2009) (see also Kratzer 2000). With activities ((6), (7)), this is to be expected: The event structure does not contain a state.

(6) a. #Die Katze ist gestreichelt.
the cat is petted

[2] This contrasts with BECOME-passives, where the external argument is syntactically active, even when it remains implicit (see also Gehrke & Grillo 2009: and literature cited therein).

b. Anna hat ihre Nachbarspflichten erfüllt: Der Briefkasten ist
Anna has her neighbour-duties fulfilled the mail-box is
geleert, die Blumen sind gegossen, und die Katze ist gestreichelt.
emptied the flowers are watered and the cat is petted
'Anna has done her neighbourly duties: the mailbox is emptied, the flowers are watered and the cat is petted.'

The BE-passive of a semelfactive verb[3] like *streicheln* 'stroke' in (6a) is rather bad out of context. However, if we create a context under which someone promised his or her neighbour to take care of things while the neighbour is on holiday, and one of the chores is to stroke the cat, the construction becomes acceptable (6b).

Similarly, the performative verb *zitieren* 'cite' out of context, as in (7a), is not a good candidate for the construction because it does not license an event structure with a stative component. In the right context, in this case adding the *by*-phrase *by Chomsky* (7b)[4], the sentence becomes acceptable again.

(7) a. #Das Manuskript ist zitiert.
the manuscript is cited
b. Das Manuskript ist von Chomsky zitiert.
the manuscript is by Chomsky cited

What is not expected if all we needed were a stative component to license the construction, is the fact that there are also restrictions on deriving BE-passives from some stative predicates ((8), though see (10), below).

(8) a. #Die Antwort ist gewusst.
the answer is known
b. Ist die Antwort gewusst oder geraten?
is the answer known or guessed

The BE-passive of *wissen* 'know' out of context is rather bad but gets better when embedded under the question in (8b). It is important to note, however,

[3] The terms activity, accomplishment, and achievement are used in the sense of Rothstein (2004). It could be debated whether semelfactives (or performatives, as in (7b)) are activities, but there is general agreement that semelfactives and performatives do not lexically specify a consequent state.
[4] A German PP headed by *von* 'of, from' in these contexts is commonly translated into English with a *by*-phrase. However, since it is generally claimed for English that *by*-phrases are not possible with stative passives, it is not fully clear whether (a) this claim is simply wrong (exceptions for English exist; German data are discussed in more detail in section 4); or (b) whether German *von*-phrases are not fully equivalent to English *by*-phrases. Given the facts in (4) (which extend to combinations with acceptable *by*-phrases), we have to assume that these *by*-phrases are still different from the *by*-phrases with eventive passives, which introduce true external arguments.

that many speakers do not even accept (7b) and (8b), whereas (6b) is accepted by everyone. A more restrictive hypothesis, then, is the one in (9).

(9) Only verbs that lexically specify a consequent state derive BE-passives.

It follows from (9) that accomplishment and achievement verbs, whose internal argument undergoes a change of state and as a result is the bearer of a consequent state, are the perfect candidates for this construction. In addition, state verbs that allow an inchoative (re-?)interpretation (see also Gehrke & Grillo 2009) are also fine, as evidenced by the acceptable BE-passives of the psych predicates in (10), in contrast to (8a).

(10) Marie ist genervt / verärgert / amüsiert.
Marie is annoyed / angered / amused

This hypothesis also makes sense of the fact that the subject is always the theme argument of the underlying verb: Changes of state, as a rule, affect theme arguments.

2.2 BE-Passives Involve Event Kinds

We saw in (2) and (7b) that the underlying event can be modified by event-related modifiers, such as instrumentals, manner modifiers, and *by*-phrases. However, it has often been observed that such modification is only possible if it pertains to the consequent state; cf. the contrast between (11) and (12) (examples after Rapp 1996).

(11) Der Mülleimer ist (* von meiner Nichte / *langsam) geleert.
the rubbish bin is by my niece / slowly emptied

(12) a. Das Haus ist von Studenten bewohnt.
the house is by students in-lived
b. Er ist von der Musik beeindruckt.
he is by the music impressed

The modifiers in (11) are out because they refer to an event participant or the manner of the event that (could have) brought about the particular state described by the sentence without having an impact on or being 'visible' during the consequent state. In contrast, the event participants described by the *by*-phrases in (12) clearly belong to the state described (see section 4).

Similarly, the modifiers in (13) have an impact on the underlying event that is still visible during the consequent state.

(13) a. Die Zeichnung ist von einem Kind angefertigt.
the drawing is by a child made
b. Der Brief war mit einem Bleistift geschrieben.
the letter was with a pencil written
c. Das Haar war ziemlich schlampig gekämmt.
the hair was rather slopp(il)y combed

In section 3, I will propose that BE-passives only allow modifiers that either modify an event kind (as in (13)) or that modify the state directly (as in (12)).

Another important restriction on the modification of BE-passives is that the underlying event cannot be temporally or spatially modified.[5] For example, a modifier like *recently* can only modify the state (14).

(14) Die Tür war kürzlich geöffnet.
the door was recently opened.
'The door was in the opened state recently, but probably is no longer.'
(*NOT*: The door is in the opened state, the opening took place recently.)

BE-passives are also incompatible with temporal frame adverbials (15) (examples from von Stechow 1998) (see also Rapp 1996, 1997).

(15) a. *Der Computer ist vor drei Tagen repariert.
the computer is before three days repaired
('The computer is repaired three days ago.')
b. Der Computer ist seit drei Tagen repariert.
the computer is since three days repaired

This has to do with the fact that BE-passives with a present tense copula are statements about the present (in contrast to present perfect BECOME-passives, which - at least in German - are statements about the past[6]).

Furthermore, spatial modifiers that pick out the location of the event that brought about the consequent state are also generally bad (16).

(16) a. ??? Die Reifen sind in der Garage aufgepumpt.
the tires are in the garage inflated

[5] The incompatibility of spatial and temporal modifiers with (many or most) stative predicates is discussed extensively in Maienborn (2007b) and literature cited therein.

[6] See also Rapp (1996); Kratzer (2000); Maienborn (2007a) and literature cited therein for arguments against treating BE-passives as an ellipsis of an eventive passive perfect construction. (German *werden* 'become' forms the perfect with the auxiliary *be*.)

b. ??? Das Kind war im Badezimmer gekämmt.
the child was in the bathroom combed

From these data I conclude that the event associated with the underlying verb lacks spatiotemporal location. To capture this fact, the account outlined in the next section crucially builds on the assumption that BE-passives involve event kinds, not event tokens.

3 The Proposal

Based on the discussion in the previous section, I propose that a BE-passive refers to the instantiation of a consequent state kind of an event kind (17).

(17) a. Die Tür ist geschlossen.
the door is closed
b. $\exists e_k, s_k, s\,[\text{BECOME}(e_k, s_k) \wedge \text{THEME}(e_k, \textbf{door}) \wedge \textbf{closed}(s) \wedge \text{THEME}(s, \textbf{door}) \wedge \textbf{R}(s, s_k)]$

R is Carlson's (1977) realisation relation whereas BECOME should be understood as an event semantic version of Dowty's (1979) BECOME-operator, associated with accomplishment and achievement predicates; e.g. (18).

(18) *Informal event semantics of* BECOME *(von Stechow 1996)*
$[\![\text{BECOME}]\!]$ (P)(e) = 1 iff e is the smallest event such that P is not true of the prestate of e but P is true of the target state of e.

The use of BECOME is motivated by the hypothesis in (9).[7]

The idea that BE-passives involve event kinds, in turn, is motivated by the restricted availability of event-related modifiers discussed in the previous section.[8] The unavailability of spatial and temporal modifiers shows that the event in BE-passives has no spatiotemporal manifestation. Instrumental, manner modifiers and *by*-phrases, on the other hand, are only available if they can be interpreted as event kind modifiers, or if they modify the state (token) directly. Event kind modification will be discussed in this section, whereas state

[7] Something like BECOME is also employed in Embick's (2004) account of one type of stative passive participles he identifies, namely the resultative one.

[8] Event kinds are natural to expect if we assume that events form a subsort in our ontology of (token) individuals (Davidson 1967), kinds form another subsort in that ontology (Carlson 1977), and as a rule, any token in the ontology should be the realisation of some kind in that ontology. Event kinds have an analog in e.g. the Situation Semantics notion of event type (Barwise & Perry 1983), though the formal details are quite different. Under a Neo-Davidsonian view (e.g. Parsons 1990), events can be decomposed into subevent, which motivates the additional assumption about the existence of subevent kinds.

modifiers are addressed in section 4.

Empirical arguments for event kinds as an ontological category have been brought forward by e.g. Landman & Morzycki (2003); Ginzburg (2005); Gehrke & McNally (to appear). For example, Landman & Morzycki (2003) propose to model manner modification in terms of kinds. Since their line of argumentation provides additional independent support for my analysis of BE-passives, the following subsection will briefly recapitulate the relevant points.

3.1 Modeling Manner in Terms of Kinds (Landman & Morzycki 2003)

Landman & Morzycki observe semantic and syntactic parallels with *so*-anaphora in the nominal and verbal domain across various languages. Their examples from German are given in (19).

(19) a. so ein Hund (wie dieser)
so a dog (like this)
'such a dog like this one'
b. Er hat so getanzt (wie Maria).
he has so danced (like Mary)
'He danced like Mary.'

In (19) there is a direct semantic parallel in the adnominal and adverbial uses of *so*, which refers back to a particular kind of entity (a kind of dog or a kind of dancing event). There is furthermore a syntactic parallel in that both can occur with an additional clause of comparison introduced by *wie* 'like'.

Given that elements like *so* under the adnominal use (19a), in particular English *such*, are commonly treated as kind anaphors, following Carlson (1977), Landman & Morzycki (2003) treat adverbial *so* analogously, as anaphor to event kinds. In particular, they propose that (adverbial) *so* denotes a property of events that realise a (particular contextually supplied) kind (20).

(20) $[\![\text{so}_i]\!] = \lambda e.e$ realises k_i

An additional argument that kinds are involved comes from the fact that temporal and locative adverbials generally cannot antecede adverbial *so* (21), unless they can be seen as creating a new (or sub-)kind (22) (examples from Landman & Morzycki 2003).

(21) a. *Maria hat am Dienstag getanzt, und Jan hat auch so getanzt.
Mary has on Tuesday danced and John has also so danced

b. *Maria hat in Minnesota gegessen, und Jan hat auch so
Mary has in Minnesota eaten and John has also so
gegessen.
eaten

(22) Maria schläft in einem Schlafsack, und Jan schläft auch so.
Mary sleeps in a sleeping bag and John sleeps also so
'Mary sleeps in a sleeping bag and John does so, too.'

For example, the locative modifier in (22) does not serve to specify the location of a particular sleeping event, but rather serves to create a new sub-kind of sleeping event, namely the kind of sleeping in sleeping bags. Hence, it is not a proper spatial modifier but rather used as a kind of manner modifier.

Given facts like these, Landmann & Morzycki suggest to treat manner modifiers as event kind modifiers in general.

3.2 Relevance for this Paper

Returning to the topic of this paper, it is striking to see that the same kind of modifiers that are acceptable antecedents for *so* are also possible with BE-passives, namely and foremost manner modifiers, which modify an event kind. Spatial and temporal modifiers, on the other hand, modify an event token and are neither good antecedents of *so* nor acceptable with BE-passives, as observed in the previous section.

If manner modification is taken to be kind modification, one type of restriction on event-related modification with BE-passives is straightforwardly accounted for under the current proposal (abstracting away from state modifiers for the time being). Since BE-passives involve event kinds, only kind-related event modification is possible, including modifiers that serve to create a new or a subkind. It should also be clear, then, that the particular modifiers are semantically and not just pragmatically licensed, contra Maienborn (2007a, 2009).

To illustrate how the kind-based approach captures the restrictions on event-related modification with BE-passives, let us come back to the contrast between (11) and (13) (I will return to the stative examples in (12) in section 4). The example in (11) without the modifier describes the state the rubbish bin is in as a result of an emptying event kind. Combining event-related modifiers with the BE-passive should only be allowed either if these modify the (consequent) state (token) or if they create a new subkind, by narrowing down the event kind of emptying rubbish bins. The particular modifiers in (11), however, do not do either, since they do not relate to the consequent state itself and since there are also no common or established subkinds of rubbish-bin-emptying by

my niece or slowly.[9] The modifiers in (13), in turn, pick out particular subkinds of the events in question, namely childish drawings, pencil-writings or sloppy combings.

In the following section, I will take a closer look at restrictions on the availability of *by*-phrases and show that some *by*-phrases modify a state whereas others should be treated as event kind modifiers.

4 Different Types of *by*-Phrases with BE-Passives

Schlücker (2005) observes that there are two types of *by*-phrases that can combine with BE-passives. She argues that one type constitutes VP-adjuncts (23), which do not form a prosodic unit with the participle.

(23) a. weil Peter von dem GeJAmmer genervt ist
because Peter by the lamentation annoyed is CONTRASTIVE
b. weil Peter von dem GeJÁmmer geNÈRVT ist
because Peter by the lamentation annoyed is NEUTRAL

Neutral stress with these phrases is on the participle, secondary stress on the modifier (the latter point is not noted in Schlücker, but see Hoekstra 1999; Gehrke 2008 for similar facts from Dutch).

The second type of *by*-phrases is argued to be V-adjuncts, which form a prosodic unit with the participle, with neutral stress on the modifier (24), (25).

(24) a. weil die Wände von FEUer geschwärzt sind
because the walls by fire blackened are NEUTRAL
b. weil die Wände von Feuer geSCHWÄRZT sind
because the walls by fire blackened are
CONTRASTIVE

(25) a. weil seine Töchter von der SANGesmuse geküsst sind
because his daughters by the muse of singing kissed are
NEUTRAL
b. weil seine Töchter von der Sangesmuse geKÜSST
because his daughters by the muse of singing kissed
sind
are
CONTRASTIVE

[9] The question remains how to determine whether a subkind is common or established. Ultimately, a pragmatic account should answer such questions, and this is where the current proposal meets pragmatic accounts like Schlücker (2005) and Maienborn (2007a).

Schlücker observes that the intonation facts with her 'V-adjuncts' match those with other event-related modifiers that are allowed with BE-passives (26), (27).

(26) a. weil die Birnen in ROTwein gedünstet sind
because the pears in red wine steamed are NEUTRAL
b. weil die Birnen in Rotwein geDÜNStet sind
because the pears in red wine steamed are CONTRASTIVE

(27) a. weil der Brief mit WACHS versiegelt ist
because the letter with wax sealed is NEUTRAL
b. weil der Brief mit Wachs verSIEgelt ist
because the letter with wax sealed is CONTRASTIVE

She concludes that these latter event-related modifiers, as well as *by*-phrases which behave like V-adjuncts, are pragmatically licensed in line with the account proposed by Maienborn, by forming a complex ad hoc property with the stative property denoted by the verbal participle.[10]

In addition, Schlücker notes that the two types of *by*-phrases further differ with respect to the nature of their complements. With her VP-adjuncts, the *by*-phrase is stated to denote the agent or direct cause of the underlying event. Animate entities are commonly expressed by proper names or members of a group denoted by a collective noun, e.g. *Polizist* 'police-man'. Inanimate entities are referred to by definite uses of mass nouns, e.g. *vom Feuer* 'by the fire', or by appellatives used definitely, e.g. *von der Bombe* 'by the bomb'.

With her V-adjuncts, on the other hand, a *by*-phrase is argued to denote the theme of the underlying event or an indirect cause. It is supposed to have an instrumental character and to provide information about the manner or reason of the event. Animate entities are referred to by collective nouns, e.g. *von der Polizei* 'by the police', inanimate entities by generic uses of mass nouns (*von Feuer* 'by fire') or indefinite uses of appellatives (*von einer Bombe, von Bomben* 'by a bomb, by bombs').

In the following, I will make some qualifications with respect to the data discussed in Schlücker and relate the facts to the current proposal.

4.1 Some Qualifications

A first observation is that the V-adjuncts discussed by Schlücker are parts of fixed expressions and idioms. For example, there is no literal 'verbal' meaning in (25), in the sense that the muse of singing actually kisses or kissed the

[10] This is basically what I called a common or established subkind above. Her account of the syntax of 'VP-adjuncts' remains unclear, given that she rejects the possibility of phrasal adjectivisation.

daughters.[11] A second type of *by*-phrases behaving like V-adjuncts is found in examples already discussed in previous sections, such as (7b) and (13a), repeated in (28) with the additional neutral stress pattern identifying them as V-adjuncts.

(28) a. Das Manuskript ist von CHOMsky zitiert.
the manuscript is by Chomsky cited
b. Die Zeichnung ist von einem KIND angefertigt.
the drawing is by a child made

The 'VP-adjuncts' discussed by Schlücker, on the other hand, are fully acceptable only with stative predicates. An example from previous sections, which displays this intonation pattern, is the stative one in (12b), repeated in (29) with the relevant intonation pattern.

(29) Er ist von der MuSÍK beÈINdruckt.
he is by the music impressed

For the other alleged 'VP-adjuncts', i.e. those that do not combine with stative predicates, I do not find them very good and I do not share the judgments about the intonation identifying them as VP-adjuncts. If acceptable at all, they rather behave like V-adjuncts, e.g. there is no secondary stress ((30), Schlücker's examples, my judgments about stress).[12]

(30) a. ?? weil der Saal von der Heinrich-BÖLL-Stiftung gemietet
because the hall by the Heinrich-Böll-foundation rented
ist.
is
NEUTRAL

b. ?? weil der Saal von der Heinrich-Böll-Stiftung geMIEtet
because the hall by the Heinrich-Böll-foundation rented
ist
is
CONTRASTIVE

[11] Similarly, the combination 'von Feuer geschwärzt' in (24) appears rather fixed. A preliminary google-search revealed very few instances of 'geschwärzt' in combination with a *by*-phrase. These were limited to *von Feuer*, *von Rauch* 'by smoke', and *von Ruß* 'by carbon black'.

[12] Other native speakers agreed with my judgments. Further syntactic tests to distinguish between V- and VP-adjuncts, mentioned by Schlücker (2005), such as the relative placement (with respect to modifier and participle) of sentence negation, sentence adverbials and floating quantifiers, yield the same results.

I conclude from these facts, then, that *by*-phrases that behave like VP-adjuncts are fully acceptable only with states.[13] Given observations in previous sections, this makes sense, since only with these predicates, the entity denoted by the *by*-phrase modifies the state (which is interpreted as an inchoative state).

4.2 Rapp (1996)

A similar modification restriction to stative predicates with BE-passives is already observed in Rapp (1996). Rapp notes that *by*-phrases that relate to the action or the process itself (as opposed to a stative component) are generally incompatible with *un*-prefixation (31), while this combination is more acceptable with stative verbs (32) (examples due to Lenz 1993).

(31) a. Die Suppe ist (*von Maja) ungewürzt.
*the soup is (*by Maja) unseasoned*

b. Der Brief ist (*von Maja) ungeschrieben.
*the letter is (*by Maja) unwritten*

(32) a. Die Dresdner Bürger sind von solchen Problemen
the Dresden- citizens are by such problems
unbeeindruckt.
unimpressed
'The citizens of Dresden are not concerned with such problems.'

b. ... weil sie von ihrer Arbeit unbefriedigt ist.
because they by their work unsatisfied are
'... because they are not satisfied by their work'

She concludes that the *by*-phrases with these verbs do not relate to an activity or action but express arguments of the adjective (i.e. of the state): The construction expresses the attitude of an experiencer with respect to his stimulus.

She furthermore observes that there are word order differences between non-action-related *by*-phrases (33) and other event-related modifiers in the BE-passive (34).

(33) a. Die Dresdner Bürger sind unbeeindruckt von solchen
the Dresden- citizens are unimpressed by such
Problemen.
problems

[13] The marginal acceptability of such *by*-phrases with BE-passives could be explained along the lines of Welke (2007), who assumes that there are a few instances where a BE-passive construction has to be interpreted as an elliptical BECOME-passive perfect construction.

b. ... weil sie unbefriedigt von ihrer Arbeit sind.
because they unsatisfied by their work are

(34) *... weil der Brief geschrieben von einem Experten / mit roter
because the letter written by an expert / with red
Tinte war.
ink was

Only the former can be extraposed, whereas the latter have to remain within the VP (or the verbal cluster). From these facts she concludes that the modifiers in (33) modify the adjective, while those in (34) modify a VP.[14]

4.3 Taking Stock: The Licensing of *by*-Phrases

To take stock, we have different kinds of *by*-phrases with BE-passives that are licensed semantically (and possibly syntactically) in different ways. First, we have *by*-phrases that behave like V-adjuncts, diagnosed by intonation and word order possibilities. Such *by*-phrases are only possible with idioms or when they serve to create a new (sub-)kind (e.g. (13a)). Furthermore, they behave like other event-related modifiers of BE-passives with respect to intonation and word order, as the data discussed by Rapp and Schlücker show.

In contrast, there are *by*-phrases that behave like VP-adjuncts with respect to intonation and word order possibilities, and thus contrast with other event-related modifiers with this construction. Such *by*-phrases are fully acceptable only with stative predicates, in which case they modify a state token. It is possible that such phrases are really to be treated as arguments of the AP (along the lines of Rapp), rather than arguments of the underlying VP. *By*-phrases with stative predicates commonly do not refer to agents, i.e. they are not true external arguments. For example, with psych predicates, they rather refer to the stimulus of the state expressed.

Schlücker's observation, then, that the complements of V-adjunct *by*-phrases have more of a generic character fits these conclusions and the overall proposal. If the *by*-phrase modifies an event kind rather than an event token, the potential agent of such a kind naturally has a more generic character. With the VP-adjuncts, on the other hand, we have *by*-phrases modifying an actual state token, so they are prone to be less generic.[15]

[14] Rapp takes the latter facts as an argument in favour of phrasal adjectivisation (along the lines of Kratzer 1994).

[15] Recall that Schlücker notes that VP-adjunct *by*-phrases can also refer to agents or direct causers. I assume that these must be the *by*-phrases in the non-stative examples, which are not very good to begin with.

5 Conclusion

In this paper, I proposed an account of German stative passives (BE-passives), which employed the concept of kinds in the domain of eventualities. On the basis of the restricted availability of event-related modifiers, it was argued that BE-passives instantiate a consequent state kind of an event kind. The input requirements for this construction therefore involve a participle derived from a verb whose event structure contains a consequent state, which was represented by an event-semantically interpreted BECOME component. Event-related modifiers with BE-passives, in turn, were argued to be semantically licensed, since they modify either the event kind argument or the state itself.

It was briefly noted that in some cases (for some speakers), BE-passives can be derived from verbs which do not license an event structure with a consequent state component, and it was suggested that these cases have to be contextually (pragmatically) licensed. The precise mechanisms were not discussed, however (see Maienborn 2007a, 2009; Gese 2010: for issues concerning the pragmatics of BE-passives); we could also assume that such cases involve coercion of the underlying event type. Given that the event kind is not spatiotemporally located, it might also be possible to interpret the scale underlying BECOME in a non-temporal way. This could explain different readings ascribed to BE-passives that have been discussed in the literature under different labels, such as consequent state vs. characterisation readings (Brandt 1982; Rapp 1996), resultant state vs. target state readings (Kratzer 2000) or temporal vs. qualitative readings (Maienborn 2009; Gese 2010).[16] This remains to be worked out in future research.

References

Barwise, Jon & John Perry. 1983. *Situations and Attitudes*. Cambridge, MA: MIT Press.

Brandt, Margareta. 1982. Das Zustandspassiv aus kontrastiver Sicht. *Deutsch als Fremdsprache* 19. 28–34.

Carlson, Gregory Norman. 1977. *Reference to Kinds in English*: University of Massachusetts at Amherst dissertation.

Davidson, Donald. 1967. The logical form of action sentences. In Nicholas Resher (ed.), *The Logic of Decision and Action*, 81–95. Pittsburgh: University of Pittsburgh Press.

Dowty, David. 1979. *Word Meaning and Montague Grammar: The Semantics*

[16] A somewhat different division is found in Embick (2004), who differentiates between statives and resulatives in English (see also Gehrke to appear).

of Verbs and Times in Generative Semantics and in Montague's PTQ. Dordrecht: Reidel.

Embick, David. 2004. On the structure of resultative participles in English. *Linguistic Inquiry* 35.3. 355–392.

Gehrke, Berit. 2008. *Ps in Motion: On the Syntax and Semantics of P Elements and Motion Events*: Utrecht University dissertation. LOT Dissertation Series 184.

Gehrke, Berit. to appear. Passive states. In Violeta Demonte & Louise McNally (eds.), *Telicity, Change, and State: A Cross-Categorial View of Event Structure*, Oxford University Press: Oxford.

Gehrke, Berit & Nino Grillo. 2009. How to become passive. In Kleanthes Grohmann (ed.), *Explorations of Phase Theory: Features, Arguments, and Interpretation at the Interfaces* Interface Explorations 17, 231–268. Berlin: de Gruyter.

Gehrke, Berit & Louise McNally. to appear. Frequency adjectives and assertions about event types. In *Proceedings of SALT 19*.

Gese, Helga. 2010. Implizite Ereignisse beim Zustandspassiv. Paper presented at the workshop 'Zugänglichkeit impliziter Ereignisse', University of Tübingen, July 2010.

Ginzburg, Jonathan. 2005. Situation Semantics: The ontological balance sheet. *Research on Language and Computation* 3.4. 363–389.

Hoekstra, Teun. 1999. Auxiliary selection in Dutch. *Natural Language and Linguistic Theory* 17. 67–84.

Kratzer, Angelika. 1994. The Event Argument and the Semantics of Voice. Ms. University of Massachusetts at Amherst.

Kratzer, Angelika. 2000. Building statives. Ms. University of Massachusetts at Amherst.

Landman, Meredith & Marcin Morzycki. 2003. Event-kinds and manner modification. In Nancy Mae Antrim, Grant Goodall, Martha Schulte-Nafeh & Vida Samiian (eds.), *Proceedings of the Western Conference in Linguistics (WECOL) 2002*, California State University, Fresno.

Lenz, Barbara. 1993. Probleme der Kategorisierung deutscher Partizipien. *Zeitschrift für Sprachwissenschaft* 12. 39–76.

Maienborn, Claudia. 2007a. Das Zustandspassiv: Grammatische Einordnung - Bildungsbeschränkung - Interpretationsspielraum. *Zeitschrift für germanistische Linguistik* 35. 83–144.

Maienborn, Claudia. 2007b. On Davidsonian and Kimian states. In Ileana Comorovski & Klaus von Heusinger (eds.), *Existence: Semantics and Syntax*, 107–130. Dordrecht: Springer.

Maienborn, Claudia. 2009. Building *Ad Hoc* properties: On the interpretation

of adjectival passives. In Arndt Riester & Torgrim Solstad (eds.), *Proceedings of SuB 13*, 35–49. University of Stuttgart.

Moens, Marc & Mark Steedman. 1988. Temporal ontology and temporal reference. *Computational Linguistics* 14.2. 15–28.

Parsons, Terence. 1990. *Events in the Semantics of English: A Study in Subatomic Semantics* Current Studies in Linguistics Series 19. Cambridge, MA: MIT Press.

Rapp, Irene. 1996. Zustand? Passiv? Überlegungen zum sogenannten "Zustandspassiv". *Zeitschrift für Sprachwissenschaft* 15.2. 231–265.

Rapp, Irene. 1997. *Partizipien und semantische Strukur: Zu passivischen Konstruktionen mit dem 3. Status*. Tübingen: Stauffenburg.

Rothstein, Susan. 2004. *Structuring Events: A Study in the Semantics of Lexical Aspect*. Oxford: Blackwell.

Schlücker, Barbara. 2005. Event-related modifiers in German adjectival passives. In Emar Maier, Corien Bary & Janneke Huitink (eds.), *Proceedings of SuB 9*, 417–430. Radboud University Nijmegen.

von Stechow, Arnim. 1996. The different readings of *wieder* 'again': A structural account. *Journal of Semantics* 13. 87–138.

von Stechow, Arnim. 1998. German participles II in Distributed Morphology. Ms. Unversity of Tübingen.

Wasow, Thomas. 1977. Transformations and the lexicon. In Peter Culicover, Thomas Wasow & Adrian Akmajian (eds.), *Formal Syntax*, New York: Academic Press.

Welke, Klaus. 2007. Das Zustandspassiv: Pragmatische Beschränkungen und Regelkonflikte. *Zeitschrift für germanistische Linguistik* 35. 115–145.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 259–273. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Events in Adjectival Passives*

Helga Gese
University of Tübingen
helga.gese@uni-tuebingen.de

Abstract. The paper presents a new analysis of the semantics of adjectival passives mainly concentrating on the status of the implicit event, its agent participant and the dependency relation between eventive base and derived property. On the basis of data from two questionnaire studies it proposes an adjectival ∅-affix, modifying Maienborn's (2009) analysis in two respects: First, it does not involve existential quantification over an event particular but reference to an event kind. Second, the dependency relation between the event kind and the property denoted by the participle of an adjectival passive sentence is not a causal or temporal one. It is a relation of lexical supervenience in the sense of Kim (1990) which leaves room for the pragmatic character of adjectival passives, for their specific 'surplus in meaning'.

1 Introduction

Adjectival passives such as (1) are combinations of a form of the copula *to be* plus an adjectivized past participle. In German, copula and auxiliary differ in form: Adjectival passives use the copula *sein* ('to be') whereas verbal passives are built with a form of *werden* ('to become').

(1) Die Tür ist geschlossen.
The door is[COP] *closed*
'The door is closed.'

(2) Die Tür wird geschlossen.
The door becomes[AUX] *closed*
'The door is closed.'

* Work on this paper was supported by the German Science Foundation (DFG) as part of the project A1 "The semantics and pragmatics of combinatory meaning variation" within the collaborative research center SFB 833, Universität Tübingen, and by the Ministry of Science, Research and the Arts Baden-Württemberg and the European Social Fund (ESF) within the Schlieben-Lange-Programm. I would like to thank Claudia Maienborn, Sebastian Bücking and Berit Gehrke for helpful discussion and comments. I would especially like to thank Britta Stolterfoht for having shared with me her psycholinguistic expertise.

Semantically, copula adjective sentences are property ascriptions to their subject referent (Maienborn 2005). What is special in adjectival passives, in contrast to copula sentences with genuine adjectives, is that the ascribed property is a complex property which has to be derived from the verbal base of the participle. Most semantic accounts assume that the property causally results from the occurrence of the event denoted by the adjectival passive's verbal base (cf., e.g., Maienborn 2009, Kratzer 2000; for an exception see Gehrke 2010). There are three problems with this assumption.

First, the possibility of *schon immer* ('always') modification, as in (3) and (4), and other non-event-based uses of adjectival passives, such as (5),[1] cast some doubt on whether we really have to deal with a causal relation between an event particular and its resulting state.

(3) Die linke Bronchie war schon immer verengt.
'The left bronchial tube had always been[COP] constricted.'

(4) Der Bildhauer meißelt aus dem Stein Figuren hervor, die nach seinem Verständnis dort schon immer verborgen waren.
'The sculptor carves shapes out of blocks of granit that he believes have always been[COP] hidden inside of them.'

(5) Bei den Glattnasen sind die Lidspalten bei der Geburt noch geschlossen.
'The eye-lid slits of the vesper bat are[COP] still closed at birth.'

Second, adjectival passives, contrary to verbal passives, do not regularly combine with agent modifiers (cf. (6) vs. (7)). The acceptability of agentive modification depends on whether or not it is relevant for the ascribed property (cf. Rapp 1997, Maienborn 2010, for more details on this). These restrictions cannot be easily accounted for if we assume that adjectival passives contain an event particular with agent participant as their base.

(6) Der Brief wurde von Gabi / von einem Experten geschrieben.
The letter became[AUX] *by Gabi / by an expert written*
'The letter was written by Gabi / by an expert.'

(7) Der Brief ist ???von Gabi / von einem Experten geschrieben.
The letter is[COP] *???by Gabi / by an expert written*
'The letter was written by Gabi / by an expert.'

Third, there is some evidence that the relation between the eventive base and the derived property cannot be a classical causal one. Typical causal relations

[1] The sentences (3) – (5) are adapted from real occurrences found in the world wide web.

(cf. Engelberg 2005, for more details on this) hold between events but not between states. Adjectival passives with stative base verbs such as (8) do not fit into this pattern. Moreover, causal relations normally correlate with temporal succession. This doesn't hold for adjectival passives like (9) in which the relation is one of simultaneity.

(8) Das Haus ist von Studenten bewohnt.
the house is[COP] *by students occupied*
'The house is occupied by students.'

(9) Die Gefangenen sind streng bewacht.
the prisoners are[COP] *strongly guarded*
'The prisoners are closely guarded.'

Examples like (3) to (9), *schon immer* ('always') modification, restrictions on agent modification and properties inconsistent with classical causal relations pose three questions that will be our starting point in this paper: (i) whether the occurrence of the event is in fact a necessary part of the truth conditions of adjectival passives, (ii) what role the agent plays and (iii) how event and ascribed property can be related, if not by a CAUSE or RESULT predicate. After a short presentation of the formal account which constitutes the background of the investigations and the analysis carried out in this paper, section three presents two questionnaire studies with a truth value judgment task (TVJT) which investigate the status of the event and its agent participant in adjectival passives. The results of these studies point towards an analysis relying not on event particulars but on event kinds. The remaining part of the paper concentrates on formalizing the relation between this event kind and the derived property. Borrowing a dependency relation widely used in the philosophy of mind, section four argues for analyzing the link between eventive base and derived property as a case of lexical supervenience. Supervenience allows connecting the derived property to an event kind and captures the intuition that the derived property is 'more' than the result state of the eventive base. It leaves room for the specific role pragmatics plays in the formation of adjectival passive by capturing the rather subjective, pragmatic nature of the derived property.

2 Background

Maienborn's (2009) account of the formal semantics of adjectival passives sets the frame for the investigations and modifications presented in this paper. Modeling the semantics of an adjectival passive sentence as the ascription of

an underspecified property to its subject referent, Maienborn (2009: 44) proposes the following adjectival affix:

(10) Adjectival ∅-affix: λP λx λs ∃e [s: Q(x) & result (e,s) & P(e)]

In (10) the underspecification of the ascribed property is rendered by using the free variable Q for which pragmatics has to provide a suitable value. The only restriction on Q is that it results from the event denoted by the verbal base of an adjectival passive. There are mainly three reasons which speak in favour of an underspecification account and against an account which identifies the ascribed property with the result state contained in the event structure of an adjectival passive's eventive base. First, the formation of adjectival passives is not restricted to verbs with lexically given result states (which should be the case if their semantics relied on result states), cf. (11).[2]

(11) Er war geschmeichelt, als der Personenkult um ihn schließlich groteske Formen annahm.
,He was flattered when the cult of personality surrounding him finally veered into the grotesque.' (*Der Spiegel* 40/1994, 10/3/1994)

Second, adjectival passives and genuine adjectives are not distributed in a complementary way, cf. (12) and (13). As „the output of a lexical rule may not be synonymous with an existing lexical item" (Kiparski 1983: 15), blocking should occur if adjectival passives referred not to an underspecified property but to the lexically given result state. Third, some sentences show a clear meaning difference between derived property and lexically given result state. In (14) *geöffnet* ('opened') cannot be identified with its result state *offen* ('open'). The value assigned to Q by the context is not 'open', it is the property of 'not being in the original packaging state'.

(12) Die Tür ist geöffnet.
'The door is opened.'

(13) Die Tür ist offen.
'The door is open.'

(14) Das Spiel ist geöffnet, aber unbespielt und absolut neuwertig.
'The game is opened but unplayed and in pristine condition.'
(Maienborn 2010: 9, my translation)

[2] In general, these constructions with non-resultative base verbs need contextual support, cf. Gese, Stolterfoht & Maienborn (2009: 136), Kratzer (2000: 4), Rapp (1998: 243).

In Maienborn's formulation of the ∅-affix involved in adjectival passive formation the only constraint on the ascribed property Q is that its value result from the occurrence of the base verb's event referent. In (10), this is rendered by existential quantification over an event particular. Yet, as already suggested by the non-event-based uses of adjectival passives referred to in the introduction, there are some reasons for doubting that this formalization is on the right track.

3 Experiments on the Status of the Event

Experiment 1: "Status of the Event"

To test whether the occurrence of the event denoted by the verbal base of an adjectival passive sentence is indeed a necessary ingredient of its truth conditions – as it is in the case of a verbal passive – a questionnaire study with a truth value judgment task (TVJT) was conducted (see, e.g. Crain and Thornton 1998, for more details on this method). The study tested how the judgments of verbal passives and adjectival passives can be affected by a context which excluded the occurrence of the events denoted by their base verbs. It compared adjectival passives, verbal passives and, in a control condition, copula sentences with genuine adjectives as utterances in two types of context: an eventive one and a purely stative one, in which any eventive component is excluded:
Eventive context:

(15) Pünktlich um 17 Uhr leert der Postbote den Briefkasten. Anna, die das vom Fenster aus beobachtet, freut sich, denn sie ist pleite und hat morgens einen Brief an ihren reichen Onkel eingeworfen. Zufrieden sagt sie zu Erwin: „Der Briefkasten ist geleert / wurde geleert / ist leer."
'At 5 p.m. right on schedule the mailman empties the mailbox. Anna, watching from her window, is glad to see this because she is broke and she had put in a letter addressed to her rich uncle that morning. She tells Erwin: "The mail box is[COP] emptied / is[AUX] emptied / is empty."'

Stative context:

(16) Soeben ist der fabrikneue Briefkasten an der Eugenstr. aufgestellt worden. Der Bürgermeister darf feierlich den allerersten Brief einwerfen. Die Frage, ob er denn wirklich der erste sein wird, der einen Brief in diesen Kasten einwirft, bejaht der anwesende Postfilialleiter und sagt: „Der Briefkasten ist geleert / wurde geleert / ist leer."

> 'A brand new mailbox has just been installed in Eugenstr. The mayor is expected to post the very first letter as part of a small ceremony. The manager of the post office who is in attendance confirms when asked whether the mayor will in fact be the first one to put a letter in this mailbox: "The mail box is[COP] emptied / is[AUX] emptied / is empty."'

Given the existence of adjectival passives with *schon immer* ('always') modification noted at the beginning of this paper the following hypotheses were formulated for Experiment 1:

(H1) Adjectival passives should be less dependent on the occurrence of the events denoted by their base verbs than verbal passives. Compared to verbal passives, they should receive more TRUE ratings in purely stative contexts.

(H2) (control condition) As the semantics of genuine adjectives does not contain any eventive component there should be no difference between the two sorts of contexts in the ADJ condition.

Method Fourty-two undergraduate students of Tübingen University participated for course credits or monetary reimbursement. All participants were native speakers of German.

Materials consisted of thirty-six experimental sentences in six versions and thirty-six filler sentences. All experimental items began with a context in which the occurrence of an event is described in condition EVENT or denied in condition NOEVENT and ended with the utterance of an adjectival or verbal passive or with a copula sentence with a genuine adjective. The base verbs of the adjectival and verbal passive utterances matched the event used in the EVENT-context. The copula adjective sentences contained genuine adjectives which corresponded to the result state of this event (e.g. EVENT-context: *X leert Y* ('X empties Y'), target-utterance: *Y ist geleert / wurde geleert / ist leer* ('Y is[COP] emptied / is[AUX] emptied / is empty')). The filler items presented different sorts of sentences in contexts: filler sentence plus context were either tautologous or contradictory, or the sentence was true but pragmatically odd in the context.

Six presentation lists were constructed in which the 36 experimental items were randomly mixed with the 36 filler items. The six lists were counterbalanced across items and conditions: Each participant saw only one version (AP / VP / ADJ) of each of the target utterance embedded in one type of context (EVENT or NOEVENT). The questionnaires were distributed in an introductory linguistics class. Participants had one week to complete the questionnaire. They were told to read the narratives carefully and to judge the

truth value of the sentence in the described situation ("Is the utterance in the described situation true?"; possible answers: *yes* / *no*).

Results and Discussion The results of the questionnaire study are presented in Table 1.

context type	sentence type		
	AP	VP	Adj
Event	84,1%	86,1%	83,3%
NoEvent	20,6%	5,2%	80,6%

Table 1. Percentage of TRUE responses to the TVJT

A repeated measures ANOVA revealed a significant main effect of context type and sentence type and, more importantly, a significant interaction of the two factors ($F1(2,82) = 161.89$, $p1 \leq .001$; $F2(2,70) = 155.18$, $p2 \leq .001$). As predicted by (H2), for copula sentences with genuine adjectives (adj) there was no significant difference between the event and the NOEVENT contexts (all $Fs < 1$). For the two other conditions, the judgments differed significantly depending on sentence type in the NOEVENT contexts ($F1(1,41) = 17.25$, $p1 \leq .001$; $F2(1,35) = 21.83$, $p2 \leq .001$) but not in the event contexts (all $Fs < 1$). As predicted by (H1) adjectival passives were judged true more often than verbal passives in NOEVENT contexts ($F1 (1,41) = 31.74$, $p1 \leq .001$; $F2 (1,35) = 20.90$, $p2 \leq .001$). Even though, descriptively, the percentage of true judgments for adjectival passives in purely stative contexts is not very high, the difference between adjectival and verbal passives is highly significant. Moreover, participants' judgments of the filler items in contradictory context (which were judged true only in 8,7% of the cases) were clearly different from the judgments for adjectival passives in the NOEVENT condition but not from verbal passives. Even if event-occurrence is strongly preferred in adjectival passives, this difference from contradictory sentences calls the truth-conditional relevance of event-occurrence into question.

Experiment 2: "Status of the Agent"

The experiment reported in this section focuses on the agent participant. A first hint to the status of the agent in adjectival passives comes from the restrictions on agent modification alluded to in the introduction. As agent modification serves to make explicit the implicit agent argument, the question is whether the restrictions on agent modification point to the absence of implicit agents in the semantics of adjectival passives.

In order to test this assumption another TVJT experiment was conducted. Participants judged conditional sentences such as (17) to (19) which contained in their consequent either an adjectival passive or a copula sentence

with a genuine adjective. The antecedent of the experimental sentences referred either to the whole event denoted by the base verb of the adjectival passive (17) or the participation of an agent was excluded (18). In a third condition which parallelled the NOEVENT-condition of Experiment 1 the antecedent referred to a non-event-based state (19).

(17) Wenn Karla gerade alle Rollläden in ihrem Zimmer heruntergelassen hat, dann ist das Zimmer abgedunkelt / dunkel.
'If Karla just lowered all the blinds of her room, the room is[COP] darkened / dark.'

(18) Wenn es in einem Zimmer keine Beleuchtung gibt und nach Sonnenuntergang kein Licht mehr von draußen reinscheint, dann ist das Zimmer abgedunkelt / dunkel.
'If there is no light source in the room and, after sunset, no light falls through the window from outside, the room is[COP] darkened / dark.'

(19) Wenn ein Kellerzimmer schon immer weder Fenster noch Beleuchtung hat, dann ist das Zimmer abgedunkelt / dunkel.
'If a basement room never had a window or any kind of indoor lightning, the room is[COP] darkened / dark.'

The hypotheses tested in Experiment 2 were based on the restriction on agentive modification in adjectival passives and on the results of Experiment 1 which call into question the truth-conditional relevance of event-occurrence and thus the necessity of identifying event participants:

(H1) Adjectival passives should receive more TRUE judgments in non-agentive contexts than in non-eventive contexts.

(H2) (control condition) There should be no differences between the three sorts of contexts in the genuine adjective condition.

Method Thirty-six undergraduate students of Tübingen University participated and received a monetary reimbursement. All participants were native speakers of German and none of them participated in Experiment 1.
Materials consisted of 36 experimental sentences in six versions and 36 filler sentences. Filler as well as experimental sentences were of the type *Wenn X, dann Y* ('If X than Y') where Y was in condition AP an adjectival passive sentence and in condition ADJ a copula sentence with a genuine adjective. In condition EVENT X referred to the whole event denoted by the base verb of the adjectival or verbal passive, in condition NOAG the participation of an agent was excluded and in context NOEVENT the whole event was missing.

The base verbs of all adjectival passives were causative accomplishments such as *abdunkeln* ('to darken'), *zähmen* ('to tame'), *kürzen* ('to shorten'), *verschönern* ('to embellish') or *räumen* ('to evacuate'). In the control condition (ADJ), the adjective denoted the result state of the corresponding adjectival passive's base verb (e.g. *abdunkeln – dunkel* ('to darken' – 'dark'). Filler sentences were either tautologous or contradictory, or they were true but required, in their consequent part, the cancellation of an implicature which contradicted the antecedent of the sentence (e.g. *If all students passed the exam some students passed it*.).

Design and Procedure Six presentation lists were constructed in which the 36 test items were randomly mixed with the 36 fillers. The six lists were counterbalanced across items and conditions: Each list included only one version of each experimental sentence. Sentences were presented in a self-paced fashion on a PC using E-Prime software (Psychology Software Tools, Inc.). After each sentence the participants were asked to judge its truth by answering the question "Stimmt das?" ('Is it right?') by *yes* or *no*.

Data Analysis and Results Reading times and truth-value judgments were analyzed. Reading times for the adjectival passive sentences were significantly higher in the two non-standard context conditions NOAG and NOEVENT (EVENT 1125 ms., NOAG 1648 ms., NOEVENT 1595) whereas there were no significant differences in the ADJ condition. Due to space limitations and lack of theoretical relevance, I will not report the reading times in detail here. The results of the TVJT are presented in Table 2.

context type	sentence type	
	AP	Adj
Event	92,1%	88,9%
NoAG	59,7%	87,0%
NoEvent	31,0%	86,6%

Table 2. Percentage of TRUE responses to the TVJT

For the TVJT, a repeated measures ANOVA revealed a significant main effect of context type and of sentence type. More importantly, the interaction of context type and sentence type was highly significant ($F1(2,70) = 47.68$, $p1 \leq .001$; $F2(2,70) = 49.900$, $p2 \leq .001$). Whereas, as predicted by (H2), there were no significant differences in the genuine adjective condition (all $Fs < 1$), in the adjectival passive condition the judgments differed significantly depending on context ($F1(2,70) = 75.47$, $p1 \leq .001$; $F2(2,70) = 81.25$, $p2 \leq .001$): Adjectival passive sentences received more TRUE judgments in the EVENT condition than in the two other conditions and, as predicted by (H1),

they received more TRUE judgments in condition NOAG than in condition NOEVENT ($F1(1,35) = 31.35$, $p1 \leq .001$; $F2(1,35) = 35.51$, $p2 \leq .001$).

Discussion In Experiment 1, participants gave more TRUE judgments for adjectival passives in NOEVENT contexts than for verbal passives in the same contexts (20,6% vs. 5,2%). In both experiments, there were clearly more TRUE judgments for adjectival passives in the NOEVENT condition than for contradictory filler sentences (Experiment 1: 20,6% vs. 8,7%; Experiment 2: 31% vs. 5,2%). In Experiment 2, the percentage of TRUE judgments increased if not the whole event but only the agent component of the base verb's event structure was excluded by context. Interestingly, adjectival passive sentences in such NOAG condition received even more TRUE judgments than the filler sentences which were true but contained a generalized implicature which contradicted the antecedent of the sentence (59,7% vs. 51,5%).

There are two major conclusions which can be drawn from the two experiments presented above. First, adjectival passives in event-occurrence excluding contexts are no clear cases of contradiction. In the light of existing formal accounts of the semantics of adjectival passives, this result is somewhat surprising: The adjectival affixes proposed in the literature (e.g., Maienborn 2009, Kratzer 2000) all involve existential quantification over an event particular, i.e. concrete instantiation of the event. If these analyses were correct, the occurrence of the base verb's event would be a prerequisite for an adjectival passive sentence to be true. The results of Experiment 1 and 2 show that this is not the case. Second, the agent is less important for the interpretation of an adjectival passive sentence than expected for a regular event participant. The agent contained in an event particular is accessible via the event argument. It should thus be equally important for the interpretation of a sentence as the event argument itself. The results of Experiment 2 showed that the agent is less important for the interpretation of an adjectival passive sentence than the event itself. In view of these results, it seems plausible to assume that the semantics of an adjectival passive sentence does not contain an event particular and that concrete instantiation of the event and identification of its participants might just be pragmatic issues. This conclusion receives further support by the results of Experiment 2 where NOAG adjectival passives received descriptively even more TRUE judgments than true filler sentences which required the cancellation of a generalized implicature.

4 Formal Analysis and Conclusion

We now turn to the consequences of these results for the formal semantics of adjectival passives. As already noted, event particulars necessarily have event participants and they are instantiated. On the other hand, reference to an event kind does not need identification of its participants as these are generically bound and it does not require the actual occurrence of the event. It is thus plausible to assume that the semantics of adjectival passives involves event kinds rather than event particulars.

Let us briefly return to the problem of *schon immer* ('always') modification mentioned at the beginning of this paper. Under an event kind analysis, the property denoted by the participle in an adjectival passive sentence depends on a generic evidentiality which does not contain information either about a possible instantiation or about specific agent participants.[3] This provides a simple explanation for the acceptability of *schon immer*: the modification specifies that the event kind was not instantiated.[4]

In the remainder of the paper I will propose a formal analysis of adjectival passives that follows Maienborn's (2009) underspecification account but modifies it by adding reference to event kinds and by choosing the appropriate link between event kind and derived property.

In Maienborn's adjectival affix, repeated here in (20), the underspecified property Q an adjectival passive sentence ascribes to its subject referent is causally linked to an existentially bound event particular.

(20) Adjectival ∅-affix: $\lambda P\, \lambda x\, \lambda s\, \exists e\, [s: Q(x)\ \&\ \text{result}(e,s)\ \&\ P(e)]$
(Maienborn 2009: 44)

To account for the reference to event kinds, a first idea might be to simply replace the event particular P(e) in (20) by the respective event kind $\uparrow P$[5]. There are two reasons why such a solution would be too simplistic. First, it is technically impossible for a property particular to directly result from an

[3] In sentences such as Kratzer's (2000) *The blood vessel was obstructed* the fact that the event kind does not identify event participants leads to the possibility of referring either to an agentive or to a stative *obstructing* kind.

[4] Under this view, the question why adjectival passives are in fact often interpreted as referring to a concrete event instance has to be answered pragmatically. The explanation amounts to saying that event kinds pragmatically implicate their concrete instantiation under certain conditions (e.g. in post state contexts). The exact spellout of this pragmatically implicated instantiation will be the matter of another paper.

[5] This is Link's (1995: 376) notation for an "up-arrow" operation converting predicates into kind-denoting terms; "for instance if TIGER is a one-place predicate denoting the set of tigers ↑TIGER is a singular term that denotes the kind Tiger." For a similar operator see, e.g., Chierchia 1998.

event kind.[6] Second, as already noted in the introduction, typical properties of causal relations such as temporal precedence of cause and effect are not shared by all adjectival passives. In fact, one of the most important properties of causal relations is their denseness, i.e. their tendency to form causal chains. Typical causal sentences, such as (21a) can be, potentially infinitively, expanded to more fine grained causal chains like (21b).

(21) a. Smoking causes an increase of blood pressure.
b. Smoking causes an increase of adrenalin level, this causes an increase of blood pressure.

Adjectival passives do not function this way. In (22) the relation between the event kind *Mowing the grass* in (22a) and the derived property in (22b) cannot be paraphrased by a causal sentence such as (22c) as this would imply the possibility of expansion to a more fine grained causal chain. The deviance of (22d) shows that such an expansion is impossible: There simply is no intermediate cause X which could be inserted.

(22) a. Mowing the grass
b. The grass is mown.
c. Mowing the grass causes the grass to be mown.
d. ???Mowing the grass causes X, this causes the grass to be mown.

This lack of denseness in adjectival passive sentences leads to an explanatory gap which should not be present in causal relations: Causes fully determine their effects and effects are fully predictable on the basis of their causes. In adjectival passives, however, the property denoted by the participle is not fully determined by its eventive base. This was already demonstrated by (14), in which the property denoted by the participle *geöffnet* (‘opened’) cannot be identified with the lexically given result state ‘open’. The same holds for (4), repeated here as (23), in which the property is not only the result state of *hiding*, which would be ‘to be out of sight’. Rather, it is something like ‘to be inherently present‘. Similarly, in (24a) *eingereicht* (‘submitted’) has an additional meaning component, namely ‘to be of high value’ (compared to a contextually salient alternative, e.g. an article which is still in preparation). In (24b) the same participle denotes the property of being of low value.

[6] Gehrke (to appear) chooses to solve this problem by an analysis not only referring to event kinds but also to state kinds which are instantiated via a realization operation. The problem with this solution is that there are no independent, non-technical reasons for assuming state kinds in adjectival passives.

(23) Der Bildhauer meißelt aus dem Stein Figuren hervor, die nach seinem Verständnis dort schon immer verborgen waren.
'The sculptor carves shapes out of blocks of granit that he believes have always been[COP] hidden inside of them.'

(24) a. Der Artikel ist nicht in Vorbereitung, er ist eingereicht.
'The article is not in preparation, it is submitted.'
b. Der Artikel ist nicht akzeptiert, er ist eingereicht.
'The article is not accepted, it is submitted.'

As (23) to (24) show, there is a surplus in the meaning of the participle of an adjectival passive which is not fully determined by its eventive base. In Maienborn's adjectival affix (20) above, this underdetermination is rendered by using a free variable Q for the property denoted by the participle in an adjectival passive sentence. There is an explanatory gap between Q and its underlying base, the event kind ↑P. Q is 'more' than (parts of the event structure of) its eventive base, therefore it is unpredictable from ↑P alone.
A similar explanatory gap is known in philosophy as the mind-body problem. There are several formulations of this problem which all rely on the intuition that the mental is somehow determined by the physical but that it cannot be reduced to it. On the one hand, physical events such as *firing of C-fibers* are more basic than mental states such as *pain feeling* in the sense that mental states depend on physical events but not vice versa. On the other hand mental properties are unpredictable or unknowable from information concerning their physical base-level phenomena (cf. Jackson's (1982) 'knowledge argument'). This explanatory gap led philosophers such as Jaegwon Kim to reject a reductive explanation of mental properties by neurophysiological processes and to opt for a non-temporal, non-dense dependency relation which they called "supervenience" (cf., e.g., Kim 1990). The common core of all definitions of supervenience can be captured by the slogan 'A supervenes on B if there is no A-difference without a B-difference (everything else being equal)'. Applied to the mind-body problem this means that a mental property supervenes on a set of neurophysiological processes in the sense that one cannot imagine differences in mental properties without neurophysiological differences (everything else being equal). The advantage of supervenience over other dependency relations (e.g. classical CAUSE) is that it only partially determines the supervenient property. It thereby leaves room for the subjective, non-reducible character of supervenient properties which cannot be deduced from their underlying base-level phenomena.

This dependency leaving room for underdetemination, for an irreducible 'surplus in meaning', is precisely what we need for the semantics of

adjectival passives. Borrowing a term from Engelberg (2005), we will call supervenience in the domain of the lexicon *Lexical Supervenience*. An informal definition is given under (25):

(25) Lexical Supervenience
For any state s and set of events e[7], [[LSV (s, e)]] = 1 iff there can be no change in s without a change in e (everything else being equal).

In the case of adjectival passives the property denoted by the participle lexically supervenes on the event kind of the verbal base in the sense that if two adjectival passive sentences which are maximally similar, i.e. which share the same subject and the same context, refer to two different properties they also have to differ in their eventive base. On the other hand, lexical supervenience makes it possible to derive different properties from the same eventive base if the context differs too, cf. (24a) and (b). It thereby accounts for the subjective, pragmatic character of adjectival passives.
Applying the LSV-relation to Maienborn's adjectival affix (20) and replacing event particulars by event kinds finally yields our new version of the ∅-affix:

(26) Adjectival ∅-affix: λP λx λs [s: Q(x) & LSV (s, ↑P)]

According to (26) the adjectival affix introduces an underspecified property Q which is ascribed to the subject referent x of the sentence. The assignment of a value to Q must be done by pragmatics with the only restriction that it lexically supervenes on the event kind derived from the verbal base. This means that Q depends on its eventive base ↑P, but that there is an explanatory gap between the two.[8] Lexical supervenience accounts for this specific gap in the meaning derivation of adjectival passives. It leaves room for the role pragmatics plays in the interpretation of adjectival passives and for their characteristic 'surplus in meaning'.

[7] Supervenience is usually defined as holding between a property and a set of properties. As kinds can be roughly characterized as the set of all their instances (cf. Chierchia (1998)), this makes the above definition particularly suitable for the dependency relation between event kind and ascribed property in adjectival passives.
[8] Depending on the sort of base verb and the context of the sentence this gap may be smaller or bigger. If the meaning component which is supplied by the eventive base is informative enough in the given context pragmatics may choose to identify Q with it, but in other cases Q is a pragmatically derived complex property which contains a characteristic 'surplus in meaning' compared to its verbal base.

References

Chierchia, Gennaro. 1998. Reference to kinds across languages. *Natural Language Semantics* 6. 339–405.

Crain, Stephen and Rosalind Thornton. 1998. Investigations in universal grammar: a guide to experiments in the acquisition of syntax and semantics. Cambridge, Mass: MIT Press.

Engelberg, Stefan. 2005. Stativity, supervenience, and sentential subjects. In Claudia Maienborn & Angelika Wöllstein (eds.), *Event Arguments: Foundations and Applications*. 45–68. Tübingen: Niemeyer.

Gehrke, Berit. to appear. Passive states. To appear in Violeta Demonte & Louise McNally (eds.), *Telicity, Change, and State: A Cross-Categorial View of Event Structure*. Oxford: Oxford University Press.

Gese, Helga, Britta Stolterfoht & Claudia Maienborn. 2009. Context effects in the formation of adjectival resultatives. In Susanne Winkler & Sam Featherston (eds.), *The Fruits of Empirical Linguistics*, vol. 2, *Product*, 125–155. Berlin, New York: Mouton de Gruyter.

Jackson, Frank. 1982. Epiphenomenal Qualia. *Philosophical Quarterly* 32. 127–136.

Kim, Jaegwon. 1990. Supervenience as a philosophical concept. *Metaphilosophy* 21. 1–27.

Kiparsky, Paul. 1983. Word formation and the lexicon. In *Proceedings of the 1982 Mid-America Linguistics Conference*, 3–29. Lawrence, Kansas: University of Kansas.

Kratzer, Angelika. 2000. Building statives. In *Berkeley Linguistic Society* 26. 385–399.

Link, Godehard. 1995. Generic information and dependent generics. In Gregory Carlson & Francis Pelletier (eds.), *The Generic Book*. 358–382.
Chicago: University of Chicago Press.

Maienborn, Claudia. 2005. On the limits of the Davidsonian approach: the case of copula sentences. *Theoretical Linguistics* 31(3). 275–316.

Maienborn, Claudia. 2009. Building event-based ad hoc properties: on the interpretation of adjectival passives. In Arndt Riester & Torgrim Solstad (eds.), *Proceedings of Sinn und Bedeutung 13*, 35–49. Stuttgart: University of Stuttgart.

Rapp, Irene. 1997. Partizipien und semantische Struktur. Zu passivischen Konstruktionen mit dem 3. Status. Tübingen: Stauffenburg.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 275–289. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Facts and Ideals: On the Role of *doch* in Conditionals and Optatives*

Patrick Grosz
MIT
grosz@mit.edu

Abstract. This paper addresses *optative constructions*, constructions that express a wish or desire without a modal that means 'wish' or 'want'. Focusing on German, I argue that "expressing a wish" is a possible use of a conditional antecedent that is freely available. The question is how certain elements, such as the contrastive particle *doch* (or the focus particle *nur* 'only'), which are typical for optative constructions, interact with this wish. I argue that they interact with the wish indirectly; they have a meaning that is independent from optativity, but which can be used to bring out an already available wish reading. This is achieved by eliminating alternative readings. Discussing German *doch* as a case study, I show how this interaction can be made precise.

1 The Puzzle

Optative constructions (Scholz 1991, Rosengren 1993, Rifkin 2000, Asarina & Shklovsky 2008, Biezma 2010, Gärtner 2010) express a wish or desire without containing a modal that means *wish* or *want*. This is illustrated in (1); (1a) conveys a wish that appears equivalent to the wish described in (1b).

(1) a. **If only** John had come to the party!
b. **I wish** John had come to the party.

In many languages, optatives seem to have the shape of conditional antecedents that contain the particle *only* (Rifkin 2000). In some languages, other particles are prototypical markers of optative constructions; in German, (2a), the unstressed contrast particle *doch* (cf. Thurmair 1989) seems to support an optative reading; as shown in (2b), Dutch *toch* can do so as well.

* For helpful discussions, I thank Norbert Corver, Kai von Fintel, Hans-Martin Gärtner, Noah Goodman, Martin Hackl, Irene Heim, Sabine Iatridou, Angelika Kratzer, Pritty Patel-Grosz, Paul Portner, Josh Tenenbaum and Coppe van Urk; I would also like to thank the audience at MIT's ling-lunch.

(2) a. Wenn Hans **doch** einmal auf Maria gehört hätte! *German*
if Hans doch once to Maria listened had
'If only Hans had listened to Maria once!'
b. Als Jan **toch** eens naar Marie had geluistered! *Dutch*
if Jan toch once to Marie had listened
'If only Jan had listened to Marie once!'

A question at the core of research such as Rifkin (2000) is what such particles contribute to an optative clause, specifically whether they compositionally contribute optativity. The present paper analyzes German *doch* in optatives as a case study, based on the semantics of *doch* in declaratives (Abraham 1991, Doherty 1987, Grosz in press, Karagjosova 2001, 2004, Lindner 1991, Ormelius-Sandblom 1997). In declaratives, *doch* roughly marks the modified proposition *p* as an established fact (in the sense of Kratzer & Matthewson 2009), which in the evaluation context is presupposed to contradict a salient alternative *r*, as shown in (3).

(3) Hans kocht oder putzt immer, aber $[_{\neg[p \wedge r]}$ nie beides]. Also wissen
Hans cooks or cleans always but never both thus know
wir, dass $[_{\neg r}$ Hans nicht gekocht hat], weil $[_{p}$ er **doch** geputzt hat].
we that Hans not cooked has because he doch cleaned has
'Hans always cooks or cleans, but never both. Therefore, we know that Hans didn't cook, because he [doch] cleaned.'

presuppositions triggered by "doch":
It is an established fact that [p = Hans cleaned], and there is a salient alternative proposition [r = Hans cooked], such that $\neg[p \wedge r]$.

This paper addresses two questions. First, can we devise a uniform semantics of *doch* that covers both its optative use and its use in non-optative constructions? Second, how is *doch* linked to optativity? I answer the first question in the affirmative and present a generalized analysis of *doch* that covers its optative and its non-optative uses. The second question is answered as follows: The contribution of *doch* to optative constructions is indirect in the sense that it can block non-optative readings in out-of-the-blue contexts.

2 The Proposal

2.1 A Uniform Analysis of *doch*

Before discussing optatives with the form of conditional antecedents, this section provides the general background for my analysis of *doch* in optative clauses. Consider first the difference in German between the root clause with

verb-second movement in (4a) and the unembedded *dass*-clause in (4b), Truckenbrodt (2006). By virtue of convention, a verb-second clause typically has the force of an assertion, (4a). In contrast, an unembedded *dass*-clause in German can be exclamative or have the optative force of a command or wish, (4b). I treat such conventional forces as reflecting different *uses* of the expressed proposition (i.e. as different speech acts, cf. Levinson 1983).

(4) a. Ich **hätte** Rom noch einmal gesehen.
I had Rome still once seen
'I would have seen Rome once more.' (assertion)
b. **Dass** ich Rom noch einmal gesehen **hätte**!
that I Rome still once seen had
'I wish I had seen Rome once more!' (wish / #assertion)

I will henceforth call utterances like (4a) *declarative statements* and cases like (4b) *dass-optatives*. Both utterance types allow for the presence of *doch*, (5). Again, the verb-second clause in (5a) is used as a (reinforcing) statement, whereas the *dass*-clause in (5b) expresses a wish. By virtue of *doch*, (5a) conveys that in a given set of circumstances, the speaker takes it to be granted that she would have seen Rome once more. The less transparent contribution of *doch* in (5b) is discussed further down. The core question is how to account for the presence of *doch* in both utterances in a uniform way.

(5) a. Ich **hätte** Rom **doch** noch einmal gesehen.
I had Rome doch still once seen
'(As we know,) I would have seen Rome once more.' (statement)
b. **Dass** ich Rom **doch** noch einmal gesehen **hätte**!
that I Rome doch still once seen had
'I wish I had [doch] seen Rome once more!' (wish)

In order to posit a uniform analysis of *doch*, we need to relativize its meaning to the type of the utterance that it occurs in. To do so, I pursue the following strategy. First, I assume that there are at least two contextually given sets of propositions that are used to manage the discourse (which I will henceforth call *context sets*): The *common ground* is the set that contains propositions that are treated as mutual knowledge by the discourse participants (Stalnaker 1974, 1978). The *ideal list* of a discourse participant *i* is the set that contains propositions that reflect *i*'s ideals (subsuming *i*'s wishes, *i*'s goals, and laws that *i* abides to). The ideal list replaces Han's (1998) Plan Set and Portner's (2005) To-Do List (which are reminiscent of Lewis' 1979 sphere of

permissibility), which it is based on[1]. It serves to order possible worlds into better worlds and less optimal worlds and thus behaves like an ordering source (Kratzer 1981). Having assumed that discourse contexts involve both a common ground and different participants' ideal lists, it is natural to assume that assertions (and statements in general), like (4a) and (5a), are speech acts that operate on the common ground, whereas wishes, like (4b) and (5b), are speech acts that operate on ideal lists. In other words, utterance types come with conventionalized instructions on where to assign the modified proposition.

We also need to assume that apart from speech acts that *add* to the common ground or to an ideal list (like assertions or commands), there must be speech acts that *reactivate* propositions from a context set, to make them salient in the discourse (e.g. as a premise for something else), cf. (6). An assertion can be rejected as inappropriate if the expressed proposition is shared knowledge, (6a); in contrast, a reactivating statement, marked by the particle *ja* cannot be rejected in this way, (6b). (Cf. Repp 2009, in the spirit of Krifka's 2007 common ground management.)

(6) a. *adding p to the common ground*
A: Im März 1968 war Thatcher noch nicht an der Macht.
in March 1968 was Thatcher yet not in the power
'In 1968, Thatcher wasn't in power yet.'
B: Jaja, das weiß ich eh! 'Duh, I know that!'
b. *reactivating p from the common ground*
A: Im März 1968 war Thatcher **ja** noch nicht an der Macht.
in March 1968 was Thatcher ja yet not in the power
'As we all know, in 1968, Thatcher wasn't in power yet.'
B: # Jaja, das weiß ich eh! 'Duh, I know that!'

By virtue of the (unstressed variants of the) German particles *doch* and *ja*, an utterance can be marked as reactivating old information, rather than adding new information. This is illustrated in (7a) versus (7b). If the modified proposition is shared knowledge of the speaker and hearer, as in (7a), *doch* and *ja* are possible, and a declarative without such particles (the lack of which is symbolized by '*Ø*') is pragmatically odd. In contrast, if the modified information is new information, as in (7b), unstressed *doch* and *ja* are odd.

[1] The label *(i's) ideal list* is chosen (as opposed to *Plan Set* or *To-Do List*) to reflect the fact that it can contain propositions that *i* has no control over, such as *that it rains tomorrow*.

(7) a. Context: H is well aware that she's been to Paris and S wants to make this shared fact salient in order to follow up on it.
Du warst **ja** / **doch** / #**Ø** schon in Paris.
you were ja doch #Ø already in Paris
'You've (ja / doch / #Ø) already been to Paris.'

b. Context: H is an amnesiac and believes that she has never been to Paris; S discovers an old flight ticket to Paris with H's name on it.
Du warst #**ja** / #**doch** / **Ø** schon in Paris.
you were #ja #doch Ø already in Paris
'You've (#ja / #doch / Ø) already been to Paris.'

We can now give an analysis of *doch*, relativized to speech acts, cf. (8). The 'familiarity' component discussed above is captured by (8a). Furthermore, (8b) captures the fact that *doch* differs from *ja* in that it presupposes that there is a salient alternative proposition *r*, which contradicts the modified proposition *p* in the utterance context (see Grosz in press for a recent discussion). I use the term *indicates* instead of 'presupposes' or 'implicates', as it is not clear how these terms apply at the speech act level.

(8) *Semantics of "doch" (simplified and generalized to speech acts)*
For any proposition *p* used in a speech act φ,
a. *doch p* indicates that the speaker considers *p* to be established as part of the context set targeted by φ.
b. *doch p* indicates that there is a contextually salient proposition *r*, such that the common ground entails $\neg[p \wedge r]$.

Having established a distinction between ideal list and common ground and a uniform analysis of *doch*, we can now provide an analysis for (5a+b), in (9), omitting the meaning component in (8b) for ease of exposition.

(9) a. Ich **hätte** Rom **doch** noch einmal gesehen.
I had Rome doch still once seen
i. speech act: **retrieve** [(in certain salient circumstances) the speaker would have seen Rome once more] from the **common ground**.
ii. doch $\Rightarrow$ [(in such circumstances) the speaker would have seen Rome once more] is an established part of the **common ground**.

b. **Dass** ich Rom **doch** noch einmal gesehen **hätte**!
that I Rome doch still once seen had
i. speech act: **retrieve** [the speaker has seen Rome once more] from the speaker's **ideal list**.
ii. *doch* $\Rightarrow$ [the speaker has seen Rome once more] is an established part of the speaker's **ideal list**.

Having shown the analysis at work, it is worth pointing out a further parallel between *doch* in optatives and *doch* in non-optative clauses. Grosz (in press) argues that *doch* interacts with focus, positing that the salient proposition *r* that conflicts with the modified proposition *p* (in (8b)) must be a focus alternative, illustrated in (10).

(10) Context: Georg and Peter see a blue Peugeot parked in front of the pub.
Peter: Schau, der Hans ist da! 'Look, Hans is here!'
Georg: Nein, der Hans hat **doch** einen $[\text{GRÜNEN}]_F$ Peugeot.
no the Hans has doch a green Peugeot
'No, (as we both know) Hans has [doch] a GREEN Peugeot.'
i. *doch* indicates that Georg considers [$_p$ Hans has a green Peugeot] to be an established part of the common ground (i.e. not under de-bate).
ii. *doch* indicates that there is a salient focus alternative r = [Hans has a blue Peugeot], such that $\neg[p \wedge r]$ (given that Hans only has one car).

While I have omitted this feature from (8b) as it is not at the core of the present discussion, such interaction with focus can also be observed in the case of optatives, illustrated in (11). Here, focus indicates which aspect of reality the speaker would like to change.[2] This can be taken as further evidence for a uniform contribution of *doch*.

(11) a. Dass **doch** $[\text{OTTO}]_F$ die Nachtschicht mit Anna geteilt hätte!
that doch OTTO the night.shift with Anna shared had
'If only it had been OTTO who shared the night shift with Anna!'
b. Dass Otto **doch** [die NACHT_Fschicht] mit Anna geteilt hätte!
'If only it had been the NIGHT shift that Otto shared with Anna!'
c. Dass Otto die Nachtschicht **doch** [mit $\text{ANNA}]_F$ geteilt hätte!
'If only it had been ANNA that Otto shared the night shift with!'

Having posited a uniform analysis of *doch*, section 2.2 considers conditional antecedents with *doch*. The remainder of this paper argues that a uniform approach to *doch* extends to optative and non-optative *if*-clauses and sheds light on why *doch* in an *if*-clause prefers an optative reading.

2.2 *Doch* in Conditional Antecedents

This section discusses what *doch* adds to conditional antecedents, covering both non-optative and optative cases. (12a) is a baseline example of a non-counterfactual conditional clause, (12b) is a counterfactual conditional clause.

[2] Replacing *dass* 'that' by *wenn* 'if' in (11) does not change the judgments, as counterfactual *dass*-optatives and counterfactual *wenn*-optatives are roughly equivalent (cf. Scholz 1991).

(12) a. Wenn Karl gewinnt, (dann) wird gefeiert!
if Karl wins then it.is celebrated
'If Karl wins, we celebrate.'
b. Wenn Karl gewonnen hätte, (dann) hätten wir gefeiert!
if Karl won had then had we celebrated
'If Karl had won, we would have celebrated.'

Adding *doch* to a conditional antecedent can have two effects. The first effect is illustrated in (13). Here, by means of using unstressed *doch* (typically in indicative conditional antecedents) the speaker conveys that the truth of the antecedent proposition is established (cf. also Iatridou 1991 on factual conditionals and *since*-clauses). For now, I assume that the antecedent is used in a secondary speech act (as an *embedded root clause*, cf. Hooper & Thompson 1973, Haegeman 2003), by means of which the antecedent proposition is reactivated from the common ground.

(13) a. Wenn Karl **doch** gewinnt, dann wird gefeiert.
if Karl doch wins then it.is celebrated
'Since Karl is obviously going to win, we will celebrate.'
b. primary speech act: assert [if Karl wins, we celebrate]
c. secondary s.a.: reactivate [Karl will win] from the **common ground**

The second effect of *doch* in conditional antecedents is shown in (14), (glossing over possible prosodic differences between (13) and (14)). Here, by virtue of unstressed *doch* (typically in counterfactual conditional antecedents) the speaker conveys a wish for the truth of the antecedent proposition[3].

(14) a. Wenn Karl **doch** gewonnen hätte, dann hätten wir gefeiert!
if Karl doch won had then had we celebrated
'If only Karl had won, then we would have celebrated!'
b. primary s.a.: assert [if Karl had won, we would have celebrated]
c. secondary s.a.: reactivate [Karl won] from the speaker's **ideal list**

The analysis presented in (8) derives the following. Assume that the secondary speech act is *retrieval* in both (13) and (14); in (13) it operates on the common ground, in (14) it operates on the speaker's ideal list. It follows that in (13) *doch* conveys that the antecedent proposition is an established part of the common ground. By analogy, in (14) *doch* indicates that the antecedent proposition is an established part of the speaker's ideal list. In both cases,

[3] It is beyond the scope of this paper why optative *if*-clauses can occur without a consequent, as in (2a) above, whereas non-optative *if*-clauses require a consequent.

doch supports (or even *triggers*) retrieval of this proposition from some context set. I now provide evidence for such a contribution of *doch*.

(15) and (16) show that *doch* in a non-optative conditional antecedent indicates that the truth of the antecedent has been established (i.e. made part of the common ground). Therefore, *doch* can be placed into the antecedent in (15), where it has already been established that the antecedent is true.

(15) A: Es regnet! – B: Und?
'It is raining!' 'So?'
A: (Na,) wenn es **doch** regnet, müssen wir die Party absagen.
well if it doch rains must we the party cancel
'(Well,) since it's [doch] raining, we have to cancel the party.'

In contrast, *doch* cannot be used in the conditional antecedent in (16), where it is still under debate whether the antecedent is true.

(16) A: Regnet es? – B: Ich weiß nicht. Warum?
'Is it raining?' 'I don't know. Why?'
A: (Na,) wenn es (#**doch**) regnet, müssen wir die Party absagen.
well if it doch rains must we the party cancel
'(Well,) if / #Since it's (#doch) raining, we have to cancel the party.'

This shows that *doch* can only be used in conditional antecedents if the truth of the antecedent is established. For *doch* in optative antecedents, an analogous point can be made. In example (17b), the *doch*-marked optative antecedent is ill-formed (as opposed to the straight imperative in (17a)). This follows if *doch* requires the hearer, Stefan, to accommodate that the modified proposition is already on the speaker's ideal list. While hearers will often accommodate for such information (explaining that optatives are usually good in out-of-the-blue contexts, cf. Scholz 1991), Stefan has good reasons (e.g. social norms) to refuse to accommodate in (17b). This example thus feels inappropriate, as it conveys that Stefan should have known all along.

(17) Context: Stefan is at Thomas's place and Thomas has made no suggestion whatsoever that he doesn't want Stefan to stay for longer.
Stefan: Stört es dich, wenn ich mir noch ein Bier nehme?
'Does it bother you if I have another beer?'
a. Thomas: Ach, Stefan, geh jetzt bitte. Mir wird es zu spät.
oh Stefan leave now please me becomes it too late
'Oh Stefan, please leave now. It's getting too late for me.'

b. Thomas: # Ach, Stefan, wenn du **doch** jetzt gehen würdest.
oh Stefan if you doch now leave would
'Oh Stefan, if only you'd leave now.'

Contrast (17) with (18); in (18), Thomas's initial suggestion plausibly adds the proposition that Stefan leaves to Thomas's ideal list. Therefore, it is felicitous in (18) to reactivate this proposition in the subsequent optative.

(18) Context: Thomas is sick. Stefan is looking after him even though there is a great party on for tonight.
Thomas: Stefan, geh ruhig auf die Party. Das stört mich nicht.
'Stefan, please do go to the party. That doesn't bother me.'
Stefan: Nein, nein, ich bleibe bei dir.
'No, no, I'll stay here with you.'
Thomas: Ach, Stefan, wenn du **doch** jetzt gehen würdest.
oh Stefan if you doch now leave would
'Oh Stefan, if only you'd leave now.'
Du hättest so viel Spaß!
'You would have so much fun!'

2.3 Why Does *doch* Seem to Cause Optativity?

At this point, we can return to the question of what *doch* contributes to an optative conditional. Specifically, why does *doch* trigger optativity in (19a), in the sense that (19a) is typically understood as an optative and a non-optative reading is not even considered, even though it is possible, cf. (19b) .

(19) a. Wenn Hans **doch** geblieben wäre …
if Hans doch stayed were
'If only Hans had stayed!'
b. Wenn Hans **doch** geblieben wäre, wäre Fürchterliches passiert.
if Hans doch stayed were were horrible.things happened
'Since (under certain circumstances) Hans would have stayed, horrible things would have happened.'

To account for this pattern, I propose that the contribution of *doch* in conditional antecedents makes an optative reading more accessible whenever the context does not explicitly favor a non-optative reading. To see this approach at work, we need to consider minimally contrasting pairs of utterances. So far, we have only considered indicative cases of *doch* in non-optative conditional antecedents, as in (20a). Crucially, such constructions are possible in the subjunctive, as shown in (20b) (and also in (19b) above).

(20) a. Wenn Karl **doch** gewinnt, dann wird gefeiert.
if Karl doch wins then it.is celebrated
'Since Karl is obviously going to win, we will celebrate.'
b. Wenn Karl **doch** gewonnen hätte, hätten wir gefeiert.
if Karl doch won had had we celebrated
'Since Karl would have won, we would have celebrated.'

Evidently, (20b) cannot be counterfactual, as *doch* requires the truth of the antecedent to be established whereas counterfactual antecedents are implied to be false. A context for (20b) is given in (21); as indicated, the antecedent in (20b) and (21) must be implicitly conditionalized. The implicit conditional is made overt (in parentheses) in (21).

(21) Berti: I'm so annoyed that the race was canceled. – Susi: But why? – Berti: Because Karl would have won. – Susi: So? Why do you care? You don't even like Karl. – Berti: But I like to celebrate and …
… wenn Karl (, wäre das Rennen nicht abgesagt worden,) **doch** gewonnen hätte, hätten wir gefeiert.
if Karl were the race not canceled been doch won had had we celebrated
'Since(, had the race not been canceled,) Karl would have won, we would have celebrated.'

We can now construct an example that allows for both an optative reading and a non-optative reading, given in (22), (23) and (24).

(22) Wenn Karl **doch** gewonnen hätte … dann hätten wir gefeiert!
if Karl doch won had then had we celebrated
'If Karl doch had won … then we would have celebrated.'

What (22) conveys on its non-optative reading is given in (23).

(23) *Non-optative reading of (22):*
If Karl had won, we would have celebrated.
Karl didn't win (or lose) because the race was canceled.
We didn't celebrate.
doch ⇒ I reactivate from the common ground that [Karl would have won if the race had not been canceled].

Contrast this with the optative reading of (22), given in (24).

(24) *Optative reading of (22):*
If Karl had won, we would have celebrated.
Karl didn't win.

We didn't celebrate.
doch ⇒ I reactivate from my ideal list that [Karl did win].

The fact that *doch* in such ambiguous conditional antecedents typically gives rise to an optative reading can now be derived as follows. Under an optative use, (24), *doch* triggers a presupposition/implicature with respect to the speaker's ideal list. Given that the speaker is the highest authority with respect to her own ideal list, this will by default be self-fulfilling, i.e. the hearer will accommodate unless there are good reasons to refuse to accommodate (cf. Stefan in (17b)). In contrast, in non-optative cases, e.g. (23), *doch* triggers a presupposition/implicature with respect to the common ground, i.e. with respect to shared knowledge between speaker and hearer. This will fail in all contexts in which no such shared knowledge persists and cannot be easily accommodated. Furthermore, given that optatives with *doch* are typically in the subjunctive, a further asymmetry arises. Non-optative subjunctive antecedents that contain *doch* must be implicitly conditionalized, as in (21) and (23), whereas optative antecedents do not have such a requirement. It follows that non-optative readings, like (23), are further restricted to contexts in which the implicit conditionalization of the conditional antecedent can be successfully resolved. Therefore, by virtue of placing the particle *doch* in a conditional antecedent, as in (22), non-optative readings are restricted to very specific contexts and blocked in all other contexts. In contrast, *doch* in an optative conditional antecedent imposes restrictions that are typically self-fulfilling (in the sense that a hearer will accommodate a presupposition with respect to what the speaker wishes for). This makes *doch* acceptable in an optative conditional antecedent even when uttered out of the blue, deriving the fact that *doch* biases an optative reading.

2.4 Against a Strictly Compositional Approach

I have argued that *doch* has a uniform semantics that is sensitive to the type of utterance it occurs in. The meaning of *doch* is thus in some sense independent from optativity, which predicts that typical optative features such as the particle *doch* are neither sufficient nor necessary conditions of optativity. We have already seen that particles like *doch* do not automatically give rise to an optative reading when placed into a subjunctive *if*-clause, (25).

(25) Wenn du **doch** so einfach aufhören könntest zu rauchen,
if you doch so easily stop could to smoke
warum machst du's dann nicht?
why make you'it then not
'If, **as we've established**, you could stop smoking that easily, then why don't you do it?' (slightly sarcastic)

Similarly, my analysis predicts that optativity should be possible in the absence of any particle. This prediction also seems to be correct, as the bare conditional antecedent in (26)[4] can be understood as expressing a wish.

(26) Rico schaute die Blumen an und dachte:
'Rico looked at the flowers and thought:'
Wenn Stineli diese sehen könnte!
if Stineli these see could
'If Stineli could see these!'
und stand lange unbeweglich am Zaun.
'and stood at the fence for a long time without moving.'

2.5 Why Optatives without any Cues Fail

In sum, I have argued for a particular view of *doch* in conditional antecedents that can be summarized as in (27), where *doch* is viewed as an optativity cue.

(27) Summary – Cue for a wish
An optativity cue is an element that cues a wish reading for a conditional antecedent as follows:
i. Its semantic contribution is independent from optativity.
ii. Its meaning is compatible with a conditional antecedent that expresses a wish in a non-specific (or even out-of-the-blue) context.
iii. Its semantic contribution to a non-optative conditional antecedent requires a very specific context (which cannot be out-of-the-blue).
iv. Therefore, if the context does not determine whether a wish speech act is intended or not, the optativity cue conveys that a wish speech act is intended by blocking alternative readings, due to (iii).

An interesting aspect of optative constructions is that optatives without any cue are typically somewhat marked, (28), making the presence of particles seem obligatory (but see Rosengren 1993, cf. also (26) above).

[4] From Johanna Spyri (1878): *Heimatlos. Geschichten für Kinder und auch für solche, welche die Kinder lieb haben*. Acceptability in modern-day German verified with native speakers.

(28) *in an out-of-the-blue context:*
Wenn ich ??(**doch**) reich wäre!
if I doch rich were
'If ??(doch) I were rich!'

While (26) suggests that optatives without particles are not always ill-formed, the question arises why optatives without any particles are dispreferred. I propose that this follows from treating such particles as optativity cues, if we make standard assumptions on rational discourse participants (cf. Lewis's 1969 *signaling games*). If a speaker has to decide whether to use optativity cues and the hearer has to decide how to interpret conditional antecedents without such cues, the most successful strategies are typically those where speakers always use cues and hearers always interpret antecedents without cues as true conditionals. It follows that hearers will typically understand (28) without *doch* as a (fragmentary) non-optative conditional, unless the context overrides this preference. In cases like (26), an optative intention can be inferred from other information (such as the inferred friendship between Rico and Stineli, the description of the context, the verb that is used, etc.).

3 Conclusion

I addressed the meaning and role of particles such as German *doch* in optative constructions. I argued that conditional antecedents can express a wish by virtue of a secondary speech act; particles do not encode this wish, but act as cues that bring out a possible wish reading (i.e. optative reading) by eliminating competing non-optative readings. I showed that this analysis correctly predicts that such particles are neither necessary nor sufficient conditions of optativity. Finally, I showed that this analysis can explain that unmarked conditional antecedents are typically understood as non-optative fragments. This follows, as rational discourse participants will usually pursue strategies where optative cues are used when optativity is intended and conditional antecedents without such cues are understood as non-optative.

References

Abraham, Werner. 1991. Discourse particles in German: How does their illocutive force come about? In: Werner Abraham (ed.): *Discourse Particles*, 203–252. Amsterdam: John Benjamins.

Asarina, Alya & Kirill Shklovsky. 2008. Optativity in English and Other Languages. Handout for MIT Ling-Lunch.

Biezma, Maria. 2010. Optatives: conditionals with reversed topicality. Handout for Sinn und Bedeutung 15.

Doherty, Monika. 1987. *Epistemic Meaning*. Berlin: Springer.

Gärtner, Hans-Martin 2010. SAI and NPI-Licensing: The Case of Optatives. Slides for Oberseminar Neuere Arbeiten zu Syntax und Semantik, Universität Tübingen.

Grosz, Patrick. in press. German doch. An Element that Triggers a Contrast Presupposition. In *Proceedings of CLS 46*.

Han, Chung-Hye 1998. *The Structure and Interpretation of Imperatives. Mood and Force in Universal Grammar*: UPenn PhD. Thesis.

Haegeman, Liliane. 2003. Conditional Clauses: External and Internal Syntax. *Mind and Language* 18. 317–339.

Hooper, Joan & Sandra Thompson. 1973. On the applicability of root transformations. *Linguistic Inquiry* 4. 465–497.

Iatridou, Sabine. 1991. *Topics in Conditionals*: MIT PhD. Thesis.

Karagjosova, Elena. 2001. Towards a comprehensive meaning of German doch. In *Proceedings of the Sixth ESSLLI 2001 Session*. 131–142.

Karagjosova, Elena. 2004. German *doch* as a marker of given information. *Sprache & Datenverarbeitung* 28. 71–78.

Kratzer, Angelika & Lisa Matthewson. 2009. Anatomy of two discourse particles. Handout for SULA 5.

Kratzer, Angelika. 1981. The Notional Category of Modality. In Hans-Jürgen Eikmeyer & Hannes Rieser (eds.): *Words, Worlds, and Contexts*, 38–74. Berlin / New York: de Gruyter.

Krifka, Manfred. 2007. Basic Notions of Information Structure. In Caroline Féry, Gisbert Fanselow & Manfred Krifka (eds.): *The Notions of Information Structure*. 13–55. Potsdam: Universitätsverlag Potsdam.

Levinson, Stephen C. 1983. *Pragmatics*. Cambridge: CUP.

Lewis, David. 1969. *Convention*. Cambridge, MA: Harvard University Press.

Lewis, David. 1979. A problem about permission. In Esa Saarinen, Risto Hilpinen, Ilkka Niiniluoto & Merril Provence Hintikka (eds.): *Essays in honour of Jaakko Hintikka*. 163–175. Dordrecht: Reidel.

Lindner, Katrin. 1991. "Wir sind ja doch alte Bekannte." The use of German ja and doch as modal particles. In Werner Abraham (ed.): *Discourse Particles*. 163–201. Amsterdam: John Benjamins.

Ormelius-Sandblom, Elisabet. 1997. *Die Modalpartikeln ja, doch und schon. Zu ihrer Syntax, Semantik und Pragmatik*. Stockholm: Almqvist & Wiksell International.

Portner, Paul. 2005. The Semantics of Imperatives within a Theory of Clause Types. In *Proceedings of SALT 14*. New York: CLC Publications.

Repp, Sophie. 2009. On the interplay of discourse particles and illocutionary negation. Handout for the workshop on expressives and other kinds of non-truth-conditional meaning, DGfS 31. University of Osnabrück.

Rifkin, Jay. 2000. If only if only were if plus only. In *CLS 36–1*. 369–384.

Rosengren, Inger. 1993. Imperativsatz und "Wunschsatz" – zu ihrer Grammatik und Pragmatik. In Inger Rosengren (ed.): *Satz und Illokution Bd. 2*. 1–47. Tübingen: Niemeyer.

Scholz, Ulrike. 1991. *Wunschsätze im Deutschen – Formale und funktionale Beschreibung. Satztypen mit Verberst- und Verbletztstellung.* Tübingen: Niemeyer.

Stalnaker, Robert. 1974. Pragmatic presupposition. In Milton Munitz & Peter Unger (eds.): *Semantics and philosophy*. 197–213. New York: New York University Press.

Stalnaker, Robert. 1978. Assertion. In Peter Cole (ed.): *Syntax and semantics 9: Pragmatics*. 315–332. New York: Academic Press.

Thurmair, Maria. 1989. *Modalpartikeln und ihre Kombinationen.* Tübingen: Niemeyer.

Truckenbrodt, Hubert. 2006. On the semantic motivation of syntactic verb movement to C in German. *Theoretical Linguistics* 32. 257–306.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 291–305. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Conventional and Free Association with Focus in Ngamo (West Chadic)*

Mira Grubic
University of Potsdam
grubic@uni-potsdam.de

Malte Zimmermann
University of Potsdam
mazimmer@uni-potsdam.de

Abstract. The paper discusses association with focus in Ngamo (West Chadic, Afro-Asiatic). We present evidence from this non-Indoeuropean language in favour of Beaver & Clark (2008)'s claim that different kinds of focus-sensitive elements interact with the meaning of focus in different ways, namely conventional association with focus vs free association. We show that exclusive particles (*only*) in Ngamo, as in English, conventionally associate with focus. (Scalar-) Additive particles (*also*, *even*), by contrast, do not pattern like their English counterparts: Same as Q-adverbials, they are more free in their association behaviour, and can also associate with non-focused elements under certain conditions.

1 Association with Focus

Focus-sensitive elements depend on the grammatical placement of focus for their interpretation. This semantic dependency is often referred to as *association with focus* and can be seen clearly in sentences containing the focus-sensitive particle *only* (cf. (1)): *only* is an exclusive particle, it leads to an exclusion of the alternatives induced by focus. In (1a), because focus is on *Bill*, it is excluded that John likes other people, whereas in (1b), because focus is on *likes*, it is excluded that John loves or admires Bill. In the case of *only*, association with focus actually makes a truth-conditional difference: (1a) is false in the given context, whereas (1b) is true.

(1) (Context: John likes Mary and Bill, but he loves Sue.)
   a. # John *only* likes $[\text{BILL}]_F$.
      (excluded alternatives: {John likes Mary, John likes Sue})
   b. John *only* $[\text{LIkes}]_F$ Bill.
      (excluded alternative: {John loves Bill})

* This research was conducted as part of project A5 "Focus realization, focus interpretation and focus use from a cross-linguistic perspective" of the Collaborative Research Center 632 "Information Structure", funded by the German Science Association (DFG). We would like to thank the German Science Association, as well as our Ngamo informants Jibir Audu Janga Dole, Zakar Yusuf Baba Shitte and Hadiza Abdullahi.

Analogous, but non-truth-conditional effects can be seen with the focus-sensitive particles *also* and *even*. *Also* is an additive particle, which includes alternatives to the focused element. (2a) says that John sent a letter to somebody besides Bill, whereas (2b) expresses that John sent something besides a letter to Bill.

(2) a. John *also* sent a letter to [BILL]$_F$.
(included alternative e.g. {John sent a letter to Sue})
b. John *also* sent a [LETTer]$_F$ to Bill.
(included alternative e.g. {John sent a package to Bill})

Even also has this additive meaning component, e.g. that John sent a letter to someone else in (3a). In addition, it has a scalar meaning component (Karttunen & Peters 1979): the presence of *even* expresses that on a scale of expectability, Bill is less likely to receive a letter by John than any of the implied (focus) alternatives to Bill.

(3) a. John *even* sent a letter to [BILL]$_F$.
(included alternative e.g. {John sent a letter to his mother})
b. John *even* sent a [LETTer]$_F$ to Bill.
(included alternative e.g. {John sent an email to Bill})

Again, the alternatives that are added and the corresponding scale shift when the focus is shifted: in (3b), what is added is that John sent something else to Bill – e.g. an email, and that sending this other object is more expected than sending a letter. Each of these particles thus associates with focus in an intuitive sense. The main question of this paper is whether the particles *only*, *also* and *even* associate with focus in the same way, intra- as well as cross-linguistically. Chapter 2 describes two unified approaches to this association process, *conventional* and *free* association, and presents the mixed approach of Beaver & Clark (2008), whose general framework and terminology we adopt in this paper. Their main argument is that in English, different focus-sensitive elements associate with focus in different ways. The focus particles *only*, *also* and *even* all conventionally associate with focus, whereas other focus-sensitive elements like the q-adverbial *always* freely associate with focus. In section 3, we present some data from the West Chadic language Ngamo that show that, as proposed by Beaver & Clark for English, there are also different kinds of association with focus in Ngamo. The data also suggests, however, that, unlike in English, additive(-scalar) particles associate only freely with focus in Ngamo. Section 4 presents the formal semantic analysis of focus-sensitive particles in Ngamo. Section 5 concludes.

2 Conventional and Free Association with Focus

There are two kinds of unified approaches to the association process: *Conventional association* accounts and *free association* accounts. Conventional and free association are the terms used by Beaver & Clark (2008), and correspond to Rooth's (1992) weak and strong association, respectively.

In conventional association accounts (Rooth 1985; Jacobs 1983), focus-sensitive elements relate directly to the alternatives introduced by focus. This relation is semantic, i.e. the dependency on focus is coded directly into their lexical meaning, as shown for *only* in (4a). In free association (Rooth 1992; von Fintel 1994), on the other hand, focus-sensitive elements quantify over an implicit free variable C, the reference of which is fixed by the context (4b).

(4) a. $[\![\text{only}]\!]^w = \lambda q\, \forall p \in [\![\mathbf{q}]\!]^f : p(w) \rightarrow p = [\![q]\!]^0$

b. $[\![\text{only}_C]\!]^{g,w} = \lambda q\, \forall p \in g([\![\mathbf{C}]\!]) : p(w) \rightarrow p = q$

C usually resolves to the focus alternatives, since these are contextually salient, so the difference is mainly one of empirical elegance: According to Rooth (1992), a free account is stronger because it does not tie the semantic effects of focus to the meaning of specific lexical items. Moreover, the free association account makes a prediction that the conventional account does not make: (apparent) association with non-focused elements should be possible if the context provides a value for C that differs from the focus alternatives. As Beaver & Clark (2008) point out, this prediction is borne out for some focus-sensitive elements, but not for others. While *only* can never associate with grammatically non-focused constituents, *always* can occur in contexts in which it seems to associate with non-focused material. This can be seen in example (5) from Beaver & Clark (2008: 193), which tests for association with weak, unstressable, and hence inherently unfocused pronouns. The test sentence enforces a reading in which the focus-sensitive element associates with the weak DO-pronoun, because other possible readings (association with the verb or VP) are excluded by the context. This reading is not accepted for a sentence with *only*, but it is fine for the parallel sentence with *always*.

(5) a. ??People who grow rice **only** eat **it**. # 'People who grow rice eat nothing but rice'

b. People who grow rice **always** eat **it**. 'Whenever people who grow rice eat, they eat rice'

Based on the different behaviour of *always* and *only*, Beaver & Clark (2008) propose that different focus-sensitive elements associate with focus in different ways, with some elements conventionally associating with focus (e.g.*only*), and

others freely associating with focus (e.g. *always*). According to them, the class of conventionally associating elements in English contains the focus-sensitive particles *only*, *also* and *even* discussed above, whereas the class of freely associating expressions contains, for example, quantificational adverbs like *always*, generics, counterfactuals, and modals.
Another candidate for a freely associating element is the stressed additive particle *AUCH* ("also") in German, which appears to associate with the preceding contrastive topic (Krifka 1999).

(6) (I know that Pia visited the exhibition. But what did Peter do?)
Peter hat die Ausstellung AUCH besucht. 'Peter visited the exhibition, too.'

In these cases, the contrastive topic introduces the alternatives that are relevant for the resolution of the free variable C. This is another instance in which a "focus-sensitive" element can associate with a prosodically weak or even empty element. In example (7a), the associate of the stressed additive particle can be elided, because it is given in the preceding context question. This is not possible for prefocal unstressed *auch*, which must associate with an overt focus-accented element (7b).

(7) (You did the dishes. And the garbage?)
a. Hab ich AUCH erledigt.
have I AUCH done
b. Auch *(DAS) hab ich erledigt.
auch that have I done
'I took care (of it) too.'

The next section presents data from Ngamo (West Chadic) that support Beaver & Clark's claim that there are different kinds of focus-sensitive elements. Moreover, the Ngamo data provide further evidence that additive particles, at least in some languages, do not belong in the same class as exclusives. This is not fully unexpected given the behaviour of German additives mentioned above.

3 Focus & Focus-Sensitive Particles in Ngamo

This section gives an overview of grammatical focus marking and focus-sensitive particles in Ngamo. Ngamo is a West Chadic language of the 'A' subbranch spoken in NE Nigeria by about 60'000 speakers (Gordon 2005). It has two major dialects, Yaya Ngamo and Gudi Ngamo (Schuh 2005). The data in this paper come from the Gudi dialect.

3.1 Focus in Ngamo

As in many other African languages (Fiedler et al. 2010), overt focus marking in Ngamo is asymmetric: Focused subjects must be syntactically marked, whereas focused non-subjects need not be explicitly marked for focus. The canonical word order is SVO, but when a subject is questioned or focused, the subject is inverted to the right edge of vP. The subject cannot occur between the verb and the object (8a), but its word order is free with respect to other constituents following the direct object (cf. (8b)). Non-subject focus is preferably realized in-situ (9a), but ex-situ test sentences are also accepted (9b).

(8) a. *Salko **-i lo** *bano* a Nigeria mano?
build-PFV BM *who house in Nigeria last.year*

b. Sàlko *bànò* (**-ì lo**) à Nìgerià (**-ì lo**) mànò (**-i lô**) ?
build-PFV *house* BM *who in Nigeria* BM *who last.year* BM *who*
'Who built a house in Nigeria last year?'

(9) a. Shuwa èsha **lò** *yâm*?
*Shuwa call.*PFV *who loudly*
'Who did Shuwa call loudly?'

b. Èsha *yâm* **yè Jajêi**.
*call.*PFV *loudly* BM *Jajei*
'(she) called JAJEI loudly.'

We suggest that the reason behind the subject inversion to the right edge of vP is an interface requirement that forces the focused element to be right-aligned with a phonological phrase boundary projected by the right edge of vP (Samek-Lodovici 2005; Truckenbrodt 1999; Zimmermann 2006). Since objects and adjuncts are canonically realized at the right edge of vP anyway, it follows that they can remain in-situ when focused.

Inverted subjects are obligatorily preceded by a morphological marker *i/ye* (10a), which is again optional with focused non-subjects (10b). Schuh (2005: 27) suggests that *i/ye* is not a focus marker, but a background marker, which is historically derived from the definite determiner *ye'e*. This suggestion is supported by the fact that it can occur twice in an utterance, thus marking backgrounded material following the focused constituent (10c).

(10) a. [Context: Hasha called Yura]
O'ò, eshà Yùrà ***(-ì) Kulè**
*No, call.*PFV *Yura* BM *Kule*
'No, KULE called Yura.'

b. [Context: Who did Shuwa call?]
Shùwa èshà **(-ì) Jàjêi**.
*Shuwa call.*PFV BM *Jajei*
'Shuwa called JAJEI.'

c. Sàlko bànò **-ì lo** à Nìgerià mànò **yê**?
build-PFV *house* BM *who in Nigeria last-year* BM
'Who built a house in Nigeria last year?'

A standard test for exhaustivity in (11) shows that answers with *i/ye* are interpreted as exhaustive, or maximal, in contrast to answers without *i/ye*: In the question context in (11), the complete answer A entails the partial answer A1 without *i/ye*, but it does not entail the partial answer A2 with *i/ye*, which signals maximality, making A2 infelicitous in the given context.

(11) [Context: Who did Kule call?] A: Kule called Shuwa and Dimza.
→ A1:Kule èsha **Dìmzà**
*Kule call.*PFV *Dimza*
'There was an event of Kule calling Dimza.'
↛ A2:#Kule èshà **-ì Dimzâ**
*Kule call.*PFV BM *Dimza*
'The maximal calling event by Kule involves Dimza as a callee.'

We suggest that *i/ye* is a definiteness marker on events (Larson 2003; Hole submitted) that introduces a presupposition that there is a maximal contextually salient event exemplifying the vP-denotation (excluding the focus denotation) as in (Kratzer 2007), cf. answer A2 in (11):

(12) $[\![\text{-i/ye}]\!] = \lambda f_{<v,t>}$: there is a maximal salient event e, s.t. f(e) = 1. f

This analysis of the maximality effect is supported by the fact that it is cancellable in cases in which we talk about separate events (13).

(13) Sàlko bànò **-ì** **Dimzà**, Umàr kè sàlko bànò.
build-PFV *house* BM *Dimza* *Umar also build*-PFV *house*
'(lit.) DIMZA did the house-building, and Umar built a(nother) house.'

To sum up, subject focus in Ngamo is obligatorily marked by inversion to the right edge of vP, with background marking of the backgrounded part preceding the focused subject. Non-subject focus is only optionally marked. The background marker is a definiteness marker on events which introduces a maximality presupposition on the backgrounded vP-denotation.

3.2 Focus-Sensitive Particles in Ngamo

This section presents the distribution and the association behaviour of three focus-sensitive particles in Ngamo: the additive *ke* ('also'), the additive-scalar *har* ('even'), and the exclusive particle *yak* ('only').
When associating with non-subjects, the three particles behave alike. All three focus-sensitive particles can occur sentence-initially, in immediately preverbal position and after the VP, but not between the verb and the direct object.

(14) (*Har*) Baba (*har*) **bo'ytak** bano-s('e) (*har'i*).
even Baba even sell-PFV *house even*
'Baba even SOLD the house.'

(15) (*Ke*) Dìmzà (*ke*) ònko àgogo (*ke*) **ki Abù** (*kè'ê*).
also Dimza also give-PFV *watch also to Abu also*
'Dimza also gave a watch TO ABU.'

(16) (*Yak*) te (*yak*) esha si (*yak*) **nzono** (*yak'i*).
*only she only call.*PFV *him only yesterday only*
'She only called him YESTERDAY.'

These examples show that the particles can precede or follow their associate, without a change in meaning. In addition, they have a pre-focal (e.g. *har*) and a post-focal form (e.g. *har'i*), the distribution of which appears to be conditioned by prosodic factors, such as the presence of a subsequent prosodic boundary. The examples also show that there is no adjacency requirement: all three particles can associate from an adjacent or distant position. Non-adjacent preverbal and post-VP particles are illustrated in (17).

(17) [Context: Kule built a house.]
a. si *ke* sàlko **makarantâ**.
he also build-PFV *school*
'He also built a SCHOOL.'
b. Kule **bo'ytak** bano-s *ke'e*.
Kule sell-PFV *house*=DET *also*
'Kule also SOLD the house'

We propose that focus particles in Ngamo typically denote adverbial operators that are adjoined to the extended vP-projection, but there appear to be adnominal counterparts as well (e.g. the third *yak* in (16)).

Crucially, the three particles however behave differently when it comes to association with subjects. Recall that in cases of conventional association with focus, the associate of the focus-sensitive particle is obligatorily focus-

marked, whereas in free association with focus this is not necessarily the case. Since focused subjects are marked by inversion, we therefore predict that conventionally associating focus-sensitive elements will only be able to associate with inverted – and, thus, focus-marked – subjects! This expectation is borne out for exclusive *yak*, which can only associate with inverted subjects.

(18) a. Sàlko bànò **-ì** *yak* **Kulè**
build-PFV *house* BM *only Kule*
'Only KULE built a house.'
b. #*Yak* **Shuwa** *yak* sàlko bànò *yàk'i*.
only Shuwa only build-PFV *house only*
(intended:) 'Only SHUWA built a house.'

In contrast, *ke*/*har* cannot associate with inverted subjects. We suggest that this is due to a clash of the maximality presupposition of the background marker with the additive presupposition of the particles. In (19), background marking introduces the presupposition that there is a salient maximal event of building a house involving Kule (and nobody else), whereas the additive particle *ke* ('also') presupposes that someone else took part in the contextually salient event of house-building, in violation of maximality. According to one consultant, this structure is only permitted in a context in which the (maximal) house-building event is juxtaposed to a (maximal) event of a different type.

(19) [Context: Hawwa built a house]
a. #Salko bano -i *ke* **Kule**.
build-PFV *house* BM *also Kule*
(intended) 'KULE also built a house.'
(Consultant comment: 'Where there is 'salko bano-i', this means that the other person did something else.')
b. *Salko bano -i *har* **Kule**
build-PFV *house* BM *even Kule*
(intended): 'Even KULE built a house.'

Instead, the only way of expressing what looks like association with subjects with these particles is to leave the subject in its canonical preverbal position.

(20) a. *Kè*/*Har* **Kulè** sàlko bànò
also/even Kule build-PFV *house*
b. **Kulè** *kè*/*har* sàlko bànò.
Kule also/even build-PFV *house*

c. **Kulè** sàlko bànò *kè'ê/hàr'î.*
Kule build-PFV *house also/even*
'KULE built a house, too.'

Since focused subjects are banned from this position (see above), we are led to conclude that the particles *ke* and *har* do not operate directly on the focus value of the subject in such cases, but interact with the subject denotation in a more indirect way. In short, we capture the difference between the additive particles and the exclusive particle by suggesting that the former freely associate with focus, whereas the latter conventionally associates with focus.

Further evidence for this proposal comes from the association of the different types of particles with weak and strong pronouns. In Ngamo, indirect object pronouns are usually incorporated into the verb. When the pronoun is focused, it must occur in its strong form, which is headed by the preposition *ki* ('to'). Crucially, additive *ke* can associate with the weak, incorporated, and thus non-focused form of the pronoun (21), whereas *yak* can only associate with strong, and hence focused pronouns (22).

(21) [Context: Whom did Kule give a watch?]
'Onko agoggo -i ki Dimzà, *ke* o**no** agoggô.
give-PFV *watch* BM *to Dimza also give*-1SG *watch*
'He gave a watch to Dimza, and also gave a watch to me.'

(22) [Context: Did Kule give a watch to all of them?]
a. #O'o, Kule on**to** agoggo *yak'i.*
*No Kule give-3*SG.F *watch only*
(intended:) 'No, Kule only gave a watch to HER.'
b. O'o, Kule onko agoggo **-i ki te** *yak'i.*
No Kule give-PFV *watch* BM *to 3*SG.F *only*
'No, Kule only gave a watch to HER.'

Moreover, *ke* can freely associate with zero subjects, an option excluded for the exclusive particle, as is shown for the contrastive topic context in (23), which is modeled after an example from (Krifka 1999). Here, an answer with a contrastive topic subject is enforced by explicitly giving a partial answer to a superquestion of the form "Who did what?", which is followed by a request for information concerning a second individual, functioning as a contrastive topic in this context. As the subject is given, it can be dropped from the answer, although the additive particle *ke* seemingly associates with it. This is another instance in which the additive particle associates with unfocused material, and thus evidence in favour of free, and not conventional, association with focus.

(23) a. Nè mànoti Kulè sàlko bànò, Shùwa me jô?
*I know.*PRS *Kule build*-PFV *house Shuwa but what.about*
'I know that Kule built a house, but what about Shuwa?'
b. *Kè* salkô (bànò).
also build-PFV *house*
'(He) also built a house.'

Summing up, additive(-scalar) particles show a different association behaviour with subject focus when compared to the exclusive particle: While *yak* ('only') must associate with focus-marked (inverted) subjects, *ke* ('also') and *har* ('even') cannot associate with such inverted subjects. Instead, they appear to associate with preverbal subjects, which are never focused. This leads us to conclude that *yak* conventionally associates with focus, while *ke* and *har* freely associate with focus.

4 Analysis & Discussion

This section presents the formal analysis of the focus-sensitive particles introduced in the previous section. First, the framework used for the analysis is presented in section (4.1), then the exclusive particle *yak* will be discussed (4.2), then the additive(-scalar) particles *ke* and *har* (4.3).

4.1 A QUD Approach to Information Structure

In a QUD-approach (e.g. Roberts 1996, Büring 2003), the idea that the goal of discourse is to share previously unshared information is captured by modeling discourse as driven by implicit (hearer-) questions: The goal of each new conversation is to cooperatively answer the super-question "What is the way things are?". This question is tackled by splitting it up into subquestions, which each ask for a partial answer to the superquestion. Each new declarative utterance answers the lowest question in the tree – the *Current Question*. In this model, information structural categories like focus and topic are used for discourse-management. They indicate what the implicit questions under discussion are. This is done through question-answer congruence: According to Roberts (1996), the focus alternative set (cf. Rooth 1985; 1992) of the utterance is congruent to the set of possible answers indicated by the Current Question, e.g. (24) for answer A1 in (25a).[1]

(24) $[\![\text{CQ}]\!]^0 = [\![\text{A1}]\!]^F$ = {John likes Bill, John likes Mary, John likes Sue}

[1] For weaker constraints on question-answer congruence, see Büring (2003: 517) and Beaver & Clark (2008: 47).

(25) (a) What is the way things are?
|
...
|
CQ. **Whom** does John like?
|
A1. [John likes [**Bill**]$_F$

(b) What is the way things are?
|
...
|
Who likes **whom**?
|
CQ. **Whom** does *John* like?
|
A2. [*John*]$_{CT}$ likes [**Bill**]$_F$

Contrastive topics indicate the presence of alternatives raised by questions above the Current Question (Büring 2003). So in (25b), the focus on *Bill* in A2 indicates that *Bill* must be replaced by a *wh*-element in the Current Question CQ, but the contrastive topic accent on *John* indicates that there is an additional relevant question immediately above the Current Question, in which the subject *John* is also replaced by a *wh*-element. Büring (2003) proposes that utterances like this do not only have a normal and a focus value, but also a CT value, which marks them as partial answers to this higher question.

4.2 The Exclusive Particle *yak*

In order to account for the conventional association behaviour of the exclusive particle *yak* 'only' in Ngamo, we follow suggestions by Beaver & Clark (2008) on the semantic function of exclusives. According to these authors, the main function of exclusive particles is not to exclude alternatives, but to indicate that the proposition modified by the exclusive particle in an answer to an explicit or implicit CQ indicated by the focus structure is less strong (on a salient scale) than expected by the hearer. By uttering (26A) in response to the explicit CQ in (26Q), for instance, the speaker signals that he takes the hearer to expect a stronger alternative out of the question denotation to be true, e.g. that John invited Mary, Sue, Bill and John, among others.

(26) Q. Whom did he invite?
A. He invited only Mary$_F$.

Technically, this effect can be modelled by assigning *yak* the lexical entry in (27), which can be conceived of as a variant of the lexical entry for *only* in Beaver & Clark (2008):

(27) $[\![\textbf{yak}]\!]^w(\textbf{p}) = 1$ iff $\neg \exists\, q \in CQ_{yak}: p \leq q \wedge q(w)$;
defined iff $\forall q \in CQ_{yak}\ p \leq q$; where '$\leq$' stands for 'weaker on a contextually salient scale'.

According to (27), the semantic effects of *yak* are twofold. First, the presence of *yak* imposes a restriction - in form of a presupposition - of the original CQ indicated by grammatical focus marking. According to the presupposition in (27), the new CQ_{yak} contains only propositional alternatives that are at least as strong (on a contextually salient scale) as the proposition expressed by the utterance containing *yak*. Restricting the original CQ to CQ_{yak} in this way captures the intuition that the hearer expects stronger alternatives to p to be true. At the same time, the presupposition excludes alternatives of equal strength (e.g., Bill and John in the case of (26)) as it requires all the alternatives in CQ_{yak} to be either identical to p, or stronger than p on a relevant scale. The second effect of *yak* takes place at the truth-conditional level by specifying that p is indeed the strongest true alternative in the *yak*-modified CQ_{yak}. Importantly, this analysis continues to treat *yak* as conventionally associating with focus, as *yak* makes direct reference to an – albeit modified – CQ as indicated by grammatical focus marking in its lexical entry.

4.3 The Additive(-Scalar) Particles *ke* and *har*

The additive(-scalar) particles *ke* and *har* do not refer to the focus alternatives directly. Their central semantic constribution consists in presupposing the existence of another contextually salient situation, in which an alternative proposition out of a contextually bound variable C holds.

(28) $[\![\mathbf{ke}_C]\!]^{g,w}\mathbf{(p)(s)} =$ p(s)(w);
defined iff $\exists$ s' in w, s' $\neq$ s : $\exists$ q $\in$ g($[\![\mathbf{C}]\!]$), q $\neq$ p: [q(s')(w)]

Har additionally presupposes that its complement is relatively unlikely.

(29) $[\![\mathbf{har}_C]\!]^{g,w}\mathbf{(p)(s)} =$ p(s)(w), defined iff
i. $\exists$ s' in w, s' $\neq$ s : $\exists$ q $\in$ g($[\![\mathbf{C}]\!]$), q $\neq$ p: [q(s')(w)]
ii. p is (relatively) unexpected compared to other elements in g($[\![\mathbf{C}]\!]$).

Since the Current Question is typically salient in a given context, the context variable C is usually resolved to it; e.g. in (30), C is resolved to the Current Question "What did Kule build?", giving rise to the meaning in (31).

(30) [CQ: What did Kule build? Kule built a school, and...]
Kule *ke* salko **bano**.
Kule also build-PFV *house.*
'Kule also built a HOUSE.'

(31) $[\![\text{ke}_C]\!]^{g,w}$($[\![$ Kule built a school $]\!]$)(s) = 1 iff Kule built a school in s in w, defined iff $\exists$ s' in w, s' $\neq$ s : $\exists$ q $\in$ {Kule built a school, Kule built

a house, Kule built a shed, ...}, q ≠ p: [q(s')(w)]

As seen in connection with example (19), in the case of focus-marked (inverted) subjects (32), we see that if C is contextually resolved to the Current Question: "Who built a house?", this will normally lead to a clash between the presuppositions of *ke* and the background marker (33) (but see below).

(32) [CQ: Who built a house? Hawwa built a house, and...]
#salko bano **-i** *ke* **Kule**.
build-PFV *house* BM *also Kule*
(intended:) 'KULE also built a house.'

(33) $[\![\text{ke}_C]\!]^{g,w}([\![\text{Kule built a house}]\!])(s) = 1$ iff Kule built a house in s in w, defined iff ∃ s' in w, s' ≠ s : ∃ q ∈ {Hawwa built a house, Kule built a house, Shuwa built a house, ...}, q ≠ p: [q(s')(w)]
Presupposition of i-marking: There is a maximal salient house-building event whose agent is Kule.

Instead, as argued above, any association of a (scalar-) additive particle with a subject is indirect in nature, constituting an instance of free association with focus. There are at least two ways for such free associations with non-focused subjects to arise. First, the Current Question can be resolved to wide-scope questions of the form "What happened?" (34) in contexts in which the VP is given, as illustrated in (35). Notice that the nuclear accent in the English paraphrase falls on the subject because the VP is given.

(34) [What happened? Hawwa built a house, and...]
Kule *ke* salko bano.
Kule also build-PFV *house*
'KULE also built a house.'

(35) $[\![\text{ke}_C]\!]^{g,w}([\![\text{Kule built a house}]\!])(s) = 1$ iff Kule built a house in s in w, defined iff ∃ s' in w, s' ≠ s : ∃ q ∈ {Hawwa built a house, Hawwa bought a car, Kule built a house, ...}, q ≠ p: [q(s')(w)]

The second strategy involves apparent association with a (contrastive) topic, which is possible since the canonical preverbal position of subjects is the default topic position. In this case, the *ke*-sentence with topical subject relates to the super-question "Who did what?", which splits up into VP-subquestions as in (36), leading to (37).

(36) [(What did Hawwa do?) Hawwa built a house, and... (CQ: What did Kule do?)]

Kule *ke* salko bano.
Kule also build-PFV *house*
'KULE built a house, too.'

(37) $[\![\text{ke}_C]\!]^{g,w}([\![\text{Kule built a house}]\!])(s) = 1$ iff Kule built a house in s in w, defined iff $\exists$ s' in w, s' $\neq$ s : $\exists$ q $\in$ {Hawwa built a house, Hawwa bought a car, Kule built a house, ...}, q $\neq$ p: [q(s')(w)]

Additional evidence for this second option comes from marked discourse-contexts in which *ke* actually does occur together with a focus-marked subject (38). In such cases, the focus/background marking suggests that the meaning of the *i/ye*-marked VP 'building a house' forms the (contrastive) topic event. The antecedent super-question is again "Who did what?", but this time it is split up into subject questions ranging over contextually given events (38). The result is shown in (39).

(38) [(Who bought a car?) Hawwa bought a car, and... (CQ: Who built a house?)]
Salko bano **-i** *ke* **Kule**.
build-PFV *house* BM *also Kule*
'Kule (also) built a house.'

(39) $[\![\text{ke}_C]\!]^{g,w}([\![\text{Kule built a house}]\!])(s) = 1$ iff Kule built a house in s in w, defined iff $\exists$ s' in w, s' $\neq$ s : $\exists$ q $\in$ {Hawwa built a house, Hawwa bought a car, Kule built a house, ...}, q $\neq$ p: [q(s')(w)]
Presupposition of i-marking: There is a maximal salient house-building event whose agent is Kule.

In sum, we have shown that the proposed analysis of *ke* and *har* with the denotations in (28) and (29) can account for the behaviour of these particles observed in section 3.2.

5 Conclusion

The Ngamo data presented suggest that there are different kinds of association with focus, similar to what was found for English by Beaver & Clark (2008). However, in contrast to English *also* and *even*, Ngamo additive particles do not conventionally associate with focus. This corresponds to findings from other languages, e.g. Bura (Hartmann & Zimmermann 2008) and Thompson Salish (Koch & Zimmermann 2010). What remains to be seen is whether the analysis of additive particles in Ngamo can be extended to provide a unified account of stressed and unstressed additive particles in German.

References

Beaver, D. & B. Clark. 2008. *Sense and Sensitivity*. Oxford: Wiley-Blackwell.

Büring, D. 2003. On D-Trees, Beans, and B-Accents. *Linguistics & Philosophy* 26. 511–545.

Fiedler, I. et al. 2010. Subject focus in West African languages. In M. Zimmermann & C. Féry (eds.), *Information structure*, 234–257. Oxford: Oxford University Press.

von Fintel, K. 1994. *Restrictions on Quantifier Domains*: UMass Amherst dissertation.

Gordon, R.G. 2005. *Ethnologue: Languages of the World*. Dallas, Texas: SIL.

Hartmann, K. & M. Zimmermann. 2008. Not only 'only', but 'too', too. Alternative-sensitive particles in Bura. In A. Grønn (ed.), *Proceedings of Sinn und Bedeutung (SuB) 12*, 196–211.

Hole, D. submitted. The deconstruction of Chinese 'shi...de' clefts revisited.

Jacobs, J. 1983. *Fokus und Skalen*. Tübingen: Niemeyer.

Karttunen, L. & S. Peters. 1979. Conventional implicature. In C.K. Oh & D. Dineen (eds.), *Presupposition*, New York: Academic Press.

Koch, K. & M. Zimmermann. 2010. Focus-sensitive operators in Nlhe7kepmxcin (Thompson River Salish). In M. Prinzhorn et al. (eds.), *Proceedings of Sinn und Bedeutung 14, Vienna*, .

Kratzer, A. 2007. Situations in natural language semantics. In E.N. Zalta (ed.), *Stanford encyclopedia of philosophy*, Stanford: CSLI.

Krifka, M. 1999. Additive Particles under Stress. In *Proceedings of SALT 8*, 111–128. Cornell: CLC Publications.

Larson, R.K. 2003. Event descriptions in Fon and Haitian Creole. In D. Adone (ed.), *Development in Creole Studies*, Tuebingen: Niemeyer.

Roberts, C. 1996. Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics. *OSU Working Papers in Linguistics* 49.

Rooth, M. 1985. *Association with focus*. UMass. Amherst: Graduate Linguistics Student Association.

Rooth, M. 1992. A Theory of Focus Interpretation. *Natural Language Semantics* 1. 75–116.

Samek-Lodovici, V. 2005. Prosody syntax interaction in the expression of focus. *Natural Language and Linguistic Theory* 23. 687–755.

Schuh, R. 2005. Yobe State, Nigeria as a Linguistic Area. Manuscript, UCLA.

Truckenbrodt, H. 1999. On the Relation between Syntactic Phrases and Phonological Phrases. *Linguistic Inquiry* 30. 219–255.

Zimmermann, M. 2006. Focus in Western Chadic: A Unified OT-Account. In C Davis et al. (eds.), *Proceedings of NELS 36*, UMASS, Amherst.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 307–320. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

The Concept of Semantic Phase and the Different Readings of *again*

Sabine Gründer
University of Bielefeld
sabine.gruender@uni-bielefeld.de

Abstract. The paper offers a new kind of approach to the semantic contrast between repetitive and restitutive *again*. The heart of the theory is the new concept of Semantic Phase. It parallels the syntactic concept and is motivated as an instance of the Principle of Hierarchical Abstraction. The concept refers to a switch from imperfective to perfective view of a situation at the level of vP. Applying the modifier before or after phase transition derives the two readings without stipulation of lexical ambiguity. The framework used is Finite-state Temporal Semantics of Fernando. The syntactic background is an Orphan analysis of right-peripheral adverbials. Syntactic underspecification is resolved by the use of pragmatic information reflected locally by the prosody of the utterance.

1 Introduction

1.1 The Basic Data

The paper is concerned with the ambiguity that can arise in connection with the interpretation of the adverb *again* (or German 'wieder'). While in connection with atelic *states* and *activities* again expresses plain repetition, applied to a telic *accomplishment* or *achievement*, the adverb either expresses repetition of the entire event (*repetitive reading*) or repetition of its result state only (*restitutive reading*). Consider the following telic standard example.

(1) John opened the door again. (rep./rest.)

The restitutive interpretation presupposes that the door has been open sometime before, but it does not require that is has been opened by John or anybody else. For the repetitive interpretation to be true, the door must have been opened by John at some point of time in the past.

The surface position of the adverb seems to have influence on the availability of the possible interpretations. On the one hand there is the ambiguous sentences in (1) where we find the adverb in sentence final position, on the other hand the second sentence in (2) with sentence initial adverb for which only the repetitive interpretation is available.

(2) Again, John opened the door. (rep.)

For the ambiguous first construction intonation can be used as a disambiguation device. While unmarked intonation goes with the restitutive reading, main accent on the adverb forces the repetitive interpretation.

(3) a. John opened the DOOR again. (rest.)
b. John opened the door AGAIN. (rep.)

1.2 Some Existing Approaches

The repetitive/restitutive duality of *again*/'wieder' is probably the most thoroughly discussed example of the syntactic-semantic flexibility that is characteristic of adverbial adjuncts in general. Against this background, the outcome of the several approaches was not purely descriptive, but was at the same time aiming at giving us some deeper and more general insights into the syntax and semantics of verb phrases and into the constitution of interfaces. Therefore, the analysis of *again*/'wieder' has always been like a measure of what has been achieved in the linguistic theory of adjuncts. Up to now the issues are far from being settled. The controversy primarily concerns the question of where to locate the source of the ambiguity: in semantics, syntax or pragmatics.

The classical treatment of Dowty (1979) presupposes decomposition in a conceptual semantic language. In the representations of the two readings of the ambiguous sentence, the adverb occupies the same structural position. The interpretational contrast arises from two different semantic representations that belong to different syntactic categories: a sentence modifier and verb phrase modifier. A meaning postulate accounts for the semantic relationship between the two. Although the semantic contrast derives correctly in this framework, no explanation can be given for the influence of syntax or prosody, and the solution is based on stipulation of lexical ambiguity .

Later approaches that include the concept of lexical ambiguity (with or without meaning postulates) are, for instance, Fabricius-Hansen (2001), Reyle, Rossdeutscher & Kamp (2008), Jaeger & Blutner (2003).

The most principled alternative, that tries to do without theoretically costly stipulations on the lexical semantic side, is the theory of von Stechow (1996). It is based on the following kind of data for German 'wieder'.

(4) a. (weil) Fritz wieder das Fenster öffnete (rep.)
b. (weil) Fritz das Fenster wieder öffnete (rest./rep.)

Assuming a single lexical semantic entry, von Stechow claims that the ambiguity can be resolved entirely in terms of syntactic scope. Decomposition in the

style of Generative Semantics is located in the syntax. The theory is based on a rather complex and abstract syntactic theory and uses movement of arguments to Case positions. The leading idea is, that a structural accusative position has wide scope with respect to the agent relation expressed by the head of the Voice Phrase. If 'wieder' precedes an accusative object, a repetitive reading is obligatory, if it follows the accusative object, two readings are available due to two possible positions of the adverbial. Since the arguments have moved to their Case positions outside the Voice Phrase, the D-position of the adverb is no longer uniquely identifiable from the surface, hence the ambiguity.

Another scope-based account was given by Pittner (2003). On the base of a single lexical entry for the adverb, the different readings are determined by the syntactic entity the modifier is related to. Although this assumption seems very natural and promising, it is not a trivial matter from a theoretical point of view. If one accepts that an adjunct that is assigned one and only one semantic representation can modify different types of entities, one would have to account for the interaction between the semantic contribution of the adjunct and the semantic properties of the modified entity in a principled way.

Pointing to German word-order effects in connection with indefinite objects as well as to the disambiguating effects of intonation, Jaeger & Blutner (2003) offer an alternative approach to the syntactically based theories, that uses the framework of Optimality Theory. Disambiguation is the result of a process of pragmatic strengthening, which selects optimal candidates from a highly underspecified relation between form and meaning. The word-order effects involve scrambling of definite noun phrases. Optional from the point of view of syntax, scrambling of nominal arguments plays an important role in the information structural partition of an utterance into background and focus. Semantic material that is known or in some sense anaphoric relative to the context is moved out of the focus domain. On this basis it can be explained why the semantics of example (5) below, with the adverbial preceding an indefinite object, is similar to the one given before where the adverbial follows a definite object (4b).

(5) (weil) Fritz wieder ein Fenster öffnete (rest./rep.)

Furthermore, considering the connection between pragmatic and prosody, it can be stated that de-accented constituents are given. Accordingly, de-accenting a verb phrase in a syntactically ambiguous 'wieder'-construction triggers a repetitive interpretation; in this case the sentence accent ends up on the adverbial. Unmarked intonation, on the other hand, places the main accent on the object if it is verb adjacent and on the verb otherwise, and causes a restitutive

interpretation. As was shown at the beginning (3), for the English examples there are similar disambiguation effects arising from the presence or absence of an accent on the adverbial.

(6) a. (weil) Fritz das Fenster WIEDER öffnete (rep.)
b. (weil) Fritz das Fenster wieder ÖFFNETE (rest.)

Although the approach does justice to the influence of context and intonation, the different interpretations need to be based on different lexical entries again, and there is no compositional semantics available in the theory.

1.3 The Aims of the Paper

In this paper we are going to present a new type of approach that tries to combine the virtues of the existing theories while avoiding their drawbacks.

It uses a concept of semantic decomposition that is less abstract than the one introduced by Dowty. There is no assumption of lexical ambiguity. It is a scopal approach but it can do with a much simpler structure and without the concept of syntactic decomposition. Furthermore, scope is not syntactically but pragmatically determined, and mediated by the assignment of constituents to the information structure domains of focus and background. This kind of context-sensitive scope resolution gets formally implemented using prosodic information that is locally available on the constituents of the utterance. The different readings of the adverbial are determined with respect to the same situation seen from different aspectual viewpoints. The idea of systematically changing the view of a situation follows from an independently motivated and general cognitive principle: the Principle of Hierarchical Abstraction.

The proposal is part of a more general approach to left/right contrasts in the interpretation of English temporal adverbials that was offered in Gründer (2009). Accordingly, the focus of the investigation is on finding a theoretically well-motivated and general analysis for the standard cases of repetitive/restitutive ambiguity for *again*. Technical solutions for special cases or exceptions, that are known in the literature, will have to be part of a more detailed future work. We take the fact that the general strategy motivated in the paper can also be used to derive several other contrasts in adverbial modification as giving further weight to the proposal made here.

2 Semantic Phase Theory

2.1 Hierarchical Abstraction

The *Principle of Hierarchical Abstraction* is seen as one of the most fundamental and general cognitive principles to reduce complexity of problem-solving

tasks. It is a means to reduce details and condense information through stepwise merge of several elements in the problem space into one.

In modern linguistic theory, language too is described as a *'system of discrete infinity, consisting of hierarchically organized objects'* (Chomsky 2008: 137). Additionally, the Principle of Hierarchical Abstraction is included in form of *Syntactic Phases* (Chomsky 2001, 2008).

Phases mark points in the derivation where syntactic material is transferred to the phonological component of the language system. At the level of CP and vP (or VP if one does without assumption of the v-head), only material in the head and the specifier is kept available for further syntactic processing; the information contained in the complement is spelled out respectively. In consequence, complexity of syntactic processing is reduced by minimizing search space and unloading working memory.

Interestingly, pragmatics assumes a similar transition point too. In information structure theory, the verbal domain is often considered the new information focus domain of the utterance. This view rests on the assumption that the syntactic tree undergoes partition into areas which are treated differently in semantics (for instance, Diesing (1992)).

Now the idea is to integrate this pragmatic differentiation into semantics and make vP a relevant transition point for semantic composition too. The concept of Semantic Phase, that is proposed in this paper is considered an instance of the general Principle of Hierarchical abstraction. Taking into account the parallel to the syntactic as well as the pragmatic concept, phase abstraction would become a candidate for a general interface principle.

2.2 Perfective vs. Imperfective Viewpoint

In case of the semantic phase concept, phase transition is supposed to consist in a change of the temporal granularity of the model when leaving vP. More precisely, while at a point of semantic processing inside vP, the situation appears to be internally structured into different temporal phases, outside vP it is seen as an unstructured single whole.

These two different views of a situation can be considered a structural realization of the concepts of imperfective and perfective aspect. According to Comrie (1976), aspectual categories are different ways of viewing the internal constituency of a situation. *'Perfectivity indicates the view of the situation as a single whole, without distinction of the various separate phases that make up that situation; while the imperfective pays essential attention to the internal structure of the situation'* (ibid.).

Obviously, changing from imperfective to perfective view at the level of vP is a way of hierarchically abstracting from details and reducing complexity

of the model and of the representation.

2.3 The Proposal in a Nutshell

In the context of the paper, the capacity to describe the world at different levels of granularity is considered a symptom of the context-sensitivity of natural language. It is explained as a means to reduce complexity of semantic processing by applying the Principle of Hierarchical Abstraction.

Granularity shifts proceed via underspecifying situations and situational descriptions with respect to certain temporal aspects of their interpretation. Conceptual details concerning the internal temporal constituency of a situation are only available during local processing inside the new information focus of an utterance. They are abstracted away as soon as processing reaches the background domain of the utterance, where the information needs to be globally handled and brought into relation to the overall semantic context.

To have available two different conceptual views of a situation makes natural language a very flexible descriptive means that can be very precise and very effective at the same time.

In connection with the problem of ambiguities in temporal adverbial modification the idea is the following. The puzzling flexibility in the semantics of temporal adverbials is due to the granularity of temporal meaning. The imperfective or perfective view of a situation is chosen as an attaching point for the adverbial depending on the context of its use inside or outside the new information focus of an utterance. Applying the identical adverbial to the same situation represented at different levels of granularity causes the entire group of characteristic interpretational contrasts.

3 The Semantic Framework

3.1 Situations as Regular Languages

What is needed to formally analyze the semantic contrast for the adverb *again* in the way sketched above is a semantic framework that is decompositional. A situation has to be represented not just as an indivisible atom, but its different temporal parts need to be taken into account and made accessible by the formalism. Additionally, there should be the possibility to implement the idea of different levels of granularity. Thereby, internal structure of a situation can be included or abstracted away by decision.

A modern approach to event semantics that could serve well as a basis for formal implementation is *Finite-state Temporal Semantics* of Fernando (2003, 2004, 2006) Fernando (2003, 2004, 2006). In Fernando‘s theory, a situational concept is formalized as a Regular Language.

Given a finite set Φ of formulas, a symbol σ of such language consists of a non-contradictory subset of Φ, which non-exhaustively describes what holds true at some single point in time. The symbols are combined via the basic regular operations concatenation $\sigma_1\sigma_2$, alternation $\sigma_1 + \sigma_2$ and iteration σ_1^* (or σ_1^+ for non-empty iteration) to form regular expressions which define a regular language as a set of strings. Negation of symbols is defined in the style of De Morgan as: $\neg\,\square = \Phi$; $\neg\,\boxed{\phi_1,...,\phi_n} = \boxed{\neg\phi_1} + ... + \boxed{\neg\phi_n}$.

A simple example (by Fernando) is given below. Take the symbols to be snapshots of a camera; then each string can be viewed as a temporal sequence of such snapshots. With respect to the given example 'rain from dawn to dusk' this means, that the formalization of the situational concept starts with a picture on the left, on which there can be seen rain and dawn, followed by a finite number of pictures in the middle on which there is rain, and ended by one on the right that shows rain and dusk.

(7) Λ(*rain from dawn to dusk*) = $\boxed{\text{rain, dawn}}\ \boxed{\text{rain}}^*\ \boxed{\text{rain, dusk}}$

Therefore, a situation is represented not just as an atom, but its internal states are taken into account as well. No abstract BECOME-operator needs to be used, since the concept just directly mirrors the temporal path of the event.

The model of such a language is given by a Kripke Frame with partial valuations. More precisely, the interpretational basis consists of a set of states that are partial valuations over a set of variables A, the carrier of a first-order structure.

Additionally, Fernando includes time variables in language and grounds them in the model by the help of δ-*points*. That means, instead of the continuum of the real numbers, moments in time get modeled by non-open intervals $(r\text{-}\frac{\delta}{2},\ r+\frac{\delta}{2})$. This strategy is motivated by the intuition that the precision of actual observations always is finite. The choice of the extension of the δ-*points* determines a certain temporal granularity of the model.

3.2 Situational Classes

Fernando's central idea for a definition of aspectual features is to formally base it on the symbols α(L) and ω(L) that start and finish a given language, respectively. They serve to encode the property of a situational type of being initially or finally bounded or unbounded. If the condition α(L) is immediately switched after the first stage an initial boundary is marked; if α(L) is preserved the concept is initially unbounded. In the same way ω(L) can be used to mark a final boundary, reading the string from right to left in that case. Aspectual features, according to Fernando, then just enumerate all the possibilities for a corresponding concept to be bounded or unbounded in that sense.

Definition 1. Aspectual Features:

telic (L) = $\neg\omega(\mathrm{L})^{+}\,\square$
iter (L) = $\square\,\omega(\mathrm{L})^{+}$
prog (L) = $\square\,\neg\alpha(\mathrm{L})^{+}$
reten (L) = $\alpha(\mathrm{L})^{+}\,\square$

Let us assume a situational concept has a minimal length of three symbols, in other words, every situation consists of a beginning, a middle part, and an end. On this perspective, the four classical aspectual classes are derivable as the set of logically possible cross-combinations of the four aspectual features as defined above.

Below, the corresponding properties of being initially or finally bounded, are marked by using a short binary code, with the first digit referring to the beginning, the second to the ending, and 1 and 0 indicating the presence or absence of a boundary, respectively. If we let *a* and *o* refer to the two boundary marking propositions inside the symbols α(L) and ω(L) we get the abstract characterizations on the very right.

Definition 2. Aspectual Classes:

state:	reten, iter	(0 0)	$[a]\,[a, o]^{+}\,[o]$
activity:	prog, iter	(1 0)	$[a]\,[\neg a, o]^{+}\,[\neg a, o]$
achievement:	reten, telic	(0 1)	$[a, \neg o]\,[a, \neg o]^{+}\,[o]$
accomplishment:	prog, telic	(1 1)	$[a]\,[\neg a, \neg o]^{+}\,[\neg a, o]$

The following translations, which give formalizations within the framework of some concrete examples, may serve as an illustration. (For the sake of abbreviation, $\neg a$ is suppressed in presence of *o* on the basis of obvious entailment relations.)

(8) a. $\Lambda(\textit{be silly}) =$ [be silly(x)] [be silly(x)]$^{+}$ [be silly(x)]

b. $\Lambda(\textit{swim}) =$ [$\neg\exists y \neq \emptyset$ (swim(y))] [$\exists y \neq \emptyset$ (swim(y))]$^{+}$ [$\exists y \neq \emptyset$ (swim(y))]

c. $\Lambda(\textit{reach the summit}) =$ [$\neg$(be at summ.(x))] [$\neg$(be at summ.(x))]$^{+}$ [be at summ.(x)]

d. $\Lambda(\textit{build a tower}) =$ [$\neg\exists y \leq t$ (build(y))] [$\exists y \leq t$ (build(y)), $\neg$build(t)]$^{+}$ [build(t)]

In example (8a) the relevant proposition - being *a* and *o* at the same time - refers to a state of mind of the subject. The valuation of the proposition remains unchanged for finitely many states, and so no boundaries are marked for the state-concept. In the representation of the activity concept in (8b) the variable is referring to parts of a spatial path the subject is taking. Here, an initial boundary exists due to the change of the truth value of the *a/o*-proposition from the first to the second state. Since after this immediate switch the valuation of the proposition then remains unchanged for finitely many states, no final boundary is marked, and the situational concept therefore is an iterative or atelic one. In (8c) the spatial position of the subject is what matter for a characterization of the phases of the achievement. The change in truth value of the *o*-proposition from the second last to the last state marks a final boundary, and therefore makes the situational concept telic. But there exists no initial boundary. Finally, in (8d) the constant *t* is referring to the tower, the values of the variable *y* are the parts of the tower that were already constructed. Condition α ($\neg\exists y \leq t$ (*build*(*y*))) changes its truth value right after start; condition *o* (*build*(*t*)) just before the end. Accordingly, the accomplishment-concept is initially as well as finally bounded.[1]

4 The Semantic Analysis

4.1 The Basic Concepts

The possibility within the framework to change the granularity of the model allows a direct formal implementation of the concept of semantic phase, that was proposed in Section 2. For a representation of the imperfective view of a situation, that takes into account its internal temporal structure, the representation mainly looks like the formula presented in the previous section, just with the subject included. Below there is the imperfective version of the concept 'John open the door' (infinitive) from the initial examples (*o* refers to the opening-angle of the door, *j* the subject).

(9) $\boxed{\neg\exists x \leq o\ (\text{open}\ (j, x))}\ \boxed{\exists x \leq o\ (\text{open}\ (j, x)), \neg\text{open}\ (o)}^{+}\ \boxed{\text{open}\ (o)}$

[1] In order to differentiate result states that are reversible ('open the door') from those that are not, Fernando marks a set of inertial formula, that hold until a force is applied to stop them holding ('build a tower') or cannot be stopped at all ('write an article'). For Fernando this concept of inertia is relevant in connection with the definition of the perfect, but it also plays a role for temporal adverbial modification. For instance, application of *again* should be blocked in cases where a result is strictly inertial. In what follows this problem will be of minor interest though. The main focus of the formalization of the initial examples will be on the contrast between telic and atelic concepts with respect to the interpretational effects they show in connection with the adverb *again*.

In order to get a perfective view of the same situation, that abstracts away from its internal structure, one has to increase granularity of the model until the entire situation just falls into one state. Metaphorically, the snapshot taken by our camera has an increased duration of exposure such that the entire event can be taken by a single picture. Accordingly, after of phase transition at the level of vP, the above representation in (9) gets changed and condensed in the following way.

(10) $\square^{*}$ [j open the door]

For an analysis of the meaning of the adverb *again* I assume the following single representation. The formula refers to the last symbol $\omega(L)$ of the regular expression that represents the situational concept the adverb is supposed to modify.

(11) $\Lambda(again) = \omega(\mathrm{L})\,\square^{*}$

The adverbial concept will get combined with the situational concept by simple concatenation. By just writing the two respective string one after the other in that way, the temporal presuppositional character of the meaning of *again* is captured directly.

4.2 *Again* and Telic Situational Concepts

Now let us see how the contrast between the repetitive and restitutive reading, which *again* shows when applied to a telic situational concept, derives on that basis.

In case of the restitutive reading, the adverb gets interpreted before phase transition and with respect to the imperfective view of the situation. In this constellation, the symbol $\omega(L)$, that is used by the modifier, is just the result state of the event. Consequently, after modification the concept mirrors a temporal course where the result of the event held already at an earlier point in time. Below this is spelled out for the initial example 'John open the door again'. Here, an accomplishment is chosen, but for an achievement the mechanism would obviously work quite parallel.[2]

(12) [open (o)] $\square^{*}$ [$\neg\exists x \leq o$ (open (j, x))] [$\exists x \leq o$ (open (j, x)), $\neg$open (o)]$^{+}$ [open (o)]

In contrast, the repetitive reading follows from applying the adverb after phase transition. Now, the situation is represented from a perfective point of view. In result, the relevant symbol $\omega(L)$, that it taken by the adverbial, comprises the

[2] Tempus is not included in this article, but can easily be following the formalization available in Finite-state Temporal Semantics.

description of the full situation, that was condensed into a single state of the model. Accordingly, the regular expression that comes up after modification describes a temporal course where the entire event with the identical subject already took place at some previous point in time.

(13) [j open the door] $\Box^*$ [j open the door]

This means, the identical semantic representation for the adverb *again* can be used to derive both possible readings. Note, that since the imperfective and the perfective view of the a situation are both just regular expressions, no problems of type-shift arise in the formalism used here.

4.3 *Again* and Atelic Situational Concepts

As was said at the beginning, in connection with atelic situational concepts no similar semantic contrast appears, but *again* just always expresses plain repetition. Let us check whether this empirical fact can be accounted for by the proposed theory.

In the case of atelic states and activities, the last symbol of the imperfective concept does not mark a final boundary. This means that no result state is described but just a continuation of the state or activity phase that characterizes the situation, respectively. Consequently, it does not make a real difference in interpretation whether the adverbial gets applied to the imperfective or perfective view of an atelic situation. Below both readings are spelled out for a stative concept 'John be silly again' and an activity concept 'John swim again'.

(14)

a. [be silly(x)] $\Box^*$ [be silly(x)] [be silly(x)]$^+$ [be silly(x)]

b. [j silly] $\Box^*$ [j silly]

(15)

a. [$\exists y \neq \emptyset$ (swim(j, y))] $\Box^*$ [$\neg\exists y \neq \emptyset$ (swim(j, y))] [$\exists y \neq \emptyset$ (swim(j, y))]$^+$ [$\exists y \neq \emptyset$ (swim(j, y))]

b. [j swim] $\Box^*$ [j swim]

5 Syntax (Informal Sketch)

5.1 General Background

For reasons of space, the syntactic part of the theory can not be presented in formal detail, but we will have to restrict ourselves to giving some general ideas and informal explanations. For a full formal analysis we refer the reader to Gründer (2009) or other material to appear. The framework used there is

an adapted and extended version of Dynamic Syntax of Kempson, Meyer-Viol and Gabbay (2001).

To supplement this semantic approach by a fitting syntactic theory, the right-peripheral adverbials in question are assumed to be *orphans*. *Orphans* are constituents that are independent of their host sentence in syntax. Prosodic information, reflecting the contextual status of the constituents, is mediating between underspecified syntactic and specified semantic structure. Since the relevant information is read off locally on the constituents of the utterance, contextual principles can be put at work without having to implement heavy mechanisms on discourse level.

This idea is methodologically challenging, since in the standard grammatical systems, following the example of Chomsky, semantic interpretation is fully determined syntactically. Pragmatic considerations take place outside the real grammar formalism and after semantic processing only. And there is, for principle reason, no interaction between the different components of the grammar in a way that phonetics would mirror pragmatics and would interact with syntax in order to determine semantics. But following the considerations from the beginning of the paper, this kind of interaction is just what is needed for an analysis of the meaning of adverbial modifiers, for instance *again*.

5.2 Dynamic Scope Resolution by Prosody

In the formalism of *Dynamic Syntax*, that is used in Gründer (2009) as a formal basis, syntactic processing is seen as progressive and goal-driven enrichment of some partial, underspecified structure through stepwise parse of a string of words. Information is built up on a left-to-right basis relative to some context against which choices may be made as the construction process proceeds. Words are the processing units of the parser, and they include their syntactic information in form of a simple program that effects changes in a tree-structure that is growing top-down. For the placement of the elements in the tree, tree-addresses are used. A number of processing rules govern the integration and further processing of information.

Among the several adaptions and extensions we made to the original system of Dynamic Syntax, the most relevant one is the inclusion of prosodic information into the parsing process. This means that the input of words comes marked with respect to accent, and accent marks have influence on the processing and placement of the information inside the tree structure.

In case of right-peripheral *again* the disambiguation process intuitively works like this. At the point where scanning of the modifier is triggered, it does not actually get integrated by the syntactic rule, but its structural position remains underspecified. Now, depending on the prosodic marking of the

adverbial as plus or minus accented, the semantic information carried by the word is placed at different position inside the tree. Lower, at the level of vP, if there is no accent, or higher, at sentence level, if there is an accent on *again*. Consequently, the adverbial gets involved into the semantic form at the right place relative to the phase transition point, and therefore applies to either the imperfective or perfective view of the situation.

6 Conclusion

The paper offered an explanation of the semantic flexibility of the adverb *again* on the basis of the concept of granularity. Temporal granularity of meaning refers to changes in the degree of conceptual detail for time-related aspects of interpretation. Application of the non-ambiguous modifier to either the imperfective or perfective view of the same situation can cause the two different readings. The choice between both interpretations is not syntactically determined, but it is made relative to the semantic context that is reflected locally by the prosody of the utterance.

If one considers the results of the paper from a more general theoretical perspective, then the investigation of adverbial modifiers was shown to have theoretical depth as well as the capacity to illuminate systematic processes at the interfaces between syntax, semantics and pragmatics. Additionally, it could give a clear and concrete example for the relationship between linguistic theory and general principles of cognition.

References

Chomsky, N. 2001. Deriation by phase. In Kenstowicz (ed.), *Ken hale: A life in language*, 1–52. Cambridge: Mit Press.

Chomsky, N. 2008. On phases. Ms., MIT.

Comrie, B. 1976. *Aspect*. Cambridge: Cambridge University Press.

Diesing, M. 1992. *Indefinites*. Cambridge, MA: MIT Press.

Dowty, D. 1979. *Word meaning and montague grammar*. Dordrecht: Kluwer.

Fabricius-Hansen, C. 2001. Wi(e)der and again(st). In C. Fery & W. Sternefeld (eds.), *Audiatur vox sapientia. a festschrift for arnim von stechow*, 101–130. Berlin: Akademie Verlag.

Fernando, T. 2003. Finite-state descriptions for temporal semantics. In *Proceedings of the fifth international workshop on computational semantics (iwcs-5)*, 122–136.

Fernando, T. 2004. A finite-state approach to events in natural language semantics. *Journal of Logic and Computation* 14(1). 79–92.

Fernando, T. 2006. Situations as strings. *Electronic Notes in Theoretical Com-*

puter Science 165. 23–36.

Gründer, S. 2009. *Die Granularität zeitlicher Bedeutung - Ein dynamischer Ansatz zur Syntax und Semantik Temporaler Adverbiale*: University of Leipzig, Faculty of Mathematics and Computer Science dissertation.

Jaeger, G. & R. Blutner. 2003. Competition and interpretation: The german adverb *wieder* („again"). In E. Lang, C. Maienborn & C. Fabricius-Hansen (eds.), *Modifying adjuncts*, 393–416. Berlin/New York: deGruyter.

Kempson, R., W. Meyer-Viol & D. Gabbay. 2001. *Dynamic syntax*. Oxford: Blackwell.

Pittner, K. 2003. Process, eventuality, and *wieder/again*. In E. Lang, C. Maienborn & C. Fabricius-Hansen (eds.), *Modifying adjuncts*, 365–392. Berlin/New York: deGruyter.

Reyle, U., A. Rossdeutscher & U. Kamp. 2008. Ups and downs in the theory of temporal reference. *Linguistics and Philosophy* 5. 565–635.

von Stechow, A. 1996. The different readings of *wieder* „again": A structural account. *Journal of Semantics* 13. 87–138.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 321–335. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Degree Modification in Russian Morphology: The Case of the Suffix *-ovat*

Olga Kagan
Ben Gurion University of the Negev
olga@sharat.co.il

Sascha Alexeyenko
University of Osnabrück
olalyeks@uos.de

Abstract. In this paper, we investigate the semantics of the adjectival suffix *-ovat* in Russian. We argue that this suffix constitutes a morphological degree modifier and propose for it a formal analysis formulated within the framework of degree semantics. The suffix specifies that the degree to which a property holds of an object is slightly higher than the standard of comparison. A detailed consideration of different types of adjectives and standards of comparison available for these adjectives, in combination with the proposed analysis, allows us to account for the distribution of the suffix and for the range of arising interpretations.

1 Introduction: Data

In this paper, we investigate the semantics of the adjectival suffix *-ovat* in Russian as in the following examples where it is applied to the adjectives *dorogoj* 'expensive' and *vysokij* 'high':

(1) a. Etot restoran okazalsja dlja nas dorog-ovat-ym.
*this restaurant turned_out for us expensive-ovat-*M.INSTR
'This restaurant turned out to be somewhat expensive for us.'
b. Takije kabluki dlja menja vysok-ovat-y.
*such heels for me high-ovat-*PL.NOM
'Such heels are somewhat too high for me.'

Intuitively, the interpretation associated with *-ovat* comes close to "a little bit too": The prices in the restaurant in (1a) slightly exceeded the speaker's expectations or average prices for restaurants of that type, but were still not simply *too* expensive such that the speaker was not able to pay them. Similarly, the heels in (1b) are somewhat too high for the speaker as to be absolutely comfortable or to look completely appropriate, however, they are *only somewhat* too high rather than just too high.

However, it seems that *-ovat* can make different contributions with different adjectives. While with *dorogoj* 'expensive' and *vysokij* 'high' in (1)

its meaning is comparable to that of the English *slightly too*, this is not the case with adjectives like *sladkij* 'sweet' or *vlažnyj* 'wet' as below:

(2) a. Po utram on pjot proxladnyj sladk-ovat-yj čaj.
*at mornings he drinks cool sweet-ovat-*M.ACC *tea*
'In the mornings, he drinks cool sweetish tea.'
b. Lena protjorla mebel' vlažn-ovat-oj trjapkoj.
*Lena wiped furniture wet-ovat-*F.INSTR *duster*
'Lena wiped the furniture with a wettish duster.'

In examples in (2), *-ovat* implies that the property lexicalized by the stem holds of the argument to an intuitively low degree, e.g., the tea in (2a) is not really sweet, rather it is only somewhat sweetish. In other words, 'sweet + -o*vat*' does not entail 'sweet'. The same holds for *vlažnovatyj* in (2b), which implies that objects, of which it is true, are not properly wet, but are not really dry either. Again, this means the lack of entailment to the meaning of the unmodified positive form *vlažnyj* 'wet'.

Another interesting fact concerning the distribution of *-ovat* is that it can be attached to some adjectives but not to others:

(a) it is incompatible with non-gradable adjectives, such as *živoj* 'alive', *mjortvyj* 'dead', or *čjotnyj* 'even'; thus, **živovatyj*, **mertvovatyj*, and **čjotnovatyj* are not acceptable forms;
(b) in many pairs of positive and negative adjectives that lexicalize scales with the same dimension, the suffix can be attached to one member of the pair only, namely, to the one that conventionally has a negative connotation, e.g. *grjaznovatyj* (dirty+ *-ovat*) / **čistovatyj* (clean+ *-ovat*); *ploxovatyj* (bad+ *-ovat*) / **xoroševatyj* (good+ *-ovat*); *dorogovatyj* (expensive+ *-ovat*) / **deše(vo)vatyj* (cheap+ *-ovat*); *slabovatyj* (weak + *-ovat*) / **sil'novatyj* (strong + *-ovat*);
(c) in some other pairs, by contrast, both the positive and the negative member can combine with the suffix, e.g. *dlinnovatyj* (long+ *-ovat*) / *korotkovatyj* (short+ *-ovat*); *širokovatyj* (broad + *-ovat*) / *uzkovatyj* (narrow + *-ovat*); *tjaželovatyj* (heavy + *-ovat*) / *legkovatyj* (light + *-ovat*).

Finally, we assume that in some cases the suffix cannot attach to a root due to purely morpho-phonological factors, such as, e.g., the length of the word or euphony, cf. **interesnovatyj* 'interesting + *-ovat*', **agressivnovatyj* 'aggressive + *-ovat*', **prostodušnovatyj* 'simple-minded + *-ovat*'. For instance, the suffix is unlikely to combine with a stem that consists of more than two syllables. However, in what follows we will ignore such cases and concentrate on the semantic-pragmatic nature of the suffix.

The core idea of our analysis is that the suffix *-ovat* functions as a degree modifier, similarly to comparative morphemes. We argue that it imposes a relation between two degrees on the scale lexicalized by the adjectival root. One of them is the maximal degree to which the property holds of the individual argument of the adjective. It is entailed to slightly exceed the other one, namely, the standard of comparison.

The paper is structured as follows. In Section 2, we briefly discuss the necessary theoretic considerations about scales, degrees, and standards of comparison, mainly based on work by Kennedy & McNally (2005) and Heim (2000). In Section 3, we set forth our analysis that accounts for the data from Section 1. We systematically discuss different types of adjectives, both non-gradable adjectives and various sub-classes of gradable adjectives, and different types of standards of comparison, which *-ovat* can apply to. Finally, Section 4 concludes the discussion.

2 Scales and Standards

2.1 Types of Scales

Following a number of studies on the semantics of gradable adjectives (Cruse 1980, Winter & Rotstein 2004, Kennedy & McNally 2005, Kennedy & Levin 2007, among many others), we assume that the meanings of gradable adjectives can be characterized in terms of scales and degrees, defining a scale as a set of degrees totally ordered along some dimension. Depending on the structure of the scale, the following subtypes of scales have usually been distinguished:

(a) ***totally open scales***: such scales do not have minimal or maximal points, and, therefore, adjectives that map their arguments along such scales are not compatible with degree modifiers that pick out end points, e.g., *absolutely* and *completely* for the maximal degree, *slightly* and *partially* for the minimal degree:
- tall, expensive, deep, glad, heavy, etc.

(b) ***upper-bound closed scales***: the property has a maximal possible degree, which constitutes the upper bound of the scale; the corresponding adjectives can be modified by *absolutely* and *completely*:
- clean, dry, flat, straight, etc.

(c) ***lower-bound closed scales***[1]: the property is instantiated to at least a smallest value, which follows the zero degree at the lower bound of the scale; adjectives with underlying scales of this type can be modified by *slightly* and *partially*:
- dirty[2], wet, bumpy, dangerous, etc.

Applying this distinction to Russian adjectives, we can see that adjectives like *dorogoj* 'expensive' / *dešovyj* 'cheap' and *vysokij* 'high' / *nizkij* 'low' lexicalize totally open scales lacking both a minimal and a maximal degree, since neither *soveršenno* 'absolutely' nor *slegka* 'slightly' is compatible with either of them:

(3) a. #soveršenno vysokij / #slegka vysokij
#absolutely high / #slightly high
b. #soveršenno nizkij / #slegka nizkij
#absolutely low / #slightly low
c. nizkij — vysokij → highness
d. vysokij — nizkij → lowness

Adjective pairs like *grjaznyj* 'dirty' / *čistyj* 'clean' and *sladkij* 'sweet' / *nesladkij* 'not sweet' lexicalize partially closed scales. More precisely, 'clean' and 'not sweet' map their arguments along upper-bound closed scales (with the maximal degree at the upper bound), while 'dirty' and 'sweet' map their arguments along lower-bound closed scales (with the minimal degree at the lower bound):

(4) a. soveršenno čistyj / #slegka čistyj
absolutely clean / #slightly clean
b. #soveršenno grjaznyj / slegka grjaznyj
#absolutely dirty / slightly dirty
c. grjaznyj — čistyj → cleanness (max)
d. čistyj — grjaznyj → dirtiness (min)

[1] Yoon (1996) and Rotstein & Winter (2004) alternatively use the terms "total" and "partial" for antonymous adjectives lexicalizing upper- and lower-bound closed scales respectively.

[2] Antonymous members in pairs of gradable adjectives (such as *clean* and *dirty*) map their arguments onto scales with the same dimension and the same degrees. However, their scales are different, since the respective orderings are inverse (but see Kennedy 2001 and Kennedy & McNally 2005 for an alternative view, on which such antonyms lexicalize the same scale but involve positive versus negative degrees).

An important implication that Kennedy & McNally (2005) draw from the fact of differences in the scale structure concerns the nature of the standard of comparison.

Gradable adjectives, which map their arguments along totally open scales, are claimed to have a context-dependent standard of comparison, therefore they are called ***relative*** gradable adjectives. This type of standard of comparison, called ***distributional standard*** throughout the paper, is determined with respect to the domain of the adjective, i.e., based on the distribution in the class of objects, which constitute the comparison set in the respective context. The objects, which the positive form is true of, "stand out" with respect to the property that the adjective encodes.

By contrast, gradable adjectives, which map their arguments onto degrees on scales closed from at least one end, are supposed to have a context-independent ***absolute standard*** of comparison that corresponds to the minimal or maximal degree on the scale. These adjectives have been dubbed ***absolute*** gradable adjectives. The standard of adjectives with upper-bound closed scales corresponds to the maximal degree, i.e., they require their arguments to possess a maximal amount of property they describe (e.g. *čistyj* 'clean' and *nesladkij* 'not sweet'). Adjectives with lower-bound closed scales have their standard at the minimal degree on the scale, i.e., they require their arguments to possess some minimal degree of the relevant property (e.g. *grjaznyj* 'dirty' and *sladkij* 'sweet').

In addition, we assume the existence of a ***functional standard*** for all types of gradable adjectives, which is determined relative to some purpose relevant in the context of utterance.

2.2 Functional Standard

The functional standard is the maximal degree on the interval consisting of degrees that are compatible with the requirements of the situation. The most typical case when this standard is invoked is the modification by the degree modifier *too* (Heim 2000, Meier 2003). A sentence of the form *x is too P* means, roughly, that *x* is characterized by the property *P* to a degree that is higher "than is compatible with certain (contextually given) goals or desires" (Heim 2000: 19). These goals or desires can be provided explicitly, as in (5) and (6), or need be inferred from the context, as in (7):

(5) Our truck is too tall to go through this tunnel.

(6) This concert is too long to burn to a single CD.

(7) These heels are too high.

The contextually relevant goals for the sentences in (5)-(6) are packed in a *to*-phrase: to go through a certain tunnel in (5) and to burn a concert to a CD in (6). The corresponding functional standards in these contexts, i.e., the maximal degrees of height and length that are compatible with the respective goals, although not provided explicitly, are recoverable from the situation. For the sentence in (5), this degree corresponds to the height of the tunnel; for the sentence in (6), it corresponds to the volume of the CD.

By contrast, the contextually relevant goal/desire for the sentence in (7) remains implicit and can vary from context to context. It may be the desire that shoes should be comfortable or the goal to look appropriate in a society, or, essentially, any other contextual requirement.

Heim (2000) captures the meaning component contributed by *too* by assigning this item a modal semantics (see also Meier 2003 for a similar modal analysis). The analysis she proposes is provided in (8):

(8) $[\![\textit{too}]\!]^{w} = \lambda P_{<s,dt>} . \max(P(w)) > \max\{d: \exists w' \in Acc(w): P(w')(d) = 1\}$

The construction *x is too P* implies that the maximal degree to which *P* holds of *x* in the reference world *w* is higher than the maximal degree to which *P* holds of *x* in any possible world that stands in a particular accessibility relation to *w*. The accessibility relation *Acc* maps a world *w* to a set of worlds in which the contextually specified purposes or desires are achieved or satisfied, and which are similar to *w* in other relevant respects. As demonstrated above, the nature of the accessibility relation varies from context to context.

What has been called the functional standard throughout this paper is represented in Heim's analysis in (8) as $\max\{d: \exists w' \in Acc(w): P(w')(d) = 1\}$, i.e., it is the maximal degree that is compatible with the situation requirements. For the sake of simplicity, below we will abbreviate this formula simply as *C* to refer to the functional standard, following Nakanishi (2004).

3 A Unified Analysis of *-ovat*

We propose that the suffix *-ovat* is a morphological degree modifier. It provides information regarding the degree to which the argument possesses the property lexicalized by the stem. The suffix imposes a relation between this degree and the standard of comparison. The semantics of *-ovat* is provided in (9):

(9) $\lambda P_{<d,et>} \lambda d'_{d} \lambda x_{e} . \max\{d: P(d)(x)\} > d' \wedge (\max\{d: P(d)(x)\} - d' < d_{c})$

In prose, the suffix specifies that the maximal degree *d* to which a property *P* holds of an individual *x* is higher than another degree *d'*, i.e., the standard of comparison, whose source will be discussed below. It further specifies that the difference between the two degrees is relatively low, i.e., lower than d_c, which represents a contextually provided expectation value. Thus, the suffix fulfills the double function of (i) imposing a relation between two degrees on a scale and (ii) vaguely measuring the difference between these degrees.

Below, we argue that *-ovat* consistently contributes the semantics in (9). The different sub-meanings of the suffix, discussed in Section 1, arise by virtue of the fact that the suffix can apply to different types of standards of comparison. In what follows, we systematically discuss the application of *-ovat* to adjectives with underlying scales of different types and different standards of comparison.

3.1 Non-Gradable Adjectives

The analysis predicts correctly that *-ovat* cannot attach to non-gradable adjectives. Degree modifiers require their adjectival argument to be gradable (Kennedy & McNally 2005). If it is not gradable, a type mismatch occurs. The adjectives **žyvoj* 'alive', *mjortvyj* 'dead', and *čjotnyj* 'even' are not gradable and, therefore, they are of type <e,t> (the property type). But the suffix requires an argument of type <d,<e,t>>. Hence the unacceptability of such forms as **žyvovatyj*, **mjortvovatyj*, and **čjotnovatyj*.[3] On a more intuitive level, the adjectival stems do not provide a degree which could then be compared to the standard of comparison.

3.2 Gradable Adjectives: Absolute Standard

3.2.1 Lower-Bound Closed Scales

If the scale lexicalized by the stem is lower closed and, thus, has a minimal value, it is to this value that the suffix applies. Thus, the lowest degree on the scale functions as the standard of comparison.

Let's illustrate the application of *-ovat* to an adjective with an underlying lower-bound closed scale, such as, for instance, *sladkij* 'sweet'. The compatibility with *slegka* 'slightly' but not with *soveršenno* 'absolutely' indicates that this adjective lexicalizes a lower-bound closed scale, which has

[3] Note that the unacceptability of **žyvovatyj* and **mjortvovatyj* cannot be explained phonologically by the fact that the stem ends in the consonant *-v-*. This is shown by the acceptability of such adjectives as *krivovatyj* and *čerstvovatyj*, whose stems end in *-v-* as well. Further, the same kind of phonological explanation could not apply to the non-existence of such adjectives as **čjotnovatyj*.

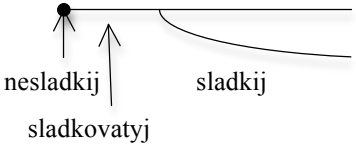
a minimal value and no maximal value (an entity can be absolutely not sweet, but not absolutely sweet):

(10) Čaj slegka / #soveršenno sladkij.
tea slightly / absolutely sweet
'The tea is slightly / #absolutely sweet.'

The adjective *sladkovatyj* denotes the property of being slightly sweet, e.g. *sladkovatyj čaj* is tea that contains a small amount of sugar. The argument of *sladkovatyj* is entailed to possess sweetness to a degree that is slightly higher than the minimum. This meaning is derived in the following way:

(a) The semantics of *sweet* is provided in (11a).
(b) The result of application of *-ovat* to the stem *sladk-* reveals the representation in (11b). The maximal degree to which the argument of the resulting adjective is sweet slightly exceeds the standard of comparison, i.e., the minimal degree on the scale.
(c) The resulting function applies to the standard of comparison associated with the stem, and we get the meaning in (11c).

(11) a. $\lambda d \lambda x$. sweet(d)(x)
b. $\lambda d' \lambda x$. max{d: sweet(d)(x)} > d' ∧ (max{d: sweet(d)(x)} – d' < d_c)
c. λx . max{d: sweet(d)(x)} > min(S_{sweet}) ∧ (max{d: sweet(d)(x)} – min(S_{sweet}) < d_c)
d. → sweetness



The figure in (11d) graphically represents the relations between the denotations of *nesladkij* 'not sweet', *sladkij* 'sweet', and *sladkovatyj*. We assume that the lower boundary on the scale of sweetness represents zero sweetness, i.e., corresponds to the absence of the property. In order for an object to fall under the denotation of *sladkij* 'sweet', it has to reach a particular degree of sweetness. Finally, an object counts as *sladkovatyj* if the degree of its sweetness is higher than the minimal point on the scale, but not considerably higher than this point.[4]

[4] That is, we assume that *sladkovatyj* is outside of the denotation of *sladkij*. For further discussion of this issue, see Kagan & Alexeyenko (2010), Section 4.2.

A further example that illustrates the application of *-ovat* to an adjective with a lower-bound closed scale is *grjaznyj* 'dirty'. The scale of dirtiness has a minimal value (corresponding to zero dirtiness, or absolute cleanliness) but no maximal value (there is no limit to how dirty one can get). The suffix *-ovat* applies to the minimal value on the underlying scale of this adjective, so that the resulting adjective, *grijaznovatyj*, denotes the property of being slightly dirty, i.e., slightly dirtier than an absolutely clean entity.

(12) $[\![\textit{grijaznovatyj}]\!] = \lambda x \,.\, \max\{d\text{: dirty}(d)(x)\} > \min(S_{dirty}) \wedge (\max\{d\text{: dirty}(d)(x)\} - \min(S_{dirty}) < d_c)$

Several additional examples of adjectives that lexicalize a scale with a lower boundary and can be modified by the suffix *-ovat* are provided below:

(13) *vlažnovatyj* (wet-*ovat*) 'slightly wet', *gor'kovatyj* (bitter-*ovat*) 'slightly bitter', *ostrovatyj* (spicy-*ovat*) 'slightly spicy', *krivovatyj* (crooked-*ovat*) 'slightly crooked', *strannovatyj* (strange-*ovat*) 'somewhat strange', *grustnovatyj* (sad-*ovat*) 'a little bit sad', etc.

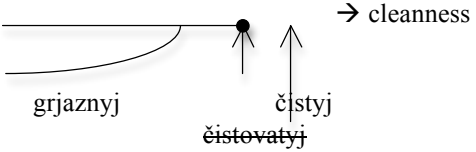
3.2.2 Upper-Bound Closed Scales

When a scale has a maximal value, its upper boundary constitutes another potential standard of comparison for the application of *-ovat*. However, it turns out that *-ovat* fails to apply to this standard. Recall that the suffix ensures that the property holds of an argument to a degree that is *higher* than the standard of comparison. Trivially, no degree can be higher than the maximal element on the scale.

An example of an adjective that lexicalizes an upper-bound closed scale is *čistyj* 'clean', which lacks a minimal value and whose maximal value corresponds to absolute cleanliness. This scale is almost identical to the one lexicalized by the antonymous adjective *grjaznyj* 'dirty' discussed in Section 3.2.1 above, except for the fact that the two scales are characterized by inverse ordering relations. Roughly, the higher an object is on the scale of cleanliness (i.e., the cleaner it is), the lower it is on the scale of dirtiness. We noted above that the scale of dirtiness has a minimal value but no maximal one. Correspondingly, the scale of cleanliness has a maximal but not a minimal value.

The adjective **čistovatyj* does not exist. Formally, the unacceptability of this form can be explained as follows. The standard of the adjective *čistyj* 'clean' is the upper scale boundary. Thus, the application of the suffix *-ovat* to this adjective would render the semantics in (14a):

(14) a. λx . max{d: clean(d)(x)} > max(S_{clean}) ∧ (max{d: clean(d)(x)} – max(S_{clean}) < d_c)

b. 

Since no degree on the scale of cleanliness can be higher than max(S_{clean}), the requirement max{d: clean(d)(x)} > max(S_{clean}) cannot be satisfied. Therefore, *-ovat* cannot be felicitously applied.

We now have an explanation of the contrast between the existing *grijaznovatyj* and the non-existing **čistovatyj*. The adjectives *grjaznyj* and *čistyj* are antonyms that lexicalize scales with the same dimension. The scales come with one and the same standard (absolute cleanliness), which corresponds to the minimal value on S_{dirty} and the maximal value on S_{clean}. For both adjectives, this standard is a potential candidate for *-ovat* to apply to. Given the ordering that characterizes each scale, we get the following result. With *grjaznyj*, the application of the suffix produces the meaning 'slightly dirtier than the minimum', or 'slightly dirtier than an absolutely clean entity'. This is an acceptable interpretation, and the adjective *grjaznovatyj* exists. With *čistyj*, the resulting meaning would be 'slightly cleaner than the maximum', or 'slightly cleaner than an absolutely clean entity'. This interpretation is ruled out, and so the adjective **čistovatyj* does not exist.

Additional upper-bound closed adjectives that cannot combine with *-ovat* are provided below:

(15) **rovnovatyj* (straight-*ovat*)[5], **ploskovatyj* (flat-*ovat*)[6], **sveževatyj* (fresh-*ovat*)[7], etc.

It should be pointed out, however, that some upper-bound closed adjectives (such as e.g. *suxoj* 'dry') *can* combine with *-ovat*. We argue that this is possible because in such cases, the suffix applies to a different type of standard, namely, to the functional standard. This issue will be addressed in Section 3.3.2 below.

[5] Compare to the acceptable *krivovatyj* (crooked-*ovat*).
[6] The adjective exists under a different, idiomatic meaning.
[7] The intended meaning here is one of being a fresh product; presumably, under this meaning, the adjective lexicalizes an upper closed scale, as it is possible to say *Jeda absolutno svežaja* 'The food is absolutely fresh'.

3.3 Gradable Adjectives: Functional Standard

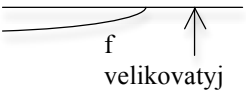
In Sections 2.1 and 2.2, we demonstrated that both relative gradable adjectives and absolute gradable adjectives have a standard of comparison other than the absolute and the distributional one respectively. This standard is not computed relative to the distribution in the class, nor does it constitute a (minimal or maximal) boundary on the underlying scale. Rather, it is determined relative to some contextually relevant goal or desire. In this section, we consider cases in which *-ovat* applies to the functional standard.

3.3.1 Open Scales

Relative adjectives lexicalize scales that lack both a minimal and a maximal value. Thus, no absolute standard is available. Still the suffix *-ovat* is compatible with adjectives of this kind. With such adjectives, *-ovat* applies to the functional standard. In particular, it specifies that the degree to which the property holds of an argument is slightly too high to be compatible with the requirements of the situation.[8]

The adjective *velikovatyj* 'big/great-*ovat*' illustrates our point. This adjective lexicalizes an open scale and denotes a property of being *slightly too big* for the present purpose.

(16) a. $[\![\textit{velikovatyj}]\!] = \lambda x . \max\{d: \text{big}(d)(x)\} > C \wedge (\max\{d: \text{big}(d)(x)\} - C < d_c)$

b.  → bigness

For instance, this adjective can be used to describe shoes that are too big for a given individual, or a piece of furniture that is too big to fit in a particular room. At the same time, the argument of *velikovatyj* is only en-tailed to be *slightly* too big for the current purposes. Therefore, if this prop-erty characterizes the shoes that one is trying for size, this may not yet be a reason not to buy them: insoles or socks could solve the problem.

Along with *velikovatyj*, *-ovat* applies to the functional standard with numerous relative adjectives, including the following:

(17) *vysokovatyj* (tall-*ovat*) 'slightly too tall', *nizkovatyj* (short/low-*ovat*) 'slightly too short/low', *širokovatyj* (wide-*ovat*) 'slightly too wide',

[8] Interestingly, *-ovat* cannot apply to a distributional standard. In Kagan and Alexeyenko (2010) (cf. Section 4.1), we suggest that this is a result of the inherently vague nature of this standard.

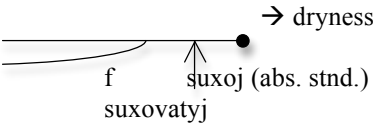
dlinnovatyj (long-*ovat*) 'slightly too long', *dorogovatyj* (expensive-*ovat*) 'a little bit too expensive', *starovatyj* (old-*ovat*) 'somewhat too old'...

The negative connotation sometimes associated with *-ovat* comes from the cases when it applies to the functional standard. An excess and the resulting incompatibility with the requirements of the situation create the negative flavour.

3.3.2 (Partially) Closed Scales

The suffix *-ovat* can also apply to the functional standard with some adjectives that lexicalize scales with a boundary. For instance, the adjective *suxoj* 'dry' lexicalizes an upper-bound close scale (an entity can be absolutely dry, but not absolutely wet). *-ovat* cannot take the maximal value as the standard, for reasons discussed in Section 3.2.2. An object cannot be drier than absolutely dry. However, *-ovat* can attach to this adjective applying to the functional standard. The resulting adjective denotes a property of being *slightly too dry for the present purposes* (for instance, a duster may be too dry for an efficient cleaning). The adjective *suxovatyj* thus receives the semantics in (18)[9]:

(18) a. $[\![suxovatyj]\!] = \lambda x . \max\{d: dry(d)(x)\} > C \wedge (\max\{d: dry(d)(x)\} - C < d_c)$

b. 

Turning to adjectives that lexicalize a lower-bound scale, they, too, appear to allow the application of *-ovat* to the functional standard. For instance, it has been mentioned above that the adjective *ostrovatyj* (spicy-*ovat*) can mean 'slightly spicy'. However, it may also mean 'somewhat spicier than desirable in the given context', as illustrated in (19):

(19) Etot sup dlja menja neskol'ko ostrovat.
this soup for me somewhat spicy-ovat
'This soup is somewhat too spicy for me.'

[9] Of course, this raises the question of why such adjectives as **čistovatyj* do not exist. We have seen why the suffix cannot take the maximal value on the scale as the standard, but why can it not apply to a functional standard, triggering an entailment that the argument is too clean for some purpose? This issue is addressed in Section 3.3.3.

We therefore propose that *ostrovatyj* is ambiguous between the following two readings, which differ in terms of the standard selected by the suffix:

(20) a. $[\![ostrovatyj_1]\!] = \lambda x . \max\{d: spicy(d)(x)\} > \min(S_{spicy}) \wedge (\max\{d: spicy(d)(x)\} - \min(S_{spicy}) < d_c)$

b. $[\![ostrovatyj_2]\!] = \lambda x . \max\{d: spicy(d)(x)\} > C \wedge (\max\{d: spicy(d)(x)\} - C < d_c)$

Under (20a), the adjective denotes the property of being just a little bit spicy. Objects that are included in its denotation do not lack the property of spiciness but have it to a low degree. In turn, (20b) represents the property of being slightly exceeding the functional standard for spiciness, i.e., being slightly more spicy than desirable in the given context.

3.3.3 Conventionalized Gaps: Adjectives with a Positive Connotation

If *-ovat* can apply to the functional standard with absolute adjectives, as demonstrated in Section 3.3.2, why do the words **čistovatyj* (clean-*ovat*) or **rovnovatyj* (straight-*ovat*) not exist? Further, why do we get the asymmetry with such relative antonyms as the following: *ploxovatyj* (bad-*ovat*) - **xoroševatyj* (good-*ovat*), *slabovatyj* (weak-*ovat*) - **sil'novatyj* (strong-*ovat*), *glupovatyj* (stupid-*ovat*) - **umnovatyj* (clever-*ovat*)?

Note that in these pairs the stems consistently denote properties one of which is conventionally viewed as positive and the other one, as negative. That is, by default, it is good to be clever but not to be stupid, and being strong is judged to be preferable over being weak. Analogously, clean is better than dirty. Once such a conventional opposition is present, *-ovat* is typically compatible only with the member of the pair that carries a negative connotation. Apparently, with these pairs of adjectives, the attachment of the suffix and the resulting interpretation is governed not only by contextual but also by conventional considerations. It is conventionally determined for certain dimensions an excess in what direction is likely to be undesirable. Roughly, 'worse than desirable' is much more likely than 'better than desirable', 'weaker than desirable' is more likely than 'stronger than desirable', etc. Conventionally, by default, a high degree of cleanliness, cleverness, goodness, etc. is judged as a good thing, which makes these adjectives less easily compatible with the negative flavour of "a higher degree than desirable", which is contributed by *-ovat*.

Of course, in an appropriate context, it is possible to conceptualize of an individual being "too good", "too strong", and even "too clever". Therefore, the degree modifier *too* is perfectly compatible with such adjectives. However, due to the fact that *-ovat* is a derivational morpheme, which com-

bines with the stem in the course of word formation, it is more sensitive to lexical and conventional restrictions. Therefore, it does not easily apply to properties whose degree is unlikely to be higher than desirable. In contrast, *too*, which is an independent lexical item that combines with an adjective at a much higher level of the derivation, can override the conventionalized preferences of the stem in an appropriate context.

Interestingly, if a polysemous adjective is inherently likely to receive a negative connotation under only one of its sub-meanings, this sub-meaning will be compatible with *-ovat*. For instance, the adjective *prostovatyj* (simple-*ovat*) sounds strange when modifying a problem or a question. Here, we have the positive/negative contrast *prostovatyj/složnovatyj (simple-*ovat* /strong-*ovat*) of the kind discussed above. But the adjective *prostoj* may also be used to modify one's personality, in which case it receives the meaning 'simple-minded'. This sub-meaning inherently receives a negative connotation, and the word *prostovatyj* is perfectly acceptable if used in this sense.[10]

4 Conclusion

To sum up, in this paper we have investigated the semantics of the adjectival suffix *-ovat* in Russian. We argued that this suffix constitutes a morphological degree modifier and proposed for it a formal analysis formulated within the framework of degree semantics. The suffix specifies that the degree to which a property holds of an object is slightly higher than the standard of comparison. A detailed consideration of different types of adjectives and standards of comparison available for these adjectives, in combination with the proposed analysis, allows us to account for the distribution of the suffix and for the range of arising interpretations.

References

Cruse, David. 1986. Lexical semantics. Cambridge, UK: Cambridge University Press.

Heim, Irene. 2000. Degree Operators and Scope. In *Proceedings of SALT 10*, 40–64. Ithaca: CLC Publications.

Kagan, Olga & Sascha Alexeyenko. 2010. Degree Modification in Russian Morphology: The Case of the Suffix *-ovat*. In *Proceedings of IATL 26*.

Kennedy, Chris. 2001. Polar Opposition and the Ontology of 'Degrees'. *Linguistics and Philosophy* 24. 33–70.

[10] Similarly, *mjagkij* 'gentle' used with respect to people generally has a positive connotation. By contrast, *mjagkovatyj* (gentle-*ovat*) refers to someone who is too gentle, getting spineless.

Kennedy, Chris & Beth Levin. 2007. Measure of change: The adjectival core of degree achievements. In L. McNally and C. Kennedy (Eds.), *Adjectives and adverbs: Syntax, semantics and discourse*. Oxford: Oxford University Press.

Kennedy, Chris & Louise McNally. 2005. Scale Structure, Degree Modification, and the Semantics of Gradable Predicates. *Language* 81(2). 345–381.

Meier, Cécile. 2003. The Meaning of *too*, *enough* and *so… that*. *Natural Language Semantics* 11. 69–107.

Nakanishi, Kimiko. 2004. On Comparative Quantification in the Verbal Domain. In *Proceedings of SALT 14*, 179–196. Ithaca: CLC Publications.

Rappaport Hovav, Malka. 2009. Scalar Roots and Their Results. Handout of a talk given at Roots Workshop at Stuttgart, June 2009.

Rotstein, Carmen & Yoad Winter. 2004. Total adjectives vs. partial adjectives: Scale structure and higher-order modifiers. *Natural Language Semantics* 12. 259–288.

Yoon, Youngeun. 1996. Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics* 4. 217–236.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 337–351. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On the Relation between Coherence Relations and Anaphoric Demonstratives in German*

Elsi Kaiser
University of Southern California
emkaiser@usc.edu

Abstract. Recent research suggests that pronoun interpretation is guided by the semantic coherence relations between clauses. However, it is not yet well-understood whether coherence effects extend to other anaphoric expressions beyond pronouns. We report an experiment on German, a language in which human antecedents can be referred to both with personal and demonstrative pronouns. How do anaphoric demonstratives – whose referential properties have been argued to be complementary to pronouns – fit into coherence-based views? Our results suggest that although coherence does not modulate the antecedent choice of anaphoric demonstratives to the same extent that it influences pronoun interpretation, demonstratives interact with coherence-related processing by guiding comprehenders' expectations of coherence relations.

1 Introduction

One of the most-researched challenges of language comprehension has to do with the interpretation of pronouns and other 'underspecified' referring expressions. An expression such *she*, *it* or *this* is semantically uninformative: on its own, it does not provide sufficient information to identify the intended referent. However, we encounter these kinds of forms very frequently in both written and spoken language and are able to interpret them without difficulties. In this paper, I report a psycholinguistic experiment that aims to shed light on the processes involved in reference resolution by investigating the referential properties of two kinds of underspecified forms in German, namely personal pronouns (*er, sie* 's/he') and demonstrative pronouns (*der, die*). The results show that to understand the referential properties of these forms, we need to take into account the semantic coherence relations between sentences, but that pronouns and demonstratives interact with coherence-related processing in different ways.

* Thanks to Petra Horvath, Erik Bresch and Samuli Heilala for assistance with coding the data. Thanks are also due to Caroline Féry, Thomas Weskott and Robin Hörnig who made it possible for me to collect data at the University of Potsdam. I would also like to thank the *SuB* audience for valuable comments. This research was partly supported by NIH grant 1R01HD061457.

Various approaches to anaphor resolution have been proposed. In this section, I review some key approaches and summarize recent evidence regarding the importance of inter-sentential semantic relations. According to *attention-based approaches,* the interpretation of pronouns and other forms is guided by a correlation between referring expressions and the salience/accessibility of the antecedent (e.g., Givón 1983, Ariel 1990, Gundel et al. 1993): The most reduced referring expressions (e.g. unstressed pronouns) refer to the most salient/accessible entities, and demonstrative pronouns and other fuller forms refer to less salient entities. Salience is often regarded as being influenced by grammatical role, with subjects more salient than objects, or topicality, with topics more salient than non-topics. However, there are empirical complications for the subjecthood=salience view. In particular, Smyth (1994) and Chambers & Smyth (1998) found *structural parallelism* effects: pronouns prefer referents in parallel syntactic positions.

Recent evidence suggests that neither attention-based nor parallelism-oriented approaches are sufficient, and argues for *coherence-based approaches*. According to coherence accounts, the use and interpretation of pronouns depends on the semantic relation between the pronoun-containing clause and the antecedent-containing clause. These approaches view anaphor resolution as a by-product of general inferencing/reasoning about relations between clauses (Hobbs 1979, Kehler 2002, Kehler, Kertz, Rohde & Elman 2008). To see how coherence relations influence pronoun interpretation, consider ex.(1). In principle, 'him' could refer to Phil or to Stanley. However, if the relation between the sentences is semantically parallel ex.(1a), people tend to interpret 'him' as referring to the parallel argument, Stanley (Kertz, Kehler & Elman 2006): Comprehenders construe the two events as similar, i.e., Stanley was tickled and was poked. In contrast, if the relation between the two clauses is a result relation ex.(1b), people are more likely to interpret 'him' as referring to the subject Phil (Kertz et al. 2006).

(1) a. Phil tickled Stanley, and (similarly) Liz poked *him*.
Parallel relation: *him* => bias to object (Stanley)
b. Phil tickled Stanley, and (as a result) Liz poked *him*.
Result relation: *him* => bias to subject (Phil)

As shown in ex.(2), subject pronouns are also sensitive to coherence. When the relation between the two clauses is result/cause-effect, as in (2a), subject-position pronouns prefer the preceding object (Kertz et al. 2006). In contrast, when the relation between the two clauses is a temporal narrative relation (one event preceded the other but did not cause it), Kehler (2002) notes that we may observe a subject bias ex.(2b), see also Kertz et al. (2006).

(2) a. Phil tickled Stanley, and as a result *he* laughed uncontrollably.
Result relation: *he* => bias to object (Stanley)
b. Phil tickled Stanley, and then *he* laughed at Mark's joke.
Narrative relation: *he* => bias to subject (Phil)

It is important to note that particular coherence relations do not always push pronouns to antecedents with certain grammatical roles. What matters is the semantics of the clauses and their relation. E.g., a subject pronoun in a result relation does *not* have to refer to the preceding object: Both (3a) and (3b) involve a result relation but *he* can refer to the preceding subject or object:

(3) a. Peter snapped at Ethan, and he sulked the rest of the afternoon.
Result relation: *he* => bias to object (Kertz et al. 2006)
b. Peter snapped at Ethan, and he felt guilty the rest of the afternoon.
Result relation: *he* => bias to subject (Kertz et al. 2006)

As a whole, a number of studies indicate that a successful account of pronoun interpretation needs to take into account the semantic coherence relations that hold between clauses (e.g. Wolf, Gibson & Desmet 2004, Kertz et al. 2006, Kehler et al. 2008, Rohde & Kehler 2008, Kaiser 2009).

2 What about Other Anaphoric Forms?

Existing work on coherence effects has focused primarily on the behavior of overt pronouns. However, other referential forms are also used to refer to previously-mentioned entities, including null pronouns, demonstratives and definite NPs. This brings up the question of whether coherence sensitivity also extends to other referring expressions. Are coherence effects a core property of all kinds of reference tracking, regardless of form, or are they a specific phenomenon that only occurs with certain anaphoric forms? In particular, could it be the case that only the default anaphoric form in a particular language exhibits sensitivity to coherence relations, and that other forms are governed by factors such as grammatical role?

On a general level, existing work suggests that referring expressions can indeed differ in how sensitive they are to different kinds of information. For example, although Kaiser & Trueswell (2008) did not look specifically at coherence, they found that Finnish personal pronouns and demonstratives differ in how much they 'care' about a potential antecedent's grammatical role vs. its linear position/discourse-status (see also Kaiser (in press) on Dutch). Recently, Ueno & Kehler (2010) found that Japanese null pronouns are primarily sensitive to grammatical role whereas overt pronouns are more sensitive to verb aspect (see also Rohde & Kehler 2008).

Thus, as a whole, existing research indicates that referring expressions can be asymmetrical in terms of what kind of information they are sensitive to. In the present paper, to test whether referring expressions differ in how sensitive they are to coherence information, I compared the behavior of personal pronouns and demonstrative pronouns in German. Although this research is on German, it is potentially relevant to other languages as well, since demonstrative pronouns are used to refer anaphorically to human antecedents in many languages (e.g. Kibrik 1996 on Russian, Comrie 1997 on Dutch, Kaiser & Vihman 2010 on Estonian, Himmelmann 1996).

2.1 Existing Work on Pronouns and Demonstratives

In German, both personal pronouns and demonstrative pronouns can be used to refer back to human antecedents[1], but their referential biases are different: Pronouns are described as preferring an antecedent in subject position, while demonstratives prefer non-subject antedecents, as shown in (4a,b).

(4) a. Paul$_1$ wollte mit Peter$_2$ Tennis spielen.
Paul$_1$ wanted to play tennis with Peter$_2$.
b. Doch {er$_1$/der$_2$} war krank.
But {he$_1$/DEM$_2$} was sick. (Bosch & Umbach 2007)

Personal pronouns can be regarded as more default/less marked than demonstratives, based on relative frequency (Bosch, Rozario & Zhao 2003).[2] Before investigating the referential properties of these forms, let us consider some background facts. Demonstratives often look like definite determiners (e.g. *der Mann* 'the man'), but differ in certain cases/numbers (see Bosch, Katz & Umbach 2007). Although demonstratives are sometimes felt to have a pejorative tone and are more common in informal registers, they also occur in written text (Bosch et al. 2007) and are not consistently felt to be pejorative.

Let us now take a look at the referential properties of pronouns and (short) demonstratives. Given that both forms can refer to human antecedents, what guides the division of labor between them? Based on the NEGRA corpus of written German, Bosch, Rozario and Zhao (2003) found that when the antecedent is in the immediately preceding sentence, pronouns refer to a nominative element in 86.7% of the cases, whereas demonstratives refer to a nominative element in only 23.6% of the cases. (Nominative is the default subject case). Based on these findings, Bosch et al. put forth the

[1] Following Bosch et al (2003, 2007), I refer to anaphoric *der* and *die* as demonstrative pronouns,
[2] German also has longer demonstrative pronouns (e.g., *diese(r), jene(r)*), which Bosch et al. (2007) describe as less frequent than the short forms (see Abraham 2006 for further discussion of *diese(r)*). I do not discuss these forms here, but regard them as an important area for future work.

Complementarity Hypothesis: "Anaphoric personal pronouns prefer referents that are established as discourse topics, while demonstratives prefer non-topical referents." They regard nominative case (subjecthood) as signaling topicality, so the Complementarity Hypothesis treats pronouns and demonstratives as having complementarity grammatical-role and information-structural preferences. However, psycholinguistic experiments by Bosch, Katz & Umbach (2007) found that although demonstratives prefer object antecedents, pronouns do not exhibit a clear subject preference. Consequently, Bosch & Umbach (2007) argue that pronouns prefer discourse topics and demonstratives avoid topics. Topicality is also mentioned by Zifoun et al. (1997, vol.1: 558), who suggest pronouns are used for referents already established as topics, and demonstratives for referents that are new information or contrastive. Abraham (2006) also analyzes pronouns as involving topic continuation, and demonstratives as markers of topic shift.

3 How Do Anaphoric Demonstratives Fit into Coherence-Based Views?

Let us now consider how demonstrative pronouns could fit into coherence-based views of reference resolution. As we saw in Section 1, a growing body of work on English points to a close relation between the interpretation of pronouns and the coherence relations that hold between the pronoun-containing clause and the antecedent-containing clause.

One of the key aims of the experiment reported in this paper is to test whether German personal pronouns show the coherence sensitivity observed in English. In addition to providing evidence of crosslinguistic replicability, this question is of interest given that German has a particular anaphoric form specialized for object reference, i.e., the demonstrative pronoun. English has no comparable expression.[3] Thus, perhaps English subject-position pronouns can be pushed towards object interpretations by result relations (see ex.2) because there exists no dedicated object-referring anaphor? Continuing with this reasoning, one might expect that the existence of a special object-referring form in German, the demonstrative, means that personal pronouns cannot be pushed to refer to an object antecedent.

[3] A possible candidate for English, *former/latter*, is rare and highly marked. The distinction between stressed/unstressed pronouns is sometimes mentioned as being similar to the pronoun/demonstrative distinction (see Bosch et al. 2003). However, existing work on English stressed pronouns led to conflicting claims: Some (e.g. Kameyama 1999) argue for a salience-based approach, but others claim use of stressed pronouns is driven by contrast (e.g. de Hoop 2003).

Furthermore, we wanted to investigate how referential dependencies influence comprehenders' assumptions about coherence. More specifically, even if the interpretation of anaphoric demonstratives is strongly object-biased and perhaps not influenced by coherence, can demonstratives nevertheless influence comprehenders' expectations about coherence? If a connective is ambiguous between a result relation and a narrative relation, can com-prehenders' assumptions about which relation to activate be influenced by the referential biases of the anaphor? I discuss this below.

3.1 Inferring Coherence Relations from Anaphoric Dependencies

The question of whether particular referential dependencies can shape comprehenders' expectations about coherence relations relates to work by Rohde (2008) and Rohde & Kehler (2008). They noted that, if different coherence relations are associated with different referential dependencies, we might expect that encountering a particular referential pattern will lead people to expect a particular coherence relation. In other words, we might find that not only do coherence relations influence the interpretation of pronouns, as argued by Kehler (2002) and Kehler et al. (2008), but that the *interpretation of pronouns also influences the construal of coherence relations*. Indeed, in a series of sentence continuation studies, Rohde and Kehler showed this to be the case, and thus argued for *a bidirectional relation* between pronoun interpretation and coherence establishment.

Because the logic of their experiments is relevant for my work, let us take a closer look at one of their studies. In Rohde (2008)'s sentence-completion study, participants read short fragments consisting of a sentence and the first word of the next sentence (ex.5a,b), and wrote continuations. The verbs in the first clause were NP1 implicit causality verbs (Garvey & Caramazza 1974). Prior work has shown that when a sentence with an NP1 implicit causality verb is followed by an 'explanation' continuation (ex.5a), the continuation is likely to start with reference to the first noun in the initial clause (the subject). Given this well-known pattern, Rohde hypothesized:

> If comprehenders use cues about who has been mentioned next to determine which coherence relation is likely to be operative, then an NP1-referring pronoun is predicted to shift comprehenders' expectations in favor of NP1-biased coherence relations, whereas an NP2-referring pronoun is predicted to shift expectations in favor of NP2-biased coherence relations. (Rohde 2008:87)

(5) a. John infuriated Mary. He… `cheated at Scrabble.`
b. John infuriated Mary. She… `told him to take a hike.`

The results showed that (i) when the gender of the pronoun signalled a subject antecedent, participants were more likely to provide a continuation that constituted an *explanation* relation (ex.5a), and (ii) when the gender of the pronoun signalled an object antecedent, participants wrote more *result* continuations (ex.5b). Rohde (2008) concludes that "comprehenders use information about which referent has been mentioned next to update their expectations about the operative coherence relation" (p.97).

As a class of referential forms, pronouns are known to be rather flexible; a pronoun can be used to refer to a preceding subject or preceding object. Thus, one could argue that a pronoun that refers clearly to the preceding subject (or preceding object) provides information about the coherence relation, because the form *could* also have referred to the other potential antecedent. In contrast, demonstrative pronouns are 'pickier' and more rigid in that they have a strong preference for the object antecedent. Thus, I wanted to find out how rigid demonstratives actually are and whether a rigidly object-referring form could also influence participants' inferences about what coherence relation is operative.

4 Experiment

To look at the scope of coherence effects in German, I used a sentence completion task where participants read a sentence followed by a prompt word (e.g. *X tickled Y and then he…*) and provided a continuation sentence. In critical items, the prompt word was a pronoun or a demonstrative. This task is a combination of comprehension and production: Participants need to interpret the prompt anaphor before they can provide a continuation.

4.1 Methods, Design

Twenty native German speakers (mostly students at the University of Potsdam, Germany) participated in a sentence-completion task with 16 targets and 32 fillers. Targets consisted of an initial transitive clause followed by a connective and either a personal pronoun or a demonstrative pronoun:

(6) Die Schauspielerin hat die Schneiderin gekitzelt und dann hat
The actress has the seamstress tickled and then has
{sie/die}
{pronoun/demonstrative}…
'The actress tickled the seamstress and then {PRO/DEM}…'

Participants were asked to provide natural-sounding continuations. All target sentences mentioned two same-gender characters in the first clause (e.g. *der Bauer* 'the farmer', *der Feuerwehrmann* 'the fireman', *die Kellnerin* 'the

waitress', *die Friseurin* 'the hairdresser (f.)'). The verbs were action/ agent-patient verbs (as defined by Stevenson, Crawley & Kleinman, 1994).[4] As shown in (6), targets contained the connective *dann* 'then' which – like English 'then' – is ambiguous between a narrative interpretation and a result interpretation. Use of a connective that is ambiguous between these two readings is crucial, as it allows us to see whether participants' interpretation of the connective is influenced by the nature of the anaphoric form.

In addition to using the ambiguous connective *dann* 'then', I tested a clearly causal connective, *demzufolge* 'therefore, as a result'. However, some native speakers find this connective to be unnatural/odd-sounding with certain types of causal sequences. In some respects, this connective is perhaps akin to English 'thus' or 'hence.' Thus, while I will briefly mention the results with *demzufolge*, I focus mostly on *dann*. More generally, the ways in which German resultative connectives (*demzufolge*, *folglich*, *deswegen*, *infolgedessen*, etc.) map to different kinds of causal relations is an interesting question (see also Pander Maat & Sanders 2001 on Dutch).

4.2 Research Questions

First, to test whether *German pronouns* show the coherence sensitivity exhibited by pronouns in English, I wanted to see whether result relations would be associated with an increased proportion of object interpretations. When faced with a pronoun prompt, if a comprehender chooses to treat two clauses as being connected by a result relation (recall that the connective *dann* 'then' is ambiguous), does this push the pronoun away from the preceding subject – presumbaly prominent both due to its syntactic position and due to structural parallelism– and boost the rate of object interpretations? To investigate this, I analyzed the antecedents of pronouns depending on whether the relation between the clauses was a result or non-result relation.

Second, I wanted to find out whether the strong object bias that had been previously observed with *German demonstrative pronouns* would persist regardless of coherence relation and whether it would influence participants' inferences about coherence relations. More specifically, in light of the behavior of English subject-position pronouns – namely that result relations tend to be associated with object reference (see Rohde 2008) and narrative relations tend to be associated with subject reference (suggested by Kehler 2002) – I wanted to see whether in German, demonstratives push comprehenders to expect a result relation. This is shown schematically in (7):

[4] The perfect tense (aux + past participle) allowed us to include a verb + anaphor sequence in the second clause (German is verb-second) without constraining participants' continuation options.

(7) a. X verbed Y and then *pronoun*… => then/next (narrative)
b. X verbed Y and then *demonstrative*… => result

Thus, the prediction is that subject-preferring pronouns may trigger the expectation that we are dealing with a narrative 'next' relation, and object-referring demonstratives may trigger an expectation of a result relation.

In addition to shedding light on the referential properties of German pronouns and demonstratives, the issues investigated here can contribute to our understanding of whether and how coherence effects relate to grammatical roles. Recall that work by Rohde (2008) and Rohde & Kehler (2008) suggests that encountering a particular grammatical-role-based referential pattern (e.g. mention of preceding object) leads people to expect a particular coherence relation (e.g. result). However, as discussed with respect to ex.(3), a particular coherence relation does not force a pronoun to 'point to' a certain grammatical role: Following a cause-effect relation, a subject-position pronoun can refer to a preceding subject or object. This flexibility raises questions regarding the nature and robustness of the associations between certain kinds of referential dependencies and certain coherence relations. My experiment on German allows us to contribute to these issues by investigating how robustly a particular referential pattern leads people to expect a particular coherence relation – especially when the cue is in the form of a rather rigidly object-referring demonstrative pronoun.

4.3 Data Analysis

Participants' continuations were analyzed independently by two native German speakers blind to the aims of the experiment. A third blind coder's analyses were used to resolve any disagreements. The continuations were analyzed for (i) whether the anaphoric expression (the prompt word) referred to the preceding subject, preceding object, or whether the antecedent was unclear. Coders also noted (ii) whether the demonstrative was used anaphorically or as a definite article, since the demonstrative prompts are ambiguous between these two construals. Furthermore, since the connective *dann* 'then' is ambiguous (ex.8a, b), coders analyzed each *dann* token individually to see (iii) whether it involved a result or non-result relation.

(8) a. The actress tickled the seamstress and then she
`sat down and learned her lines.` [non-result, narrative relation]
b. The actress tickled the seamstress and then she
`laughed really hard for 10 minutes.` [result relation]

5 Results and Discussion

In this section, we first consider the results for the pronoun conditions (Section 5.1) and then the results for the demonstrative conditions (Section 5.2). At the end of this section, we consider the occasions on which participants used the demonstrative prompt as a definite article (Section 5.3), which occurred frequently, on 75.6% of all demonstrative trials.

5.1 Pronouns

Overall, when *dann* is followed by a pronoun, there are more subject continuations (73.4%) than object continuations (26.6%). The proportion of subject continuations is significantly higher than chance (one-sample t-test, hypothesized mean 0.5 (50%), $t1(18)=4.9$, $p<.001$, $t2(15)=2.699$, $p<.02$).[5] Now, taking a closer look at the data, Figure 1 (next page) shows the percentage of trials on which participants used the pronoun to refer to the preceding subject or object, grouped by whether the relation between the clauses was result or non-result. (20% of *dann*+pronoun trials were coded as 'unclear antecedent'; they are excluded from analysis.)

Figure 1 reveals a clear relationship between coherence and choice of antecedent: When participants use the pronoun to refer to the preceding subject, we find mostly non-result relations (4.7% result relations, 68.8% non-result relations). However, when participants use the pronoun to refer to the preceding object, result relations are more frequent (23.4% result relations, 3.1% non-result relations). Looking separately at subject and object continuations, we find that the distribution of result vs. non-result relations differs significantly from chance for both kinds of continuations (p's<.02).

5.2 Demonstratives Used Anaphorically

Figure 2 (next page) shows the behavior of demonstrative pronouns when they are preceded by *dann* 'then' and used anaphorically. (Five percent of *dann*+anaphoric demonstrative trials had an unclear antecedent; they are excluded from these analyses.) Now, contrary to what we saw with pronouns, there are more object continuations than subject continuations: the gray bar is taller than the black bar (88.88% object continuations vs 11.11% subject

[5] Some degrees of freedom vary due to empty cells. Also, recall that I also tested the more marked, specifically causal connective *demzufolge* 'therefore'; these results are not shown in Figure 1. When pronouns are preceded by this connective, there is no subject advantage: There are 49.33% subject continuations and 50.66% object continuations. This asymmetry between the ambiguous *dann* 'then' and the causal *demzufolge* 'therefore' already suggests that result relations are associated with a boost in object interpretations.

continuations). The proportion of object continuations is significantly higher than a hypothesized chance level of 50% (p's<.01).

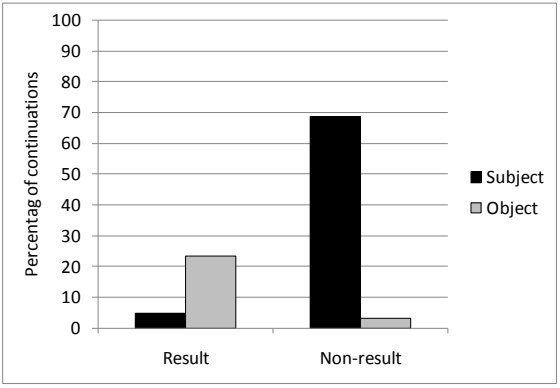


Figure 1. Personal pronouns preceded by *dann* 'then': How often did participants interpret the pronoun as referring to the preceding subject vs. object, as a function of what the relation between the clauses was.

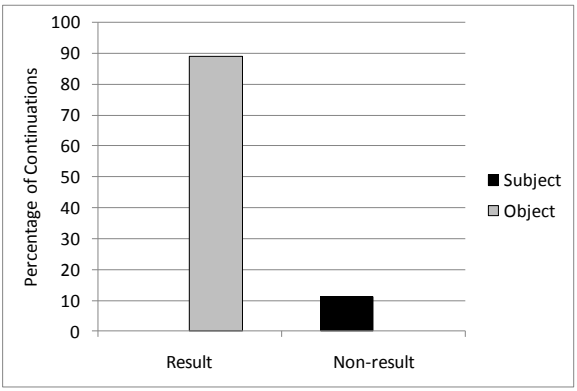


Figure 2. Demonstrative pronouns preceded by *dann* 'then': How often did participants interpret the demonstrative as referring to the preceding subject vs. object, as a function of what the relation between the clauses was.

Furthermore, it is quite striking that all of the object continuations involve result relations, and all subject continuations involve non-result relations. Thus, with demonstratives we see a very clear connection between referential dependency and coherence relation. Even when the coherence relation is

ambiguous, people tend to interpret demonstratives as referring to the preceding object and the coherence relation as being result.[6]

5.3 Demonstratives Used as Definite Articles

Figure 3 shows the behavior of demonstratives in *dann* conditions when they were used as definite articles. As with demonstratives, we find that – overall, collapsing result and non-result relations – when participants opted to produce a full noun, they were more likely to refer to the preceding object (79%) than the preceding subject (8.6%). The overall proportion of object continuations is significantly higher than chance (p's<.01). Furthermore, echoing the findings with demonstrative anaphors, we find that object continuations are more likely to involve a result relation (65.5%) than a non-result relation (13.8%).The distribution of result vs. non-result relations in object continuations differs significantly from chance (p's<.01.).[7] The small number of subject continuations (8.6%) all involve non-result relations.

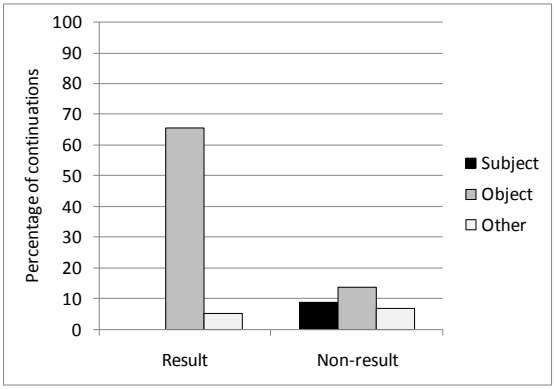


Figure 3. Demonstratives used as definite articles (in *dann* 'then' conditions): When participants used the demonstrative as a definite article, how often did the resulting noun refer to to preceding subject, object, or some other entity, as a function of what the relation between the clauses was.

Thus, it is not the case that *demonstratives* are specifically associated with result relations (as Figure 2 might suggest), but rather that any kind of reference to the object – at least with *agent-patient* verbs, where the object is

[6] The link between object reference and result relations also emerges with causal *demzufolge* 'as a result, therefore'. Demonstratives followed by *demzufolge* triggered 93% object continuations.
[7] For one-sample t-tests, references to ‚other' were excluded as a hypothesized mean of 0.5 was used. On a side note: Not surprisingly, *demzufolge* resulted in mostly object continuations (88%).

the patient – is associated with result relations. We see this with pronouns in Figure 1, demonstratives in Figure 2 and full nouns in Figure 3.

6 Conclusions

Our results shed light on the extent and nature of coherence-sensitivity in reference resolution. Our findings for German show that pronouns are more flexible in their referential behavior than demonstratives, supporting observations by Bosch et al. (2007). With regard to coherence, we found that *pronoun interpretation* is influenced by coherence relations even in a language where more specific forms for object reference are available.

In addition, regarding the *interpretation of demonstratives*, our findings show that although coherence does not modulate the antecedent choice of anaphoric demonstratives to the same extent that it influences pronoun interpretation (demonstratives have a clear object preference in all contexts that we tested), demonstratives nevertheless interact with coherence-related processing by guiding comprehenders' expectations of coherence relations. In particular, we find that object-biased expressions[8] trigger an expectation of a result relation (see also Rohde 2008, Rohde & Kehler 2008 on English pronouns). In fact, the connection between demonstratives and result relations, combined with prior claims that demonstratives disprefer topics, brings up interesting questions for future work regarding the relation between information-structural representations and coherence representations.

In addition, these findings contribute to our understanding of the role that grammatical and thematic roles play in reference resolution. On the one hand, one of the defining traits of the coherence approach is the view that anaphor resolution cannot be explained simply in terms of grammatical role. Interestingly, at the same time, we find that grammatical roles/thematic roles (not differentiated in this study) cannot be fully ignored – in particular, there seems to be a persistent connection between result relations and reference to the object/patient. Future work will play an important role in disentangling the effects of grammatical and thematic role.

References

Abraham, Werner. 2007. Discourse binding: DP and pronouns in German, Dutch, and English. In Werner Abraham, Elisabeth Leiss, & Elisabeth Stark (eds), *Nominal determination: Typology, context constraints, and historical emergence*, 21–47. Amsterdam: Benjamins.

[8] In this study, all objects were patients; we cannot distinguish syntactic role from thematic role.

Ariel, Mira. 1990. *Accessing NP antecedents*. London: Croom Helm.

Bosch, Peter & Carla Umbach. 2007. Reference Determination for Demonstrative Pronouns . In Dagmar Bittner & Natalia Gargarina (eds), *Intersentential Pronominal Reference in Child and Adult Language,* 39–51. Zentrum für Allgemeine Sprachwissenschaft, Berlin, Germany.

Bosch, Peter, Graham Katz & Carla Umbach. 2007. The Non-subject Bias of German Demonstrative Pronouns. In Monika Schwarz-Friesel, Manfred Consten,& Mareile Knees (eds.) *Anaphors in Text: Cognitive, formal and applied approaches to anaphoric reference*, 145–164. Benjamins.

Bosch, Peter, Tom Rozario & Yufan Zhao 2003. Demonstrative Pronouns and Personal Pronouns. German *der* vs. *er*. In *Proceedings of the EACL2003, Workshop on the Computational Treatment of Anaphora*.

Chambers, Greg C. & Ron Smyth. 1998. Structural parallelism and discourse coherence. *Journal of Memory and Language* 39. 593–608.

Comrie, Bernard. 1997. Pragmatic binding: Demonstratives as anaphors in Dutch. In Matthew L. Juge & Jeri L. Moxley (Eds.), *Proceedings of the 23rd Meeting of the Berkeley Linguistics Society*, 50–61. Berkeley, CA.

de Hoop, Helen. 2003. On the interpretation of stressed pronouns. In Matthias Weisgerber (ed), *Proceedings of Sinn und Bedeutung 7*, 159–172. University of Constance, Constance, Germany.

Garvey, Catherine & Alfonso Caramazza. 1974. Implicit causality in verbs. *Linguistic Inquiry* 5. 459–464.

Givón, Talmy. 1983. *Topic continuity in discourse: A quantitative cross-language study*. Philadelphia/Amsterdam: John Benjamins.

Gundel, Jeanette, Nancy Hedberg & Ron Zacharski. 1993. Cognitive status and form of referring expressions in discourse. *Language 69.* 274–307.

Himmelmann, Nikolaus. 1996. Demonstratives in Narrative Discourse: A Taxonomy of Universal Uses. In Barbara Fox (ed.), *Studies in anaphora*, 205–254. Amsterdam: Benjamins.

Hobbs, Jerry. 1979. Coherence and coreference. *Cognitive Science 3.* 67–90.

Kaiser, Elsi. 2009. Effects of Anaphoric Dependencies and Semantic Representations on Pronoun Interpretation. In S.L. Devi, A. Branco and R. Mitkov (eds.), *Anaphora Processing and Applications,* 121–130. Heidelberg: Springer.

Kaiser, Elsi & Trueswell, John C. 2008. Interpreting pronouns and demonstratives in Finnish: Evidence for a form-specific approach to reference resolution. *Language and Cognitive Processes* 23. 709–748.

Kaiser, Elsi & Virve Vihman. 2010. *On the referential properties of Estonian pronouns and demonstratives.* In Hans Götzsche (ed.), Memory, Mind and Language, 193–205. Newcastle upon Tyne: Cambridge Scholars.

Kaiser, Elsi. In press. Salience and contrast effects in reference resolution: The interpretation of Dutch pronouns and demonstratives. *Language and Cognitive Processes.*

Kameyama, Megumi. 1999. Stressed and unstressed pronouns: Complementary preferences. In Peter Bosch & Rob van der Sandt (Eds.), *Focus: Linguistic, cognitive, and computational perspectives*, 306–321. Cambridge, UK: Cambridge University Press.

Kehler, Andrew, Laura Kertz, Hannah Rohde & Jeff Elman. 2008. Coherence and Coreference Revisited. *Journal of Semantics* 25. 1–44.

Kehler, Andrew. 2002. *Coherence, reference, and the theory of grammar.* CSLI Publications, Stanford, CA.

Kertz, Laura, Andrew Kehler & Jeff Elman. 2006. Grammatical and Coherence-Based Factors in Pronoun Interpretation. *Proceedings of the 28th Annual Conference of the Cognitive Science Society,* Vancouver.

Kibrik, Andrej. 1996. Anaphora in Russian narrative prose. In Barbara Fox (ed.), *Studies in anaphora*, 266–303. Amsterdam: Benjamins.

Pander Maat, Henk & Ted Sanders. 2001. Subjectivity in causal connectives: Empirical study of language in use. *Cognitive Linguistics* 12. 247–273.

Rohde, Hannah & Andrew Kehler. 2008. The bidirectional influence between coherence establishment and pronoun interpretation. Poster presented at the *21st Annual CUNY Conference on Human Sentence Processing.*

Rohde, Hannah. 2008. *Coherence-Driven Effects in Sentence and Discourse Processing*. Ph.D. Dissertation, University of California, San Diego.

Smyth, Ron. 1994. Grammatical determinants of ambiguous pronoun resolution. *Journal of Psycholinguistic Research* 23. 197–229.

Stevenson, Rosemary. J., Crawley, Rosemary.A. & Kleinman, David. 1994. Thematic roles, focus and the representation of events. *Language and Cognitive Processes 9*. 519–548.

Ueno, Mieko & Andrew Kehler. 2010. The interpretation of null and overt pronouns in Japanese. In *Proceedings of the 32nd Annual Meeting of the Cognitive Science Society,* 2057–2062. Austin, TX.

Wolf, Florian, Edward Gibson & Timothy Desmet. 2004. Discourse coherence and pronoun resolution. *Language and Cognitive Processes* 19. 665–675.

Zifonun, Gisela, Ludger Hoffman & Bruno Strecker. 1997. *Grammatik der deutschen Sprache*. Berlin: De Gruyter.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 353–364. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Lexical vs. Pragmatically Derived Interpretations of Numerals*

Masaaki Kamiya
Hamilton College
mkamiya@hamilton.edu

Akemi Matsuya
Takachiho University
a-matsuya@takachiho.ac.jp

Abstract. This paper shows that the pragmatically derived interpretations of the numerals such as 'at least N' or 'at most N' and the lexical counterparts are mutually exclusive with respect to language acquisition. Hence, children do not infer the meanings of the pragmatically derived meanings of the numerals based on the lexical counterparts and vice versa.

1 Introduction

In the linguistics literature, researchers have been discussing the mechanisms regarding the interpretations of numerals. That is, while 'two' means 'exactly two', it could mean 'at least two' or 'at most two' if appropriate contexts are provided (pragmatically derived meanings of the numerals) (Carston 1998, Horn 1972, 1992, Kadmon 2001, and Koenig 1991, among others). In developmental studies, researchers have been concerned with children's developmental processes of numerals; however, they assume that 'two' means 'exactly two'. The current study will show at what age children come to know the pragmatically derived meanings of the numerals. Based on the results of our experiments and comparing ours with Musolino (2004), we will conclude that acquisition processes of lexical ones and pragmatic ones are mutually exclusive. Thus, knowledge of the lexical ones does not entail acquisition of the pragmatic ones automatically, and vice versa. This paper is organized as follows. Section 2 briefly reviews the previous research on the acquisition of numerals and the theoretical background behind them. Section 3 shows the design of our experiments and their results. Section 4 presents a

* We would like to express our gratitude to the families and staff at Takachiho Kindergarten and the students and faculty members at Takachiho University in Tokyo. We also thank Hitomi Hirabayashi, Akina Kuroha, and Menami Tsukamoto for help in collecting child and adult data. We thank Patricia Hironymous and Fred Savarese for their comments on our draft. This paper is supported by JSPS Grant-in-Aid for Scientific Research (Grant # 20520523. PI is Akemi Matsuya). The name of authors is alphabetical order.

general discussion based on the data from the experiments. Section 5 contains concluding remarks.

2 Previous Studies

There are primarily two streams of thought with respect to the acquisition of the numerals. On the one hand, although a great deal of controversy has ensued over whether a counting set (see Gelman and Gallistel 1978) precedes acquisition of the meaning of number words or not (see Gelman and Gallistel 1978, Gallistel and Gelman 1992, Briars and Siegler 1984, and Fuson 1988, among others), developmental psychologists investigate how children acquire numerals, uniformly assuming that number words semantically refers to 'exactly N' and claim that children have acquired the meanings of the numerals around 3 or 4 years of age (see Sarnecka and Gelman 2004). For example, as far as the acquisition of Japanese number words is concerned, based on the results of experiments concerning the children's comprehension of quantifiers, numerals, and classifiers[1], Barner et al. (2009b) concludes that Japanese children are delayed in numeral comprehension due to the usage of classifiers compared to that of English speaking children: a significant delay of the acquisition of numerals is observed in Japanese-speaking children at 2 years of age (Japanese = 0.44 and English = 1.14 in ANOVA analysis). Once they reach 3 years of age, this difference between English-speaking and Japanese-speaking children disappears (3 years and 4 years Japanese = 2.62 and 3.89, and 3 years and 4 years English = 2.25 and 3.38, respectively).

On the other hand, in the linguistics literature (see Carston 1998, Horn 1972; 1992, Kadmon 2001, and Koenig 1991, among others), researchers have been concerned with pragmatically derived meanings of numerals, as in the following examples cited from Musolino (2004: 3): while (1) means 'exactly N,' (2) and (3) signify 'at least N' and 'at most N,' respectively.

(1) A: How many mistakes did you make?
B: I made three mistakes.

(2) You need to make three mistakes to be allowed to take the test again.

(3) You can make three mistakes and still pass this test.

---

[1] Barner et al. (2009b) employs (i) the Give-Quantifier task, (ii) the Give-Number task, and (iii) the Classifier Match task, which were revised versions of the tasks in Barner at al. (2009a). In (i) and (ii), the experimenter showed the subjects a red circle and asked them to put a quantity /certain number of a specific kind of fruit into it using a quantifier, e.g. 'zenbu (= all),'/ a number word, e.g. 'rokko (= six).'

The theoretical background behind these studies is briefly summarized as follows. Under Grice's maxims restricting the quantity of information in utterances (4), scalar implicatures are said to be derived from conversational implicatures: 'Some of my friends passed the entrance examination' implies 'Not all of my friends passed the entrance examination.' This traditional Gricean approach also claims that the propositions of stronger (= more informative) terms are true in a narrower set of circumstances than those of weaker (= less informative) ones: 'All of my classmates caught a cold' asymmetrically entails 'some of my classmates caught a cold.'

(4) Maxim of Quantity
   a. Make your contribution as informative as required (for the current purposes of the exchange).
   b. Do not make your contribution more informative than is required.
(Grice 1989)

Horn (1972; 1989) attempted to apply the Gricean account to numerals. He suggests that like quantifier cases, 'Linda has three daughters' asymmetrically entails 'Linda has three/two/one daughters' (= 'at least N' interpretation): semantically, numerals are lower-bounded. Adding an upward bounding implicature to this lower bounded semantics, 'Linda has three daughters' will be able to imply 'Linda has exactly three daughters.'

Pointing out two problems with the traditional and neo-Gricean approaches on numerals, Carston (1998) raised an objection to them: one is that an 'at most N' interpretation was not dealt with and that the so-called 'scale reversal' effect (5) could not be accounted for by these strategies. The other is that the three interpretations (6b - d) to (6a), which are set as the conditions of the bet between two people, are conveyed in the utterance and that these interpretations display the truth conditional content of the conversation. Consequently, numerically quantified NPs are taken to be semantically underspecified and to be pragmatically yielded (Carston 1985, Horn 1992 etc.).[2]

(5) a. That golfer is capable of a round of 100 (and maybe even 90/*110).

---

[2] Carston (1985) assumes the semantic representation of numerals to be the following.

(i) [X [N]]
X= a variable instantiated by pragmatic enrichment
N = a number word

b. She can counter most of the arguments (and maybe even *some/all).
Sadock (1984:143)

(6) a. There will be 20 people there.
b. There will be at most 20 people there.
c. There will be exactly 20 people there.
d. There will be at least 20 people there. Harnish (1976)

Musolino (2004) and Papafragou and Musolino (2003) attempted to capture how children acquire 'at least N' and 'at most N', which contain a range of entailments and pragmatic effects, as well as 'exactly N.' Papafragou and Musolino's (2003) work concludes that young children treat numeral scales (e.g. 'two' and 'three') differently from quantificational scales (e.g. 'some' and 'all') and aspectual scales (e.g. 'start' and 'finish') unlike adults: the rate of correct responses of numeral scales was lower than that of others. Considering the implications of Papafragou and Musolino's (2003) results, in order to see whether children and adults have the same representation of numerals and whether children's interpretations switch from 'exactly N' to 'non-exactly N (= 'at least/at most N) at some point, Musolino (2004) conducted the Truth Value Judgment Task[3] concerning pragmatically derived 'at least/at most N', overt (= lexical) 'at least/at most N', overt 'more than N' and 'exactly N' on English-speaking young children. Musolino (2004) claims that preschoolers acquire the knowledge of 'non-exact' interpretations, i.e. pragmatically derived 'at least/at most N' interpretations, although there were some difficulties with implementation of the experiments, especially with setting up of proper contexts.[4] As for the interpretations of overt numerals, children behave similarly to adults with respect to 'exactly N' and 'more than N'. Their performance in 'overt at least/at most N' differs from that of adults. Summing up Musolino (2004), English-speaking children tend to acquire pragmatically derived 'at least/at most N' earlier than lexical 'at least/at most

[3] In the experiments with respect to pragmatically derived 'at least/at most N', the first experimenter performs short stories in front of the subjects and then the second experimenter, who has a puppet, states what he thinks happens in the scenario and asks the subject to answer whether his statement is correct or wrong. In the experiments concerning the overt quantified N, exactly N, and more than N, children are presented cards with zero-to- five smiley faces or stars. Then they are asked to answer whether a card meets the puppet's request or not, for example, he likes a card with 'exactly two stars'

[4] According to Musolino (2004), the percentages of correct responses concerning pragmatically derived 'at least N' and 'at most N,' are 35% and 82.5%, respectively. But the percentage of correct responses of the former rose up to 80% under the improved context.

N'. Additionally, the semantic representation of the quantified numerals is the same among children and adults.
In the following section, we designed some experiments in order to explore cross-linguistic differences in the acquisition of overt and covert quantified numeral expressions between Japanese-speaking and English speaking preschoolers.

3 Experiments

3.1 Experimental Design

The purpose of this experiment is to find out (i) whether or not adult speakers of Japanese are able to assign non-exact semantics of numerals (i.e., 'at least N' or 'at most N'); and (ii) 5-6 year-old speakers of Japanese can assign non-exact semantics of numerals. In addition, we would like to investigate whether 5-6 year-olds can understand the meanings of the overt counterparts such as *sukunakutomo* 'at least' and *seizei* 'at most'. To achieve this experiment, we had to create contexts in which numerals could be naturally understood 'at least N' or 'at most N' interpretations. For example, it is plausible to interpret *nuta-tu* 'two' as 'at least two' in the context where a child would be given an ice cream if s/he ate two pieces of broccoli. In this situation, *s/he ate two pieces of broccoli* can be naturally interpreted as 'at least two pieces of broccoli.' Example (7a) is the Japanese counterpart of this example. On the other hand, *huta-tu* 'two' can be understood 'at most two' in the context where a child can eat two pieces of broccoli if s/he is able to. In this example, *two pieces of broccoli* should be most plausibly interpreted as 'at most three'. Example (7b) is the Japanese counterpart.

(7) a. Burokkorii-o huta-tu tabe-tara,
broccoli-ACC *two*-CL *eat-if*
aisukuriimu-o ageru.
ice-cream-ACC *give*
'I can give you an ice-cream if you eat (at least) two pieces of broccoli.'

b. Boku-wa tabe-rare-temo
I-TOP *eat-can-even if*
(burokkori-wa) huta-tu danaa.
broccoli-TOP *two*-CL *probably is*
'I can eat (at most) two pieces of broccoli even if I can eat it.'

3.2 Participants, Method and Procedure

We tested 32 Japanese-speaking children (16 boys and 16 girls) between the ages of 5.10 and 6.11 (mean 6.3 year-olds). We chose children of this age group based on Barner et al. (2009a), which reports that by this age, children have already acquired numerals.[5] These children were recruited at Takachiho Kindergarten in Tokyo. As a control group, we tested 31 adults who are students and faculty members at Takachiho University. To investigate Japanese children's interpretations of non-exact semantics of numerals, we used the Truth Value Judgment Task (TVJT, Crain and Thornton 1998). In the TVJT, two experimenters are generally required; one tells the story of each experiment with dolls or visual aids and the other plays the role of a puppet that listens to the story with the participant. By the end of each story, the puppet gives a statement of each story to the participant and the role of the participant is to say 'true' or 'false' to the statement of the puppet. As a follow-up, the participants are questioned to verify their answers by accounting for why they think that the puppet is right or wrong.[6] To test Japanese participants, we created stories and made the relevant PowerPoint visual aids so that children could understand the situation and the relevant meanings of numerals. Two experimenters told stories and the third experimenter acted as the puppet.

Before conducting individual tests, we started with a group test as a pre-test. The pre-test is made of three control stories. If children could answer these tests appropriately, then they could hear 12 more stories including 'at least N' or 'at most N' numerals. The order of the 'true' or 'false' answers is randomized so that children cannot predict answers. For adult speakers, we used a videotaped version of the stories, which were the same ones used with the children. They provided answers on a score sheet after watching each story.

3.3 Materials

Our experiments had four conditions: two of them were designed for non-exact semantics ('at least N' and 'at most N') that are pragmatically derived.

---

[5] We also chose this age group to compare with that of English-speaking counterparts (Musolino 2004). Musolino conducts the same experiments to find out whether or not English-speaking children are able to understand non-exact semantics of numerals.

[6] It is reported that multilingual children do not have trouble understanding the procedures of the TVJT (English children – Crain and Thornton 1998, Musolino 2004, Musolino, Crain and Thornton 2000; Greek children – Papafragou and Musolino 2003; Kananda (Dravidian) – Lidz and Musolino 2002, among others).

The other two experiments were to investigate whether or not Japanese children could understand the overt counterparts of the pragmatically derived 'at least N' or 'at most N'; *sukunakutomo* 'at least' and *seizei* 'at most'. In our stories, Pikachu and Potyama (both are characters from Pocket Monster) talk about something. A puppet, Wanwan, who is a character of a popular TV program for Japanese kids, gives a statement to the subject. Below are representative examples of pragmatically derived 'at least N' in (8) and the overt counterparts in (9):

(8) Pragmatically derived 'at least N'
Pikachu: Boku-wa burokkori-ga kirai.
I-TOP *broccoli*-NOM *don't-like*
'I don't like broccoli.'
Potyama: Demo, tabe-nakya dame dayo.
but *eat-must* *bad* *it is*
Huta-tu tabe-tara, aisukuriimu-o ageru.
two-CL *eat-if* *ice cream cone*-ACC *give*
'But you have to eat them.' 'If you eat two pieces of broccoli, I will give you an ice cream cone.'
Then, Pikachu eats three pieces of broccoli.
Puppet: Pikachu-wa aisukuriimu-ga moraeru kana?
pikachu-TOP *ice cream cone*-*NOM* *get-can* *wonder*
'Can Pikachu get an ice cream cone?'

(9) Overt word *seizei* 'at least'
Pikachu: Boku-wa burokkori-ga kirai
I-TOP *broccoli*-NOM *don't-like*
'I don't like broccoli.'
Potyama: Demo, tabe-nakya dame dayo.
but *eat-must* *bad* *it is*
'But you have to eat them.'
Sukunakutomo huta-tu tabe-
at least *two*-CL *eat-if*
tara, aisukuriimu-o ageru.
if *ice cream cone*-ACC *give*
'If you eat at least two pieces of broccoli, I will give you an ice cream cone.'
Then, Pikachu eats three pieces of broccoli.
Puppet: Pikachu-wa aisukuriimu-ga moraeru kana?
pikachu-TOP *ice cream cone*-NOM *get-can* *wonder*
'Can Pikachu get an ice cream cone?'

Note that the minimum difference between (8) and (9) is the existence of the overt *sukunakutomo* 'at least'.[7]

3.4 Results

The interpretations of the pragmatically derived numerals by adults were 96.7%. Hence, adults had no problem with interpreting a sentence such as (8). The adults' interpretations of the overt *seizei* 'at most' and *sukunakutomo* 'at least' were 100%. On the other hand, the children's interpretations were different from those of the adults. In the analysis below, we show whether the true proportion of students getting the pragmatically derived 'at least N' or 'at most N' correct is equal to the true proportion of students getting overt counterparts (*sukunakutomo* 'at least' and *seizei* 'at most') correct. The alternative hypothesis is that the true proportion of students getting pragmatically derived 'at least N' and 'at most N' correct is less than that of those getting the overt counterparts correct. Based on the difference in a proportion z-test, we found that the proportion of children correctly interpreting pragmatically derived 'at least N' or 'at most N' is significantly less than the proportion of students correctly interpreting overt, with a p-value less than .001. Therefore, our study indicates that Japanese 5-6 year-olds children seem to understand the meanings of *sukunakutomo* 'at least' and *seizei* 'at most', while they appear not to have acquired the pragmatically derived 'at least' and 'at most' interpretations of numerals.

4 Discussion: Cross-Linguistic Differences and Implications of Acquisition Processes

The current study reveals a striking difference between English- and Japanese-speaking children with respect to the acquisition processes of pragmatically derived 'at least N' and 'at most N' of numerals. Musolino (2004) conducts experiments to find out whether or not 5-6 year-old children whose native language is English are able to interpret pragmatically derived 'at least N' and 'at most N' meanings of the numerals. The experimental method is TVJT. The relevant example is as follows:

(10) Goofy said that the Troll had to put two hoops on the pole in order to win the coin. Does the Troll win the coin? (Musolino 2004: 16)

[7] The example of *seizei* 'at most' is given at Appendix.

It turns out that these children in Musolino's study can understand the pragmatically derived meanings of the numerals. To determine whether those children could infer the pragmatically derived meanings of the numerals from the explicit counterparts (i.e., 'at least' and 'at most'), Musolino conducted experiments to find out whether or not children understood the explicit 'at least' and 'at most'. The results were that these children did not know the explicit meanings of 'at least' and 'at most'. Hence, Musolino assumes that the knowledge of the pragmatically derived 'at most' and 'at least' is not available in the environment:

(11) Goofy said that the Troll had to put at least two hoops on the pole in order to win the coin. Does the Troll win the coin?

One of the claims that Musolino makes is that children and adults have the same semantic representation for the numerals. Furthermore, Musolino assumes that children do not learn these implicit meanings of the numerals from the environment, but that the knowledge of the implicit meanings of the numerals is innately specified. However, Musolino's study does not show what would happen if children already know overt 'at least' or 'at most' vocabulary. Would they still interpret pragmatically derived meanings of 'at least' or 'at most' of the numerals as well as the explicit counterparts? Our study reveals that children who have already acquired 'at least' or 'at most' vocabulary seem to push back the acquisition of pragmatically derived meanings of the numerals. In other words, knowing the explicit vocabulary such as *sukunakutomo* 'at least' or *seizei* 'at most' does not guarantee or entail that children know the pragmatically derived meanings of the numerals. The difference of the acquisition processes of pragmatically derived meanings may not be surprising given the fact that the acquisition of the numerals is delayed in Japanese-speaking children due to the existence of the numeral classifier (Barner et al. 2009a). We do not know what causes the acquisition processes of the pragmatically derived meanings of the numerals to differ among languages. However, we do know that the learning processes of both pragmatically derived meanings of the numerals and the explicit ones are distinct and are not mutually helpful to each other. In other words, although the conceptual meanings are similar, they are independent of each other. Hence, our results support Musolino's experiments: acquiring the pragmatically derived meanings of the numerals has nothing to do with knowing the lexical counterparts. In the same line of thinking, our results show that knowing the explicit lexical words such as *sukunakutoko* 'at least' and *seizei* 'at most' has no effect on acquiring the pragmatic counterparts. We do not know what causes one language (such as Japanese) to delay the acquisition of

the pragmatic meanings of the numerals and vice versa in English. This implies the autonomy of semantics and pragmatics in our language system.

4 Conclusions

In this study, we argued that children do not infer the lexical meanings of 'at least' or 'at most' based on the pragmatic counterparts, and vice versa. Hence, it is implied that the domains of semantics and pragmatics are independent in the children's mind at this age. We are not sure why Japanese-speaking children cannot get access to the pragmatically derived meanings of the numerals at an early age, while the accessibility of the pragmatically derived ones is easier for English-speaking children. We also do not know what the situation is with children of other languages. We will reserve the study of this topic for our future research.

Appendix:

Pragmatically derived *seizei* 'at most'
Pochama: Burokkori-o tabe-nakya dame.
broccoli-ACC$_j$ *eat-must not good*
'You must eat broccoli.'

Burokkori-o tabe-tara, keeki-o ageru.
broccoli-ACC *eat-if* *cake*-ACC *be-given*
'If you eat broccolis, you will have a piece of cake.'

Picachu: Tabe-rare-temo huta-tu da naa.
eat-can-even if two-CL *is wonder*
'I can eat at most three if I am able to.'

Pochama: Sorezyaa dame.
If so *not good*
'If so, I will not give you a piece of cake.'

Picachu eats two pieces of broccoli. Can he eat a cake?

Overt *seizei* 'at most'
Pochama: Burokkori-o tabe-nakya dame.
broccoli-ACC$_j$ *eat-must not good*
'You must eat broccolis.'

Burokkori-o tabe-tara, keeki-o ageru.
broccoli-ACC *eat-if* *cake*-ACC *be-given*
'If you eat broccoli, you will have a piece of cake.'

Picachu: Tabe-rare-temo seizei huta-tu da naa.
eat-can-even if at most two-CL *is wonder*
'I can eat at most three if I am able to.'

Pochama: Sorezyaa dame.
If so *not good*
'If so, I will not give you a piece of cake.'

Picachu eats two pieces of broccoli. Can he eat a cake?

References

Barner, David, Katherine Chow & Shu-Ju Young. 2009a. Finding one's meaning: a test of the relation between quantifiers and integers in language development. *Cognitive Psychology*, 58 (2). 195–219.

Barner, David, Aamanda Libenson, Pierina Cheung & Mayu Takasaki. 2009b. Cross-linguistic relations between quantifiers and numerals in language acquisition: evidence from Japanese. *Journal of Experimental Child Psychology*, 103. 421–440.

Briars, Diane & Robert S. Siegler. 1984. A featural analysis of preschoolers' counting knowledge. *Developmental Psychology*, 20 (4). 607–618.

Carston, Roby. 1998. Informativeness, relevance and scalar implicature. In R. Carston & S. Uchida (Eds.), *Relevance theory: applications and implications*. Amsterdam: Benjamins.

Crain, Stephen & Rosalind Thornton. 1998. Investigations in universal grammar: a guide to research on the acquisition of syntax and semantics. Cambridge, MA: MIT Press.

Fuson, Karen. 1988. *Children's counting and concepts of number*. New York: Springer-Verlag.

Gallistel, Charles R. & Rochel Gelman. 1992. Preverbal and 0verbal counting and computation. *Cognition*, 44 (1–2). 23–74.

Gelman, Rochel & Charles R. Gallistel. 1978. *The child's understanding of number*. Cambridge, MA: Harvard University Pess.

Grice, Paul. 1989. *Studies in the way of word*s. Cambridge, MA: Harvard University Press.

Harnish, Robert. 1976. Logical form and implicature. In T. Bever, J. Katz & T. Langedoen (Eds.), *An integrated theory of linguistic ability* (pp. 313–391). New York: Crowell.

Horn, Laurence. 1971. *On the semantic properties of the logical operators in English*. Doctoral dissertation, UCLA. Distributed by IULC, Indiana University, Bloomington, IN.

Horn, Laurence. 1989. *A natural history of negation*. Chicago, IL: University of Chicago Press.

Horn, Laurence. 1992. The said and the unsaid. In C. Baker & D. Dowty (Eds.) (pp. 163–192). *Proceedings of SALT II*, Columbus, OH: Department of Linguistics, Ohio State University.

Kadmon, Nirit. 2001. *Formal pragmatics*. Oxford: Blackwell.

Lidz, Jeffrey & Julian Musolino. 2002. Children's command of quantification. *Cognition*, 84 (2). 113–154.

Musolino, Julian. 2004. The semantics and acquisition of number words: integrating linguistic and developmental perspective. *Cognition*, 93 (1). 1–14.

Papafragou, Anna & Julian Musolino. 2003. Scalar implicatures: experiments and the syntax semantics interface. *Cognition*, 86 (3). 253–282.

Sadock, Jerrold. 1984. Wither radical pragmatics? In D. Schiffrin (Ed.), *Meaning, form and use in context: linguistics applications*. Georgetown University Roundtable (pp. 139–149). Washington, DC: Georgetown University Press.

Sarnecka, Barbara W. & Susan A. Gelman. 2004. Six does not just mean a lot: preschoolers see number words as specific. *Cognition*, 92 (3). 329–352.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 365–379. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Optional and Obligatory Modal Subordination*

Peter Klecha
University of Chicago
klecha@uchicago.edu

Abstract. This paper raises the empirical point that modal subordination is not always obligatory, and that moreover, this is a point of lexical variation. Some modals, like *will*, which I call definite modals, undergo modal subordination obligatorily, and some, like *gonna*, which I call nondefinite modals, do so optionally. I propose a dynamic framework in which, following from Frank (1997), information states are possible discourse referents. I also propose that these referents are potentially subject to familiarity presuppositions, whose presence makes a modal definite, and whose absence makes a modal nondefinite.

1 Introduction

This paper presents novel data concerning the optionality (or lack thereof) of implicit conditional readings in various contexts, and proposes to account for these by adopting a dynamic semantic theory of modal subordination which crucially involves lexically variable familiarity presuppositions. The central contrast, first partially observed and discussed by Binnick (1971).

(1) a. Don't go near that bomb! It'll explode!
b. Don't go near that bomb! It's going to explode!

As Binnick noted, the second sentence in (1a) must be understood as meaning "If you go near it, it'll explode", i.e., it is an implicit conditional. Binnick also claimed that the corresponding sentence in (1b) cannot have such a conditional reading, but this is not true; indeed, (1b) *can* have an implicit conditional meaning; the difference is that it does not have to, while *will* does. To drive this empirical point home, consider (2), a context in which only the implicit conditional meaning is sensible.

(2) a. Don't drink that coffee. You'll burn your mouth.

* Thanks especially to Itamar Francez and Chris Kennedy, as well as M. Ryan Bochnak, Cleo Condoravdi, Kai von Fintel, Klaus von Heusinger, Joe Jalbert, Stefan Kaufmann, Greg Kobele, Marcin Morzycki, Alan Munn, Craige Roberts, Jerry Sadock, Kjell Johan Sæbø, Cristina Schmitt, E. Allyn Smith, Matt Teichmann, and Malte Willer for extensive discussion and feedback; any failures are despite their best efforts.

b. Don't drink that coffee. You're gonna burn your mouth.

Clearly, if *gonna* was incompatible with the implicit conditional meaning, (2b) would be infelicitous; but a conditional reading is found. Observe also the reverse case, one where the context demands the non-conditional reading, demonstrates that *will* indeed cannot support such a reading.

(3) a. Go check the incubators. # The eggs'll hatch.
b. Go check the incubators. The eggs are gonna hatch.

Despite the oddness of the conditional reading, that the eggs will hatch if you check them, the non-conditional reading cannot be forced in the case of *will*; the data here robustly shows *will* cannot support a non-conditional reading.

This paper provides an analysis of these facts, which have never been considered in the formal literature. I follow Roberts (1989), Geurts (1995), and Frank (1997) in analyzing these implicit conditional readings, which Roberts terms *modal subordination*, as cases of implicit domain restriction on modal expressions, but with the added feature of familiarity presuppositions (Heim 1982) whose presence gives rise to obligatory modal subordination, and whose absence allows for optionality.

Importantly, this distinction is not only relevant to *will* and *gonna*; rather, it is a distinction that pervades the entire class of modals. Modals generally can be divided into two subclasses: those that obligatorily undergo modal subordination, which I will call **definite modals** and those that do so optionally, which I will call **nondefinite modals**. Below are some examples.

(4) *Definite modals: modal subordination obligatory*
a. Don't go near that bomb! It would explode.
b. Don't go near that bomb! It could explode.

(5) *Nondefinite modals: modal subordination optional*
a. Don't go near that bomb! It's bound to explode.
b. Don't go near that bomb! It might explode.

This paper focuses on *will* and *gonna* as exemplars of these two classes, particularly because they form a minimal pair – besides their dynamic behavior, they are identical in meaning (observe that there is no truth-conditional difference between (1a) and the conditional reading of (1b)). The contrast in dynamic behavior therefore cannot be ascribed to any quality of the expressions other than simple lexical idiosyncrasy.

In section 2 I summarize arguments from the literature which show that *will* and *gonna* are modals and do undergo modal subordination, which is a

crucial point for the analysis. In section 3 I provide the formal analysis of optional and obligatory modal subordination and show that it predicts the relevant data. In section 4 I consider previous analyses. In section 5 I conclude.

2 Establishing Modality

Kratzer (1986) argues that conditionals simply consist of modals (which involve quantification over worlds) whose quantificational domain is restricted to the set of worlds denoted by the *if*-clause. The proposal by Roberts (1989) to consider implicit conditional readings like in (6b) as involving implicit domain restriction goes hand-in-hand with this account.

(6) a. You should eat a bagel.
b. It would fill you up. (Roberts 1989)

Roberts's original account does not treat *will* as a modal, however; rather it assumes it to be a simple tense (as is often the case in the literature, *gonna* is not discussed). The basic analysis of modal subordination developed by Roberts therefore cannot be sensibly applied to *will*. Instead she proposes an alternate strategy to account for cases like (7).

(7) a. If Edna forgets to fill the birdfeeder, she will feel bad.
b. The birds will get hungry. (Roberts 1989)

In the case of (7b), she proposes that *will* has a temporal-anaphoric relation with (7a). According to Roberts, there is a time salient in the discourse, namely the time associated with the hypothetical feeling-bad event in (7a); *will* in (7b) then picks up on this time, and the time of the getting-hungry event is taken to be after that of feeling-bad event, by the usual mechanism of temporal anaphora. However, in order to make sense of this, the getting-hungry event must occur in the same worlds as the feeling-bad event; (7b) is therefore accommodated as being under the scope of the modal in (7a).

Moreover, the claim that *will* is a tense is a fairly common one in the literature on modal subordination; for example, Asher & McCready (2007) claim that *will* indeed *cannot* have implicit conditional readings (apparently contrary to Roberts) due to its status as a tense[1], on the basis of (8) below.

(8) a. A wolf$_i$ might walk in. It$_i$ would eat you.
b. A wolf$_i$ might walk in. # It$_i$ will eat you.

[1] This is by no means a central argument for Asher & McCready, but it is worth clearing the air on this empirical point.

However, as seen above, *will* is clearly compatible with implicit conditional readings. The problem with (8a) is that the possibility is too implausible to be picked up by *will*, whereas *would* gives rise to an inference of unlikelihood when used in cases like (8a) (Iatridou 2000). Observe the following contrast:

(9) a. You can't go outside. You'll freeze.
b. You can't go outside. You'd freeze.

Both of these sentences are felicitous, but (9a) indicates that the hearer's going outside is relatively likely (and is accompanied well by a worried tone of voice) whereas the latter gives rise to an inference of unlikelihood (and goes well with a dismissive tone.)

Given the relative unlikelihood of wolves entering in any given context, *would* is highly appropriate in (8), and *will* may be degraded in this context due to scalar implicature. By fixing the context to include a more reasonable possibility, *will* (and *gonna*) can certainly have implicit conditional readings, along with a cross-sentence anaphoric dependency.

(10) Don't leave your journal out on the table. Someone$_i$ could read it!
a. They$_i$'ll discover your secrets!
b. They$_i$'re gonna discover your secrets!

The singular gender-neutral pronoun *they* is linked to *someone*, mirroring (8).

While (10) can be explained by Roberts (1989), there are many reasons to take *will* (and *gonna*) to be modals, as discussed in Klecha (2009). One that is particularly relevant is the fact itself that they undergo modal subordination. If *will* and *gonna* are taken to be modals, all cases of implicit conditional readings can be unified as cases of implicit domain restriction of a modal. Moreover, while Roberts's approach accounts for *will*, it is predicted to extend to past and present tenses as well; any simple tense which undergoes temporal anaphora should be able to trigger accommodation of the type proposed by Roberts for (10b). However, this prediction is not borne out.

(11) a. If Martina went to New York, she bought lots.
b. #She had fun.
c. If she went to New York and bought lots, she had fun.

(11b) cannot have the same meaning as (11c), contrary to Roberts's prediction. Rather, as argued in Klecha (2009), the fact that *will* (and *gonna*) undergo modal subordination and tenses do not is a strong argument for treating these expressions as modals, not tenses. See Klecha (2009) for further arguments for

a modal treatment of *will* and *gonna* as well as refutation of Kissine's (2008) arguments against a modal treatment.

Going forward I will therefore assume *will* and *gonna* to be modals, particularly necessity modals whose modal base is contextually variable (à la Kratzer 1977), but under the future reading at issue is a metaphysical modal base (e.g., Kaufmann 2005). In order to simplify the semantics, I will assume, contra Kaufmann (2005), that there is no ordering source.

3 Familiarity and Modality

I adopt a dynamic theory of implicit arguments along the lines of that developed by Condoravdi & Gawron (1996), (which in turn follows from Heim (1982)) but which also adapts proposals from Frank (1997). In this theory utterances are taken to update the information state. An information state is a representation of the information in a discourse that is shared and mutually updated by the conversational participants; both information about the world and information about the discourse itself, particularly the discourse referents.

Definite descriptions refer to familiar or salient objects in the discourse which are presupposed to already be present in the information state. Indefinite descriptions introduce novel objects into the information state, which are presupposed to have not already been present in the previous information state. Below I lay out a dynamic semantic framework which formalizes this.

3.1 The Basic Dynamic Framework

First, some basic definitions.

Definition 1: Basic Ontology W is the domain of worlds; E is the domain of individuals; {1, 0} is the domain of truth values; F is the domain of assignment functions, functions from variables to objects of any type.

Definition 2: Information States S is the set of information states such that

$$\mathrm{S} := \{\sigma \in Pow(W \times F) \mid \forall\langle w, f\rangle \in \sigma \,.\, \forall\langle u, g\rangle \in \sigma \,.\, Dom(f) = Dom(g)\}$$

Definition 2 above says that information states (ISs) are sets of world-assignment function pairs, and moreover that every assignment function in a given IS has the same domain.

Definition 3: Sentences If X is a sentence, $[\![\mathrm{X}]\!] = \phi : S \mapsto S$

Objects within double brackets $[\![.]\!]$ are taken to be sentences. Definition 3 above says that sentences are interpreted as update conditions, or functions from ISs to ISs. Usual function-argument notation is eschewed in favor of the more iconic $\sigma + \phi = \sigma'$, where σ is the old IS, ϕ is a sentence meaning, and σ' is the new IS.

Definition 4: Relating Assignment Functions $\forall f, g \in \mathrm{F}$:

1. $f < g$ iff $Dom(f) \subset Dom(g)$ and $\forall v \in Dom(f).f(v) = g(v)$
2. $f \leq g$ iff $f < g$ or $f = g$
3. $f <_x g$ iff $f < g$ and $Dom(g) = Dom(f) \cup \{x\}$
4. $f^{x/a} = \iota g.g(x) = a$ & $\forall v \in Dom(f).v \neq x \rightarrow f(v) = g(v)$ & $\forall v \in Dom(g).v \neq x \rightarrow f(v) = g(v)$

Definition 4.1 above says that an assignment function g is an extension of f if its domain is a proper superset of f's and for all the variables they have in common, they map to same objects. Definition 4.2 defines non-proper extension. Definition 4.3 says that g extends f by x if g is an extension of f and the only thing f has in its domain which g does not is x. Definition 4.4 says that $f^{x/a}$ defines the function which is just like f, except that it maps x to a; this neither presupposes that $f(x)$ is defined nor that $f(x)$ is not a.

For a simple example of (in)definiteness in this framework, consider (12).

(12) a. A dog_x walked in.

b. $\sigma_0 + [\![\text{a } \mathrm{dog}_x \text{ walked in}]\!] = \sigma_1 =$
$\{\langle w, f\rangle \mid \exists \langle w, g\rangle \in \sigma_0 : g <_x f$ & $\mathrm{dog}(f(x))(w)$ & walked-in$(f(x))(w)\}$
if $\forall \langle w, f\rangle \in \sigma_0 : x \notin Dom(f)$, else undefined.

In (12), the IS is changed from one which previously did not include an assignment for x, σ_0, to one which does, σ_1; moreover any worlds where a dog did not walk in are eliminated. This IS can then serve as the context for an utterance with a definite DP with index x. Note that this update only proceeds if x was not defined in σ_0; i.e., it bears a novelty presupposition.

(13) a. It_x sat down.

b. $\sigma_1 + [\![\mathrm{it}_x \text{ sat down}]\!] = \sigma_2 =$
$\{\langle w, f\rangle \in \sigma_1 \mid \text{sat-down}((f(x))(w)\}$
if $\forall \langle w, f\rangle \in \sigma_1 : x \in Dom(f)$, else undefined.

The definiteness of the DP *it* is represented by a familiarity condition, as in Heim (1982), i.e., a requirement that the variable associated with the DP (above, x), be in the domain of every assignment function in σ_1; this condition is satisfied because x was introduced into σ_1 by *a dog* in (12).

3.2 Information States as Referents

I analyze modal subordination as involving reference to ISs, or modal bases, following Frank (1997). A modal base is a subordinated IS; i.e., an IS which

serves not as the input to a matrix sentence, but as the conversational background of a modal expression, along the lines of Kratzer (1977, 1981).

Top-level ISs, i.e., those that serve as the input to a matrix sentence, may include assignment functions which map variables to ISs (i.e., modal bases). An expression may therefore carry an index which maps to a modal base. By default, however, there are no such mappings in an IS; they must be introduced.

Some expressions, like *will*, require that some IS be familiar in the context. Others, like *gonna*, allow for reference to a familiar IS, but in the absence of one, can introduce an IS into the context. In order to handle this, I introduce the default notation below.

Definition 5: Default Information States $\forall f \in \mathrm{F} \,.\, \forall x \in \mathrm{VAR}_S \,.\, f[x] = [\imath g.[x \in \mathit{Dom}(f) \;\&\; g = f] \vee [x \notin \mathit{Dom}(f) \;\&\; g = f^{x/\{\langle w,h\rangle \in W \times F : h = f\}}]](x)$

Definition 5 says that $f[x]$ is defined for two conditions. If x is defined in f, $f[x] = f(x)$. If x is not defined in f, $f[x]$ returns the minimal IS, one which includes all worlds, and for which the assignment function is simply f. This is the default IS because it entails no information and introduces no new referents.

As also discussed in Kratzer (1977), modal expressions may be lexically specified for which categories of modal base they may take, e.g., deontic, metaphysical, epistemic, etc. I will limit my discussion mainly to metaphysical modals to avoid any discussion of ordering sources, which will complicate the picture. Moreover, the discussion will be limited to metaphysical modality, the modality of the predictive readings of expressions like *will*, *gonna*, *might*, etc. (Condoravdi 2002, Kaufmann 2005).

Definition 6: Accessible Information States $\textsc{met}(\mathrm{w,f}) = \{\langle u, g\rangle \mid u$ branches from w at utterance time $\;\&\; \forall v \in \mathit{Dom}(f) : f(v) \notin S \,.\, v \in \mathit{Dom}(g) \;\&\; f(v) = g(v) \;\&\; \neg\exists v' \,.\, g(v') \in S\}$

As defined above, MET is an accessibility relation which takes a world-assignment pair and gives back the IS that is metaphysically accessible from it. What this entails is that i) the worlds in the accessible IS branch from the input world at utterance time[2], meaning they are identical up to utterance time but may diverge beyond that; ii) the assignments are identical to the input assignment, except that they may not themselves include mappings to ISs. This prevents any multiply-sudordinated ISs.[3] In order to show how the modal base restricts the domain of a modal, I introduce the operator $\uparrow$.

[2] I will avoid any discussion of times beyond this for simplicity.

[3] This move is for simplicity. Whether or not this is desirable is an empirical question.

Definition 7: Restricted Information States $\forall\sigma,\sigma' \in S$

$$\sigma \uparrow \sigma' = \{\langle w,f\rangle \in \sigma' \mid \exists\langle u,g\rangle \in \sigma \,.\, w = u \;\&\; f \geq g\}$$

Definition 7 allows for the definition of complex ISs. It says roughly that the worlds in $\sigma \uparrow \sigma'$ are in both σ and σ', and the assignments in $\sigma \uparrow \sigma'$ are those in σ' which are equal to or extensions of those in σ.

3.3 The Core Analysis

The necessary formalisms now being in place, the relevant denotations can be given. First, I give the denotation for *will*, which obligatorily undergoes modal subordination. I will assume that all relevant modal expressions combine with a vP, which denotes an update, and carry an index.[4]

will If $[\![\text{vP}]\!] = \phi$, then $\sigma + [\![\text{will}_m\ \text{vP}]\!] =$
$\{\langle w,f\rangle \mid \exists\langle u,g\rangle \in \sigma \,.\, w = u \;\&\; f = g^{m/g[m]+\phi} \;\&$
$\forall\langle v,h\rangle \in \text{MET}(u,g) \uparrow g[m] \,.\, \exists h'.\{\langle v,h\rangle\} + \phi = \{\langle v,h'\rangle\}\}$
if $\forall\langle u,g\rangle \in \sigma \,.\, m \in Dom(g)$, else undefined.

The denotation says that $will_m$ combines with a vP denoting ϕ to return a function from σ to σ' such that, for every $\langle w,f\rangle$ in σ', there is some $\langle u,g\rangle$ in σ such that i) u is w; ii) f is just like g except that $f(m)$ is the result of updating $g[m]$ with ϕ; iii) for every metaphysically accessible $\langle v,h\rangle$ in $g[m]$, v survives update with ϕ. Moreover, m is required to be familiar in σ.

This means that *will* basically does two things. The first is that it updates the subordinated ISs with ϕ; any novel discourse referents in ϕ are added to the assignment functions of each subordinated IS.[5] This is the main dynamic of effect of *will*, and every other modal; it updates the subordinated IS with its sister vP, potentially introducing modally subordinated discourse referents.

The second thing *will* does is to say that every metaphysically accessible world in the subordinated IS survives update with ϕ. In other words, any $\langle w,f\rangle$ in the old IS such that all the worlds in MET(w,f) are not ϕ worlds will be eliminated. This is the core meaning of *will* – it requires that ϕ is true in all the

[4] This denotation is actually simplified in at least one way: it suggests that the modal base of *will* is lexically determined to be the metaphysical modal base; however, like most modals, it is compatible with at least one other category of modal base, not just metaphysically accessible ones. Thus the third line of the denotation should read as in (i), such that all the modal bases *will* can take are enumerated.

(i) $\text{ACC} = \text{MET}(u,g) \vee \text{ACC} = \text{X}(u,g) \vee \ldots \;\&\; \forall\langle v,h\rangle \in \text{ACC} \uparrow g[m]\ldots$

[5] It also causes any worlds in which ϕ is not true to be removed from the subordinated ISs, although this is not relevant for necessity modals since they require that ϕ be true in all worlds of the subordinated IS.

salient accessible worlds.

As an example, consider (1a), repeated as (14). Without delving into the semantics of the imperative (or for that matter, negation), I will assume a denotation for the first sentence which does the minimal work necessary: making a certain set of worlds salient.

(14) a. Don't go near that bomb. It'll explode.

b. $[\![$you go near that bomb$]\!] = \phi$
$\sigma_0 + [\![$don't$_m$ go near that bomb$]\!] = \sigma_1 =$
$\{\langle u, g\rangle \mid \exists \langle w, f\rangle \in \sigma_0 \ldots g = f^{m/\lambda + \phi} \ldots\}$

c. $[\![$it explodes$]\!] = \psi$
$\sigma_1 + [\![$it will$_m$ explode$]\!] = \sigma_2 =$
$\{\langle w, f\rangle \mid \exists \langle u, g\rangle \in \sigma \,.\, w = u \;\&\; f = g^{m/g[m] + \psi} \;\&$
$\forall \langle v, h\rangle \in \text{MET}(u, g) \uparrow g[m] \,.\, \exists h' . \{\langle v, h\rangle\} + \psi = \{\langle v, h'\rangle\}\}$
if $\forall \langle u, g\rangle \in \sigma \,.\, m \in Dom(g)$, else undefined.

In (14b), the imperative constrains the context so that for every world-assignment pair, the assignment maps m to the set of worlds where the addressee goes near some previously established bomb. In (14c), *will* updates each assignment of m with ψ. It then requires that every metaphysically accessible world-assignment pair in which you go near the bomb is a world-assignment pair in which the bomb explodes. Its presupposition – that m be defined in all assignments in σ_1 – is met, since the imperative made sure that m was defined.[6]

Notice that *will* does not require that all worlds in $f(m)$ be metaphysically accessible (though some have to be); in other words, the IS that serves as its domain of quantification is not the same IS as the one which it makes salient. This is a crucial property of all modals, since modal subordination can take place across modal base types.

(15) a. I might get a dog$_x$. But I have to walk it$_x$ every day.

b. You have to wear a tie. But you won't like it.

Notice that the second sentence of (15b) means "If you wear a tie, you won't like it" not "If you wear a tie, you won't have to like it" or anything along those lines. In other words, the IS made salient by *have to* is not restricted to just deontically accessible worlds.

Now consider *gonna*; it is exactly like *will* except that it does not have a familiarity presupposition.[7]

[6] Whether it introduced m or presupposed it is beyond the scope of this paper.

[7] As with *will*, *gonna*'s modal base variability is glossed over.

gonna If $[\![\text{vP}]\!] = \phi$, then $\sigma+ [\![\text{gonna}_m \text{ vP}]\!] =$
$\{\langle w,f\rangle \mid \exists\langle u,g\rangle \in \sigma \,.\, w = u \;\&\; f = g^{m/g[m]+\phi} \;\&$
$\forall\langle v,h\rangle \in \text{MET}(u,g) \uparrow g[m] \,.\, \exists h'.\{\langle v,h\rangle\} + \phi = \{\langle v,h'\rangle\}\}$

Note that if *will* is replaced with *gonna* in (15), the exact same update will proceed. This is desired since *gonna* can have the same reading *will* does. However, consider the same situation, but where *gonna* carries a different index from that carried by the imperative.

(16) a. Don't go near that bomb. It's gonna explode.
b. $[\![\text{you go near that bomb}]\!] = \phi$
$\sigma_0+ [\![\text{don't}_m \text{ go near that bomb}]\!] = \sigma_1 =$
$\{\langle u,g\rangle \mid \exists\langle w,f\rangle \in \sigma_0 \,...\, g = f^{m/\lambda+\phi} \,...\,\}$
c. $[\![\text{it explodes}]\!] = \psi$
$\sigma_1+ [\![\text{it is gonna}_n \text{ explode}]\!] = \sigma_2 =$
$\{\langle w,f\rangle \mid \exists\langle u,g\rangle \in \sigma \,.\, w = u \;\&\; f = g^{n/g[n]+\psi} \;\&$
$\forall\langle v,h\rangle \in \text{MET}(u,g) \uparrow g[n] \,.\, \exists h'.\{\langle v,h\rangle\} + \psi = \{\langle v,h'\rangle\}\}$

Since n is not in the domain of the assignments in σ_1, $g[n]$ denotes the minimal IS. This means that *gonna* quantifies over the whole set of metaphysically accessible worlds rather than some subset of them. Thus the non-conditional reading is achieved. However, if *will* were to replace *gonna* in (16), it would fail to update, as n is not defined in the assignments in σ_1.

(17) a. Don't$_m$ go near that bomb. It's gonna$_{m,n}$ explode.
b. Don't$_m$ go near that bomb. It'll$_{m,*n}$ explode.

This is the desired result. Modal subordination is thus analyzed as fully analogous to reference in the individual domain, in line with Frank (1997). It is mediated by assignment function and potentially restricted by presuppositions on the context, as determined by lexical idiosyncrasy. It is this second fact that is new here, and which lends further support to Frank's hypothesis; the usual machinery of assignment functions and familiarity presuppositions is completely adequate to predict the data.

Notice that the treatment of modal subordination as analagous to individual reference makes a prediction: definite modals like *will* should be bad in discourse initial contexts, just like other definite descriptions which carry familiarity presuppositions. This prediction is borne out; as observed by Binnick (1971), *will* is much worse than *gonna* discourse-initially.[8]

[8] Register matters greatly here. In more formal and literary registers *will* behaves much more like *gonna*, which is absent these registers. (i) would be felicitous in a newspaper setting, as read by a

(18) *Max walks into a room and says...*

a. #I'll fail my exam.
b. I'm gonna fail my exam.

Notice that this is not because *will* is temporally anaphoric; unlike the progressive, a temporal adverbial like *tonight* does not improve *will* discourse initially.

(19) *Jasmin walks into a room and says...*

a. #I'll watch a lot of TV (tonight).
b. I'm gonna watch a lot of TV (tonight).
c. I was watching a lot of TV #(last night).

Crucially, while *will* has a familiarity presupposition and is thus analagous to a definite DP, *gonna* does not bear a novelty presupposition and so is not analagous to an indefinite DP. Rather, it is unspecified for definiteness; there is no constraint on the novelty/familiarity of its index.

There is, however, a constraint on what it introduces if its index is novel; it introduces the minimal IS (and then updates it with its prejacent). This behavior, referring either to a familiar referent or to a default, is not unique to nondefinite modals. Consider the contrast between *near there* and *nearby*, as discussed by Condoravdi & Gawron (1996).

(20) *Graham walks into a room and says...*

a. #There's an ice cream truck near there!
b. There's an ice cream truck nearby!

(21) a. I hate going to the gym$_x$. Anna is always hanging out near there$_x$.
b. I hate going to the gym$_x$. Anna is always hanging out nearby$_x$.

This pattern is identical to that displayed by *will* and *gonna*; *nearby* can refer to a salient location or simply the speaker's location, but *near there* cannot have this default reference.

This account does not predict that *will* always have a conditional meaning. Haegeman (1989) observes that *will* can be used after a use of *gonna*.

---

news anchor, and many other formal contexts.

(i) The president will send 20,000 more troops to Afghanistan.

Crucially, the same sentence uttered in a casual context is infelicitous discourse initially. This paper thus constitutes a study of the grammar of colloquial Standard American English in casual registers.

(22) It's gonna rain. The roads'll be wet.

Here *the roads'll be wet* looks like a simple prediction, but my account predicts this. *will* picks up on the worlds where it rains, as made familiar by *gonna*, but since all the metaphysically accessible worlds are worlds where it rains (as required by *gonna*), *will* ends up not looking conditional. Any other expression that introduces a superset of the metaphysically accessible worlds as the subordinated IS will thus allow *will* to have a nonconditional reading.

4 Previous Analyses

4.1 Modal Subordination

The only other work to address the fact that some modals are better than others in discourse initial contexts is Asher & McCready (2007, henceforth A&M), although it is not the focus of their paper. In their account, ISs are sets of 4-tuples $\langle w, f, G, F \rangle$ where G is the set of global possibilities and F is the set of local possibilities, akin to the subordinated IS in my framework.

For A&M, in the default state, $F = G$. This is crucially different from the analysis presented here, wherein by default no indices are mapped to ISs, which accounts for definite modals' inability to appear discourse intially. They do, however, note that *would* is "not as good" in (23) as the reverse case.

(23) A wolf would walk in. It might eat you first.

A&M claim that their "account explains this because in an out of the blue context, both the local and global possibilities are initially set to a very large set of epistemic possibilities, and it seems implausible that all of those possibilities contain a wolf that walks in. But that is what would have to happen in order for the *would* statement in (23) to go through" (Asher & McCready 2007: 114). This isn't a satisfying explanation, however. Consider (24).

(24) A wolf is about to walk in.

In most contexts, this is an absurd statement. It depicts a highly unlikely event and is almost certainly false, for example, at the time and place of the writing of this paper. However, it is not infelicitous; it is perfectly meaningful and understandable. That is not the issue with (23); the first sentence is utterly meaningless, and would still be even if it were uttered in a context where a wolf walking in is a real possibility. Moreover, this strategy for explaining discourse initial infelicity is unlikely to account for the *will*/*gonna* distinction, since they are a minimal pair, taking the same modal base/ordering source. The only adequate analysis is one which says that these lexical items simply place different

presuppositions on the context of utterance.

4.2 Futures

Besides establishing a parameter of variation among all modal lexical items, i.e., whether or not they have a familiarity presupposition, this paper also addresses a long-standing debate on the difference between *will* and *gonna*. A recent and noteworthy account of the *will*/*gonna* contrast is in Copley (2002). Her account is centered around the following contrast:

(25) *Carissa*: Can anyone help set up for the reception?
  a. *Jackson*: I will.
  b. *Jackson*: I'm going to.

Copley's observation is that (25a) is a good offer, while (25b) is not. (25b) is felicitous, but only as a prediction. (25b) sounds presumptive and inconsiderate, (25a) sounds polite. Copley's account is that while *will* is a simple metaphysical necessity modal (very much like the character I ascribe to *gonna*), *gonna* is a metaphysical necessity modal scoped over by an imperfective operator; it thus quantifies over worlds which branch from the evaluation world during an interval containing now. The effect of this is that *gonna* ϕ entails that ϕ has been settled for a little while, whereas *will* ϕ only entails that it is settled now.

This is intended to capture the inference in (25b) Jackson was already planning to help set up for colloquium. According to Copley, a felicity condition on offers says that for an utterance to be an offer, it must mean (roughly) "if you want p, then p". The denotation given to *gonna* rules this out, since Jackson is entailed to have already decided. However, this account makes wrong predictions; notice that it is not entailed by (25b) that Jackson has already decided; it is also true in a context where Jackson has decided on the spot to help set up (but is still being rude about it). Furthermore, Copley does not make the right predictions regarding the data discussed in Section 3.

However, there is still the issue of the offer data to be discussed. I argue that there are two *will*s: one which has the meaning I have argued for, and the other being a dedicated offering expression. First of all, consider that in Spanish, the simple present is used to make offers, not the future, as seen in (26). This suggests that the expression used for offers in a given language can't be derived from some principle behind the meaning of offers, rather, each language has some arbitrary lexicalized form for expressing offers.

(26) Ya abro la ventana yo.
"I'll open the window."

Moreover, there is also a performative aspect to offer-*will* not present in the other *will*, in (27), which is explainable if they are simply separate lexical items.

(27) a. *Alice*: I'll make coffee. *Ryan*: # That's not true!
b. *Alice*: Don't go near that! It'll blow up! *Ryan*: That's not true!

I therefore exclude offer-*will* from the analysis.

5 Conclusion

This paper raises the empirical point that modal subordination is sometimes obligatory and sometimes optional, and moreover that this is a point of lexical variation. Modals can be divided into at least two classes: definite modals, which must have some antecedent in the discourse, and which include at least *will*, *would*, and *could*; and nondefinite modals, which include *gonna*, *might*, *may*, *bound to*, *have to*, *should*, and possibly many others. An analysis is then put forward which provides a distributive, eliminative semantics for modal subordination, one which makes use of familiarity presuppositions (Heim 1982) to derive the crucial contrasts.

The upshot of this proposal is that modal subordination is really nothing special; it is simply a case of contextual domain restriction, which is itself a special case of anaphora. It is simply a property of the lexical entailments and presuppositions of the expressions in a given sentence, and is thus subject to lexical variation. This lexical variability suggests that we might find a third category of modals, in fact, which complete the paradigm and never undergo modal subordination. One such modal may be *must*.

(28) a. *Julia*: Someone$_x$ might be waiting for me.
Rebekah: # They$_x$ must know you're not there.
b. *Tim*: There might be blood in there.
Ezra: He must be the killer.

Ezra's utterance in (28b) cannot mean "If there's blood in there, he must be the killer". The existence of such a modal comes as no surprise in the framework I have laid out, since it allows for lexical variability on this front. Moreover, there is nothing special about modals – any semantic category of expressions can in principle display these basic properties.

(29) *Past Habituals*
a. My family used to go to Albion. We would drive through Ontario.
b. #My family would go to Albion. We used to drive through Ontario.

(29) shows that *used to* can introduce some kind of habitual timeframe, which *would* can then pick up on anaphorically. Discourse initially, however, *would* is infelicitous. The abundance of anaphoric relations across categories make it no surprise that modals display this behavior as well.

References

Asher, Nicholas & Eric McCready. 2007. Were, would, might and a compositional account of counterfactuals. *Journal of Semantics* 24. 93–129.

Binnick, Robert. 1971. Will and be going to. *Proceedings of CLS* 7. 40–52.

Condoravdi, Cleo. 2002. Temporal interpretation of modals: Modals for the present and for the past. In D. Beaver, S. Kaufmann, B. Clark & L. Casillas (eds.), *The construction of meaning*, 59–88. CSLI Publications.

Condoravdi, Cleo & Jean Mark Gawron. 1996. The context-dependency of implicit arguments. In *Quantifiers, deduction, and context*, CSLI Publications.

Copley, Bridget. 2002. *The semantics of the future*: MIT dissertation.

Frank, Anette. 1997. *Context dependence in modal constructions*: University of Stuttgart dissertation.

Geurts, Bart. 1995. *Presupposing*: University of Stuttgart dissertation.

Haegeman, Liliane. 1989. Be going to and will: a pragmatic account. *Journal of Linguistics* 25(2). 291–317.

Heim, Irene. 1982. *The semantics of definite and indefinite nps*: MIT dissertation.

Iatridou, Sabine. 2000. The grammatical ingredients of counterfactuality. *Linguistic Inquiry* 31(2). 231–270.

Kaufmann, Stefan. 2005. Conditional truth and future reference. *Journal of Semantics* 22. 119–128.

Kissine, Mikhail. 2008. Why *will* is not a modal. *Natural Language Semantics* 16(2). 129–155.

Klecha, Peter. 2009. The modality of english futures. Talk, Chronos 9; http://home.uchicago.edu/~klecha/mef.pdf.

Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1(3). 337–355.

Kratzer, Angelika. 1981. The notional category of modality. In H.-J. Eikmeyer & H. Rieser (eds.), *Words, worlds, and context*, 38–74. de Gruyter.

Kratzer, Angelika. 1986. Conditionals. *Proceedings of CLS* 22(2). 1–15.

Roberts, Craige. 1989. Modal subordination and pronominal anaphora in discourse. *Linguistics and Philosophy* 12(6). 683–721.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 381–396. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Direction and Obviation in Plains Cree: A Referent Systems Approach

Udo Klein
University of Bielefeld
udo.klein@uni-bielefeld.de

Marcus Kracht
University of Bielefeld
marcus.kracht@uni-bielefeld.de

Abstract. We present a calculus in which the variables occurring in semantic representations are associated with morphosyntactic information, and the semantic composition of two representations consists in the identification of variables with matching morphosyntactic information. Importantly, shared morphological information can lead to the identification of variables irrespective of the order of composition. This flexibility, we argue, is an important advantage in analysing the syntax-semantics interface of languages like Plains Cree, where the person and number properties of the arguments as well as the assignment of semantic roles to arguments is almost exclusively determined by the complex morphological properties of the verb.

1 Introduction

In type-driven semantics, semantic role assignment depends on the order of composition. If the denotation of *see* is $[\![see]\!] = \lambda y.\lambda x.\mathsf{see}'(x,y)$ with $\mathsf{see}'(a,b)$ iff a sees b, then the first argument to which the function applies will be assigned the semantic role of entity being seen, and the next argument will be assigned the semantic role of person seeing, so that $[\![see]\!]([\![Paul]\!])([\![Marc]\!]) = \mathsf{see}'(\mathsf{marc}',\mathsf{paul}')$ holds if Marc sees Paul. This order-dependent assignment of semantic roles works well if argument linking in a language is determined exclusively by word order. But what, if instead the assignment of semantic roles is determined by the morphosyntactic information associated with predicate and argument? To illustrate, assume for simplicity that an argument is assigned the patient-like semantic role if it is accusative, and the agent-like semantic role if nominative, as in *Videt Marcus Paulum.* ('Marc sees Paul.'). Two strategies can be pursued. First, one could assume that the role of the case morphology is to restrict the hierarchical position in which an NP can occur at the deep structure: if it is marked with accusative it can only occur as a sister of a transitive verb, if it is marked as nominative, it can only occur as a sister of a verb phrase. So despite the various possible surface orders, the deep structure is always [*Marcus* [*videt Paulum*]]. Alternatively, one can assume that the accusative morpheme denotes a function *acc*, which when applied to an NP-denotation n and a function v yields $acc(n)(v) = v(n)$, and that the nominative morpheme denotes a

function:

$$nom(n)(v) = \begin{cases} v(n), & \text{if } v \text{ is unary function} \\ \lambda x.(v(x)(n)), & \text{if } v \text{ is binary function} \end{cases}$$

In the first alternative, case is interpreted as a syntactic filter on permissible constituent structure (trees), so that an accusative NP is guaranteed to be the first argument of the predicate. In the second alternative, case is interpreted as a function which essentially makes sure that the argument it applies to, i.e. the NP denotation, occurs in the appropriate position in the λ-term. So despite the fact that (word) order plays no role in the descriptive generalization underlying semantic role assignment, both strategies use the morphological information to restrict the order of application, which in turn determines the assignment of semantic roles.

The idea we shall develop in this paper is that morphosyntactic (in particular inflectional) information can determine the assignment of semantic roles directly and irrespective of the order of composition. Semantic composition consists in identifying variables with matching morphosyntactic information. Assuming that $[\![\textit{videt}]\!] := \mathsf{see}'(x, y)$, and that the denotation of *Paulum* is $z = \mathsf{paul}'$, and assuming further that the morphosyntactic information associated with the variable y of *videt* matches the information associated with z of *Paulum*, we shall provide a calculus which identifies the variable y of $[\![\textit{videt}]\!]$ with the variable z of $[\![\textit{Paulum}]\!]$, and thus assigns the semantic role of entity seen to paul'.

As a case study we have chosen the direction and obviation system in Plains Cree, since in this language the person and number properties of the arguments as well as the assignment of semantic roles to arguments is almost exclusively determined by the complex morphological properties of the verb, and not by word order. In section 2 we sketch the direction and obviation system in Plains Cree, in 3 we introduce the theory of referent systems, in section 4 we provide the analysis of direction and obviation in terms of referent systems, and in section 5 we conclude.

2 Direction and Obviation in Plains Cree

Plains Cree is one of four dialects of Modern Cree, an Algonquian language spoken by around 60.000 people in Canada. It has a basically agglutinative structure, with a comparatively simple nominal inflection, but a formidably complex verbal inflectional system.[1] Zúñiga (2006), Dahlstrom (1986) and oth-

[1] The categories involved in the nominal system are possession, number, gender and obviation (no case), cf. Zúñiga (2006).

ers distinguish no less than nine affix positions in the verbal template of Plains Cree. Three of them (the fourth, sixth and eighth suffix) express tense, aspect and mood, whereas the others are related to the direction and obviation system, a fragment of which we present below.

The rich inflectional system of the verb is instrumental in expressing (i) the person and number properties of the verbal arguments, as well as (ii) the linking between verbal arguments and the semantic roles of the predicate. The argument linking in Plains Cree can be characterized by three basic features. First, some of the affixes (the prefix and the fifth suffix) impose restrictions on the person and number features of the verbal arguments irrespective of the particular semantic role of the argument or the number of arguments of a verb. Secondly, the link between semantic roles and arguments is established by the direction suffix (the second suffix) which adds the person and number information about the agent-like and patient-like arguments. When the predicate involves third person arguments, the direction suffix also adds information about which of the arguments is proximative (and which obviative). Finally, overtly realized third person noun phrases are morphologically marked as proximative or obviative, so that the semantic composition of noun phrase and verb is determined not by word order or position in hierarchical structure, but by sharing the same morphological feature.

To begin with, consider the following minimal pair:[2][3]

(1) a. Ki-pimipahtā-n.
2-run-SAP.SG
'You (sg) run.'
b. Ni-pimipahtā-n.
1-run-SAP.SG
'I run.'

The prefix indicates whether the participants in the relation denoted by the predicate include a speech act participant, according to the following generalization:

(2) First Prefix Generalization (based on Zúñiga (2006: 73)):
a. *ki-* is used whenever the addressee or a group containing the addressee is an argument; else:
b. *ni-* is used whenever the speaker or a group containing the speaker is argument; else

[2] All examples are quoted from Zúñiga (2006).

[3] Glossing: 1, 2, 3: first, second, third person; SAP: speech act participant; SG, PL: singular, plural; EXCL, INCL: exclusive, inclusive; DIR, INV: direct, inverse; PROX, OBV: proximative, obviative.

c. ∅-, i.e. if no SAP is an argument

The final affix *-n* also encodes information about the person and number of the participants, as illustrated by the following examples:

(3) a. Ni-pimipahtā-nān.
1-run-SAP.PL.EXCL
'We (excluding addressee) run.'
b. Ni-pimipahtā-n.
1-run-SAP.SG
'I run.'

The fifth suffix in the verbal template adds information about person and number of the participants according to the following generalization:

(4) FIFTH SUFFIX GENERALIZATION (based on Zúñiga (2006: 78)):
a. if one participant is 1 exclusive plural, then *-nān*; else
b. if one participant is 1 inclusive plural, then *-nānaw*; else
c. if one participant is 2 plural, then *-nāwāw*; else
d. if one participant is 3, then *-w*; else
e. (if 1SG or 2SG, then) *-n*

We briefly mention four important aspects of these two generalizations. First, they have an IF-THEN-ELSE structure, or put differently, they involve hierarchies, and secondly, the hierarchies involved differ from one another (and can therefore not be reduced to one hierarchy).

(5) Hierarchies involved:

Slot	**Description**	**relevant hierarchy**
prefix	**highest participant**	**2 > 1 > 3**
2. suffix	**direction**	**SAP > 3prox > 3obv > 3f.obv**
5. suffix	**person/number**	**1p > 12/2p > 3anim > sSAP > 3inan**

Thirdly, these two generalizations are insensitive to the number of arguments a predicate has. To see this note that the transitive verb *pēhtaw* ('hear') in (6):

(6) Ki- pēhtaw -i -n.
2- hear -DIR(2→1) -SAP.SG
'You$_{SG}$ hear me.'

and the intransitive verb *pimipahtā* ('run') in (1a) are both prefixed by *ki-* and

suffixed by *-n*. And fourthly, the generalizations do not make any reference to (specific or generalized) semantic roles, so that first prefix and fifth suffix are fixed by the person and number properties of the arguments irrespective of their semantic roles, which can be illustrated by the following minimal pair:

(7) a. Ki- pēhtaw -i -n.
2- hear -DIR(2→1) -SAP.SG
'You$_{SG}$ hear me.'
b. Ki- pēhtaw -iti -n.
2- hear -INV(1→2) -SAP.SG
'I hear you$_{SG}$.'

The link between arguments and semantic roles is established by the so-called direction suffix (the second suffix). The only morphosyntactic difference between these sentence pairs is the so-called direction suffix *-i* in (7a) and *iti* in (7b), which correlates with the difference in semantic role assignment. In (7a) the addressee is the person hearing, and the speaker the person heard, whereas in (7b) the semantic role assignment is reversed.

Together, the three affixes impose restrictions on the person and number of the arguments, but only the direction suffix provides information about the link between arguments and semantic roles. Different participant configurations call for different direction suffixes. The local configuration, illustrated above, involves only speech act participants (or groups containing speech act participants). In the mixed configuration, in which one argument is a SAP and another one is not, the respective direction suffixes are *-ā* and *-ikw*.

(8) a. Ki- sēkih -ā -w
2- frighten -DIR(2→ 3) *-3*
'You (sg) frighten him/her.'
b. Ki- sēkih -ikw -w
2- frighten -DIR(3 → 2) *-3*
'He/she frightens you (sg).'

And finally, in the non-local configuration, where neither argument is a SAP, the direction suffixes are *-ē/-ā* and *-ikw*.

(9) a. ∅- sēkih -ē -w
3- frighten -DIR(3.PROX → 3.OBV) *-3*
'He (prox) frightens him/her/them (obv).'
b. ∅- sēkih -ikw -w
3- frighten -DIR(3.OBV → 3.PROX) *-3*
'He/she/they (obv) frighten(s) him/her (prox).'

The direction suffixes for the different participant configurations are summed up below:

(10) The DIRECTION.SUFFIXES (for transitive verbs with animate objects):

	local		mixed		non-local	
DIR	*-i*	2→1	*-ā*	SAP→3	*-ē*	3_{PROX}→3_{OBV}
INV	*-iti*	1→2	*-ikw*	3→SAP	*-ikw*	3_{OBV}→3_{PROX}

The proximative-obviative distinction is realized not only in the verbal system but also in the nominal system. If a third person argument is overtly realized as a noun phrase, then it is morphologically marked either as proximative or as obviative.

(11) O- wīcēwākan **-a** ∅- miskaw -ē -w **awa** nēhiyaw.
3POSS- *companion* **-OBV** *3- find* -DIR *-3* **DEM:PROX** *Cree*
'The Cree_{prox} found his comrades.'

(12) Tāpwē **awa** iskwēw ∅-pakamahw-ē-w ēsa **ōhi** wīhtiko-**wa**.
truly **DEM:PRO** *woman 3-strike*-DIR*-3* REP **DEM:OBV** *windigo*-**OBV**
'Truly the woman struck down that windigo.'

For space reasons we introduced only a fragment of the actual direction and obviation system in Plains Cree. First, we focused on only three out of six affixes relevant for direction and obviation. And secondly, we ignored a number of other morphosyntactic categories which are known to be relevant for direction marking on the verb in Plains Cree. To mention only two, the affixes encoding direction in Plains Cree depend further on (i) the type of clause,[4] and (ii) the animacy of the patient-like argument. If the argument is inanimate, as in (13a), then the direction suffix *-ē* must be used instead of *-ā*, which in turn must be used in (13b), since the argument is animate.

(13) a. Ni- wāpaht -ē -nān.
1- see -DIR(SAP→3.INAN) -1PL.EXCL
'We (excl.) see it.'
b. Ni- sēkih -ā -nān.
1- frighten -DIR(SAP→3.ANIM) -1PL.EXCL
'We (excl.) frighten him/her.'

The linking of arguments and semantic roles by means of the direction and ob-

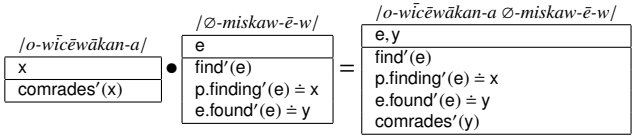
[4] The forms introduced here are basically restricted to independent clauses (belonging to the independent paradigm), whereas dependent clauses require forms from a different so-called conjunct paradigm.

viation system poses an important challenge to the theory of semantic composition, in particular to type-drive composition, because the assignment of the semantic roles to arguments is not determined by the order of composition but by shared morphological information, namely agreement in proximative/obviative features.[5] If the direction suffix is DIR(3.OBV→3.PROX), then a proximate noun phrase denotation will be assigned the patient-like argument, if the direction suffix is DIR(3.PROX→3.OBV), then it will be assigned the agent-like argument. The analysis of the contribution of first prefix and fifth affix poses an additional challenge, since these affixes impose (semantic) restrictions on the person and number of the arguments of a predicate, but they do this irrespective of the semantic role of the arguments. In section 4 we provide an analysis which meets both these challenges in terms of referent systems, which we introduce in section 3.

3 The Theory of Referent Systems

3.1 Semantic Composition by Renaming of Variables

The semantic structure of lexical items will be analyzed in terms of pairs $\langle U, C \rangle$ consisting of a set of referents U and a set of conditions C, i.e. by means of discourse representation structures (DRSs).[6] Returning to our example (11), we want the composition of the DRSs for the noun phrase *o-wīcēwākan-a* ('his comrades$_{\text{OBV}}$') and the verb *miskawēw* ('find') to result in:



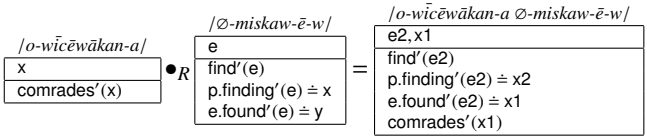
Where the referent x of the NP DRS is identified with the referent y of the verb DRS, which gets assigned the role of entity being found.[7] This result can be achieved by (i) renaming the variable x of the first DRS into x1, (ii) renaming the variables e,x,y in the second DRS into e2,x2,x1 respectively, and (iii) by conjoining the sets of renamed referents and renamed conditions respectively. Put in a nutshell, the semantic composition of two DRSs consists in conjunc-

[5] This is not to say that it is impossible to provide an analysis of semantic role assignment in Plains Cree within a type-driven approach to semantic composition.

[6] Thus, we adopt an algebraic approach to DRT, cf. Zeevat (1989), as opposed to the procedural approach of Kamp & Reyle (1993).

[7] We want these two referents to be identified irrespective of the actual variable name chosen for the NP referent, in order to account for the fact that the choice of variable name for the NP referent is actually immaterial.

tion relative to a renaming R of variables



where $R = \langle\{\langle \mathsf{x}, \mathsf{x1}\rangle\}, \{\langle \mathsf{e}, \mathsf{e2}\rangle, \langle \mathsf{x}, \mathsf{x2}\rangle, \langle \mathsf{y}, \mathsf{x1}\rangle\}\rangle$. So the renaming of variables identifies some variables (irrespective of their actual names), and keeps all other variables distinct (even if they have the same names) in order to avoid accidental identification of referents.

Definition 3.1 *A **referent** $\mathsf{x}^\frown\sigma$ consists of the variable symbol x followed by a sequence $\sigma \in \{1,2\}^*$. Let R be the set of such referents.*

Convention 3.1 To ease readability we use also the symbols $e, f, g, h, x, y, z, u, v, w, \ldots$ standing for referents.

Definition 3.2 *A renaming $r \subset R^2$ is an injective function which suffixes its argument either with a 1 or with a 2. r is a renaming of a referent system $\alpha = [\mu_1, \ldots, \mu_n]$ iff the domain $D \subset R$ of r is the set of referents $\{\mathbf{ref}(\mu_i) : 1 \leq i \leq n\}$.*

Definition 3.3 *Let $\Delta_1 = \langle U_1, C_1\rangle$, and $\Delta_2 = \langle U_2, C_2\rangle$ be two DRSs, where Δ_1 contains the variables $x_1, \ldots, x_m$ and Δ_2 contains the variables $y_1, \ldots, y_n$. Then $\bullet(\Delta_1, \Delta_2, \langle r_1, r_2\rangle)$ is defined iff (i) the domain of r_1 is the set of variables in Δ_1, and (ii) the domain of r_2 is the set of variables in Δ_2. In this case $\bullet(\langle U_1, C_1\rangle, \langle U_2, C_2\rangle, \langle r_1, r_2\rangle) = \langle r_1[U_1] \cup r_2[U_2], r_1[C_1] \cup r_2[C_2]\rangle$, where*

(i) $r_1[U_1] = \{r_1(x_i) : i \leq m\}, r_2[U_2] = \{r_2(x_j) : j \leq n\}$
(ii) $r_1[C_1] = \{\phi_i[r_1] : \phi_i \in C_1\}, r_2[C_2] = \{\phi_j[r_2] : \phi_j \in C_2\}$
(iii) $\phi[r]$ *is the result of replacing every variable x in ϕ by $r(x)$*

The renaming of variables is determined by the morphosyntactic information associated with each variable, to be presented in the next subsection.

3.2 Morphosyntactic Structure

The basic idea of the calculus of referent systems, first introduced in Vermeulen (1995) and then extended in Kracht (1999), is that the way in which variables are to be renamed is decided by the morphosyntactic information associated with each variable, and stored in so-called referent systems. Since semantic composition of two DRSs proceeds relative to the renaming dictated by the morphosyntax, the renaming of variables provides the interface between morphosyntax and semantic composition.

Every variable in a DRS is associated with morphosyntactic information relevant for the identification of this variable. There are three types of information relevant for the identification of variables, namely hierarchical, linear and categorial information. Hierarchical information is encoded by the following vertical diacritics: (i) ▽ (the referent is a functor with respect to merge) (ii) △ (the referent is an argument with respect to merge), (iii) ◊ (the referent is an adjunct), and (iv) − (the referent cannot identify any further). The linear information is encoded by the following horizontal diacritics: (i) ⊱ (referent expects argument to the right), (ii) ⊰ (referent expects argument to the left), (iii) ⦶ (referent expects argument either to the left or to the right), and (iv) ○ (no expectations). The categorial information is encoded by a finite number of **simple names** (which are essentially feature values over a certain namespace) or **transformer names** (which transform the value of a feature):

$$\begin{bmatrix} \textsc{per} : 3 \\ \textsc{num} : \textsc{sg} \\ \textsc{case} : - \end{bmatrix} \quad \begin{bmatrix} \textsc{per} : 3 \\ \textsc{num} : \textsc{sg} \\ \textsc{case} : - \rightarrow \textsc{acc} \end{bmatrix}$$

Definition 3.4 *A **vertical diacritic** vd is a subset of* {△,▽}. *A **horizontal diacritic** hd is a subset of* {⊰,⊱}.

Convention 3.2 For ease of readability, we use the following conventions for representing vertical and horizontal diacritics:

	definition	convention
vd	∅	−
	{△}	△
	{▽}	▽
	{△,▽}	◊

	definition	convention
hd	∅	○
	{⊱}	⊱
	{⊰}	⊰
	{⊰,⊱}	⦶

Definition 3.5 *A **diacritic** d is a pair* ⟨*vd*,*hd*⟩ *consisting of a vertical diacritic vd and a horizontal diacritic hd. A diacritic* ⟨*vd*,*hd*⟩ *is a **legal diacritic** iff* (▽ ∈ *vd* ∨ ▼ ∈ *vd*) ↔ *hd* ≠ ∅. *The diacritic* ⟨∅,∅⟩ *is called **trivial**.*

The categorial information will be represented by so called names.

Definition 3.6 *A **name space** **N** is a triple* ⟨*A*,*V*,*f*⟩, *where A is a finite non-empty set of attributes, V is a finite non-empty set of values disjoint from A, and* $f : A \rightarrow \wp(V)$ *is a valuation function assigning every attribute in A a subset of V.*

Definition 3.7 *A **simple name** N (over a name space* $\mathbf{N} = \langle A, V, f \rangle$*) is a feature structure over* **N**. *A **transformer name** ℜ is a pair* $\langle N, N' \rangle$ *of simple names.*

We shall use the more compact notation:

$$\begin{bmatrix} \textsc{cat} & : & \mathsf{v} \\ \textsc{pre} & : & - \\ \textsc{suff} & : & - \to + \end{bmatrix} \text{ for } \langle \begin{bmatrix} \textsc{cat} & : & \mathsf{v} \\ \textsc{pre} & : & - \\ \textsc{suff} & : & - \end{bmatrix}, \begin{bmatrix} \textsc{cat} & : & \mathsf{v} \\ \textsc{pre} & : & - \\ \textsc{suff} & : & + \end{bmatrix} \rangle$$

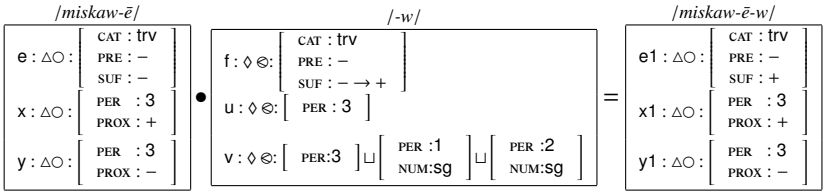
Let $n.a$ be the value of the simple name n for the feature a. The unification $n_1 \sqcap n_2$ is defined if for all attributes $a \in A$ it holds that $n_1.a \cap n_2.a \neq \emptyset$. Then $n_1 \sqcap n_2 = \{[a : v_1 \sqcap v_2] : [a : v_1] \in n_1 \wedge [a : v_2] \in n_2\}$.

We can now put together the information relevant for the identification of a referent, by defining so-called argument identification statements:

Definition 3.8 *A triple $\alpha = \langle x, \langle vd, hd \rangle, n \rangle$ is an **argument identification statement** (AIS) iff (i) x is a referent, $\langle vd, hd \rangle$ a legal diacritic with $|vd| < 2$, and n a simple name (over a name space **N**), or (ii) x is a referent, $\langle vd, hd \rangle$ a legal diacritic with $vd = \{\triangle, \triangledown\}$, and n a transformer name. Further, let* $\mathbf{ref}(\alpha) = x, \mathbf{vd}(\alpha) = vd, \mathbf{hd}(\alpha) = hd, \mathbf{n}(\alpha) = n$.

Definition 3.9 *A list of argument identification statements $[\mu_1, \ldots, \mu_m], m \geq 1$, is called a **referent system**.*

Before providing the definition for the merge of referent systems, we illustrate this operation by discussing the merge of the referent system of *miskaw-ē* ('find') with the referent system of the fifth suffix *-w*:



First, leftward merge $\alpha \bullet_l \beta$ of two referent systems α and β is defined if (i) α is saturated (i.e. with $\triangledown \notin \mathbf{vd}(\alpha)$ for all AISs in α) and (ii) at least one leftward merge of AISs is defined. A leftward merge $\mu \triangleleft \nu$ of two AISs μ and ν is defined if (i) the horizontal diacritic of ν contains $\circledcirc$, (ii) the vertical diacritic of μ is $\triangle$ or $\Diamond$, (iii) the vertical diacritic of ν is $\triangledown$ or $\Diamond$, and (iv) the names of μ and ν can be unified. In our example, the leftward merge of the AISs of the referents e and f is defined, since (i) the horizontal diacritic of f is $\circledcirc$, (ii) the vertical diacritic of e is $\triangle$, (iii) the vertical diacritic of f is $\Diamond$, and (iv) the first name of the transformer name of f matches (i.e. can be unified with) the simple name of e. Further, the AIS with referent u can be leftward-merged with the AIS with referent x, and the same holds for the two AISs with referents v and y.

Definition 3.10 *The **leftward merge of two AISs** $\mu \triangleleft \nu$ is defined iff (i)* $\circledcirc\in \mathbf{hd}(\nu)$*, (ii)* $\triangle\in \mathbf{vd}(\mu)$*, (iii)* $\triangledown \in \mathbf{vd}(\nu)$*, and (iv)* $\mathbf{n}(\mu)\cdot\mathbf{n}(\nu)$ *is defined. If defined, then:*

$$\mu \triangleleft \nu = \langle \mathbf{ref}(\mu)^\frown 1, \langle \mathbf{vd}(\mu) \cap \mathbf{vd}(\nu), \mathbf{hd}(\mu)\rangle, \mathbf{n}(\mu)\cdot\mathbf{n}(\nu)\rangle$$

*where the **resulting name** $m \cdot n$ is:*

$$\mathbf{n}(\mu)\cdot\mathbf{n}(\nu) = \begin{cases} \mathbf{n}(\mu) \sqcap \mathbf{n}(\nu), & \text{if } \mathbf{n}(\mu), \mathbf{n}(\nu) \text{ are unifiable simple names} \\ B, & \text{if } \mathbf{n}(\mu) = \langle A, B\rangle, \mathbf{n}(\nu) = C, \text{ and } A \text{ unifies with } C \\ C, & \text{if } \mathbf{n}(\mu) = A, \mathbf{n}(\nu) = \langle C, D\rangle, \text{ and } A \text{ unifies with } D \\ \text{undefined}, & \text{otherwise} \end{cases}$$

The leftward merge of referent systems is defined as follows:

Definition 3.11 *Let* $\alpha = [\mu_1, \ldots, \mu_m]$ *and* $\beta = [\nu_1, \ldots, \nu_n]$ *be two referent systems. The **leftward merge** $\bullet(\alpha, \beta, \langle r_1, r_2\rangle)$ **of** α **and** β **relative to the renaming** $\langle r_1, r_2\rangle$ is defined iff*

- *α is saturated*
- *there is an $i, 1 \leq i \leq n$ such that μ_1 accesses ν_i*
- *for every k with $1 \leq k \leq m$*
  - *$\mu_k \triangleleft \nu_{i+(k-1)}$ is defined*
  - *$r_1(\mathbf{ref}(\mu_k)) = r_2(\mathbf{ref}(\nu_{i+(k-1)})) = \mathbf{ref}(\mu_k)^\frown 1$, and*
- *for all j between $1 \leq j \leq n$ with $j \neq i + (k-1)$, $r_2(\mathbf{ref}(\nu_j)) = \mathbf{ref}(\nu_j)^\frown 2$*

In this case $\bullet(\alpha, \beta, \langle r_1, r_2\rangle) = \langle [\epsilon_p : 1 \leq p \leq n]\rangle$ where:

$$\epsilon_p = \begin{cases} \mu_k \triangleleft \nu_{i+(k-1)} & \text{if } i \leq p \leq i + (m-1) \\ \langle \mathbf{ref}(\nu_p)^\frown 2, \langle \mathbf{vd}(\nu_p), \mathbf{hd}(\nu_p)\rangle, \mathbf{n}(\nu_p)\rangle & \text{else} \end{cases}$$

Definition 3.12 *Let* $\alpha = [\mu_1, \ldots, \mu_m]$ *be a saturated referent system and* $\beta = [\nu_1, \ldots, \nu_n]$ *another referent system. Then μ_1 **accesses** ν_i $(1 \leq i \leq n)$ iff (i) either $\mu_1 \triangleleft \nu_i$ or $\nu_i \triangleright \mu_1$ is defined, and (ii) there is no ν_k with $i < k \leq n$ such that $\mu_1 \triangleleft \nu_k$ or $\nu_k \triangleright \mu_1$ is defined*

As it is formulated, the merge requires that the first AIS of the saturated referent system access the first AIS from the bottom of the functor referent system for which the left- or rightward merge of AIS is defined. The notion of access can be made dependent on the language, so that for example in some languages the merge requires that the first AIS of the saturated referent system can only access the last AIS of the functor referent system.

The rightward merge of argument identification statements and referent systems can be formulated analogously.

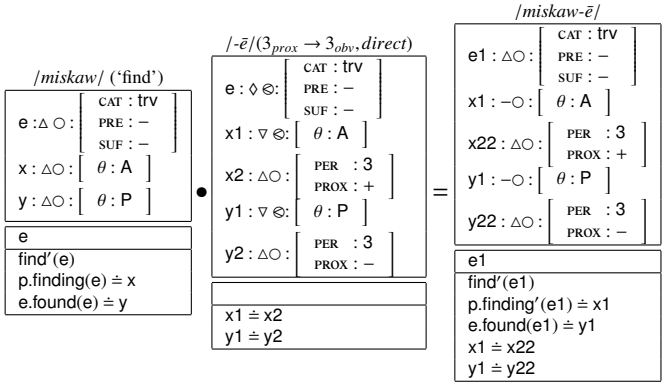
4 A Referent Systems Analysis of Direction and Obviation

In this section we provide an analysis of the direction and obviation system in terms of referent systems, and illustrate this analysis by deriving the following two sentences:

(14) a. O- wīcēwākan -**a** ∅- miskaw -ē -w **awa** nēhiyaw.
3POSS- *companion* -**OBV** *3- find* -DIR -*3* **DEM:PROX** *Cree*
'The Cree$_{prox}$ found his comrades.'

b. Ki- pēhtaw -iti -n
2- hear -INV(1→2) -SAP.SG
'I hear you (sg).'

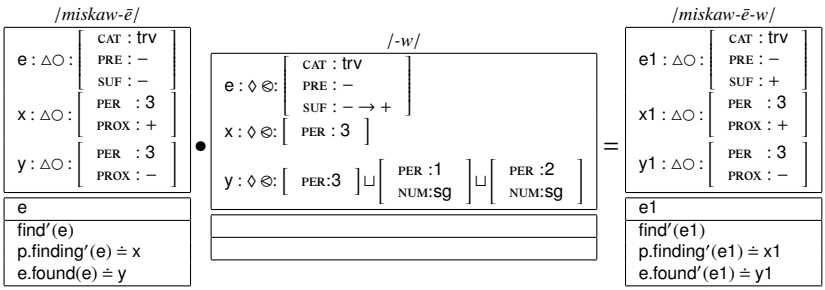
Combining the sign *miskaw* with the direction suffix *ē* results in:



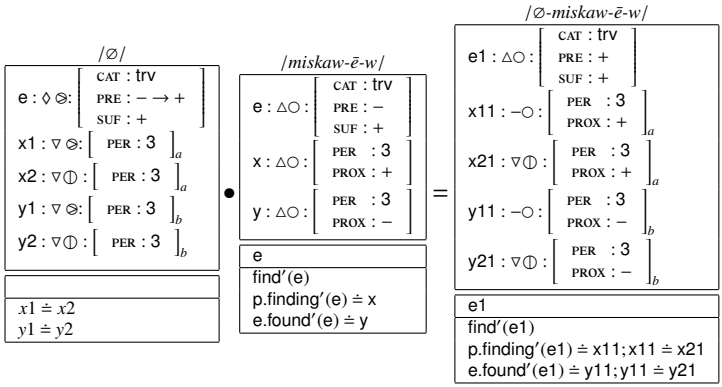
The referent system of *miskaw* contains an AIS for the event variable e, and one AIS for each argument variable x and y. Since the event variables of stem and direction suffix have matching morphosyntactic information, they get identified. Moreover, the merge of the two referent systems also identifies x and x1 (as well as y and y1), due to the matching value for the θ-role feature. As a result the variables x and x1 are both renamed to x1 (y and y1 are renamed to y1). Since the referents x1 and x2 of the direction suffix are coreferential, the two referents x1 and x22 of the referent system for *miskaw-ē* are also coreferent, which in effect means that the referent x22 is assigned the semantic role of person finding. Given its associated morphosyntactic information, this referent can only identify with 3rd person proximate noun phrases.

The attachment of the fifth suffix *−w* to this base imposes the restriction that one referent is third person and the other is either third person or a singular SAP. Moreover, the fifth suffix transforms the suffix value from − to +,

provided that the base is prefixless.

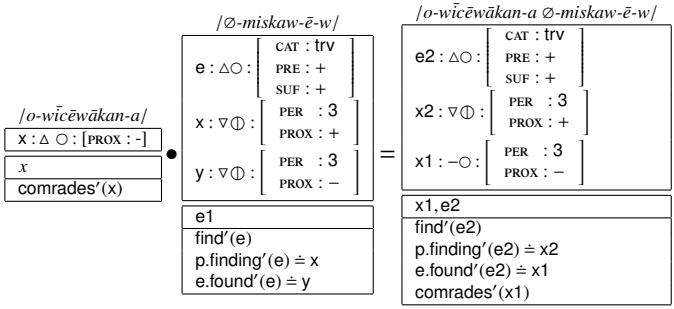


The first AIS of the zero prefix provides the morphosyntactic information associated with the event variable. This AIS can only merge with a variable whose prefix value is − and whose suffix value is +. If this is the case, it transforms the prefix value from − to +, making sure that only one prefix can attach to the base. The next two AISs of the zero prefix contain referents which are coreferential and whose categorial information is required to be identical (this is what the indices *a* and *b* are supposed to mean). The reason for this is as follows. The zero affix must be prefixed to the base, therefore the linear information associated with x1 (and y1) is ⊛. However, we would like the resulting referent to be identifiable either to the left or to the right. To achieve this, we add a coreferential referent x2 to the zero prefix, and require that it be identifiable either to the left or to the right, i.e. with ⓘ.

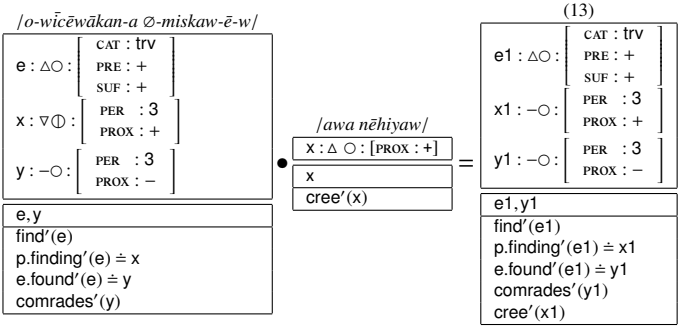


The prefixation of the zero affix then identifies the referents e, x1, y1 of the zero affix with the referents e, x, y of the base *miskaw-ē-w*, respectively, and consequently the referents x2 and y2, renamed to x21 and y21, are assigned the semantic roles of person finding and entity found, respectively.

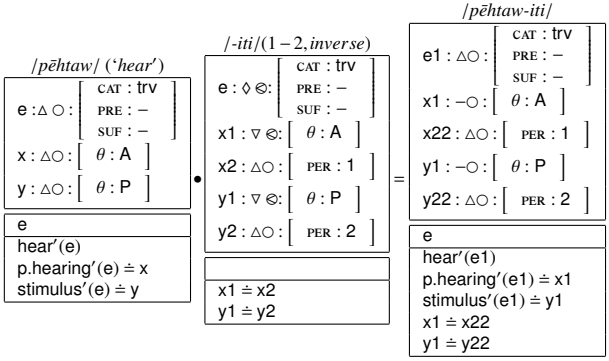
As can be seen, the referent x21, which bears the role of person finding, can only identify with referents which are third person proximative, and the referent y21 bearing the role of entity found can only be identified with third person obviative referents. Now the two noun phrases can be combined (in any order). Combining first the obviative NP result in the identification of the referent x of the NP referent system with the referent y of the verb, which in turn entails that the the semantic role of entity found is assigned to the comrades:

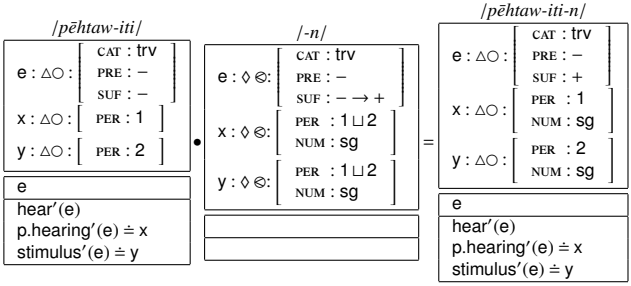


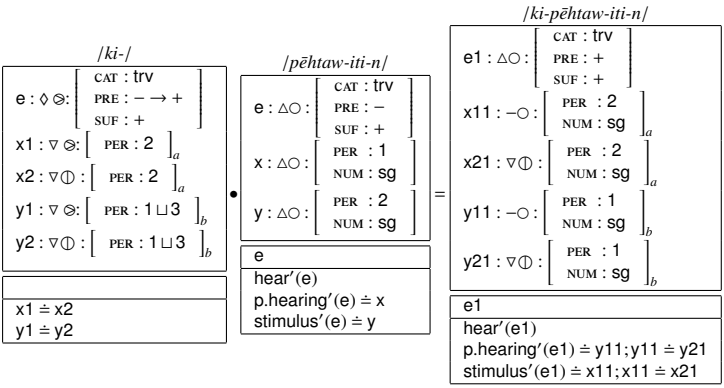
Finally, combining this verb phrase with the proximate NP results in the identification of the referent x of the proximate NP with the referent x of the verb phrase referent system, so that this referent gets assigned the semantic role of person finding.



Second derivation:







5 Conclusion

Referent systems provide an interface between syntax on the one hand and semantics on the other by allowing to detail the way in which variables are being linked (i.e. identified) under merge. Certain aspects of the system have been omitted, such as parameters or quantification, in order to make the presentation focused. We have shown how referent systems allow for greater flexibility in syntax, by opening up access in argument structure. It should be fairly obvious that merge is a fairly inexpensive operation. It consists in two steps: the first is to calculate the resulting argument structure and the substitutions before merge, and the step in executing the substitutions and then merging the semantic representations. Although complete syntactic flexibility has its price in terms of combinatorial explosion, referent systems allow morphology to keep this search simple by providing clues as to how arguments have to be linked. And it seems that in practice languages do employ ways of keeping this combinatorial problem at bay.

References

Dahlstrom, Amy. 1986. *Plains Cree morphosyntax*: Uni- versity of California at Berkeley dissertation.

Kamp, Hans & Uwe Reyle. 1993. *From discourse to logic*. Dordrecht/Boston/London: Kluwer Academic Publishers. Student edition.

Kracht, Marcus. 1999. Agreement Morphology, Argument Structure and Syntax. Unpublished manuscript.

Vermeulen, Kees F. M. 1995. Merging without mystery or: Variables in dynamic semantics. *Journal of Philosophical Logic* 24(4). 405–450.

Zeevat, Henk. 1989. A compositional approach to discourse representation theory. *Linguistics and Philosophy* 12. 95–131.

Zúñiga, Fernando. 2006. *Deixis and alignment. inverse systems in indigenous languages of the americas.* Amsterdam/Philadelphia: John Benjamins.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 397–417. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Thematic Roles and the Interpretation of *one-another* Reciprocals

Chris LaTerza
Maryland University
laterza@umd.edu

Abstract. This paper proposes a novel neo-Davidsonian semantics of *one another*-reciprocals that appear in several Indo-European languages. Arguments are presented that suggest that such expressions be treated as compositionally complex, in contrast to standard approaches that treat them as primitive polyadic quantifiers. A theory of logical form for *one another*-reciprocals is developed that can account for a non-trivial range of their syntactic distribution as well as a wide range of the attested readings of reciprocal sentences.

1 Introduction

This paper addresses the logical form of reciprocal sentences containing one-another reciprocals (OARs), a common type reciprocal expression found in many Indo-European languages. After considering some empirical facts about OARs in the languages where they are found, I will argue that we must view the OAR as a complex expression, contrary to the standard assumption that argument reciprocals (reciprocals that can appear in argument positions) are primitive semantic elements; more specifically, that they are polyadic quantifiers (see Dalrymple et al. 1998 and much subsequent work). I will show that with a certain neo-Davidsonian decomposition, it is possible to treat OARs as being composed of essentially the same *one* and *other* that occur outside of OAR constructions, while also accounting for a large amount of the polysemy known to be associated with reciprocals. This will require us to consider some developments of recent work in event semantics, which has already shown to be useful in analyses of reciprocity (Schein 2003, Dimitriadis 2008, Dotlačil 2010) and other issues concerning plurality in general (Schein 1993, Lasersohn 1995, Landman 2000, Pietroski 2005, Zweig 2008).

The paper will be organized as follows. In the second section, I will highlight some descriptive facts about the distribution of OARs that not only suggest that they are compositionally complex, but also that each part of the OAR (*one* and *other*) is associated with thematic content distinct from the

other part. In the third section, I will review some of the relevant parts from the reciprocal and event semantics literature, and propose a novel logical decomposition for sentences involving OARs. I will show that the proposals offered here, guided by the empirical facts of section 2, can account for a large portion of the range of attested reciprocal readings. The final section will summarize the results of the paper.

2 The Complexity of OARs

In this section I will argue that OARs are structurally complex in that each of its elements, *one* and *other*, are separate nominal expressions. While a treatment of this kind might seem obvious, the standard in the reciprocal literature for the past fifteen years or so has been to treat reciprocals expressions like *each other* and *one another* as polyadic quantifiers.[1]

I do not doubt that it is possible for theoreticians to represent the meaning of reciprocal sentences in terms of polyadic quantification. The issue that I am concerned with is if this is the best way that we can model how meaning is represented in the minds of speakers. I believe that we should be wary about including in our model higher order relations like polyadic quantifiers *if* there is only one family of phenomena (anaphors) that seems to call for such a device. If there is a possibility of accounting for the same facts without climbing dangerously high up the Fregean hierarchy of types, then I believe that possibility should be explored. That is what I intend to do in the rest of the paper.

2.1 Empirical Arguments for Complexity

I will show that the empirical facts presented below not only pose serious problems for analyses that treat OARs as primitive, non-decomposable expressions, but they also suggest an idea that will form the basis of the analysis in Section 3: if *one* and *other* are distinct nominals, then perhaps they are associated with distinct thematic roles.

Let us first consider the distribution of article determiners within OARs. Articles within OARs can be found in the Romance languages (Spanish (1), French (2), and Romanian (3)), as well as in Bulgarian (4).

[1] A type <1,2> quantifier in Generalized Quantifier Theory (see Peters and Westerståhl 2005). In Generalized Quantifier Theory, run-of-the-mill quantificational determiners are classified as type <1,1> quantifiers, because each argument to the determiner has an adicity of one; each one on its arguments is a monadic predicate. Reciprocals have been treated as polyadic quantifiers of type <1,2> in GQT, labeled as such since one of this quantifier's arguments is a polyadic predicate (the verb).

(1) Los estudiantes se seguian **los unos tras los otros.**
the students CL *follow* ***the ones behind the others***
'The students are following one another.'

(2) Les étudiants se sont frappé **les uns les autres.**
the students CL AUX *hit* ***the ones the others***
'The students hit one another.'

(3) Băieţii s au urmărit **unul pe celălalt.**
boys.DEF CL *have followed* ***one*.DEF ACC-PART *other*.DEF**
'The boys followed one another.'

(4) Gostite tancuvaha **edin-ija s drug-ija.**
guests.DEF *danced* ***one*.DEF *with other*.DEF**
'The guests danced with one another.'

What is important for us is that it is possible to have article morphology appear on each part of the OAR simultaneously. Though some languages allow multiple articles per nominal (such as the Scandinavian double-definiteness languages), the languages reported above do not allow this and we can take the simultaneous occurrence of two articles as evidence for two distinct noun phrases.

Next we will consider the placement of prepositions that interact with OARs. In Germanic OAR constructions, prepositions are generally placed before the OAR complex, as in English (5) and German (6).

(5) They danced with one another.

(6) Sie erzählten **voneinander.**
they talk ***about-one-another***
'They talk about one another.'

It seems however that preposition placement in Germanic OARs is the exception to a general pattern. In all the non-Germanic Indo-European languages where I found OARs to be a productive, the preposition always intervenes between *one* and *other.*[2]

[2] It is also possible in some contexts, and with certain prepositions, that Germanic OARs can show the one-P-other word order that we find to be pervasive in Indo-European languages.

(i) I put the books ones on top of another

Below, we see this in French (7), Spanish (8), Romanian (9), Bulgarian (10), Serbo-Croatian (11), and Ukrainian[3](12).

(7) Les étudiants se sont donné des livres **les uns aux autres.**
the students CL AUX *gave some books* ***the ones to-the others***
'The students gave books to one another.'

(8) Los estudiantes presentaron los profesores **el uno al otro.**
the students introduced the professors ***the one to-the other***
'The students introduced the professors to one another.'

(9) Oaspeţii au dansat **unul cu celălalt**.
guests.the have danced ***one.the.*NOM *with other.the.*ACC**
'The guests danced with one another.'

(10) Te stojat **edin do drug**.
they stand ***one beside other***
'They are standing beside one another.'

(11) Gosti su plesali **jedni s drugima.**
guests AUX *danced* ***one with other***
'The guests danced with one another.'

(12) Divčata hovoryly **odna pro odnu.**
girls talk ***one.*NOM *about one.*ACC**
'The girls are talking about one another.'

If the OAR were a primitive expression, it should come as a surprise that it is possible to break it up with prepositions, though this is what we find in a majority of languages that have OARs. Furthermore, if we can assume that it is the complements of prepositions that receive the thematic role associated with that preposition, then it is possible to attribute thematic distinctness to each element of an OAR since only one of them appears to be the complement of the preposition in these languages, the *other* element.[4]

The last empirical phenomena that I will discuss concerns case morphology within the OAR. In certain Slavic languages that use OAR constructions, each element of the OAR inflects for case. Interestingly, the

[3] Notice that Ukranian OARs are actually of the form one-one. I will assume that the second one forms a DP with a covert other adjective.

[4] Of course this would require us to say something about the Germanic cases where the whole OAR linearly follows the preposition. I suspect that there is either a transformation deriving the Germanic word order from the standard *one*-P-*other* order, or that the Germanic order came about by some form of diachronic univerbation.

case of *one* and the case of *other* are generally different. Consider the Serbo-Croatian (13) and Ukrainian (14).

(13) Studenti su udarali **jedan drugog.**
students.NOM AUX *hit* ***one.*NOM *other.*ACC**
'The students hit one another.'

(14) Studenty vdaryly **odyn odnoho.**
students.NOM hit ***one.*NOM *one.*ACC**
'The students hit one another.'

Considering just these "elementary reciprocal sentences" as they are often called (beginning with Langendoen 1978), it seems that the case of *one* must by nominative and the case of *other* must be accusative. However, when we look beyond these simple cases, we see that a deeper generalization can be made. Below are ditransitive construction in Serbo-Croatian (15a) and (16a), and Ukrainian (15b) and (16b) where the OAR is an indirect object. In (15), the interpretation is one where the students introduced the professors to other students (among *the* students), where in (16) the interpretation is where the students introduced the professors to other professors (among *the* professors).

(15) a. studenti su predstavili profesore **jedni drugima.**
students.**NOM** AUX *introduced professors*.ACC ***one.*NOM *other.*DAT**
'The students introduced the professors to one another.'
b. Studenty predstavyly profesoriv **odni odnym.**
*students.***NOM** *introduced professors*.ACC ***one.*NOM *one.*DAT**
'The students introduced the professors to one another.'

(16) a. Studenti su predstavili profesore **jedne drugima.**
students.NOM AUX *introduced professor*.**ACC *one.*ACC *other.*DAT**
'The students introduced the professors to one another.'
b. Studenty predstavyly profesoriv **odnyx odnym**
students.NOM *introduced professors*.**ACC *one.*ACC *one.*DAT**
'The students introduced the professors to one another.'

The English sentences that comprise the translations for (15) and (16) are ambiguous. Serbo-Croatian and Ukranian have no such ambiguity because of the case morphology within the OAR. Based on the meaning differences between the two pairs of sentences, in (15), it is the subject that appears to act as the antecedent for the OAR, while in (16) it appears that the direct object is the antecedent. This fact is reflected by the case morphology of the OAR. In (15), where the subject acts as the reciprocals antecedent, the case of *one* is nominative, the case typical of subjects. In (16), where the objects as

antecedent, the case of *one* is accusative, the case typically associated with direct objects. Notice that in each example in (15) and (16), the case of *other* does not vary. The proper descriptive generalization of these case facts seems to be that (i) the case of *one* will always match the case of the OAR's antecedent, and (ii) the case of *other* will always be the case that we would expect based on the position of the OAR. In (13), since the OAR is in direct object position, the case of *other* is accusative. In (15) and (16), the OAR appears in indirect object position, thus the case of *other* is dative, the case typical of indirect objects. To the best of my knowledge, this is a novel observation.

The facts presented here call for a complex treatment of OARs. While each argument alone might not be enough to convince one of this, taken together I believe that we have enough reason to seriously consider treating OARs as non-primitive. The data concerning preposition placement and (especially) case distribution not only call for a complex treatment, but also suggest that each element comprising the OAR be associated *somehow* with thematic content different from the other element. My proposal for exactly how this works will be the topic of 3.3. But before shifting to more formal matters, I want to conclude this section with a discussion of some relevant properties of *one* and *other* that are easily observable in their non-OAR uses.

2.2 Anaphoric Properties of *one* and *other*

In the introduction, I said that we should not only view OARs as complex, but also that we should view that as being composed from essentially the same *one* and *other* that we find outside of OAR constructions. In this subsection, I will discuss the relevant properties of these elements as they appear in cases of cross-sentential anaphora. In 3.3, the specific proposals about OARs will encode the same relevant anaphoric properties of these elements as they appear outside of reciprocal constructions.

Consider first the use of *other* as a cross-sentential anaphor. We can see from sentences like (17) that it is impossible for *other* to refer to the individuals denoted by its antecedent. Rather, it must refer to something other than what its antecedent refers to, *and* other than the parts that comprise what its antecedent refers to.

(17) Three boys wore hats. Another wore a sweater.

On the other hand, *one* does have the ability to refer to an individual that is a part of the plurality denoted by the antecedent. (18), on this interpretation, has the same meaning as (19), with an overt partitive phrase.

(18) Three boys wore hats. One (also) wore a sweater.

(19) Three boys wore hats. One of them (also) wore a sweater.

Although it is possible for *one* to refer to a boy other than one that is part of the plurality that its antecedent refers to, this is not always the case; see (20).

(20) Three boys walked in. One walked out.

What is important for us is that *one* can, on some occasions, be used as a sort of partitive anaphor, referring to a proper part of what its antecedent refers to. When *one* is used this way, it can act as an antecedent for *other* so that otherness can be determined with regards to something *within* a plurality, an option that is not available in (17). We can see this in (21), where *other* is linked indirectly to *three boys* by having *one* as its antecedent, and this in turn acts as a partitive anaphor directly anteceded by *three boys*.

(21) Three boys wore hats. One wore a sweater. Another wore a scarf.

I believe that the "anaphoric chain" that we see here is exactly what is at work in OARs. This means that in OARs, *other* inherits *one's* partitivity, and as a result otherness is determined by what *one* picks out. (22) shows a schematic representation about the structure of OARs under this approach.

(22) $[_S$ …Antecedent$_i$…$[_{DP}$ …one of them$_i$…$]_k$…$[_{DP}$…other than that$_k$…$]$…$]$

3 The Logical Form of OARs

The last section has outlined facts that any theory of (*one-another*) reciprocals should address. I see no way of seriously maintaining a primitive, polyadic analysis of OARs given the data from 2.1. This, however, puts us in a quandary. Polyadic quantifier analyses have been so popular as of late because they capture facts about reciprocity better than earlier theories advocating a complex treatment. However, as Schein (2003) notes, these earlier theories assume a logical syntax where verbs are understood as relational predicates. Like him, I believe that it is possible to revive the goals of these earlier approaches with the tools of neo-Davidsonian semantics. Before reviewing the relevant event literature and stating my own proposals, I think it is prudent to discuss at least one of the problems that have been at the forefront of the reciprocal literature, which I turn to immediately.

3.1 Polysemy and Reciprocity

While reasons of space prevent me from reviewing all of the aspects of the reciprocal literature that I believe bear on the issues raised here, I will at least

outline what I take to be one of the most central problems for the semantics of reciprocity that nearly the entire literature attempts to address in one way or another. The problem is summarized as such: how is it the case that the sentence in (23) can be true in so many different situations?

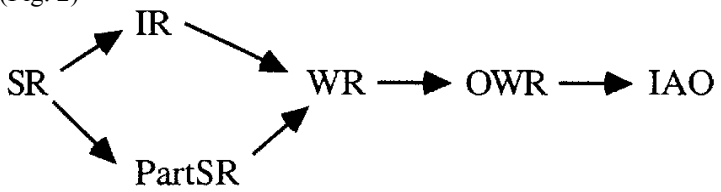
(23) The dots are pointing at one another.

This problem has been addressed as early back as Lasnik and Fiengo (1973). However, it was not until work of Langendoen (1978) that we first had an explicit typology of the different readings associated with (23). Langendoen classified these readings according to reciprocal "strength" (borrowing this term from Fiengo and Lasnik). For example, Strong Reciprocity (the strongest of reciprocal readings) is associated with the reading where every dot is pointing at, and is pointed at by, every other dot. In (Fig. 1), I have included a modern typology of these readings, taken from Beck (2001). Let *A* denote the plurality associated with the reciprocal antecedent, and R the verbal predicate.

(Fig. 1)
I. Strong Reciprocity (SR):
$\forall x \in A$: $\forall y \in A$ [$x \neq y \rightarrow xRy$]
II. Partitioned Strong Reciprocity (PartSR):
There is partition PART of *A* such that $\forall X \in$ PART:
$\forall x \in X$: $\forall y \in X$ [$x \neq y \rightarrow xRy$]
III. Intermediate Reciprocity (IR):
$\forall x \in A$: $\forall y \in A$: [$x \neq y \rightarrow \exists z_i \ldots z_n \in A[x = z_i \,\&\, y = z_n \,\&\, z_iRz_n \,\&\, \ldots z_{n-1}Rz_n]$
IV. Weak Reciprocity (WR):
$\forall x \in A$: $\exists y \in A$ [$x \neq y \rightarrow xRy$] & $\forall y \in A$: $\exists x \in A$ [$x \neq y \rightarrow xRy$]
V. One-way Weak Reciprocity (OWR):
$\forall x[x \in A \rightarrow \exists y[y \in A \,\&\, x \neq y \,\&\, xRy]]$
VI. Inclusive Alternative Ordering (IAO):
$\forall x[x \in A \rightarrow \exists y[y \in A \,\&\, x \neq y \,\&\, (xRy \vee yRx)]]$

Interestingly, as Langendoen noticed, there are certain entailment relations that hold among the possible reciprocal readings. (Fig. 2) shows these entailments, again taken from Beck (2001).

(Fig. 2)



Because of these entailments, Langendoen suggested that we take reciprocal expressions as having one meaning, and that meaning should be weak. His reasoning was that if a reciprocal sentence is judged true where the truth conditions are those of a strong type of reciprocity, then the sentence will also be true when the truth conditions are those of a weaker type of reciprocity. For example, if we judge (23) to be true where truth is evaluated in terms of SR, then it will also be true when evaluated in terms of WR. Therefore, if we view the reciprocal as a having a weak interpretation, then we can use that single interpretation in accounting for the truth-conditional meaning of all reciprocal sentences, even if such sentences are used to describe situations where a stronger type of reciprocity holds.

This elegant solution to the polysemy problem was called into question by Dalrymple et al. (1998). They raised the concern that such an under-specification analysis makes incorrect predictions with regard to sentences like (24).

(24) Alvin, Simon, and Theodor know one another.

An account like Langendoen's would predict (24) to be felicitous in a situation where there is less than full mutual acquaintance among the individuals mentioned in (24); say, where Alvin and Simon know one another, and Simon and Theodor know one another, but Alvin and Theodor never met. However, (24) cannot be used in such a situation. As Fiengo and Lasnik (1973) were the first to suggest, this infelicity seems to come about because stative verbs appear to require strong reciprocity.

I believe the issue raised by Dalrymple et al. as a criticism of underspecification analyses for reciprocity should be dismissed. My reason for this that it can be shown that stative verbs impose the same strength requirements even in non-reciprocal sentences.

(25) John and Mary know Bill and Sue.

It is not possible to have an interpretation of (25) where John and Bill know one another, and Mary and Sue know one another, and that is all the knowing involved. Thus, we should not let the idiosyncratic properties of certain verbs influence theories of reciprocity, since these idiosyncratic properties have shown not to have anything to do with reciprocity in particular.[5]

The account that I will give below follows in the spirit of Langendoen. Like him, I will propose that OARs have a single weak interpretation. In particular, the interpretation I give is analogous to the fifth reading above, OWR. This means that the conditions imposed by the proposed logical form schema will be met in situations that validate OWR and any stronger type of reciprocity, except in cases where there are independent restrictions on interpretation such as the idiosyncratic properties of certain lexical items as observed in (24) and (25). I say that the proposed interpretation is *analogous* to OWR because I will use a different metalanguage than what we see in (Fig. 1); a language that has higher-order variables that can range over both individuals and events, and where verbs are not represented as relations. In the next section, I will explicate my metalanguage assumptions.

3.2 Events and Plurality

I will assume familiarity with some basic tenets of neo-Davidsonianism, and take it as uncontroversial that an object language sentence like (26) can be represented as (27).

(26) [$_S$ John drank the coffee quickly]

(27) $\exists e\{\text{AGENT}(e, \text{John}) \,\&\, \text{DRANK}(e) \,\&\, \text{THEME}(e, \text{the coffee}) \,\&\, \text{QUICK}(e)\}$

Notice that, in contrast to logical forms like those in (Fig. 1), the verb is represented as a monadic predicate of events, which is related to it arguments indirectly by thematic relations which share the same event parameter as the verbal predicate. It is assumed that all (declarative) sentences are existentially closed by tacit event quantifiers. For discussion of the many benefits of this type of approach, see Davidson 1967, Casteneda 1967, Carlson 1984, Higginbotham 1985, Taylor 1985, Parsons 1990, Schein 1993, Kratzer 2002, Pietroski 2005, and Williams 2007, among many others.

[5] See Kerem et al. (2010) for an account of reciprocals that reaches a similar conclusion. For them, strength is attributed to the notion of typicality; e.g., (23) and (24) sound bad when used in the relevant situations because the verb *know* is typically used in situations of full mutual acquaintance.

Schein (1993) has urged that the variables used in logical forms like (27) be construed as higher-order variables, in particular, plural variables that can have many values. As an illustration, we can represent (28) as (29).

(28) The boys kissed the girls.

(29) ∃*ee*{AGENT(*ee*, the boys) & KISS(*ee*) & THEME(*ee*, the girls)

If we can interpret the singular quantifier ∃*e* in (27) into English as "there exists *an* event, *e*", then we can interpret the plural quantifier ∃*ee* in (29) as "there exists one ore more events, the *ee*-s". Crucially, as will be discussed more below, plural variables are number-neutral: their values can be one or many things. Schein has shown that modifying traditional neo-Davidsonian logical forms with higher-order variables accounts for many of the problems that are addressed in the literature on semantic plurality. The work of Landman (2000) reaches similar results, and even though his particular construal of higher order variables differs from Schein's (Landman would have the variables in (29) range over sums or Groups), the central idea seems to be shared between these authors. For the purposes of this paper, I will follow Schein and use plural variables, though this is only a personal preference. As far as I can tell, variables ranging over sums or Groups work just as well, so long as these variables remain number-neutral.[6]

I will take the rest of this section to outline the *plural first-order* language that I will use to represent sentences with OARs; for a more detailed exposition of these types of languages, I refer the reader to Schein (1993), and Linnebo (2008). This language can be seen as having everything that the language of first-order predicate calculus has (which I will not include here for purposes of space), plus the plural machinery I will describe below.

As for terms in our language, in addition to familiar singular terms, such as singular variables *x,e*, and singular constants *a,b*, we have their corresponding number-neutral plural counterparts, *xx*, *ee*, *aa*, and *bb*. One of the central properties of plural languages is that plural terms can have *many* values, though they are just as happy with having a single value (Boolos 1984). This number-neutral aspect of plural variables will be important for the present account of OARs.

[6] Landman himself makes a distinction between variables that can have just one value and variables that can have a sum as a value. However, as Zweig (2008) shows, it is possible to have number-neutral variables in a Landman-type semantics for plurality.

There are three types of predicates in this language. First, there is the logical predicate ≤, which we can interpret as *is one of*; we can translate $x \leq yy$ into English as "*x* is one of the *yy*". We also have singular and plural monadic predicates. Following Pietroski (2005), I will assume that at least the members of the open-class lexical categories can be represented as *plural* monadic predicates; e.g. $[\![\text{dog}_N]\!] = \text{DOG}(xx)$; $[\![\text{kiss}_V]\!] = \text{KISS}(ee)$; $[\![\text{smart}_{Adj}]\!] = \text{SMART}(xx)$; $[\![\text{quickly}_{Adv}]\!] = \text{QUICK}(ee)$. As an idealization, sufficient for the purposes of this paper, assume the following interpretive axiom for plural monadic predicates.[7]

(30) $P(xx)$ iff $\forall x$: $x \leq xx[P(x)]$

Exceptions to the monadic trend are certain open-class morphemes that are inherently relation. These include *same, different,* and of particular interest for us, *other*. I will treat these as formally dyadic, though in this paper, we will only consider cases when these predicates have singular arguments such as $\text{OTHER}(x,y)$, which are interpreted as a simple first-order relation. See Moltmann (1992).

The last type of predicate in our plural first-order language is dyadic thematic predicates. Aside from the logical predicate ≤, and the special relational open-class morphemes (*same, different, other, etc.*), these are the only non-monadic predicates in the language that I will consider here. These predicates represent the interpretation of thematic roles. Again, I will assume an idealized interpretive axiom for these predicates when they appear with plural arguments[8] (cf. Schein 2005).

(31) $\Theta(ee, xx)$ iff $\forall x$: $x \leq xx$ [$\exists e$: $e \leq ee$ [$\Theta(e,x)$]]
& $\forall e$: $e \leq ee$ [$\exists x$: $x \leq xx$ [$\Theta(e,x)$]]

All of these predicates alone count as formulas of the language. If two non-logical predicates share a common parameter, such as $P(ee)$ and $Q(ee,xx)$, then the conjunction of these formulas, $P(ee)$ & $Q(ee,xx)$, is also a formula. The plural quantified expressions $\exists vv$.F, $\forall v$: $v \leq vv$.F, and $\exists v$: $v \leq vv$.F are formulas if F is a formula. I intentionally leave out discussion of reciprocals with quantificational antecedents since there is not enough space here to discuss treatments of quantificational determiners; however, when necessary

[7] Certain plural monadic predicates are taken to be collective; for example, three(xx) can be true of some things taken together, even though it does not hold of any one x such that x ≤ xx. I will put aside this possibility and treat monadic predicates as being distributive in the sense of (30).

[8] Outlier effects are pervasive with plural DPs, especially when large pluralities are involved. Again, I will stick to the idealized interpretive axiom, though we will see exceptions to (31) even in this paper.

I will sometimes use the following notation of Schein's when representing the content of determiners, and assume that the resulting constituent in logical form is a formula of the language that can be appended to other formulas in the same manner as the previously mentioned quantifiers.

(32) The boys slept.

(33) ∃*ee*{[the *xx*: BOY(*xx*)]AGENT(*ee, xx*) & SLEEP(*ee*)}

Having outlined a suitable metalanguage, I will now turn to my specific proposals for OARs.

3.3 Interpreting OARs

The goal of this section is to put forth of theory of the interpretation of OARs, and the sentences in which they are embedded, in a way that not only respects the empirical facts from Section 2, but also captures a wide range of the attested readings from 3.1 in a straightforward manner.

I want the logical forms of these sentences to not only reflect that OARs are complex, as argued for in 2.1, but as being composed of the same *one* and *other* that we saw in instances of cross-sentential anaphora (Section 2.2). This means that the analysis should include the following two things: (i), that *one* of OARs is inherently partitive, and (ii) that anaphora in OARs is linked in exactly the same way as it is in (21) and (22), specifically that the antecedent of OARs is only the antecedent to *one,* and *other* is indirectly related to this antecedent by being anteceded by *one*. And since *one* antecedes *other*, *other* inherits *one*'s partitivity.

I will also propose some additions to the logical form, which are also guided by the facts from Section 2; additions that are necessary for explaining the range of polysemy discussed above. First, I propose that the case facts we saw at the end of section 2.1 reflect the thematic properties of both *one* and *other*. I believe that *one* inherits not only morphological case from its antecedent, but also that it inherits its antecedent's thematic role. When interpreted, *one* is associated with whatever thematic relation in logical form that its antecedent is (e.g., AGENT(*e,x*)), modulo specific values of variables. As for *other*, I suggest that its thematic role, like its case, be the one typical of the position where the OAR finds itself: if the OAR is a direct object, *other* will be interpreted as a Theme; if an indirect object, *other* will be interpreted as a Goal.

I also propose that the DP containing *one* has a covert distributive quantifier.[9] Much work in the event semantics literature have shown that it is useful to view distributive quantifiers as being immediately followed by sub-event quantifiers in logical form (see, for example, Pietroski and Hornstein 2002; Schein 1993 and elsewhere; Taylor 1985), and I will adopt this view here. There are several benefits to this approach to distributivity. For example, it allows us to apportion different adverbial modifiers to different event arguments, as shown in (34), an example from Taylor (1985).

(34) Gracefully, Sally ate every crisp quickly.

We can interpret this sentence as meaning that the entirety of the eating was graceful, but as far as the eating of each crisp is concerned, this happened quickly. This is represented in (35).

(35) ∃*ee*{**GRACEFUL(*ee*)** & AGENT(*ee*, Sally) & EAT(*ee*)
& [every(*y*): CRISP(*y*)] ∃*e'*: *e'* ≤ *ee* {THEME(*e'*,*y*) & **QUICK(*e'*)**}}

From (35), we can see that it is possible to construe some event predicates as being associated with subevents, and others as being associated with the "larger event". Schein (1993) has shown that this apportionment applies not only to adverbial predicates, but also verbal predicates and thematic relations; an assumption that forms the basis for his argument for thematic separation (see Schein 1993: Ch 4; Kratzer 2003). Observe (36), where the relevant reading is one where the two brothers did all the making, and for each customer, that customer received three slices of pizza.

(36) Two brothers made every customer three slices of pizza.

Schein captures this reading by representing (36) as (37), where the thematic predicate associated with *three slices of pizza* has its event variable bound by the sub-event quantifier introduced by the distributive DP, *every customer*.

(37) ∃*ee*{AGENT(*ee, two brothers*) & give(*ee*) & [every *x*: customer(*x*)]
∃e': e' ≤ ee{Goal(e', x) & THEME(e', three slices of pizza)}}

[9] Several authors have proposed that some things that are apparently indefinite (such as *one* here), can sometimes receive a universal interpretation. Consider (i)

(i) Three students drank a bottle of beer

Covert distributivity has been proposed to account for cases like (i) not only by those working in the plural event literature (Schein 1993, Landman 2000), but also in the DRT framework (Kamp and Reyle 1993).

I will implement this approach to distributivity in the case of OARs as follows. Assuming that *other* is interpreted within the scope of *one*, and that *one* is interpreted distributively (as "each one"), then the event variable within *other'*s corresponding thematic relation in logical form will be bound by the sub-event quantifier introduced by the distributive quantifier, in much the same way as the thematic predicate associated with *three slices of pizza* has its event variable bound in (37).

With these points in mind, I propose (38) as the interpretation of *one another*. The thematic predicate Θ_{xx} is meant to represent the thematic relation inherited from the reciprocal antecedent, i.e., the same thing whose values form the whole from which the *one*'s partitivity is determined. The thematic predicate Θ_C is meant to represent the "canonical" thematic role associated with the position where the OAR. As the logical form shows, this thematic role is associated with whatever the value of *other* is, in accord with my proposals above.

(38) ⟦one another⟧ =
$\forall x'$: $x' \leq xx$ [$\exists e'$: $e' \leq ee$ {$\Theta_{xx}(e',x')$ & ←contribution of *one*
[$\exists x''$: $x'' \leq xx$ & OTHER(x', x'') & $\Theta_C(e',x'')$]}] ←contribution of *other*

We can see that (38) also encodes the relevant properties that we observed at work in the cases of cross-sentential anaphora we saw in 2.2. Specifically, *one*'s partitivity is represented as $x' \leq xx$, where xx picks out the values associated with the antecedent; and *other* inherits this partitivity ($x'' \leq xx$) and determines distinctness with regard to what *one* picks out (OTHER(x', x''). We can also see the work of the sub-event quantifier introduced by the distributive quantifier that I claimed is part of [$_{DP}$…*one*…]. The sub-events are such that each individual value of *one*, x', has its own subevent e', where $it_{x'}$ act as a Θ_{xx}, and in that e' something other than $it_{x'}$ acts as a Θ_C.

Let us now apply the schema in (38) to actual sentences with OARs. Consider first an elementary reciprocal sentence.

(39) The boys hit one another.

(40) $\exists ee$ {[the xx: BOY(xx)]AGENT(ee, xx) & HIT(ee)
& $\forall x'$: $x' \leq xx$[$\exists e'$: $e' \leq ee$ {AGENT(e', x')
& [$\exists xx''$: $x'' \leq x$ & OTHER(x', x'') &THEME(e', x'')]}]}

We can see here how specific values of Θ_{xx} and Θ_C are determined. Since the OARs antecedent has the Agent role, the value of Θ_{xx} is Agent in (40). And

since the OAR is a direct object, the role of *other* (40) is the role typical of direct objects, i.e., Theme.

Turning now to more complicated cases, consider when the OAR is an indirect object, in which case it has multiple potential antecedents.

(41) The students introduced the professors to one another.

These are the cases discussed at end of 2.1, where Serbo-Croatian and Ukrainian show different case morphology on *one*, depending on the intended meaning. As I am claiming that *both* case and thematic role of *one* is dependant on the reciprocal antecedent, then we should expect that when *one* is nominative, it is associated with the thematic relation AGENT in logical form, and when *one* is accusative, it is associated with THEME. The logical forms below show that this association gives the correct interpretations.

Consider first the reading of (41) where the professors are introduced to students. This is the reading that is represented in (42); where the case of *one* is nominative (cf. 15). Since the antecedent to *one* here is the subject, *one* gets interpreted as an Agent, and the whole from which *one*'s partitivity is determined by what the subject denotes, in this case, the students.

(42) $\exists ee\{[\text{the } xx\text{: STUDENT}(xx)]\text{AGENT}(ee, xx)$ & $\text{HIT}(ee)$
& $[\text{the } yy\text{: PROFESSOR}(yy)]\text{THEME}(yy)$
& $\forall x'\text{: } x' \leq xx[\exists e'\text{: } e' \leq ee\{\underline{\textbf{AGENT}}(e', x')$
& $[\exists x''\text{: } x'' \leq xx$ & $\text{OTHER}(x', x'')$ & $\text{GOAL}(e', x'')]\}]\}$

Consider now the reading where the professors are introduced to professors (cf. 16). Here, *one* gets interpreted as a Theme, and its partitivity is determined with regards to what the direct object picks out, in this case, the professors.

(43) $\exists ee\{[\text{the } xx\text{: STUDENT}(xx)]\text{AGENT}(ee, xx)$ & $\text{HIT}(ee)$
& $[\text{the } yy\text{: PROFESSOR}(yy)]\text{THEME}(yy)$
& $\forall y'\text{: } y' \leq yy[\exists e'\text{: } e' \leq ee\{\underline{\textbf{THEME}}(e', y')$
& $[\exists y''\text{: } y'' \leq yy$ & $\text{OTHER}(y', y'')$ & $\text{GOAL}(e', y'')]\}]\}$

In both readings, *other* is interpreted as a Goal, which is expected since the OAR is an indirect object.

Admittedly, there are certain situations that this approach predicts to be false, but are not. This concerns situations described by the following sentences.

(44) The students are following one another.

(45) The plates are stacked on one another.

Imagine that the situations are such that there is a student at the front of the line that is not following anyone, and a plate at the bottom of the stack that is not stacked on anything. My proposed logical form would predict (44) and (45) to be false in these situations, because of the universal force associated with *one*. However, most people, including myself, would judge these sentences to be fine in such situations. But before trying to save myself from this problem, let me first consider how the slightly flawed present approach fairs against other proposal to deal with this issue. And to consider this, let us reflect on a bit on the present methodology. I have tried here to revive Langendoen's underspecification approach for the reasons discussed in 3.1. Why is it then that I proposed something analogous to Reading 5 (OWR) and not the weakest reading, Reading 6 (IAO)? Something like IAO is able to capture the truth (44) and (45) as true in the relevant situations, and there exist accounts, such as Dalrymple et al's (1998), that take IAO to be a possible interpretation. However, this comes at a price: while approaches that include IAO as a possibility can account for the "edge" cases in (44) and (45), they make bad predictions with regard to comparative sentences like (46) and (47).

(46) #The students are taller than one another.

(47) #The students exceed one another (in height).

A theory with IAO would predict sentences like (46) and (47) to be true just as long as one individual is taller than the rest. The approach outlined in this paper predicts these sentences to be contradictory, and this prediction is borne out, as we can see from the logical form of (47)[10] in (48).

(48) $\exists ee\{[\text{the } xx\text{: STUDENT}(xx)]\text{AGENT}(ee, xx)$ & $\text{EXCEED}(ee)$
& $\forall x'\text{: } x' \leq xx[\exists e'\text{: } e' \leq ee\{\text{AGENT}(e', x')$
& $[\exists xx''\text{: } x'' \leq x$ & $\text{OTHER}(x', x'')$ & $\text{THEME}(e', x'')]\}]\}$

This states, roughly, that every individual is associated (through an event of exceeding) with another individual such that the former is taller than the latter. This is something that cannot be true of every individual, hence the infelicity of (47). So we are left with a choice between two flawed theories, the current one, where we have to make exceptions for "edge" effects, or a theory with IAO, which runs into problems with comparatives. Sauerland (1998) has previously suggested in his work on reciprocals that there is a pragmatic principle, which he calls Benevolence, that allows for a certain

[10] I am giving the logical form of (47), and not (46), since they illustrate the same thing, but interpreting (46) would require to me to discuss a neo-Davidsonian treatment of comparative constructions, a digression that unfortunately cannot fit in this paper.

degree of exception when judging a sentence to be true. If we allow for such a device, then that seems like a step toward saving the present approach in the face of these "edge" cases. Lastly, on par with the discussion above of the strength imposed by stative verbs, notice that it appears we must make exceptions for edges even in cases where reciprocals are not involved, suggesting that theories of reciprocity should not have to worry about accommodating a more general problem.

(49) The plates are stacked.

I want to close this discussion by briefly mentioning an extension of the current approach. As we know, there are more than just elementary reciprocal sentences that a theory of reciprocity has to account for. We have already looked at non-elementary sentences where the OAR is in indirect object position. I want now to consider OARs as they appear *within* noun phrases, as in (50).

(50) I enjoyed the artists' pictures of one another.

We can interpret this sentence with the current approach by modifying (38) so that the existential quantifier introduced by distributive *one* be of a polymorphic type. That is, in some cases, it will range over events, and other cases, it will ranger over individuals. This modified version of (38) is shown below in (51). I will use *u* and *uu* as singular and plural metavariables, where specific instances of the OAR will dictate whether these variables range over events (*e* and *ee*) or individuals (*x* and *xx*).

(51) ⟦one another⟧ =
$\forall x'\colon x' \leq xx\ [\exists u'\colon u' \leq uu\ \{\Theta_{xx}(e',x')\ \&$
$[\exists x''\colon x'' \leq xx\ \&\ \text{OTHER}(x', x'')\ \&\ \Theta_C(e',x'')]\}]$

With (51) as our rule for interpreting OARs, the logical form for (50) would be as in (52). In what follows, I will simplify the logical forms for clarity, and only explicitly state the interpretation of nominals when necessary, and when not, I will just provide subscripted variable names. As for the existence nominal thematic roles, and for the specific ones used here, I refer the reader to Barker (1991) for POSS and Barker and Dowty (1993) for OF.

(52) $\exists ee\{\text{AGENT}(ee, I_{xx})\ \&\ \text{ENJOY}(ee)$
$\&\ \exists yy[\text{POSS}(yy, \text{the artists}_{zz})\ \&\ \text{PICTURE}(yy)$
$\&\ \forall z'\colon z' \leq zz\ [\exists y'\colon y' \leq yy\ \{\text{POSS}(y',z')$
$\&\ [\exists z''\colon z'' \leq zz\ \&\ \text{OTHER}(z', z'')\ \&\ \text{OF}(y',x'')]\}]$

The only change that we had to make (38) to account for such constructions was to allow the relevant quantifier to range over different types of things; everything else stays the same, such as how thematic roles are apportioned and how antecedence works. We still need to elucidate exactly what determines what the quantifier will ranger over, but roughly, I believe that this is determined by the type of constituent that *one* is (immediately) embedded in. If it is occurs within a sentence, the quantifier will range over events, as in (41)-(48); if it occurs within a nominal, it will range over individuals, as in (50) and (52). For a more detailed account of this, see LaTerza (2011).

4 Conclusion

In this paper I have argued that OARs should be treated as compositionally complex expressions, where each element contributes essentially the same meaning here as in their non-OAR occurrences. I claimed that the only differences in this regard is that the *one* of OARS is always a partitive anaphor, and that it also contains a covert distributive quantifier. We have seen in 3.3 that a neo-Davidsonian theory designed to reflect the observable distributional properties of OARs (and the relevant cases of cross-sentential anaphora) can account for a wide range of the attested reciprocal readings, regardless of where the reciprocal appears in the sentence. Furthermore, it does so without positing any sort of ambiguity in reciprocal expressions, and also without resorting to polyadic quantification. I am not aware of any other approach that can accommodate such a wide range of readings *and* syntactic distribution with a uniform semantics for OARs (as we saw in (51)). While reasons of space prevent me from explicating how the logical forms discussed here are composed from smaller meaningful units, I refer the reader to LaTerza (2011) for the details of a recursive specification of semantic values, where I also provide proposals about the LF phrase markers that are interpreted.

References

Baker, C.L. 1978. *Introduction to Transformational-Generative Syntax*. Prentice-Hall, Englewood Cliffs, NJ.

Barker, Chris. 1991. *Possessive Descriptions*. PhD Dissertation, University of California, Santa Cruz.

Barker, Chris and David Dowty. 1993. Nominal thematic proto-roles. Unpublished Ms.

Beck, Sigrid. 2001. Reciprocals are definites. *Natural Language Semantics* 9. 69–138.

Boolos, George. 1984. To be is to be the value of a variable (or the values of some variables). *Journal of Philosophy*, 81. 430–450.

Carlson, Greg. 1984. Thematic roles and their role in semantic interpretation. *Linguistics*, 22. 259–79.

Casteñeda, Hector. 1967. Comments. In *The Logic of Decision and Action*, ed. Rescher.

Dalrymple, Mary, Makoto Kanazawa, Yookyung Kim, Sam Mchombo and Stanley Peters. 1998. Reciprocal expressions and the concept of reciprocity. *Linguistics & Philosophy* 21.2. 159–210.

Davidson, Donald. 1967. The Logical Form of Action Sentences. In *The Logic of Decision and Action*, ed. Rescher.

Dimitriadis, Alexis. 2008. The Event Structure of Irreducibly Symmetric Reciprocals. In: Johannes Dölling, Tatjana Heyde-Zybatow and Martin Schäfer (ed.), *Event Structures in Linguistic Form and Interpretation*, 327–354. Berlin: Mouton de Gruyter.

Dotlačil, Jakub. 2010. Anaphora and Distributivity: A study of *same, different,* reciprocals, and *others*. PhD Dissertation, Utrecht University.

Dowty, David. 1989. On the semantic content of the notion of 'thematic role'. In Chierchia et. al. *Properties, Types, and Meaning II*. 69–129.

Fiengo, Robert and Howard Lasnik. 1973. The logical structure of reciprocal sentences in English. *Foundations of Language* 9. 447–468.

Higginbotham, James. 1985. On Semantics. *Linguistic Inquiry* 16. 547–593.

Kerem, Nir, Naama Friedmann, and Yoad Winter. 2009. Typicality effects and the logic of reciprocity. In *Proceedings of Semantics and Linguistic Theory, SALT19*, 2009.

Landman, Fred. 2000. Events and plurality: the Jerusalem lectures. Dordrecht: Kluwer.

Langendoen, Terrance D. 1978. The logic of reciprocity. *Linguist Inquiry* 9.2. 177–197.

Lasersohn, Peter. 1995. *Plurality, Conjunction and Events*. Dordrecht: Kluwer.

LaTerza, Chris. 2011. Floating Reciprocals. Unpublished General's Paper. University of Maryland, College Park.

Linnebo, Øystein. Plural Quantification. Available online at plato.stanford.edu/entries/plural-quant/.

Kratzer, Angelika. 2003. *The Event Argument.* Available online at www.semanticsarchive.net.

Moltmann, Friederike. 1992. Reciprocals and *same/different*: towards a semantic analysis. *Linguistics and Philosophy* 15. 411–462.

Parsons, Terrence. 1990. Events in the Semantics of English: A study in subatomic semantics. Cambridge, Mass.: MIT Press.

Peters, Stanley, and Dag Westerståhl. 2005. *Quantifiers in Language and Logic*. Oxford University Press.

Pietroski, Paul. 2005. *Events and Semantic Architecture*. Oxford University Press.

Pietroski, Paul, and Norbert Hornstein. 2002. Does every sentence like this exhibit a scope ambiguity? In W. Hinzen and H. Rott, Hansel-Hohenhausen *Belief and Meaning: Essays at the Interface.*

Sauerland, Uli. 1998. Plurals, derived predicates, and reciprocals.

Schein, Barry. 1993. *Plurals and Events*. MIT Press, Cambridge, Massachusetts.

Schein, Barry. 2003. Adverbial, descriptive reciprocals. In *Language & Philosophical Linguistics, Philosophical Perspectives,* ed. John Hawthorne, 17.1. 333–367.

Schein, Barry. 2005. Plurals. In Ernie Lepore & Barry Smith, *The Oxford Handbook of Philosophy of Language*. 716–767. Oxford: Oxford University Press.

Taylor, Barry. 1985. *Modes of Occurrence*. Oxford: Blackwell.

Williams, Alexander. 2007. *Complex Causatives and Verbal Valence*. PhD Dissertation, University of Pennsylvania.

Zweig, Eytan. 2008. *Dependent Plurals and Plural Meaning*. PhD Dissertation, New York University.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 419–433. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Evidentials in Interrogatives: A Case Study of Korean*

Dongsik Lim
CCHS-CSIC, Spain
dongsik.lim@gmail.com

Abstract. This paper concerns a puzzle about the interpretation of Korean direct evidential *-te-* in interrogatives which I call *evidential perspective shift in questions* ('origo shift of evidentials' in quesitons in Garrett 2001). This puzzle consists in the evidential being interpreted as regarding a source of information of the answerer rather than the questioner. Here I introduce a novel semantic approach to this phenomenon which derives it as a consequence of the interaction of the meaning of questions and of evidentials. I will also illustrate the conceptual and empirical advantages of this view over previous accounts.

1 Introduction

Korean verbal ending *-te-* introduces the 'implication' that the utterer has direct evidence relative to the 'prejacent'.[1] For example, unlike (1a), (1b) carries the implication that the speaker has direct evidence (or the speaker saw) that John looked at the speaker himself/herself. Furthermore, as shown in (1c), *-te-* also introduces a similar implication when used in questions.

(1) a. John-i na-lul po-nta.
John-NOM *I*-ACC *see*-DECL
'John looks at me.'

b. John-i na-lul po-te-la.
John-NOM *I*-ACC *see*-***te***-DECL
'John saw me.'
Implication: The speaker has direct evidence that John saw the speaker himself/herself

* I thank audiences in California Universities Semantics and Pragmatics (November 21, 2009, UCSC) and in SuB 15 for their questions and comments. I am also indebted to the discussions with Jean-Roger Vergnaud, Andrew Simpson, Stephen Finlay, Barry Schein, Seungho Nam and Chungmin Lee. Special thanks go to Elena Guerzoni, whose detailed comments and suggestions to the earlier version of this work were greatly helpful. All remaining errors are mine, of course.

[1] Throughout this paper, the term *implication* is used to avoid making any theoretical commitment to the question of whether it is truth-conditional, presuppositional, implicational, or illocutionary. I also extend the notion *prejacent* to indicate the propositional content of the sentence from the context of evidentials. I use this term in a purely descriptive way.

c. John-i na-lul po-te-nya?
John-NOM *I*-ACC *see-**te***-Q
'Did John see me?'
Implication: The addressee is expected to answer based on his/her direct evidence relative to whether John saw the speaker or not

(1) shows that evidentials behave like indexicals (Kaplan 1989): the implication it introduces varies depending on who the speaker is.[2] For example, if the utterer of (1b) is Bill, then it is Bill who has direct evidence, and if the utterer is Tom, then it is Tom who has direct evidence. Similarly, the denotation of the indexical, such as *na* 'I', is evaluated from the utter's perspective. Therefore, if the utterer of (1a) is Bill, then the sentence is true iff John looks at Bill, and if the utterer is Tom, then it is true iff John looks at Tom.

However, we find that the parallelism between indexicals and evidentials does not appear any more in questions. Both in the declarative (1b) and in the interrogative (1c), the pronoun *na* 'I' is interpreted as the utterer. However, the evidential implication introduced by *-te-* is 'shifted' from the speaker's perspective to the addressee's perspective: in (1b), it is the speaker who has the direct evidence, but in (1c), it is the addressee who is expected to have the direct evidence. Here we have a puzzle of *the evidential perspective shift in questions*: if both pronouns and evidentials exhibit indexicality, why are only evidentials shifted from the speaker's perspective to the addressee's perspective in questions?

This paper aims to solve this puzzle. Specifically, I will show that the facts illustrated above can be derived from the standard semantics of indexicals and questions by assuming a specific lexical entry for evidentials. To do that, first I will outline the theoretical assumptions of this paper: Kaplan's (1989) semantics of indexicals and Hamblin's (1973) semantics of questions (Section 2). Then I will make my own proposal and show how this proposal explains the puzzle (Section 3). Next I will compare my proposal with other (plausible but wrong, at least for Korean) proposals (Section 4). Finally I will conclude my paper and discuss theoretical implications and remaining problems (Section 5).

2 Theoretical Backgrounds

2.1 Semantics of Indexicals: Kaplan (1989)

Kaplan's (1989) theory of indexicals is intended to explain the difference between (2a) and (2b):

[2] Higginbotham (2009) also pointed out this characteristics under the term *First-person authority*.

(2) a. He must be rich.
b. The President of GM must be rich.

Suppose that (2a) is uttered with pointing out John as the reference of *he*. At the time of utterance, the reference of *he* does not vary over world of evaluation, and therefore, (2a) is true iff, at the time of the utterance, in every epistemic alternative of the speaker, John is rich. In contrast, (2b) (with *de dicto* reading), is true iff in every epistemic alternative of the speaker, the president of GM is rich, no matter who the president of GM might be in that world. Here the reference of the definite description *the President of GM* may vary depending on the worlds of evaluation (in one world it may be John, while in the other world it may be Mary, and so forth).

To account for the difference between indexicals and other definite descriptions, Kaplan (1989) proposes that indexicals (like *I*, *here* and *now*), receive world-independent but context-dependent denotations. Once the reference of an indexical is established within an utterance context, it behaves like a rigid designator across worlds of evaluation (Kripke 1980). To formalize this idea, Kaplan proposes two-step semantics, where the meaning of a sentence, which grammar generates, is called *character*, a function from contexts to intensions. Then a character is evaluated via two steps. First, characters are applied to the context, resulting in intensions. Second, intensions are applied to worlds of evaluation, resulting in extensions. In terms of type-driven semantics, this idea can be formalized as (3).[3] In addition to this, following common practice, I assume the utterance context c is a triple which contains the world, the time, and the speaker of utterance, as in (4).

(3) a. The character of ϕ: $[\![\phi]\!]_\chi = \lambda c.\lambda w.[\![\phi]\!]^{c,w}$
b. The intension of ϕ at context c: $[\![\phi]\!]^c{}_\xi = \lambda w.[\![\phi]\!]^{c,w}$

(4) Utterance context $c = <w^c, t^c, s^c>$[4]

Let us see how this system works with concrete examples. First consider (5).

(5) I am rich.

In Kaplan's proposal, the pronoun *I* is interpreted as the speaker of the utterance s^* in the utterance context c^*:

(6) $[\![I]\!]^{c^*} = [\![I]\!]^{<w^*,t^*,s^*>} = s^*$

[3] (3) is from von Fintel (2005). For the original formalization see Kaplan (1989: Ch.XVIII).
[4] I only specify relevant parameters: for my purpose, other parameter such as the place of utterance is not required.

Therefore, the truth-condition of (5) differs depending who the speaker is in c^*, as illustrated in (7). For example, if Mary utters (5) in c^*, then since *I* refers to Mary, (5) is true if and only if Mary is rich in c^*. Similarly, if Tom utters (5) in c^*, *I* refers to Tom, and (5) is true if and only if Tom is rich in c^*.

(7) a. If s^* is Mary, then $[\![I]\!]^{c^*} = [\![I]\!]^{<w^*,t^*,s^*>} = Mary$
Therefore, (5) is true if and only if Mary is rich in c^*
b. If s^* is Tom, then $[\![I]\!]^{c^*} = [\![I]\!]^{<w^*,t^*,s^*>} = Tom$
Therefore, (5) is true if and only if Tom is rich in c^*

Given this, let us further see how this system works for evidentials, which also exhibit indexicality, as we saw in the introduction. Consider (8), for example, where the declarative *John-i Bill-ul po-te-la* 'John saw Bill' contains *-te-*, and is uttered in the context c^*. Then (8) carries the implication that the speaker s^* in c^* has direct evidence that John saw Bill.

(8) $[\![$*John-i Bill-ul po-te-la*$]\!]^{c^*}$
John-NOM *Bill*-ACC *see-**te***-DECL
'John saw Bill'
Implication: s^* in c^* has direct evidence that John saw Bill.

The implication introduced by *-te-* is speaker-dependent: it varies depending on the speaker s^* in c^*. For example, as illustrated in (9), if s^* is Mary, then the implication is that Mary has direct evidence that John saw Bill, and if s^* is Tom, then the implication is that Tom has direct evidence that John saw Bill.

(9) a. If the utterer of (8) is Mary, then s^* is Mary.
The implication of (8): Mary has dir. evi. that John saw Bill.
b. If the utterer of (8) is Tom, then s^* is Tom.
The implication of (8): Tom has dir. evi. that John saw Bill.

2.2 Semantics of Questions: Hamblin (1973)

Hamblin (1973) assumes that a question denotes the set of its possible answers, that is, the set of propositions. The shift from propositions to sets thereof is due to the semantics of *wh*-words. For example, in yes/no questions, Hamblin assumes the lexical entry (10) for (either overt or covert) *whether*, where it maps every proposition to the set containing it and its negation:[5]

(10) $[\![whether]\!] = \{ \lambda p_{st} . p_{st}, \lambda p_{st} . \sim p_{st} \}$

[5] For simplicity I only focus on yes/no questions, but my proposal can easily extend to *wh*-questions.

Since a *wh*-word denotes a set of individuals, properties, or functions taking propositions, in different stages of semantic computation, we may find one of the three cases in (11): either the function is in a set (11a), the argument is in a set (11b), or both are in different sets (11c).

(11) a. $[\ [\ \alpha_{<\sigma,\tau>}\ ]\quad [\ \{\beta : \beta \in D_{\sigma}\}\ ]\ ]$
b. $[\ [\ \{\alpha : \alpha \in D_{<\sigma,\tau>}\}\ ]\quad [\ \beta_{\sigma}\ ]\ ]$
c. $[\ [\ \{\alpha : \alpha \in D_{<\sigma,\tau>}\}\ ]\quad [\ \{\beta : \beta \in D_{\sigma}\}\ ]\ ]$

Since, in these cases, the usual functional application (FA) rule does not work any more, Hamblin (1973) proposes a new rule, that is, a set-tolerant FA rule, or a point-wise FA rule. This rule can be implemented into type-driven semantics as (12), a rendition of Hamblin's rule made by Heim & von Fintel (2001).

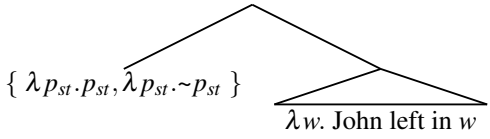
(12) Pointwise Functional Application Rule (PFA)
If α is a branching node and $\{\beta, \gamma\}$ is the set of its daughters, then:
a. $[\![\alpha]\!]_{c} = \lambda w.\ [\![\beta]\!]_{c}(w)([\![\gamma]\!]_{c}(w))$
b. or $\{\lambda w.\ [\![\beta]\!]_{c}(w)(x(w)) : x \in [\![\gamma]\!]_{c}\}$
c. or $\{\lambda w.\ f(w)([\![\gamma]\!]_{c}(w)) : f \in [\![\beta]\!]_{c}\}$
d. or $\{\lambda w.\ f(w)(x(w)) : f \in [\![\beta]\!]_{c}\ \&\ x \in [\![\gamma]\!]_{c}\}$
whichever is defined.

By these rules, in (11a), each argument in the set β can combine with the function α, returning a set of elements of type τ. Similarly, in (11b), each function in the set α can combine with the function β, returning a set of elements of type τ, and in (11c), each function in the set α can combine with each argument in a set β, returning a set of elements of type τ.

Let us see how Hamblin's (1973) semantics of questions actually works with a concrete example, that is (13), whose LF is (14):

(13) Did John leave?

(14)



Here the proposition *that John left* needs to combine with each of two functions in the set denoted by *whether*, which can be done via PFA (12c). Therefore, (14) is computed as shown in (15), where we can see that the denotation of (13) is a set of two possible answers (or two propositions), that is, *that John left* and *that John did not leave*, as expected:

(15) $[\![(13)]\!]^{c} = [\![$ *Did John leave?* $]\!]^{c} = [\![$ *Whether (John left)* $]\!]^{c}$
$= \{f(\lambda w.$ John left in $w): f \in \{\lambda p_{st}.p_{st}, \lambda p_{st}.\sim p_{st}\}\}$
$= \{[\lambda p_{st}.p_{st}](\lambda w.$ John left in $w), [\lambda p_{st}.\sim p_{st}](\lambda w.$ John left in $w)\}$
$= \{\lambda w.$ John left in $w, \lambda w.$ John did not leave in $w\}$

3 Proposal

Given the backgrounds shown above, I propose that the lexical entry for *-te-* is (16), where *-te-* takes a proposition as its argument and returns a character:[6]

(16) For any utterance context c^*,
$[\![$ *-te-* $]\!]^{c^*} = \lambda p_{st}.\lambda c$: s^c has only direct evidence relative to p. p
(where c is a variable over contexts: a triple of $< w^c, t^c, s^c >$)

According to (16), for any utterance context c^*, *-te-* takes a proposition as its argument and returns a partial character with the definedness condition (that is presupposition) that the speaker in c only has direct perceptive evidence that p. When this partial character is applied to a context with the definedness condition satisfied, it returns the proposition p itself.

This proposal makes the following two predictions. First, if the resulting character is immediately applied to c^*, the evidential presupposition relates to the utterance context c^*, and is anchored to the utterance speaker s^*. In this case, both evidentials and indexicals are interpreted from s^*'s perspective. Second, when characters of this sort are not directly uttered (for example, when they are members of a set of answers), these characters are not directly applied to the uterance context c^*. In this case, indexicals are still interpreted from s^*'s perspective, whereas evidential presuppositions are not interpreted from s^*'s perspective. In the rest of this section, I will show that the first prediction is borne out in declaratives, and the second prediction is borne out in questions.

3.1 *-te-* in Declaratives

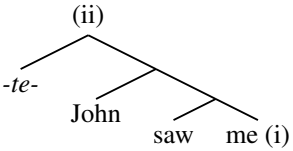
First consider (17).

(17) John-i na-lul po-te-la.
John-NOM *I*-ACC *see*-***te***-DECL
'John saw me'
Presupposition: the speaker has direct evidence that John saw the speaker himself/herself

The LF of (17) is (18):

[6] For simplicity I ignore the temporal interpretation of *-te-*. Readers interested in this issue are referred to Chung (2007) and Lee (2010), *inter alia*.

(18)



For any utterance context c^* (i.e., the triple $< w^*, t^*, s^* >$), the denotation of (18) is derived as follows:

(19) a. $[\![(\text{i})]\!]^{c^*} = [\![me]\!]^{c^*} = s^*$[7]

b. $[\![(\text{ii})]\!]^{c^*} = [\![(17)]\!]^{c^*}$
$= [\![\text{-}te\text{-}]\!]^{c^*}([\![John\ saw\ me]\!]^{c^*})$ (by Intensional FA and (19a))
$= [\![\text{-}te\text{-}]\!]^{c^*}$ (λw. John saw s^* in w) (by (16) and FA)
$= \lambda c$: s^c has direct evidence that J. saw s^*. λw. J. saw s^* in w

Here we can see that the evidential presupposition that the speaker in c has only direct evidence that John saw s^*, is anchored to the context c, which is still bound by λ. When the speaker s^* in c^* utters (17), he/she applies this character to c^* with the result in (20).

(20) $[\![(17)]\!]^{c^*} = [\lambda c$: s^c has dir. evi. that J. saw s^*. λw. J. saw s^* in $w](c^*)$
$= \lambda w$. J. saw s^* in w (presupposition: s^* has dir. evi. that J. saw s^*)

When the context s^* satisfies the presupposition that s^* has direct evidence that John saw s^*, we get the proposition that John saw s^* in w. Now we can see that the first prediction is borne out in declaratives : both evidentials and indexicals are interpreted from s^*'s perspective.

3.2 *-te-* in Questions

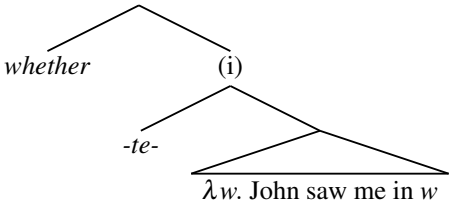
Consider the following question:

(21) John-i na-lul po-te-nya?
John-NOM *I*-ACC *see*-***te***-Q
'Did John see me?'

In the question like (21), in principle, we have two possible logical forms, with respect to the relative scope between *whether* and the evidential *-te-*. First consider the case where *whether* takes wide scope over *-te-*, which is (22).

[7] A careful reader may wonder how the pronoun gets its denotation from the utterance context. I assume that this is done by Korean sentence final declarative/interrogative endings, which vary depending on the utterance context. For a detailed explanation, see Lim (2010: Ch.5.1).

(22)

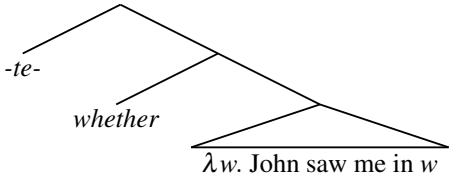


At the node (i), we have the following character which is of type $< c, st >$:

(23) λc: s^c has dir. evi. that J. saw s^*. λw. J. saw s^* in w

This is the same character as that in declaratives: see (19). However, each function in *whether* needs a proposition, and not a character, as its argument: see (10). Therefore, we have type mismatch. This means that, for the logical form to be interpretable, *-te-* should take wide scope over *whether* as in (24):

(24)



As in declaratives, for any utterance context c^*, *me* denotes the speaker s^*. Then the question *whether John saw me* is computed as we saw in Section 2.2, resulting in the set of two propositions in (25):

(25) $\{\lambda w$. John saw s^* in w, λw. John did not see s^* in $w\}$

-te-, as a function taking a proposition and returning a partial character (of type $< c, st >$), combines with each proposition in this set via PFA, and returns a set of two characters in (26):

(26) $\{\lambda c$: s^c has dir. evi. that J. saw s^* in w: λw. J. saw s^* in w,
λc: s^c has dir. evi. that J. didn't see s^* in w: λw. J. didn't see s^* in $w\}$

At this point, let us recall the pragmatics of questions in general. In Hamblin's semantics of questions, to ask a question is to present a set of answers to the addressee. When doing so, none of the answers is directly uttered by the questioner: each answer can be directly uttered only when the addressee chooses it as a true answer. This holds *no matter what the type of the answers may be*, either propositions or characters. Therefore, it follows that the characters in the set of answers are *not directly uttered by the questioner.*

This said, consider (26) again. Here we have the set of two characters, where pronouns are interpreted from s^*'s perspective, whereas the evidential presupposition is anchored to s^c in c, which is still bound by λ. None of the characters in this set is uttered directly by s^*, the questioner, but each character in (26) can be uttered only when the addressee chooses one of them as a true answer. When chosen, the character as a true answer is uttered by the addressee. Then it is applied to the addressee's context, and the evidential presupposition is anchored to the addressee's perspective. Here we can see that the second prediction is borne out: indexicals are still interpreted from s^*'s perspective, but evidential presuppositions are not interpreted from s^*'s perspective.

To summarize, in this section, I proposed that *-te-* is a function from propositions to characters, introducing a definedness condition that the speaker has direct evidence relative to the prejacent. Furthermore, *-te-* takes wide scope over *wh*-words, and a question containing *-te-* denotes a set of characters and not a set of propositions (as standardly assumed). I have also shown that, once we assume that *-te-* is a function from propositions to characters, we can derive the evidential perspective shift in questions from the semantics of *-te-* and its interaction with the semantics and pragmatics of questions in general, without any fundamental revision of Hamblin's (1973) semantics of questions or Kaplan's (1989) semantics of indexicals.

4 Comparison with Other Proposals

In this section I discuss possible alternatives of my proposal in this paper, and show why my proposal has theoretical as well as empirical advantages over these alternatives.

4.1 Potential Pragmatic Alternative

One might choose to account for the evidential perspective shift in questions in terms of the pragmatics of questions, rather than the semantic account I proposed above. The potential pragmatic account is as follows. Suppose that a questioner asks a question to an answerer about the issue P (the term *issue* is also used descriptively here). In genuine information-seeking circumstances, the questioner is ignorant of P. This means that, typically, the questioner has no evidence relative to P, no matter what the type of evidence may be. Therefore the evidential cannot be anchored to the questioner. However, for the addressee to answer the question, he/she is expected to have evidence relative to P. Hence, the evidential perspective shift.

This kind of pragmatic account makes the following prediction. Suppose that a questioner's state of information is limited: that is, the speaker only has reportative evidence about P, which is weaker than direct perceptive evidence.

In this case, it is reasonable for the questioner to ask a question to the addressee, who is expected to have stronger evidence, that is direct perceptive evidence. Then it is expected in the pragmatic account that the questioner would use the reportative evidential marker in his/her question, to indicate his/her own weak evidence, without anchoring it to the answerer. This prediction is not borne out, however. Consider the following scenario.

(27) John is a detective and is investigating a case of embezzlement in a company. While interviewing several employees in the company, John heard that Mary is the one who embezzled the money. Finally, he interviewed Mary and asked a question...

Then imagine that John asked the following question under (27):

(28) #Tangsin-i ton-ul hoynglyengha-ess-ta-pnikka?
you-NOM *money*-ACC *embezzle*-PAST-***ta***-Q
'Did you embezzle the money?'

The pragmatic account predicts that, under (27), the example (28), where Korean reportative evidential *-ta-* (Lim 2010) is used in a question, would be felicitous: since the speaker only has reportative evidence, and the addressee obviously has stronger evidence (since she *is* the embezzler), the reportative evidential *-ta-* should be anchored to the speaker. However, as indicated in (28), this prediction is not borne out, and under (27), (28) is simply infelicitous. This indicates that in Korean, the perspective shift of evidentials in questions obligatorily occurs, and therefore the pragmatic alternative does not explain Korean facts: we need an account based on the semantics, as proposed above.

4.2 Garrett (2001) on Tibetan

Garrett (2001) discusses the evidential perspective shift in Tibetan (which he calls *the origo shift*), and claims that, to account for the shift, the extension of a question should be modified as the set of assertions rather than the set of propositions, as shown in (29) (from Garrett 2001: 237):

(29) The revised extension of *Who left?*
Answer-Set(*Who left?*) = $\{A_{<h,s>} \mid \lambda x.$ Content(A) = *x* left$\}$
In words: the answer set for *Who left?* is the set of assertions A from *h* to *s* such that there is *x* such that the content of A is that *x* left.

Garrett's (2001) approach bears several problems. First, since both the speaker parameter and the addressee parameter is specified in each answer, it seems to predict that the shift is optional: it can be either anchored to the speaker or

to the addressee. However, the evidential perspective shift in Korean is obligatory, as we saw in Section 4.1. Second, it is unclear how to compositionally derive the extension in (29). Finally, again, since both parameters are specified in each answer, Garrett (2001) predicts that, when there is a shift, indexicals should also shift, but at least in Korean questions the shift of indexicals does not occur. Therefore we can conclude that Garret's proposal do not extend to Korean facts.[8]

4.3 Faller (2002) on Cuzco Quechua

Discussing Cuzco Quechua reportative evidential *-si-* in questions, Faller (2002) observes that a question with *-si-* is ambiguous between two readings, introducing different implications, as shown in (30) (from Faller 2002: 230):

(30) Pi-ta-s Inés-qa watuku-sqa?
who-ACC-***si*** *Inés*-TOP *visit*-PAST2
'Who did Inés visit?'
(i) Speaker indicates that somebody else is asking.
(ii) Speaker expects hearer to have indirect evidence for his/her answer

The reading (i) is similar to the (indirect) quotation of the question: the speaker indicates that somebody else is asking. The reading (ii) is the shifted reading, similar to the evidential perspective shift in questions discussed in this paper. To solve this problem, Faller (2002) assumes that the speech act QUEST(ION) is a request of an assertion to the addressee:

(31) QUEST = REQUEST (ASSERT$_h$(q)) (Faller 2002: 237)

Then Faller assumes scope ambiguity between different illocutionary acts. In reading (i), the operator EVI takes wide scope over the operator REQUEST, and in reading (ii) REQUEST takes wide scope over EVI:

(32) a. Reading (i): EVI (REQUEST (ASSERT$_h$(q))) (speaker-anchored)
b. Reading (ii): REQUEST (EVI (ASSERT$_h$(q))) (addressee-anchored)

A question immediately follows from (32): Can we find the similar ambiguity in a question with a different evidential marker in Cuzco Quechua? Faller's (2002) answer is positive, and her example is (33), where the BPG (best-possible-ground) evidential *-mi-* is used in a question (from Faller 2002: 230,

[8] Note that, due to the similar reason, McCready's (2007) analysis does not extend to Korean facts, either. McCready (2007) analyzes the perspective shift in some Japanese dialects, but in these dialects, when the evidential perspective is shifted, indexicals are also shifted, unlike Korean.

ex.189a):

(33) Pi-ta-n Inés-qa watuku-sqa?
who-ACC-***mi*** *Inés*-TOP *visit*-PAST2
'Who did Inés visit?'
(i) The speaker has the best possible grounds for asking
(ii) The speaker expects the hearer to base his/her answer on the best possible grounds

The problem in (33) is that, as Faller herself agrees, the ambiguity with *-mi-* in a question is less clear. Specifically, what does it mean that "the speaker has the best possible grounds for asking"? According to Faller (2002), the speaker may have 'the best possible grounds for asking' in two cases. First, we may imagine the scenario where a teacher is asking a question (34a) to his/her students. Here the speaker has authority over the hearer and therefore has the best possible grounds for demanding an answer. Second, we may imagine the scenario where a customer is asking a question (34b) to a merchant. In this case the speaker has very good reasons for wanting to know the answer, and therefore has the best possible grounds to ask a question.

(34) a. Hayk'a-n iskay yapa-sqa iskay-man?
*how-much-**mi** two add*-PP *to-Illa*
'How much is two plus two?' (Faller 2002: 232, ex.193a)
b. Hayk'a-n vale-n chay?
*how-much-**mi** cost*-3 *this*
'How much does this cost?' (Faller 2002: 232, ex.193b)

However, in both examples, the addressee-anchored reading of *-mi-* is equally available, and therefore it is unclear whether two questions in (34) actually the addressee-anchored reading or the speaker-anchored reading. Faller (2002) also agrees that there are ambiguities in (some) questions with *-mi-* between the speaker-anchored reading and the addressee-anchored reading, which seems to me that Faller's account of the shift based on scope ambiguity is less plausible.[9]

Finally, even though Faller manages to solve all the problems pointed out above, Korean does not show such an ambiguity as Cuzco Quechua. For example, in (35), where the reportative evidential *-ta-* is used in a question, we see that it only has the reading (ii), that is, the addressee-anchored reading. This means that, no matter what Faller's analysis on Cuzco Quechua evidentials in questions may be, it cannot extend to Korean facts.

[9] The natural question at this point is how to account for the ambiguity of *si* in (30). To me the lexical ambiguity seems plausible, but more investigation is required.

(35) Inés-nun nwukwu-lul manna-ess-ta-ni?
Inés-TOP *who*-ACC *meet*-PAST-***ta***-Q
'Who did Inés meet?'
(i) ~~The speaker indicates that somebody else is asking~~
(ii) The speaker expects the addressee to have indirect evidence for his/her answer

Summarizing this section, I have shown that the simple-minded pragmatics-based account does not explain the evidential perspective shift in questions in Korean, since in Korean the shift is obligatory in questions. Furthermore, I also showed my semantics-based proposal can capture the perspective shift in Korean questions better than other proposals made for other languages.

5 Conclusion and Remaining Issues

In this paper, I showed that the evidential perspective shift in questions in Korean should be explained in terms of semantics rather than of pragmatics, because the shift obligatorily occurs when an evidential marker appears in a question. I also explained the perspective shift by assuming that Korean evidentials are functions from propositions to characters, without making any fundamental revision to Hamblin's (1973) semantics of questions or Kaplan's (1989) semantics of indexicals.

There are several open questions which are not clearly answered in this paper. One of such questions is about similarities and the differences between evidentials and other perspective-anchored items such as expressives and utterance-modifying adverbials (Amaral, Roberts & Smith 2007, Potts 2005, Potts 2007, Harris & Potts 2009, *i.a.*). The main difference between these perspective-dependent items and Korean evidentials is that the former allow the optional shift in questions, but the latter are obligatorily shifted in questions. Since we have already seen that Korean evidentials in questions are obligatorily anchored to the addressee's perspective, in this conclusion I will only show examples containing other perspective-related items. First, consider (36), where the expressive *pilemekul* 'damn' appears in a question.

(36) Ne-nun ku pilemekul il-ul kumantwu-ess-ni?
You-TOP *that damn* *job*-ACC *quit*-PAST-Q
'Did you quit that damn job?'

In (36), the implication introduced by *pilemekul* can be interpreted in two ways - the speaker may think that the addressee's job is pretty bad, or the addressee may think that his/her own job is pretty bad. This shows that the perspective

shift in (36) is optional, unlike the shift triggered by *-te-*.

The utterance modifying adverbial like *solcikhi* 'honestly' triggers an optional shift in questions, unlike *-te-*. Consider the following question.

(37) Solcikhi, John-i ne-lul manna-ess-ni?
Honestly John-NOM *you*-ACC *meet*-PAST-Q
'Honestly, did John meet you?'

When *solcikhi* is anchored to the addressee, (36) carries the implication that the speaker asks the addressee to answer in an honest way. When it is anchored to the speaker, however, (36) carries the implication that the speaker's curiosity in asking the question is genuine (or, he/she really does not know anything about the answer). This ambiguity shows that, in Korean, utterance-modifying adverbs are also optionally shifted in questions, unlike evidentials.

The previous two examples suggest to us that (at least) in Korean, evidentials are different from other perspective-anchored items with respect to whether they are shifted optionally or obligatorily in questions: evidentials are obligatorily shifted, but others are optionally shifted. This difference may be due to the difference of implications they introduce: as shown above, Korean evidentials are presupposition triggers, whereas expressives and utterance-modifying adverbials introduce conventional implicatures (Potts 2005) or expressive meanings (Potts 2007, Harris & Potts 2009). However, this account leads us to another question. Presuppositions are usually regarded as information which is already given and is shared by conversation participants, but in many cases, evidentials seem to introduce some new information to the common ground. If evidential implications are presuppositions, how can they introduce new information to the common ground?

This question is uneasy to answer. Because of this, Murray (to appear) posits another level of meaning, that is, non-at-issue assertion. However, scholars such as Stalnaker (2002) and Schlenker (2007) propose that a certain type of presuppositions can systematically introduce new information to the common ground, and for the moment I assume that in Korean, the implications introduced by evidentials are such presuppositions. Even though we still need to investigate what kind of presuppositions can introduce new information, but with other possible questions, I leave this question for future research.

References

Amaral, Patricia, Craige Roberts & E. Allyn Smith. 2007. Review of *The Logic of Conventional Implicatures* by Chris Potts. *Linguistics and Philosophy* 30(6). 707–749.

Chung, Kyung-Sook. 2007. Spatial deictic tense and evidentials in Korean. *Natural Language Semantics* 15. 187–219.

Faller, Martina. 2002. *Semantics and Pragmatics of Evidentials in Cuzco Quechua*: Stanford University dissertation.

von Fintel, Kai. 2005. Pragmatics in Linguistic Theory. Lecture Notes, 2005 LSA Institute, Harvard and MIT.

Garrett, Edward. 2001. *Evidentiality and Assertion in Tibetan*: University of California Los Angeles dissertation.

Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10. 41–53.

Harris, Jesse A. & Christopher Potts. 2009. Perspective-shifting with appositives and expressives. *Linguistics and Philosophy* 32. 523–552.

Heim, Irene & Kai von Fintel. 2001. Class notes. 'Advanced Semantics', MIT.

Higginbotham, James. 2009. Evidentials: Some Preliminary Distinctions. In Robert J. Stainton & Christopher Viger (eds.), *Compositionality, Context and Semantic Values: Essays in Honour of Ernie Lepore*, 221–235. Dordrecht: Springer.

Kaplan, David. 1989. Demonstratives. In Joseph Almog, John Perry & Howard Wettstein (eds.), *Themes from Kaplan*, Oxford: Oxford University Press.

Kripke, Saul. 1980. *Naming and Necessity*. Cambridge: Harvard University Press.

Lee, Jungmee. 2010. The Korean evidential *-te*: A modal analysis. In *Empirical issues in syntax and semantics 8*, CSSP.

Lim, Dongsik. 2010. *Evidentials and Interrogatives: A case study from Korean*: University of Southern California dissertation.

McCready, Eric. 2007. Context shifting in questions and elsewhere. In E. Puig-Waldmüller (ed.), *Proceedings of Sinn und Bedeutung 11*, 418–432. Universitat Pompeu Fabra.

Murray, Sarah. to appear. A Hamblin Semantics for Evidentials. In Satoshi Ito & Ed Cormany (eds.), *Proceedings of Semantics and Linguistic Theory 19*, Ithaca: CLC Publications.

Potts, Christopher. 2005. *The Logic of Conventional Implicatures*. Oxford: Oxford University Press.

Potts, Christopher. 2007. The expressive dimension. *Theoretical Linguistics* 33(2). 165–198.

Schlenker, Philippe. 2007. The expressive presupposition. *Theoretical Linguistics* 33(2). 237–245.

Stalnaker, Robert. 2002. Common Ground. *Linguistics and Philosophy* 25. 701–721.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 435–449. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On the Encoding of the Definite/Indefinite Distinction in Karitiana

Ana Müller
University of São Paulo
anamuler@usp.br

Abstract. This article discusses the role of noun phrases in Karitiana, especially in terms of the possibility that these phrases may express definiteness and indefiniteness in the language. As they are nominals without any overt functional morphemes, our claim is that they do not encode definiteness or indefiniteness in the language. Our claim is that the NPs in Karitiana only have the function of introducing a predicate and a variable in the logical form of a sentence, and that readings related to definiteness and indefiniteness are provided by the morphosyntactic or context in which the nominal phrase is used.

1 Introduction

This paper contributes to the description and analysis of the encoding of definiteness and indefiniteness in natural languages in general, by discussing the specific role of noun phrases (NPs) in Karitiana, especially the possibility that they may not express the definiteness and indefiniteness distinction. Cross-linguistically, there are languages such as the Romance and Germanic languages in which the determiners encode definiteness (e.g. *the boy*), or indefiniteness (e.g. *a boy*). However, there are other languages in which the determiners do not fulfill this role, such as some languages of the Salish family (see Matthewson 1996). There are also languages such as the creole of Guiné-Bissau and Karitiana in which there are no definite or indefinite articles.

Matthewson (1996) discusses whether the distinction between definiteness and indefiniteness is necessarily expressed by the grammar of a language or whether this distinction may be outside the grammar in some languages. This paper contributes to this discussion in the sense that it assumes the impossibility of distinguishing between definiteness and indefiniteness in Karitiana solely by means of its grammar. The paper tries to answer the following question: do the NPs in Karitiana express definiteness

and indefiniteness as they do in determiner languages such as English or Portuguese?

In Karitiana the NPs are always bare, which means that the functional morphemes, which are responsible for marking functions such as gender, case, definiteness, indefiniteness, and number are not present. The article claims that the NPs in Karitiana: (i) do not encode definiteness or indefiniteness; (ii) they only introduce a predicate and a variable in the logical form of a sentence. Karitiana belongs to the Tupí stock. It is spoken by approximately 400 people who live on a reserve northwest of Brazilian Amazonian region. It is a head final language, but the matrix sentences, in declarative mood, generally occur with the verb in second position (SVO, OVS), whilst in embedded sentences the verb always appears in final position (see Sorto 1999, 2003). In addition, Karitiana basically identifies two tenses: future and non-future. Agreement, mood and tense are marked only in the root sentences, as we can see in (1) below:[1]

(1) [taso õwã mangat-a-ty] y-ta-pyting-∅ yn.
man child lift<VT>OBL 1P-DECL-*want*-NFT *I*[2]
'I want the men to lift up the children.'[3]

Furthermore, as Storto (1999) has observed, Karitiana possesses an ergative-absolutive pattern of agreement, which means that the verb agrees with the subject in intransitive sentences, as shown in the example in (2), and agrees with the object in transitive sentences, as shown in the example in (3).

(2) A-ta-opiso-t na. (Storto 1999)
2P-DECL-*listened*-NFT *you*
'You listened.' (intransitive)[4]

(3) An y-ta-oky-t yn.

[1] The order for the presentation of the data is as following: on the first line, the morphological segmentation of each word; on the second line, the meaning of each segment; on the last line, the translation into English. The data presented were collected by Ana Müller through field work, except where they are explicitly attributed to another researcher.

[2] Abbreviations used: ASS=assertive; ∅=null morpheme; 1P=first person; 2P=second person; 3P=third person; CAUS=causative; CONC=agreement; COP=copula; DECL=declarative; DET=determiner; IMP= imperfect; FUT= future; NFT=non-future; OBL= oblique; PART= participle; PASS=passive; POS=post-position; REDPL=reduplicative; SUB=subordinate; VT= thematic vowel.

[3] The translations given are those provided by the speaker or by the researcher in the particular context. It should be remembered that each sentence could have other interpretations.

[4] Non-future time (NFT) is equivalent to both past and present time. However, in most cases this time has been translated as past, since this was the form used in the context of the collection of the data.

2P 1P- DECL-*hurt*-NFT *I*
'You hurt me.' (transitive)

In order to achieve our aim of verifying whether the NPs in Karitiana encode definiteness, Section 2 looks at the semantics of determiners in natural languages, especially with regard to the definiteness and indefiniteness which they may express. Section 3 describes the characteristics of the NPs in Karitiana. Section 4 deals with whether the NPs in Karitiana encode (in)definiteness. Finally, Section 5 analyses the data from Karitiana, and claims that the NPs in this language do not encode definiteness and indefiniteness, nor do they have the properties which would result from such encoding. We maintain, however, that the role of the NPs in Karitiana is only to introduce a predicate with its variable in the logical form of a sentence.

2 Definiteness and Indefiniteness: the Role of Determiners

Human languages have a group of expressions referred to as *determiners* which contribute to the meaning of an NP, and, of course, of the sentence as a whole. These expressions are responsible for a range of distinctions in languages, such as *definiteness, gender, number* and *case, inter alia*. In Romance and Germanic languages, for example, the articles can express a range of distinctions and, because of this, it has become the convention to separate them in accordance with this range. In Portuguese, for example, determiners can be definite (*o, a, os, as)* or indefinite (*um, uma, uns, umas*); they can possess masculine gender (*o, os, um, uns*) or feminine gender (*a, as, uma, umas*); they can express singular number (*o, a, um, uma*) or plural number (*os, as, uns, umas*). However, these distinctions are not expressed in the same way in all languages. As this article focuses on definiteness and indefiniteness, we shall begin by reviewing briefly what definiteness and indefiniteness express.

We assume that one of the main difference between definite and indefinite phrases is the fact that the former indicate something familiar which is already present in the universe of discourse, whilst the latter indicate something which is novel in the discourse (see Heim 1982).[5] Thus definiteness is a mark of the familiarity of an entity, and indefiniteness is a mark of the non-familiarity (novelty) of an entity in the discourse. This situation is common in narratives such as children's stories. Sentence (4) illustrates the expression of the novel/non-novel distinction by articles.

[5] In this article, *discourse, universe of discourse,* and *situation*, are used in a general sense as synonyms for *context.*

(4) A king had **a beautiful daughter. The daughter** dreamed of becoming a professor.

The reason why (4) is the only adequate sequence stems from the new/familiar relationship which is indicated by the phrases 'a beautiful daughter' and 'the daughter'. Indefinite NPs introduce a new entity into the context and, once this entity has been introduced, it can be referred to again by means of expressions which indicate familiarity.
Uniqueness is another property of definites which has been widely discussed in the literature on the subject (see Russell 1905, Heim 1991, *inter alia*). Definite determiners express uniqueness, i.e. a definite NP states that there is only one entity of the type denoted by the noun. When we read sentence (5) below, for example, we understand that the speaker is referring to a single article which is ready. If there are two or more articles or none, then sentence (5) is not interpretable.

(5) **The article** is ready.

In the same way, a definite plural NP denotes a single entity composed of the total sum of the relevant entities in the universe of the discourse, as in (6) below:

(6) **The articles** are ready.

In this case, the definite plural NP expresses that there is a single group of articles which is ready. Indefinite NPs, however, do not presuppose uniqueness. The difference between definite and indefinite NPs can be seen in negative sentences such as (7). While sentence (7a) presupposes that only one single article on semantics was to have been written by João, sentence (7b) does not raise this type of presupposition.

(7) a. João did not write **the article on semantics**.
b. João did not write an article on semantics.

Finally, another property which definite NPs possess is that of anaphoricity: these phrases cause an anaphoric interpretation in relation to an antecedent NP with the same type of denotation. This means that, when two NPs have equivalent meanings, if the second of these is definite, it refers back to the same individual introduced by the first NP, as in (8) below:

(8) a. João ate **the pizza**, and Pedro ate **the pizza**, too.
b. **A dog** came in. **The dog** lay down on the floor.

The indefinite NPs, however, impose a disjoint interpretation in relation to an antecedent NP with the same denotation, i.e. if there are two equivalent NPs, and the second of these is an indefinite NP, it will not refer to the same entity introduced in the first NP, as in (9) below:

(9) João ate *a pizza* and Pedro ate *a pizza,* too.

Following the work of Kamp (1981) and Heim (1982), it has become customary to assume that indefinite NPs are variables. A "variable" is an expression whose value can vary in terms of reference. In Section 5 below, we will see that, as the NPs in Karitiana can be interpreted both in terms of existential quantification as in terms of universal quantification, as is the case with the indefinite NP in English**.**

So far we have seen that definiteness and indefiniteness possess a number of properties, such as the novel/familiar distinction, uniqueness, and the possibility (or impossibility) of anaphoric reference. Some languages do have expressions which can be classified as "determiners", but the NPs which contain these determiners do not denote some of the properties we have described above. This is the case with the languages of the Salish family. Matthewson (1996) shows that the Sechelt language, for example, possesses a determiner *lhe* which does not distinguish between the novel and the familiar.

Let us now return to our target language, Karitiana. If a language such as Sechelt possesses a determiner which does not distinguish definiteness from indefiniteness, what should we expect from a language like Karitiana which has no determiners at all in the structure of the NP? It seems sensible to expect that languages may vary in whether or not they express definiteness and indefiniteness. It is possible that definiteness and indefiniteness will not be encountered in the structure of the NPs in Karitiana. This hypothesis will be considered below.

In this section we have shown that definite and indefinite phrases have three important properties: the distinction between the novel and the familiar, uniqueness and non-uniqueness, anaphoricity and non-anaphoricity. In the next section we will present the characteristics of the NPs in Karitiana, and then investigate whether they encode definiteness or not.

3 Noun Phrases in Karitiana

Some of the functional morphemes which mark gender, number, determination, quantification, voice, aspect and time, *inter alia,* are absent in certain languages. In Karitiana, for example, the structural position of the

determiner is never overtly filled. In Karitiana, the NP is always bare without any determiners such as *the, a* or *every*, which are present in other languages. In Karitiana, the form is always the same and invariable (cf Müller et al, 2006). The data in (10) give evidence concerning the morphology of (in) definiteness, and of the the marking of case.

(10) **Taso** ∅-naka-'y-t **boroja**
man 3P-DECL-*eat*-NFT *snake*
'(The/A/some) man/men ate (the/a/some) snake(s).'
'The/A man ate (a/the/some snake(s)).'
Literally: 'man ate/eats snake'

In (10), the NPs *taso* 'man' and *boroja* 'snake' do not possess any morphology of case, nor do they have determiners which are realised phonetically. The sentence can be used in different situations, as is shown in the translation ('The/A man ate (the/a snake (s)'). The data in (11) below show that NPs in Karitiana are not marked for number, nor do they have numeral classifiers. The adverbial adjunct *sypomp* ('two', 'twice') is responsible for attributing the number of individuals who take part in the event and/or the number of events. Thus the sentence can indicate that the speaker ate two monkeys, or that he ate monkey twice.[6]

(11) yn ∅-naka-'y-t **sypom-p pikom.**
I 3P-DECL-*est*-NFT *two*-OBL *monkey*
'I ate two monkeys.' or 'Í ate monkey twice.'

The universal quantifier is also absent from the structure of the NPs in Karitiana. Universal quantification is expressed by a relative sentence (see (12)). In the sentence in (12) above, the insertion of the relative utterance *taso akatyym* 'men who are (there)' makes the interpretation of universal quantification in the sentence obligatory. Demonstrative roles are also played by relative clauses in Karitiana as illustrated by (13) below.

(12) **Taso aka-tyym** ∅-na-pon-pon-Ø pikom.
man cop-sub 3P-DECL-*shoot*-REDPL-NFT *monkey*
'All the men shot at monkeys.'
Literally: 'Men who be there shot at monkeys.'

(13) Dibm Ø-naka-tat-i **ony taso aka**.
tomorrow 3P-DECL-*leave*-FUT *there man* COP
'Those men will leave tomorrow.'

[6] Numerals are adjuncts in the language (see Müller *et al* 2006).

Literally: 'Men who be there will leave tomorrow'.

In all the cases described so far, it is clear that NPs in Karitiana are bare, i.e. they do not possess functional morphemes, and this brings into question whether they encode definiteness and indefiniteness. If we take up Matthewson's (1996:19) suggestion concerning the languages of the Salish family, we may ask whether Karitiana has other devices in its grammar (except context or discourse) to express definiteness and indefiniteness, or should we simply say that the distinction between definite and indefinite does not exist in the language? The following section discusses the properties of definiteness in Karitiana, with the purpose of verifying whether they can be expressed by these phrases or not.

4 Do Noun Phrases in Karitiana Express (In)Definiteness?

Before dealing directly with the behaviour of NPs in Karitiana, let us begin this section by recapitulating some of the properties of definite and indefinite NPs. In previous sections we have seen that:

(14) **Definite NPs**: do not introduce a new entity into the universe of discourse; presuppose the uniqueness of or familiarity of the entity they denote; make obligatory an anaphoric reference in the discourse to a previously-mentioned NP which has the same type of denotation.

(15) **Indefinite NPs**: introduce a new entity into the discourse; do not presuppose uniqueness or familiarity in relation to the entity they denote; are not anaphorically linked in the discourse to a previously-mentioned NP which has the same type of denotation.

In order to facilitate our analysis, this section will be divided into three sub-sections. In the first of these we will discuss the question of the expression of definiteness through the use of NPs in Karitiana; in the second sub-section we will talk about the presupposition of uniqueness in these phrases; in the third sub-section we will deal with the issue of anaphoric and disjoint references in the language.

4.1 (In)Definiteness in Karitiana

Our thesis is that the NPs in Karitiana do not distinguish between definiteness and indefiniteness. In (16) below, we analyse the case of *õwã* ('child'). Once again, we will call attention to the absence of functional morphemes in the NPs, which is typical in Karitiana.

(16) a. Yn DECL-sadna-FUT õwã hadna hyk
I DECL-*tell*-FUT *child story about*
'I am going to tell the story of a child.'
b. Py-py-n-a ãdyk-y-n õwã
ass-know<VT> IMPF.PASS<VT>NFT *child*
'The child was intelligent.'

As indicated in (14) above, we expect that a definite NP will be used in situations like that in (16a), since it is a typical case of the introduction of a novel referent in the background of the conversation. On the other hand, (16b) would require a definite NP because it relates to the sequence of the story, and the referent is already familiar in the universe of the discourse. However, as shown in the data given above, in Karitiana there is no marker which distinguishes an indefinite NP from a definite one: in both cases the bare NP *õwã* is used.

In terms of anaphoricity, we have seen that definite NPs, unlike indefinite ones, are anaphoric in relation to another NP with the same denotation. The data in (17) and (18) show that bare NPs in Karitiana can be taken up again by a singular pronoun, which is different from the process in English.

(17) Context: the informant narrates his experience with a jaguar.
a. Yn 'i-so'oo-t **õbaky**-ty
I 3P-*see*-NFT *jaguar*-OBL
'I saw a jaguar.'
b. Yn i-so'oo-t sojxa **õbaky** i-'yt
I *3P-see*-NFT *boar jaguar* 3P-*eat*-NFT
'I saw that the jaguar was eating a wild boar.'

(18) a. **Professo** **enfermera** na-aka-t i-amby-t
teacher *nurse* DECL-COP-NFT PART-*come*-CONC.COP
y-ambip
1P-*house*
'A teacher and a nurse came to my house yesterday.'
b. **Professor** na-aka-t i-le-t livro-ty
teacher *na*-COP-NFT PART-*ler*-CONC.COP *livro*-OBL
y-'iti hot
1P-*daughter* *to*
'The teacher read the book to my daughter.'
c. **Enfermera** na-aka-t i- so'kym<VT>∅
nurse *na*-COP-NFT PART-*take.care*<VT>CONC.COP

y-'tiita
1P-*mother*
'The nurse looked after my mother'.

In the data provided in (17) above, the NP *õbaky* ('jaguar') is in the environment of a indefinite NP (17a), and also in another environment which is generally occupied by a definite NP (17b). In (18a) both *professor* ('teacher') and *enfermera* ('nurse') are new individuals in the discourse and, as such, can be regarded as indefinite NPs. However, the same NPs appear again in (18b) and (18c) respectively, but are now familiar. Thus the cases presented above demonstrate that the NPs in Karitiana are insufficient on their own to make the novel/familiar distinction. We will deal further with anaphoric reference in section 4.3 below.

4.2 Presupposition of Uniqueness

In section 2, we saw that the definite NPs presuppose uniqueness (and familiarity); the indefinite NPs do not carry this type of presupposition. In Karitiana, the bare NPs are used both in contexts which presuppose uniqueness and in those where this presupposition is not present. Cases like (18) are also examples of the presupposition of uniqueness.

At the same time as examples (18) show us that NPs in Karitiana do not distinguish between definite/indefinite or novel/familiar, they also indicate that the same NPs can be used in contexts that presuppose uniqueness. In the case of (18b,c), they denote unique teacher and unique nurse. Let us now look at some cases where this presupposition is not present (19).

(19) I-so'oot-∅ Inácio **sojxa**-ty?
3P-*see*-NFT *Inácio* *boar*-OBL
'Did Inácio see any boars?'

The sentence in (19) asks if Inácio saw two or more wild boars and, as a result, we can say that the NP *sojxa* ('boar') does not presuppose even if there was a wild boar to be seen. We do not attribute the property of uniqueness to the NP in this case, though this would be possible if we were dealing with a definite NP. On the basis of the data analysed above, we can deduce that an NP in Karitiana does not necessarily indicate uniqueness.

4.3 Anaphoricity of NPs in Karitiana

At the end of section 2.1, we showed that the definite NPs oblige us to refer back anaphorically to a previous NP with the same denotation. On the other hand, the indefinite NPs manifest disjoint reference, i.e. they refer to a different individual to the one indicated by the previous NP with a similar

denotation. In Karitiana, the NPs permit anaphoric interpretations, but these are not obligatory. The data in (20a, b) are examples of disjoint reference between NPs, while the ones in (17-18) are examples of anaphoric reference between NPs.

(20) a. Pyry-'a tyka-n **irip** akan.
ASS-*exist* IMP-NFT *tapir* *village*
'There is a tapir in this village.'
b. Pyry- 'a tyka-n **irip** akan ota pip tyym.
ASS-*exist* IMP-NFT *tapir* *village* *other* *in* *too*
'There is a tapir in another village, too.'

As example (20) shows, the two occurrences of the same NP *irip* ('tapir') have disjunctive reference, i.e. they mention two different tapirs, one in each village. In (17), however, there is an anaphoric interpretation of the second occurrence of *õbaky* ('jaguar'), in relation to the first occurrence. Whilst the first NP indicates a new entity in (17a), the second NP refers back to the same entity in (17b). Because of this, we can say that NPs in Karitiana can express both anaphoric reference and disjoint reference in relation to an antecedent NP with the same type of denotation.

In this section, we have seen how the NPs in Karitiana are not capable of distinguishing between definiteness and indefiniteness. As a result, the same NP can introduce both entities which are new into the universe of discourse (which is a common feature of indefinite NPs) and refer to familiar entities (which is a common feature of definite NPs) in this same universe. In the same way, the NPs in Karitiana do not necessarily indicate uniqueness. Finally, we have dealt with the question of anaphoricity and have verified that the NPs in Karitiana can refer back to other NPs (which is a feature of definite NPs), as well as having disjoint reference to a previous NP (which is a feature of indefinite NPs). In the next section, we will present an analysis of the data from Karitiana.

5 Analysis

In line with the description of the data from Karitiana given in the previous section, let us posit two basic hypotheses: i) the NPs, which are bare nominals, do not encode definiteness and indefiniteness in Karitiana and ii) their function is only to introduce a predicate and a variable in the logical form of the sentence. This variable will be determined, either by means of open or hidden quantification, or by means of deixis. If the two hypotheses are correct, then we can predict the following consequences:

I. The NPs in Karitiana can occur in both definite and indefinite contexts.
II. The NPs can occur in both existential and universal interpretations.
III. The NPs will not behave like names of kinds.

The first consequence was amply proved by the examples given in sections 3 and 4 above: the NPs in Karitiana do not encode either definiteness or indefiniteness, and it is the context which causes us to interpret them as definite or indefinite when we translate them to English. We will now look at the other two theses.

Since the NPs in Karitiana are always bare and do not encode definiteness or indefiniteness, we predicted in (II) that they will appear both in contexts of universal quantification, and of existential quantification. The data in (21a-b) below show that the NPs in Karitiana produce universal interpretations.

(21) a. **Õbaky** Ø -na-aka-t kinda-t.
jaguar DECL-COP-NFT *entity*-CONC.COP
'Jaguars are animals.'
b. Oharyjn Ø-na-aka-t **õbaky**
head.good DECL-COP-NFT *jaguar*
'Jaguars are intelligent.'

The examples in (21a, b) are typically generic, and the NP *õbaky* ('jaguar') is being used with a universal interpretation ('every jaguar is an animal/ intelligent'*)*. The NPs in Karitiana also appear in existential contexts, i.e. those contexts which affirm or presuppose the existence of a certain entity, which confirms the prediction we made earlier. The sentences in (22) below are typical existential structures and appear with the bare NPs in Karitiana. Another situation in which the interpretation is existential is the introduction of a novel entity in the universe of discourse, as in (23) below:

(22) Pyry-kii-t **geladera** akan pip
ASS-COP.PL-NFT *fridge* *village* *in*
'There are refrigerators in the village.'

(23) Pyry-heredna-n **otiyrypo.**
ASS-*appear*-NFT *star*
'A star appeared.'

The third prediction made in this section was that the NPs in Karitiana would not always behave like names of kinds. In the example in (25) below, the NPs in bold refer to a kind, which is that of dinosaurs.

(24) **Dinosaurs** became extinct many years ago.

In line with the work of Carlson (1977), the bare plural in English is considered to be a kind-denoting term, and could be used in the sentences above ('dinosaurs') to talk about the extinction of the species of dinosaurs. Thus before we verify if NPs in Karitiana behave like names of kinds, we must look briefly at bare plurals in English. Carlson observed that bare plurals can appear in negative sentences but, unlike indefinite NPs, they are not ambiguous between two interpretations. We can see this in the examples (25) in English.

(25) a. John didn't see **a teacher**.
b. John didn't see **teachers.**

The sentence in (25a) can have two interpretations. The first is that there is a certain teacher and that João did not see him/her. This is what is called a *wide scope* reading. The second interpretation of (25a) is that João did not see any teachers at all, and this is called a *narrow scope* reading.

If the NPs in Karitiana are always bare nominals, we could entertain an initial hypothesis that they would behave like names of kinds, as is the case with the bare plural in English. On the other hand, we would expect the NPs in Karitiana to have only narrow and not wide scope. However, on the basis of the description we are undertaking, and of the analysis we are proposing here, we can predict that the NPs in Karitiana will be different from those in English. This means that we are predicting that the bare NPs in Karitiana will allow that sentences similar to (25b) can have two interpretations, one of wide scope, and the other of narrow scope. This prediction is borne out by the data in (26) below.

(26) **Enfermera** otãm tykiri Ø-na-osedna-j Inácio.
nurse *arrive when* DECL-*feliz*-FUT *Inácio*
'Inácio will be happy when (a/some) nurse(s) arrive(s).'

In the sentence in (26), the NP *enfermera* ('nurse') could be referring to a specific nurse with a wide scope interpretation: Inácio will be happy when a specific nurse arrives. But this NP can also have a narrow scope interpretation: Inácio will be happy when any nurse whatever arrives. Thus we can affirm that the NPs in Karitiana do not only have narrow scope, just like the bare nominals in English, and have scopal properties like the ones of indefinite NPs, as we saw above.

Our analysis so far has shown that NPs in Karitiana do not encode definiteness and indefiniteness, and therefore we have not been able to

identify the presence or absence of any markers which could indicate familiarity or uniqueness in these NPs. We have also noted that despite the fact that they are bare NPs, they do not behave in the same way as the bare plurals in English.

Let us now try to answer the question of whether the NPs in Karitiana are ambiguous in terms of their having definite and indefinite interpretations produced by an ambiguous zero determiner. Or would it be possible to defend the thesis that Karitiana has two zero (or covert) determiners, one definite and one indefinite? These questions are relevant because most theoretical paradigms will assume the existence of empty categories with syntactic roles. We reject the possibility that there is an empty/zero and ambiguous determiner between a definite and an indefinite interpretation in line with the following argument. Let us imagine that there indeed was a determiner that was ambiguous between definite and indefinite interpretations – call it determiner **D**. The main problem for **D** would be its obligation to carry indistinguishable contradictory information. Thus, in a sentence such as (23), we would be faced with something like **D** *otiyrpo* ('D star'), and D could indicate simultaneously 'the star appeared' and 'a star appeared'.

As a result, **D** would indicate simultaneously that 'a novel star appeared in the discourse' and 'a familiar star appeared in the discourse', i.e. contradictory information would be linked to this determiner, which is incoherent. Another solution would be to recognize the existence of two different empty/zero determiners, one which would encode definiteness and another which would encode indefiniteness. In this case, if there were two different empty/zero determiners which were always possible in the same contexts, the existence of either one of these determiners would be impossible to prove. This hypothesis is therefore vacuous.

Another problem concerning the existence of two empty determiners is their presupposition of uniqueness and their scope. They would indicate that the NP could be simultaneously interpreted as unique (like a definite NP) and as non-unique (like a indefinite NP). In line with this analysis, a sentence such as (26) would have two simultaneous interpretations: Inácio will be happy if the only nurse in context arrives, or if any nurse whatever arrives, which is contradictory and undesirable. In the light of the above, we claim that a zero **D**, either definite or indefinite, does not exist in Karitiana, and the interpretation of *enfermera* ('nurse') as a single person (wide scope) or as any nurse (narrow scope) would be resolved by the context.

Finally, another point which supports our rejection of the existence of one or two zero **D**s is that of anaphoricity. Since there would be ambiguity between definite and indefinite Ds (or, if there were two Ds, one definite and the other

non-definite), then in every sentence in Karitiana with at least one NP, D would necessarily indicate that the NP referred back to in the sentence could simultaneously refer or not refer to the same individual denoted by a previous NP. This means that the NP would make an anaphoric reference (as definite NPs do) and would at the same time have disjunctive reference (like indefinite NPs) in relation to an antecedent NP with the same denotation, i.e. it would have two mutually contradictory meanings.

As we have been demonstrating throughout this paper, the NPs in Karitiana do not possess any functional projections (at least not overt ones), nor do they possess determiners; but they can have both universal and existential interpretations. Furthermore, they do not encode definiteness or indefiniteness, and their fundamental role is to introduce a predicate and a variable into the logical form.

Matthewson (1999) argues that familiarity and uniqueness are certainly properties of definite NPs; however, the absence of familiarity and uniqueness is not necessarily a property of indefinite NPs. It stems from implicatures generated by the existence of definite determiners in languages which have them. In a language without definite NPs, the indefinite NPs or, in the absence of these, the unmarked NPs (as in Karitiana) would not generate the implicatures of non-uniqueness or non-familiarity, but would be neutral with regard to these properties. Thus these NPs could be used indistinguishably in contexts of [+/-familiarity] and [+/-uniqueness].

In the light of the above, we conclude that the NPs in Karitiana are neutral in relation to this difference, and that definiteness and indefiniteness are determined by the particular context. A theoretical consequence of this is that the bare nominals will necessarily have an indefinite interpretation, but do not necessarily have a definite interpretation.

6 Conclusions

In this paper, we have tried to verify whether the NPs in Karitiana are able to codify definiteness and indefiniteness. Since Karitiana does not have open determiners or functional categories in its NPs, our aim has been to find out whether the bare NPs alone were capable of encoding definiteness and indefiniteness. We therefore conclude that the NPs in Karitiana are neutral in relation to this difference, and that definiteness and indefiniteness are determined by the particular context.

References

Heim, Irene. 1982. "The Semantics of Definite and Indefinite Noun Phrases". Ph.D. Dissertation, University of Massachusetts.

Heim, Irene. 1991. "Artikel und Definitheit" *in:* A. v. Stechow and D. Wunderlich (eds.). Handbuch der Semantik. Berlin: de Gruyter, pp. 487–535.

Kamp, Hans 1981. "A theory of truth and semantic representation", *in:* J.A.G. Groenendijk et al. (eds.) *Formal Methods in the Study of Language*. Amsterdam: Mathematical Centre. pp. 277–322.

Khim, Alain. 2010. 'Fully bare nominals in two Creoles: A description and a tentative constructional account', *Journal of Portuguese Linguistics*, vol.9, n.1.

Matthewson, Lisa. 1996. "Determiner Systems and Quantificational Strategies Evidence from Salish". Ph.D., dissertation, University of British Columbia.

Matthewson, Lisa. 1999. "On the Interpretation of Wide-Scope Indefinites". *Natural Language Semantics* 7:79–134.

Müller, Ana, Luciana Storto & Thiago Coutinho-Silva. 2006 "Number and the count-mass distinction in Karitiana" *UBCWPL 19: Proceedings of the 11th WSCLA:* 122–135.

Russell, Bertrand. 1905. "On denoting". *Mind* 14: 479–493.

Storto, Luciana. 1999. "Aspects of Karitiana Grammar". MIT Ph.D. dissertation.

Storto, Luciana & Van der Velden, F. (2005). Karitiana. *Povos Indígenasmn do Brasil*. Disponível em http://www.socioambiental.org/pib/epi/karitiana/karitiana.shtm. 2005. Acesso em: 5 may 2008.

Sanchez-Mendes, Luciana. 2009. "A quantificação adverbial em karitiana". Dissertação de mestrado. São Paulo: Universidade de São Paulo.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 451–465. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On Temporal Quantification*

Edgar Onea
University of Göttingen
edgar.onea@zentr.uni-goettingen.de

Abstract. Generally, it is assumed ever since Pratt & Francez (2001) that temporal expressions have a context-dependent meaning in the sense that they not only denote a set of time intervals according to their lexical content but rather their denotation is additionally restricted to some contextual time. Hence, *Monday* does not just denote the set of Mondays but a function from time intervals to the Mondays in them. This is useful in dealing with concomitant quantifiers such as *John kissed Mary every second semester on every Monday* for it allows them to restrict each other domain of quantification. In this paper I propose a way to eliminate this context dependency of temporal expressions building up on an idea of Irene Heim that domain restriction in the temporal domain is a matter of presupposition projection. In particular I argue that temporal prepositions presuppose that their argument, a time interval, intersects a higher time interval. This not only helps to derive concomitant quantification but also solves some classical problems of competing theories.

1 Introduction

Temporal quantification, i.e. the compositional derivation of the truth conditions of a sentence like (1), is a classical issue in semantic theory and a hard one at the same time. I think a fair amount of confusion is around in the literature concerning this topic for the most part due to uncertainty about the readings that should and should not be derived.

(1) John called on every first Monday after every competition that he won in every second decade.

In this paper I will develop a not too complicated theory of temporal quantification in the framework of transparent LF that tackles two of these confusions. First, scholars have assumed that time denoting expressions, such as *Monday* have context dependent denotations. I will show that this assumption is both theoretically and empirically inadequate and I will show how to replace it by

* This research has been funded by the German Initiative of Excellence, which I gratefully acknowledge. In addition I wish to thank Ingo Reich for organizing the *Sinn und Bedeutung* conference and editing this volume and Regine Eckardt and Sarah Zobel for comments and discussion. Needless to say: all shortcomings are my own.

postulating that temporal prepositions are presuppositional. Second, real quantifier stacking, i.e. applying several quantifiers to the same thematic role, and concomitant quantifiers that restrict each other's domain of quantification are different phenomena. In fact, I will argue that it is indeed possible (and at times necessary) to apply several temporal prepositional phrases in the same clause.

The first section explains the two problems to be discussed. First, the issue of the interaction between temporal quantifiers and tense, which lead to the introduction of context dependent meanings for temporal expressions, and second, the problem of stacked quantifiers. In the following I first present a theoretical argument against context dependent meanings, followed by a sketch of a theory for dealing with temporal quantification partly following von Stechow (2002). In passing, I propose a particular version of the well known *predicate abstraction* rule of Heim & Kratzer (1998). Finally I discuss the case of stacked temporal prepositional phrases and conclude the paper.

2 The Problems of Temporal Quantification

Temporal quantification is complicated because the interpretation of temporal quantifiers needs to interact with the tense operator, which seems to get quite murky. To see this, consider a fairly simple example like (2) from Ogihara (1994). If there were no tense involved the sentence would not pose any problems, however as soon as we want to consider the fact that the calling took place in the past, both conceivable representations that attempt to model this interaction in terms of scope given in (2a) and (2b) are nonsensical. What we really need is the representation in (2c), which uses the past as a domain restriction when quantifying over Mondays, but getting the past to restrict the domain of quantification of *every* is compositionally non-trivial, given standard assumptions about the place of tense in the syntactic representation of (2), in particular, past is not directly combined with *Monday*.

(2) John called every Monday.

a. $\exists i.past(i) \wedge \forall x.Monday(x) \rightarrow in(x,i) \wedge call(J,i)$
b. $\forall x.Monday(x) \rightarrow \exists i.past(i) \wedge in(x,i) \wedge call(J,i)$
c. $\exists i.past(i) \wedge \forall x.Monday(x) \wedge in(x,i) \rightarrow call(J,i)$

The standard proposal to solve the problem is to assume a higher-order meaning of time-denoting expressions such as *meeting*, *Monday*, *year* etc. such that they do not simply denote sets of time intervals, as naturally represented in (3a), but rather functions from time intervals into sets of time intervals as in (3b). This is useful, since it provides a lexical slot in time denoting expressions which can be used to essentially get the dependency on the past into the restric-

tor of the quantifier, as required in (2c). The lexical entry in principle allows for something like (3c), which allows the interaction between the past operator and the restrictor of the quantifier *every* via the variable j. (Getting this to work is still non-trivial but at least the basic ingredients are there.)

(3) a. $[\![Monday]\!] = \lambda i.Monday(i)$
b. $[\![Monday]\!] = \lambda i.\lambda j.Monday(i) \wedge in(i,j)$
c. $[\![everyMonday]\!] = \lambda Q.\lambda j.\forall x.Monday(x) \wedge in(x,j) \rightarrow Q(x)$

I will argue in this paper that this way of thinking is conceptually and empirically inadequate and show how to get rid of it.

Temporal quantifiers tend to have another problem as well, namely that they may come *stacked*, as in (4). Pratt & Francez (2001) argue that this is the very same problem as the interaction with tense. This is because Pratt & Francez (2001) apply both quantifiers one after the other at the clause level, as in (4a), and attempt to model the fact that they restrict each other's scope. For them, *every Monday* in (4) quantifies over every Monday that is in every second year, just the same way as one would model that every Monday actually quantifies over every Monday that is in the past for (2).

I think the argument of Pratt & Francez (2001) is correct, although the cases in which we really need stacking of temporal quantifiers, are rare, and distinguishable truth conditionally, whenever no real quantifiers are involved but rather definite descriptions. For most cases, temporal quantifiers modify each other like in (4b), as argued in von Stechow (2002). So, in (4), *on every second year* is interpreted as directly modifying *Monday*. Therefore, there is no stacking of quantifiers here. We rather have an embedding problem. This is modeled in a completely different way than the interaction with tense. Such a solution is rather similar to an intuitive treatment of (5), which does not seem particularly puzzling and crucially has nothing to do with time.

(4) John called every Monday on every second year.
a. John called [every Monday] [on every second year]
b. John called [every Monday [on every second year]]

(5) Peter called every son of every son of Michael.

Interestingly, the LF-style given in (4a) is used by Pratt & Francez (2001) to derive the so-called *short reading* of temporal prepositional phrases, readings that are ultimately intersective, i.e. the calling must be both every Monday and on every second year, with the twist, however, that only Mondays are considered that are in every second year. An LF-like (4b) is used by von Stechow

(2002) to derive the so called *long reading* which only requires the calling to be on Monday, but knowing that Mondays are within years makes the difference hard to see in such examples. And, finally, Beaver & Condoravdi (2007) use the LF (4a) and derive the long reading with it.

The short readings do exist, however, and cannot be reduced to scope variation in long readings. Consider (6). The first two readings, (6a) and (6b) are available for von Stechow (2002), Pratt & Francez (2001) and Beaver & Condoravdi (2007), but the third reading, the short reading, is only predicted by Pratt & Francez (2001). That is not quite true, however, for Pratt and Francez would require either the Tuesday to be after the meeting or the meeting to take place on Tuesday, hence, making (6c) truth conditionally equivalent to either (6a) or (6b). Beaver & Condoravdi (2007) are aware of this fact and explicitly postulate that we only need to derive the readings in (6a) and (6b), the short reading coming for free then.

(6) John called after the meeting on Tuesday.
   a. John called after the meeting which was on Tuesday.
   b. John called on Tuesday which was after the meeting.
   c. John called in the intersection between Tuesday and the time after the meeting.

But assume the following scenario. There is a meeting which starts on Monday at 2 pm and finishes on Tuesday at 2 pm. Now, (6c) requires a calling event to take place between Tuesday 2 pm and the end of Tuesday. I think this reading actually exists and does not boil down to neither (6a), since the meeting was not on Tuesday, nor (6b), since the Tuesday under discussion did not start after the meeting. Superficially, this could be solved by allowing overlapping between time intervals instead of inclusion, hence getting the readings (7a) and (7b). Unfortunately, however, not even the reading (7b) captures the short reading entirely correctly, for it would allow the calling to take place in a part of Tuesday that is during the meeting, for instance Tuesday at 1 pm, which is contrary to the fact.

(7) a. John called after the meeting which overlaps Tuesday.
   b. John called on Tuesday which overlaps the time after the meeting.

Getting a unified account for both kinds of readings is the natural task arising. Such a theory does not exist, however. To be clear, all existing theories fail already in singling out the right Tuesday for the reading in (6c).

Summing up there are two problems to solve. Getting rid of context dependent denotations for time-denoting expressions, and distinguishing between

real temporal PP stacking and the case of embedded quantification.

3 Against Context Dependent Denotations

It should be the null-hypothesis that temporal expressions have no context dependent denotation, so actually one needn't argue against them, but rather in favor of such denotations. That never actually happened. Still, I will give some additional reasons to refrain from assuming such denotations.

Intuitively, *Monday* denotes the set of Mondays simpliciter, just like *chair* denotes the set of chairs in a model. In order to get a more constrained set of chairs or Mondays we need to do additional work. Whenever possible we should not mess around with this intuition. And indeed, even very simple sentences like (8) would get problematic if we did.

(8) This is a Monday.

One could argue that *Monday* is ambiguous. But even this does not seem to hold generally. It rather seems that (8) cannot have a reading which can be paraphrased as *This is a Monday in t*. Consider for instance the dialogue in (9) and assume that the day Mary killed the cat was two years ago, but indeed a Monday. If Monday denoted Mondays in a salient interval, one would expect the answer (9b) to be at least conceivable, since the day under discussion is not in the salient interval, hence the sentence is just false. But as a matter of fact, it (9b) is completely nonsensical, whereas the answer (9a) is good.

(9) A: Last year, Peter called every Monday.
B: No, the day on which Marry killed the cat was a Monday and Peter did not call.
   a. A: No, that Monday is not relevant, for it was more than two years ago.
   b. A: ??No, that's not a Monday, for it was more than two years ago.

Yet another argument involves deictic expressions like *today*, *this year*. Such expressions also need to interact with the tense operator, hence, it is expectable that their denotation will also be analogous, including a context dependent variable.[1] So, we get the representations in (10) or something similar. But binding *j* by the past operator would predict that today is part of the past, which is nonsense, for as long as today is not over, some part of it will be part of the present and part of it will even be in the future.

[1] Of course one could assume that deictic expressions are interpreted higher than tense, but even so, the intersection between e.g. *today* and past will somehow need to me modeled.

(10) $\lambda j.\iota i.today(i) \wedge in(i, j)$

A final argument is based on example (11). The example seems perfectly natural. But if, indeed, *meeting* meant meeting in x and x were bound by past, we would require a past meeting, however, as the continuation shows, the meeting is a future one although the tense operator is past. This, again, is absolutely impossible according to the theory of Pratt & Francez (2001) or von Stechow (2002). In fact the same applies to any theory that uses context dependent denotations for time denoting expressions.

(11) John called before the meeting, just as he promised. Look, the meeting will be tomorrow, and he already called.

I conclude that assuming that time denoting expressions have a context dependent denotation leads to more problems than it solves. If temporal quantification can be made to work with such denotations, they should be abandoned. In the next section I give an explicit proposal to this extent.

4 The Proposal

The system I propose in the following involves three aspects. First, I need the lexical entries and the syntactic representation. Then, I need a theory of presupposition projection. Finally I derive some examples and discuss some of the benefits of the theory both with embedded quantifiers modifying each others restrictor, and with real quantifier stacking.

4.1 Basic Elements

I assume that time-denoting expressions (or event-denoting expressions coerced to time) have simple lexical meanings as given in (12) for a couple of examples. I tacitly assume that all time variables involved in natural language are intervals and omit writing up their types for simplicity.

(12) a. $[\![Monday]\!] = \lambda x.Monday(x)$
b. $[\![year]\!] = \lambda x.year(x)$
c. $[\![meeting]\!] = \lambda x.meeting(x)$

I further assume that temporal prepositions come with a presupposition of adequacy, i.e. they presuppose that the time determined by their internal argument overlaps some contextually defined time, as shown in (13). Note that there is a huge conceptual advantage in including context-dependency in the meaning of functional words as compared to the lexical denotation of content words: for instance, all examples discussed in Section 3 do not apply to temporal expres-

sions headed by a preposition.

(13) a. $[\![during]\!] = \lambda x.\lambda P.\lambda i[\underline{i \cap x \neq \emptyset}].P(x \cap i)$
b. $[\![before]\!] = \lambda x.\lambda P.\lambda i[\underline{i \cap tto(x) \neq \emptyset}].P(tto(x) \cap i)$
c. $[\![after]\!] = \lambda x.\lambda P.\lambda i[\underline{i \cap tfrom(x) \neq \emptyset}].P(tfrom(x) \cap i)$

For the more technically interested reader: time intervals are treated as ordered sets of time points, as defined in (14) hence the set theoretical operation $\cap$ applies and delivers an interval.

(14) a. x is a time point iff $x \in TIME$.
b. *chron* is a total function: $TIME \rightarrow \mathbb{R}$ defined in each model M.
c. Iff $chron(x) < chron(y)$ then x precedes y.
d. a is an INTERVAL iff
$\forall x.x \in a \rightarrow x \in TIME \wedge \forall x,y.x,y \in a \wedge chron(x) < chron(y) \rightarrow$
$\forall z.chron(z) > chron(x) \wedge chron(z) < chron(y) \rightarrow z \in a$

The operators *tto* and *tfrom* are defined in (15a) and (15b) respectively.

(15) a. $tto(a) = \{x | x \in TIME \wedge chron(x) < chron(MIN(a))\}$
b. $tfrom(a) = \{x | x \in TIME \wedge chron(x) > chron(MAX(a))\}$
c. $MIN(a) = \iota x.x \in a \wedge \forall y.y \in a \wedge y \neq x \rightarrow chron(y) > chron(x)$
d. $MAX(a) = \iota x.x \in a \wedge \forall y.y \in a \wedge y \neq x \rightarrow chron(y) < chron(x)$

Further I assume that tense is not an operator but rather a contstant, like a proper name, as given in (16).

(16) a. $[\![PAST]\!] = tto(NOW)$
b. $[\![FUTURE]\!] = tfrom(NOW)$
c. $[\![PRESENT]\!] = NOW$
d. $NOW = \{x | \sqrt[2]{(chron(x) - chron(now))^2} \leq r\}$
now = the deictic time point
r is contextually specified

In addition, I assume that aspect introduces temporal variables into a clause, as shown in (17) and that aspect existentially closes the event variable, but this assumption is not a necessary ingredient of the theory.[2]

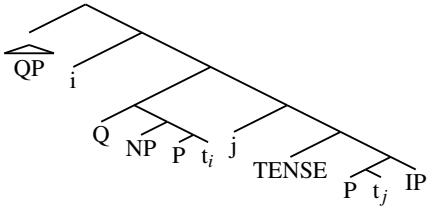
(17) a. $[\![PERFECTIVE]\!] = \lambda P.\lambda i.\exists e.in(\tau(e), i) \wedge P(e)$

[2] In fact, in order to deal with the distributive readings of temporal quantifiers with *before* and *after* we might need additional interaction with events in the meaning of quantifiers in general, as argued in Krifka (1989), but I think there are alternative possibilities also: e.g. *after* could mean not *longer than x after* in those cases.

b. $[\![PERFECT]\!] = \lambda P.\lambda i.\exists e.before(\tau(e),i) \wedge P(e)$
c. $[\![IMPERF]\!] = \lambda P.\lambda i.\exists e.in(i,\tau(e)) \wedge P(e)$
d. $before(a,b) = true$ iff $chron(MAX(a)) < chron(MIN(b))$
e. $in(a,b) = true$ iff $chron(MIN(b)) < chron(MIN(a)) \wedge$
$chron(MAX(b)) > chron(MAX(a))$

Coming to the syntax, I assume that any quantifier comes with a domain restrictor C and must be raised from the immediate argument position of any temporal preposition to a position higher than tense, which is more or less classical QR. I assume, further, that temporal quantifiers may appear as sisters of the restrictor argument of higher quantifiers, similar to von Stechow (2002), as shown in (18). In addition they can also be applied separately to an IP.

(18)



4.2 Presupposition Accommodation

Recall the original example (2), repeated here for convenience as (19). The needed reading is given in (19a). The problem is that the Mondays quantified over must be restricted to Mondays in the past. Therefore, we want the information that the Monday must be in the past to somehow enter the restrictor domain of the quantifier *every*. Competing theories achieve this by opening a slot in the representation of *Monday* such that *Monday* denotes a Monday in some interval. I rejected this line of attack altogether and proposed that instead what we have is a presupposition triggered by the covert *during* that its argument is in a contextually salient time. *Every Monday* will be raised out of the argument position of the preposition and it will end up in the highest possible position. The question, now, is whether one can accommodate this presupposition such that it enters the restrictor of *every*.

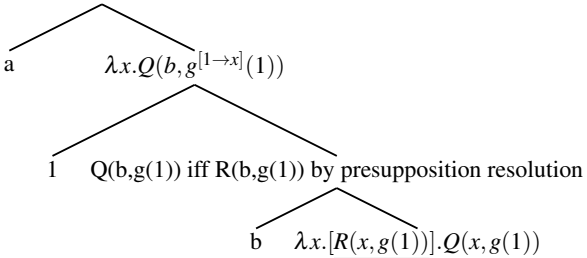
(19) John called (during) every Monday.
a. $\exists i.past(i) \wedge \forall x.Monday(x) \wedge on(i,x) \rightarrow call(J,i)$

This could be a case of intermediate accommodation in the sense of Geurts & van der Sandt (1999). However, it has been forcefully argued by Beaver (2001), but see also von Fintel (2008), that intermediate accommodation does not exist. In my view this question is not totally settled and I prefer to remain agnostic

about this issue. For explicitness I will assume that what looks like intermediate accommodation is in fact global accommodation. In particular this means that intermediate accommodation appears to exist because there is a global domain reduction to the very same extent (to avoid presupposition failure).

A formal side note is in order here. I use predicate abstraction in the sense of Heim & Kratzer (1998) to model QR. Predicate abstraction, however, has one particularly unfortunate property, namely that it loses presuppositions attached to traces abstracted over. Consider the abstract case in (20). The reason why the presupposition attached to 1 is lost is that in the predicate abstraction rule, there is nothing that would save them. While the sister node of 1 is defined for any g such that R(b,g(1)), the higher node basically frees up this constraint.

(20) Q(b,a) - whether or not R(b,a)



The problem can be solved, however, with a small change in the predicate abstraction rule, given in (21). This rule now globally projects presuppositions after predicate abstraction as well, just as (presumably) originally intended in Heim & Kratzer (1998).

(21) **Predicate abstraction with presuppositions:** If γ is a tree consisting of α and β, and α is an index i, then for any g for which $[\![\beta]\!]^g$ is defined, $[\![\gamma]\!]^g = \lambda x.[\underline{[\![\beta]\!]^{g[i\to x]} \textit{is defined}}].[\![\beta]\!]^{g[i\to x]}$

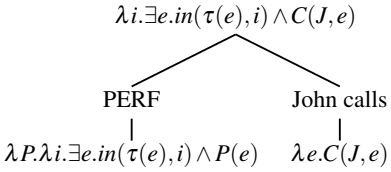
4.3 Embedded Quantification

I will derive one reading of each of the four examples given in (22a), (22b), (22c) and (22d) in the following. The derivations are given in in classical transparent LF style.

(22) a. John called every Monday.
b. John called every Monday every summer.
c. John called today.
d. John called before the meeting.

I first derive the constituent *John called* with a perfective aspect, which will appear in each of the sentences, as shown in (23).

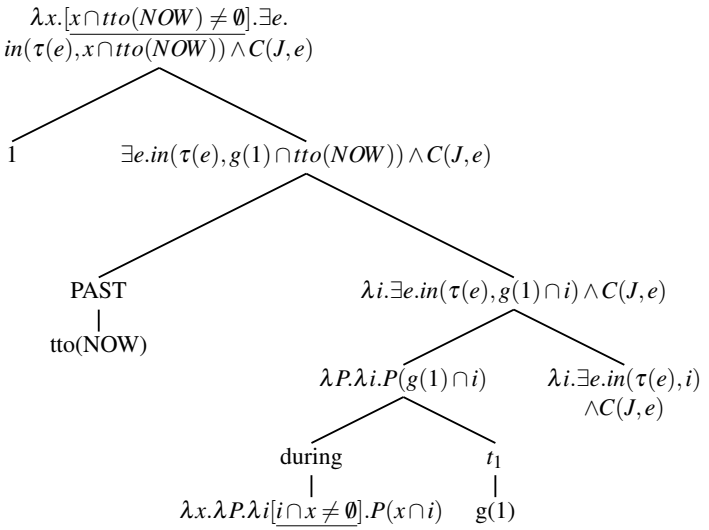
(23)



Note that any kind of temporal modification is made available by the presence of aspect. Until the event itself is built up, there is no time variable in play whatsoever. As noted before, the fact that I existentially close the event variable can be circumvented by treating it as a pronominal element.

I start with (22a). I assume that *every Monday* is headed by a covert preposition like *on* or *during*. First, I apply *during every Monday* to the result of (23), as shown in (24). Note that *every Monday* is only represented by the trace t_1, being raised to a higher position in the tree. The whole tree fragment is only defined for assignements g such that $g(1) \cap i \neq \emptyset$, via the presupposition of *during*. In the next step I apply PAST to the result and lambda abstract via the rule (21), which now preserves the presupposition.

(24)



Now, all that remains to be done is to apply the QR-ed *every Monday* which goes trivially, as given in (25). The result is defined exactly if every Monday in C overlaps with the past, and suffers presupposition failure otherwise.

The arising reading is this: it is presupposed that all Mondays in C overlap the past (could be included, of course) and it is stated that in the overlapping part between each Monday in C and the past interval, there is an event of John calling. This predicts that whenever we are explicitly speaking about non-past Mondays, the sentence is strange.

(25) $\forall y.M(y) \wedge y \in C \rightarrow \exists e.in(\tau(e), y \cap tto(NOW)) \wedge C(J,e)$

every Monday
$\lambda Q.\forall y.M(y) \wedge y \in C \rightarrow Q(y)$

$\lambda x.[\overline{x \cap tto(NOW) \neq \emptyset}].\exists e.$
$\overline{in(\tau(e), x \cap tto(NOW))} \wedge C(J,e)$

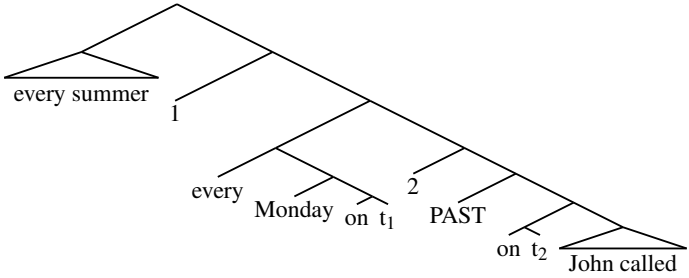
Consider a scenario in which A utters (26) in June. It seems to me that the answer in (26a) is at least more natural than the one in (26b). This is quite similar to the classical behavior of presuppositional sentences like in (27).

(26) A: Speaking about the 52 Mondays this year, John called every Monday.
   a. B: Well, that's only true for the past Mondays.
   b. C: ?Of course he did.

(27) A: Speaking about the 82 Million Germans, every German loves his Mercedes Benz.
   a. B: Well, that's only true for those who have one.
   b. C: ?Of course they do.

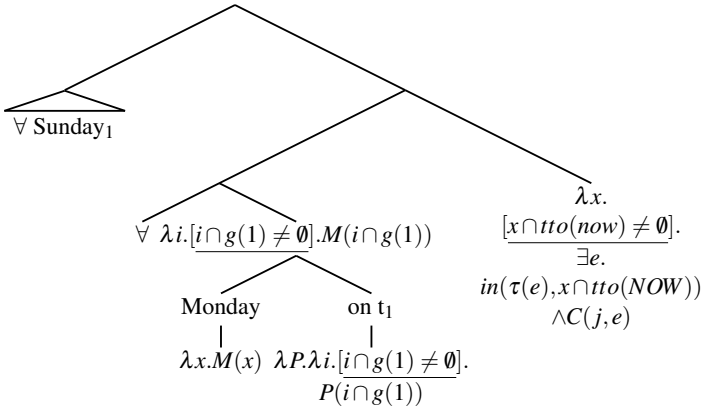
Let us now consider example (22b). This time, the quantified PP *during every summer* modifies directly the NP restrictor of the quantifier *every*, namely *Monday*. We get the structure given in (28).

(28)



The interesting question is, how *every summer* modifies *Monday*. The relevant part of the tree is given in (29). The presupposition associated with *on every summer* survives and results in the global presupposition that every summer in C overlaps the past, and the presupposition associated with *on every Monday* is locally accommodated as it ends up being in the restrictor of a universal quantifier. Apart from this, the computation is standard, hence embedded quantification poses no problem whatsoever for the system.

(29) $\forall z.S(z) \wedge z \in C \rightarrow \forall x.x \cap z \neq \emptyset \wedge M(x \cap z) \rightarrow \exists e.in(\tau(e), x \cap tto(NOW)) \wedge C(j,e)$



The problem of deictic expressions like *today* comes out trivially in the current approach, as shown in (30), which simply contains the predicted truth conditions for (22c). Presupposing that the past overlaps today is trivial and harmless.

(30) John called today.

a. asserts: $\exists e.in(\tau(e), tto(NOW) \cap \iota x.today(x)) \wedge C(J,e)$

b. presupposes: $tto(NOW) \cap \iota x.today(x) \neq \emptyset$

Finally, let us consider the example (22d), which turns out to be simpler than expected, cf. (31). The crucial point is that there is no presupposition that the meeting itself need be in the past. This is because *before x* only presupposes that the time before x will overlap the contextual time (the past). In a way, this is a fairly trivial presupposition, but if we had *after every meeting*, we had a more meaningful presupposition, as this would really require past meetings.

(31) a. asserts: $\exists e.in(\tau(e), tto(\iota x.Meeting(x)) \cap tto(NOW)) \wedge C(J,e)(y)$

b. presupposes: $[\underline{tto(\iota x.M(x)) \cap tto(NOW) \neq \emptyset}]$.

4.4 Stacking Quantifiers

Recall that (6), repeated here as (32), does not boil down to scope ambiguity alone but has a strong *short reading*. But for the scenario discussed in the introduction, this does not seem to suffice. Assume a meeting which starts on Monday at 2 pm and finishes on Tuesday at 2 pm. Now, (6c) requires a calling event to take place between Tuesday 2 pm and the end of Tuesday. As opposed to Pratt & Francez (2001) and von Stechow (2002) and Beaver & Condoravdi (2007) who actually even fail to find the right Tuesday in such a case (since there is no Tuesday in the time after the meeting and no Tuesday which includes the time after the meeting), the theory sketched here fails because it allows, in the second reading, the calling to take place on the right Tuesday, but during the meeting, i.e. in the part of Tuesday that is not after the meeting.

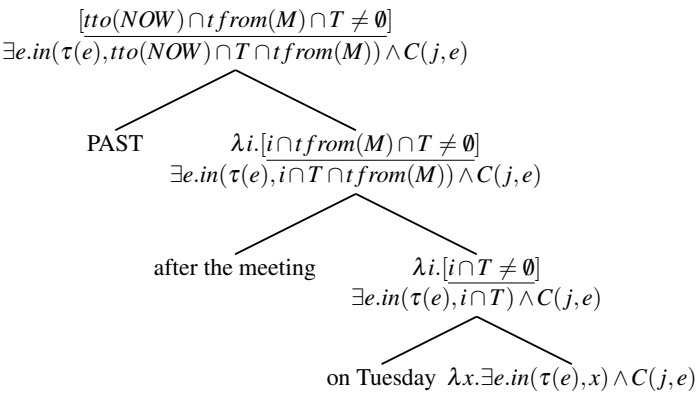
(32) John called after the meeting on Tuesday

a. John called in the overlapping time between the past and the time after the meeting which overlaps Tuesday

b. John called in the overlapping time between the past and the Tuesday which overlaps the time after the meeting

For this reason I assume that we need stacking temporal PPs as well to get the short reading of Pratt & Francez (2001). Fortunately, the system has absolutely no problems with stacking PPs. I demonstrate in (33) for (32) on a strongly simplified tree, in which M stands for *the meeting* and T for *the Tuesday*.

(33)



Stacking two real quantifiers which would undergo QR would result in presupposition failure. The problem is that we get two presuppositions hanging on both traces that depend on each other and thereby make global accommodation obscure. The only system that can handle these is Geurts & van der Sandt

(1999) but it is not clear whether those readings actually exist. Does (34) have a reading such that it presupposes that for every meeting there is a Tuesday such that that Tuesday overlaps both the time after that meeting and the time of the meeting and the calling must have taken place in the part of each Tuesday that is after the meeting? I think, the required reading does neither exist nor does it make particularly much sense. Remember that if the Tuesday was not overlapping the time of the meeting, we could reproduce the truth conditions with embedded quantification.

(34) Peter called after every meeting on every Tuesday.

5 Conclusion

In this paper I have shown first of all that it is possible to do temporal quantification without assuming any kind of context dependent lexical meanings for time-denoting expressions. This is a very important finding as it seems to deliver a solid ground for refuting a number of theories. In passing, a more elaborate version of predicate abstraction was given and in addition it has been shown that peculiar cases in which temporal prepositional phrases are really stacked can be dealt with without any further refinement of the system. Presumably, however, quantifier stacking involving more than one quantifier does not occur.

References

Beaver, David. 2001. *Presupposition and Assertion in Dynamic Semantics*. Stanford:CA: CLSI Publications.

Beaver, David & Cleo Condoravdi. 2007. On the Logic of Verbal Modification. In Paul Dekker Maria Aloni & Floris Roelofsen (eds.), *Proceedings of the sixteenth amsterdam colloquium*, 3–11. Amsterdam.

von Fintel, Kai. 2008. What is presupposition accommodation again? *Philosophical Perspectives* 22(1). 137–170.

Geurts, Bart & Rob van der Sandt. 1999. Domain restriction. In Peter Bosch & Rob van der Sandt (eds.), *Focus linguistic, cognitive and computational perspectives*, 268–292. Cambridge: Cambridge University Press.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar*. Oxford: Blackwell.

Krifka, Manfred. 1989. Nominal reference, temporal constitution and quantification in event semantics. In J. van Benthem, R. Bartsch & P. van Emde (eds.), *Semantics and Contextual Expression*, 75–115. Dordrecht: Floris.

Ogihara, T. 1994. Adverbs of Quantification and Sequence-of-Tense phenomena. In M. Harvey & L. Santelmann (eds.), *Proceedings of semantics and linguistic theory salt iv*, 251–267. Ithaca, NY: Cornell University.

Pratt, Jan & Nissim Francez. 2001. Temporal Generalized Quantifiers. *Linguistics and Philosophy* 24. 187–222.

von Stechow, Armin. 2002. Temporal Prepositional Phrases with Quantifiers: Some Additions to Pratt and Francez (2001). *Linguistics and Philosophy* 25(5-6). 755–800.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 467–481. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Focus and *wh*-Questions in Mongolian*

Edgar Onea
University of Göttingen
edgar.onea@zentr.uni-goettingen.de

Dolgor Guntsetseg
University of Stuttgart
dolgor.guntsetseg@ling.uni-stuttgart.de

Abstract. In this paper we propose an event-anaphor based analysis of Mongolian focus constructions and *wh*-questions. Mongolian has two types of corresponding *wh*-question-answer paradigms involving either in situ or ex situ foci and *wh*-words. The apparent difference between these constructions involves exhaustiveness on the focus-side and presuppositionality on the question-side. The analysis, however, reveals that both contrasts amount to the presence or absence of an anaphoric event argument. We provide a large set of data that confirm the predictions of the analysis.

1 Introduction

In Khalkha-Mongolian (the main Mongolian dialect) two types of *wh*-questions can be distinguished with regard to both syntactic properties and interpretation. We call the first type of question *in situ* and the second type *ex situ*. In situ questions as (1) are such that the *wh*-word appears at its base generated position (or at the first merge position in minimalist parlance) whereas in ex situ questions, as in (2) the *wh*-word appears at some higher syntactic position, which we assume to be a kind of focus position. The most striking correlating semantic properties are that, in a sense, ex situ questions are strongly presuppositional, whereas in situ questions are not: One can answer an in situ question negatively, e.g. with *nobody*, as shown in (1a), whereas for an ex situ question, such an answer is marked (even infelicitous at times), as shown in (2a).[1]

(1) Tuya hen-tei gerle-j bai-san be?
Tuya who-COM *marry*-CVB *be*-PST Q
'Whom did Tuya marry?'

a. Tuya hen-tei ch gerle-j bai-gaa-güi.
Tuya who-COM FOC *marry*-CVB *be*-NPST-NEG

* This research has been supported by the German Initiative of Excellence (Göttingen) and the Project C2 "Case and Referential Context: Argument Realization and Referential Context" as part of the SFB 732 "Incremental Specification in Context" funded by the German Science Foundation (DFG) at the University of Stuttgart. In addition, we wish to thank Andreas Haida, Klaus von Heusinger, Hans Kamp and Malte Zimmermann for comments and suggestions, and Ingo Reich for organising the Sinn und Bedeutung conference and editing this volume.

[1] We explicitly mark focushood only if an example appears without the corresponding *wh*-question.

'Tuya married nobody.'

(2) Hen-tei Tuya gerle-j bai-san be?
who-COM *Tuya marry*-CVB *be*-PST Q
'Whom did Tuya marry?'

a. #Hen-tei ch Tuya gerle-j bai-gaa-güi.
who-COM FOC *Tuya marry*-CVB *be*-NPST-NEG
'Tuya married nobody.' (The speaker doesn't want to tell who Tuya married)

In addition, there is a correlation between the syntactic position of the answering constituent and the syntactic position of the *wh*-word, as can be seen on the position of *hentei ch* in the answers above. The arising empirical generalization is then, that ex situ foci as answers to ex situ questions are necessarily exhaustive whereas in situ foci may or may not be exhaustive. Examples are to come.

In this paper we develop an analysis of the observed phenomena, widely following ideas from Onea (2010) for Hungarian focus, along the following lines: We assume that ex situ questions are about a particular event and so are the ex situ answers. The apparent stronger presuppositionality of ex situ questions is then nothing but a result of the fact that events must have participants (otherwise they don't exist), and the exhaustiveness arises in many but not all cases from the fact that some expressions totally specify the participants of an event.

2 Generalizations

Mongolian is an SOV language with postpositions, prenominal modifiers, a complex differential case marking system Guntsetseg (2009, 2010b) and word order constrained by grammatical roles and information structure (cf. Poppe 1951). Foci in Mongolian receive prosodic prominence and may or may not be moved from their base position. Our first impression is that a B-accent distinguishes contrastive topics from foci, which receive A-accents sensu (Bolinger 1972). Similarly, topics may or may not be moved.

It is not always trivial to distinguish in situ and ex situ questions (or foci). This is because not only focus gives rise to syntactic movement, and, hence, moved foci may surface as if they were in situ and vice versa. Given that the information structurally unmarked overt structure of the Mongolian sentence is the one in (3a), exemplified in (3), we can only safely conclude that a focus or a *wh*-word is ex situ whenever it precedes some expression that in the unmarked case would surface at its left.

(3) Öchigdör Peter Mari-g shunaltai üns-sen.
yesterday Peter Mary-ACC *passionately kiss*-PST
'Yesterday, Peter kissed Mary passionately.'

a. clausal adverbs > subject > object > verbal adverbs > verb

We remain silent on the hierarchical structure of Mongolian sentences in this paper. To avoid syntactic complications we limit the analysis to simple transitive sentences. We only use *wh*-questions about the object. We assume that whenever the *wh*-word is in front of the subject, as in (4a) we have an ex situ focus, and also we assume that whenever the *wh*-word is after the subject, as in (4b) it may be interpreted in situ (but needn't be).

(4) a. Hen-ig / MARI-g Peter üns-sen (be)?
who-ACC / *Mary*-ACC *Peter kiss*-PST Q
'Whom did Peter kiss? Peter kissed Mary.'

b. Peter hen-ig / MARI-g üns-sen (be)?
Peter who-ACC / *Mary*-ACC *kiss*-PST Q
'Whom did Peter kiss? Peter kissed Mary.'

Given these assumptions, we have the following observed facts to model: i) ex situ questions are more presuppositional, and ii) ex situ answers are exhaustive.

3 Questions

As a general framework for questions we assume a Hamblin-Rooth type of semantics in which questions are modelled as sets of possible answers, cf. e.g. Rooth (1992) and Beaver & Clark (2008) as a recent variant.

We assume that *wh*-questions of the type given in (5) may have two distinct representations given in (5a) and (5b). (5a) says that the semantic value of a question consists of all possible answers with an existentially closed event variable and (5b) says that the semantic value of a question consists of all possible answers with a presupposed event variable. In the second case we say that the question is a about a particular event.

(5) Who P?

a. $\{(\exists e)(P(e,x))|x \in D\}$

b. $\{P(\iota e((\exists y)(P(e,y) \wedge e \in C \wedge MAX(e)))),x)|x \in D\}$

Note, of course, that if the event under discussion is maximal and contextually unconstrained, the two representations are completely equivalent, however, of course, in the lack of a context, (5b) suffers presupposition failure. We assume that ex situ questions have the semantic representation in (5b) whereas in situ

questions have the semantic representation in (5a).

We now illustrate: In (6) the ex situ question is not felicitous, as the context does not satisfy the presupposition. In (7) the question with ex situ *wh*-word is acceptable and clearly refers to the event under discussion that the speaker has just reported. In (8) the question is felicitous and since the context maximizes the event under discussion to Peter's entire life, the interpretation is as given in the example, just as explained above.

(6) Context: ∅

a. #Hen-ig Peter üns-sen be?
who-ACC *Peter kiss*-PST Q
'Whom did Peter kiss?'

(7) Context: I just saw that Peter kissed a girl, but I didn't recognize her.

a. Hen-ig Peter üns-sen be?
who-ACC *Peter kiss*-PST Q
'Whom did Peter kiss in the event you saw?'

(8) Context: I'm sure, Peter kissed some girl or another in his life.

a. Hen-ig Peter üns-sen be?
who-ACC *Peter kiss*-PST Q
'Whom did Peter ever kiss?'

Evidence that in situ questions do not target the event under discussion is a bit more involved, as we must make sure that the construction contains in situ foci. Assuming that simple unstressed personal pronouns in Mongolian are inappropriate sentence topics but full DPs, especially with demonstrative articles, are, the contrast in (9) is enlightning. Note that (9b) is otherwise grammatical and fully acceptable as a general question with no salient event.

(9) Context: I just saw that a woman kissed someone, but I didn't recognize the kissee.

a. Ter hüühen hen-ig üns-sen be?
the woman who-ACC *kiss*-PST Q
'Whom did the woman kiss in the event you saw?'

b. #Ter hen-ig üns-sen be?
she who-ACC *kiss*-PST Q
'Whom did she kiss in the event you saw?'

An interesting question is what happens in the case of contrastive topics, which in Mongolian appear in front of the focused expression (or question word). Superficially, one may expect that contrastive topics may not appear with ex

situ foci, for – as argued in Büring (2003) – contrastive topics would signal the existence of a super-question: e.g. for (10) this would be a *who-kissed-whom?* type of question, leading to the non-existence of a unique kissing event. However, even though Peter is a contrastive topic in (10), it is clearly part of the background. Hence, the event that has to be accommodated involves Peter kissing someone, and not just any kissing event. This correctly predicts that ex situ questions may cooccur with contrastive topics, as shown in (11) (Note that the question word appears left to the subject in (11), hence necessarily being ex situ).

(10) Peter$_{CT}$ hen-ig üns-sen be?
Peter *who*-ACC *kiss*-PST Q
'As for Peter, whom did he kiss?'

(11) Mari-g$_{CT}$ hen-d Peter tanilzuul-san be?
Mary-ACC *who*-DAT *Peter introduce*-PST Q
'As for Mary, to whom did Peter introduce her?'

Let us now see how we can compositionally derive the difference between the ex situ and in situ questions. We assume the existence of a particular syntactic position which, similar to Hungarian (cf. Onea 2010), is responsible for the event-presupposition and syntactically requires a [+Foc] feature on its specifier, such that only *wh*-words (bearing focus according to Haida (2007)[2]) and foci may appear in its specifier. We assume that the semantics of the E head is the one given in (12). We dub this position EP. Note that the first argument is the question word, and the second the background. The formula assumes that question words are quantifiers, but of course, question words are, strictly speaking, sets of individuals (treated as generalized quantifiers) in order to derive the ordinary meaning of questions as sets of propositions. We leave this part to the reader, however.

(12) $\lambda\phi.\lambda\psi.\psi(\lambda x.\phi(x)(\iota e.e \in C \wedge MAX(e) \wedge \exists y_{\in D_e}.\phi(y)(e)))$

4 Foci

Answers to *wh*-questions contain narrow foci such that the narrowly focused constituent matches the *wh*-word in the question. We assume Alternative Semantics (Rooth (1992); Beaver & Clark (2008) as a general semantic framework for focus interpretation. In particular: Foci trigger a presupposition over sets of alternative propositions which have to match the ordinary semantic value of some question in the context by $\subseteq$ relation.

[2] We do not follow his semantic analysis of *wh*-words, however.

In Mongolian, foci appear at the same syntactic position at which the question they answer would appear. Syntactically, we model this by assuming that ex situ foci are moved to EP whenever EP enters the numeration. The reason is that the [+Foc] feature on the answer must be checked.

Semantically, the effect of the EP is, again, the introduction of the event presupposition, and for (13), we get the result in (14). (14) says that in the contextually unique event of Peter kissing someone, he kissed Mary.

(13) MARI-g Peter üns-sen.
Mary-ACC *Peter kiss*-PST
'Peter kissed Mary.'

(14) a. ordinary meaning:
$kiss(\iota e.e \in C \wedge MAX(e) \wedge \exists y_{\in D_e}.kiss(e,P,y),P,M)$
b. presupposed set:
$\{kiss(\iota e.e \in C \wedge MAX(e) \wedge \exists y_{\in D_e}.kiss(e,P,y),P,z) | z \in D_e\}$

It should be obvious now, that for (13) we have just derived the exhaustiveness inference, as it is not possible for an event to have two distinct participants on the same argument role, even if one contains the other. So, if for *e* the patient argument is Mary, the event *e'* which contains *e* and has Mary and Jane as a patient argument, must be distinct from *e*.

The exhaustification works, however, only accidentally, since it is a property of proper names as generalized quantifiers to maximally cover their restrictor set. For typical monotone increasing quantifiers such as *three women* exhaustification is not expected to arise as the derived meaning ultimately only says that in the event under discussion the cardinality of the set of individuals who are both women and have been kissed by Peter is at least three. Any further exhaustification must be purely pragmatic. This prediction is born out as shown in (15). Note that the lack of contrast between (15b) and (15d) is fully predicted as in these cases the arguments are treated as a sum individual.

(15) a. Gurvan ohin-ig Peter üns-sen. Bas neg hövgüün-ig.
three girl-ACC *Peter kiss*-PST *also a boy*-ACC
'Peter has kissed three girls. And a boy.'
b. Gurvan ohin(-ig) bolon bas neg hövgüün-ig Peter üns-sen.
three girl-ACC *and also a boy*-ACC *Peter kiss*-PST
'Peter has kissed three girls and a boy.'
c. #Mari-g Peter üns-sen. Bas neg hövgüün-ig.
Mary-ACC *Peter kiss*-PST *Also a boy*-ACC
'Peter has kissed Mary. And a boy.'

d. Mari(-g) bolon bas neg hövgüün-ig Peter üns-sen.
Mary-ACC *and also a boy*-ACC *Peter kiss*-PST
'Peter has kissed Mary and a boy.'

There is an additional test for the contrast between the exhaustification in case of proper names and other upward monotonic quantifiers, such as *three girls*. Consider the question in (16). Now an answer like (16a) is correctly predicted to be completely out in our theory, since this would mean that Peter didn't kiss Mary. An answer like (16b) is, on the other hand, not predicted to be infelicitous, since Peter kissing three girls is not supposed to be exhaustive. For one thing, of course, in principle (16b) could mean that Peter kissed a totality of three girls, however this is a marginal interpretation in Mongolian. If native speakers are confronted with the dialogue: (16)-(16b) they would say that Peter kissed a totality of four girls. The fact that (16b) is marked with a question mark rather comes from a more optimal candidate which native speakers would prefer: (16c) and (16d) which would include a special marker that we are speaking about additional girls.

(16) Mari-gaas öör hen-ig Peter üns-sen be?
Mari-ABL *different who*-ACC *Peter kiss* Q
'Except Mary, who did Peter kiss?'

a. #Tuya-g Peter üns-sen.
Tuya-ACC *Peter kiss*-PST
'Peter kissed Tuya'

b. ?Gurvan ohin-ig Peter üns-sen.
three girl-ACC *Peter kiss*-PST
'Peter has kissed three girls.'

c. Öshöö Tuya-g Peter ünssen.
more Tuya-ACC *Peter kiss*-PST
'Peter kissed also Tuya.'

d. Öshöö gurvan ohin-ig Peter üns-sen.
more three girl-ACC *Peter kiss*-PST
'Peter kissed also three girls.'

Note that this contrast is particularly strong, as not every Mongolian speaker would have problems with (16b) at all, whereas (16a) is completely out.

We do not discuss downward entailing or non monotonic quantifiers here in detail as their treatment in event semantics is fairly complicated, but note that similar to Hungarian, cf. Onea (2010), they never occur as in situ foci, as shown in (17). The reason for this is that simply existentially quantifying over an event variable will not get the correct truth conditions (Krifka 1989),

moving such quantifiers into the EP position, however, correctly predicts that they apply to one particular maximal event. If needed, of course, that event can be extended without any limit.

(17) a. Yag gurvan ohin-ig Peter üns-sen.
exactly three girl-ACC *Peter kiss*-PST
'Peter has kissed exactly three girls.'
b. #Peter yag gurvan ohin-ig üns-sen.
Peter exactly three girl-ACC *kiss*-PST
'Peter has kissed exactly three girls.'

Note that if explicit negation applies, any kind of foci may appear in situ. This is different in Hungarian. The reason for this seems to be that Hungarian has an explicit syntactic projection which contributes the existential closure of the event, whereas this is more flexible in Mongolian as far as we can judge at the current stage of our research.

5 Predictions

The system proposed in this paper has a number of surprising predictions, which are (fortunately) borne out:

For one thing, adjuncts that do not individuate events, such as explanations, will never be exhaustified even if they come as ex situ foci. This is because an event may have several reasons and therefore naming one reason or explanation for an event will not trigger any special individuating information about that event. Therefore, in the answer to a *why*-question there is no difference with regard to exhaustiveness between in situ and ex situ foci, as shown in (19) vs. (21), however, there is still a very clear difference in the interpretation of the questions. (18) must target a particular journey which most probably was discussed in the context, whereas (20) is a general question.

(18) Yagaad chi Mongol ruu yav-san be?
why you Mongolia to go-PST Q
'Why did you go to Mongolia (on a particular salient occasion)?'

(19) Minii eej övd-sön bai-san uchraas bi Mongol yav-san. Bas
my mother be_sick be-PST *because I Mongolia go*-PST *also*
minii egch gerle-h gej bai-san uchraas.
my sister marry-INF *that be*-PST *because*
'I went to Mongolia, because my mother was sick. And because my sister was getting married.'

(20) Chi Mongol ruu yagaad yav-san be?
you Mongolia to why go-PST Q
'Why did you go to Mongolia (some day)?'

(21) Bi eej övd-sön bai-san uchraas Mongol yav-san. Bas
I mother be_sick-PST *be*-PST *because Mongolia go*-PST *also*
egch gerle-h gej bai-san uchraas.
sister marry-INF *that be*-PST *because*
'I went to Mongolia, because my mother was sick. And because my sister was getting married.'

In Mongolian the system proposed above predicts that for stative verbs ex situ foci will have difficulties finding the contextually salient event the question or answer should be about.

Some states can be very well individuated in time, in fact, probably they can be even thought of as events. Such is the case for *having a headache, being angry with John*. This is fairly difficult for more extended events such as *having a car, loving John, dispising John*. If so, we may expect that in Mongolian only for the first type of states ex situ questions are available, for they do have well-individuated possible discourse antecedents. Yet this prediction is apparently wrong, since both (22) and (23) are perfectly acceptable.

(22) Hen-d Peter uurla-san be?
who-DAT *Peter be_angry*-PST Q
'With whom is Peter angry?'

(23) Hen-ig Peter üzen_jad-dag ve?
who-ACC *Peter hate*-HAB Q
'Whom does Peter dispise?'

A closer look shows that there is a difference between these cases: for (23) we need a context in which someone has informed us that Peter dispises someone. The interpretation of the sentence is identical with (24). Indeed, an answer to (23) is not interpreted as an exhaustive list of people who Peter dispises but rather as an exhaustive list of people that have been mentioned to be dispised by Peter in the context.

(24) Hen-ig Peter üzen_jad-dag gej John hel-sen be?
who-ACC *Peter hate*-HAB *that John say*-PST Q
'Whom did John say that Peter dispises?'

This means that in cases in which an event or a particular temporally well individuated state (which can be under discussion) cannot be reconstructed (or is

hard to reconstruct) from an utterance, an external event (of uttering/ speaking/ informing) will be used as a target event: instead of getting a salient event of Peter dispising someone, we get a salient event of saying that Peter dispises someone. We ignore the syntactic details.

It depends on the question semantics employed whether or not questions will need to have existential presuppositions or not. This issue is not totally settled, but we are inclined to follow Haida (2007) in saying that questions do have an existential presupposition. If this is correct, the fact that *nobody* is a good answer in a dialogue as in (25) needs an explanation. We follow Haida (2007) in the assumption that negations can be used to protest against a presupposition, and hence, the acceptability of (25) in English is not a valid argument against the presuppositionality of *wh*-questions.

(25) A: Who do you love?
B: Nobody.

But then the question arises why Mongolian behaves differently. So, why is it that when (2a) is used to answer (2) in Mongolian, native speakers get the impression that the person uttering (2a) is lying, i.e. he does not want to divulge the secret, who Tuya married? First, this cannot be because an existential presupposition is imposed by the question, as (2a) could simply contradict that presupposition. Moreover, it can be shown that even in situ questions do have an existential presupposition. So, for instance, (26), if uttered by a judge or a lawyer in court would still be rejected as presuppositional by the defence if kissing were a crime.

(26) Ter hen-ig üns-sen be?
she who-ACC *kiss*-PST Q
'Whom did she kiss?'

The explanation for the markedness of *nobody*-type answers for ex situ questions is explained by the anaphoricity of the event which the question is about. Since such an event must exist, no participant of that event can be *nobody*. So, clearly, if in the answer one says that the participant under question is *nobody*, we get a contradiction that will be pragmatically interpreted as a non-willingness to divulge a secret. The contradiction is sentence internal, however, and not between the presupposition of the question and the answer, since in the answer itself an event presupposition is triggered by the ex situ position of the answer focus. If, however, one chooses to answer with *nobody* to such a presuppositional question in situ (remember that *nobody* can be in situ despite the downward entailing properties, since it is accompanied by verbal negation)

only a contradiction between the presupposition of the question and the answer arises. This is still not quite the situation in English, however, since in Mongolian even in this case the presupposition of the question is stronger (event related) than the one in English (which is merely existential), so we expect in Mongolian a presupposition failure marker to be used. Exactly this happens in practice as shown in (27).

(27) a. Ter hen-ig üns-sen be?
she who-ACC *kiss*-PST Q
'Whom did she kiss?'
b. Ter hen-ig ch üns-ee-güi shdee
She who-ACC FOC *kiss*-NPST-NEG *actually*
'Actually, she kissed nobody.'

The same effect can be reproduced in English, as shown in (28). Note that if we omitted the embedding under *John said*, we would get a plain contradiction between A's utterances.

(28) A: John said that Peter kissed a girl in the coffee break.
B: Who did he kiss?
a. A: ? He kissed nobody.
b. A: Actually, he kissed nobody.

Haida (2007) argues that the uninformativity of a pure existential as an answer to a *wh*-question is a better test for presuppositionality as shown in (29).

(29) A: Who did you kiss?
B: ? Somebody.

The lack of any contrast between (30) and (31) in this respect shows that indeed, both types of questions in Mongolian are presuppositional, even if only one of them is about a particular event.

(30) a. Peter hen-ig üns-sen be?
Peter who-ACC *kiss*-PST Q
'Who did Peter kiss?'
b. ?Peter hen_negn-ig üns-sen.
Peter someone-ACC *kiss*-PST
'Peter kissed somebody.'

(31) a. Hen-ig Peter üns-sen be?
who-ACC *Peter kiss*-PST Q
'Who did Peter kiss?'

b. ?Hen-negn-ig Peter üns-sen.
someone-ACC *Peter kiss*-PST
'Peter kissed somebody.'

6 Outlook: Comparison to Hungarian

In this paper we have developed a sketchy analysis for two interesting facts about Mongolian questions and foci: For one thing Mongolian has two types of questions, namely in situ and ex situ questions, and also two types of typical answers containing narrow foci that can appear ex situ or in situ and which, for the most part, strictly correlate with the type of the question. We modelled this correlation and the arising semantic facts: presuppositionality differences in the question and exhaustiveness differences in the answers.

The correlation as such is partly purely syntactic: We have assumed a particular EP projection which attracts focused elements, and since we assume that question words have a [+Foc] feature, it follows that question words and narrow foci share the syntactic position in Mongolian whenever EP enters the numeration. In addition, we have assumed that the E head transforms the event argument of the clause into a presupposed maximal event, i.e. a contextually unique event of the type described in the background part. This explains the exhaustiveness of ex situ foci for proper names but not for most other quantifiers. Evidence has been given that this prediction is correct. The presuppositionality difference in the question is not related to the existential presupposition *wh*-questions generally have but rather the event-relatedness of the questions. Again, evidence to this extent has been given.

The question arises how Mongolian focus relates to Hungarian preverbal focus, which is the most prominent example of exhaustive focus in the literature, cf. Szabolcsi (1981); É. Kiss (1998), and, even more importantly, whether from Mongolian anything significant with regard to the general exhaustiveness debate follows. As a background, it must be noted that there are a number of competing analyses for Hungarian focus. For instance, it has been claimed that preverbal focus in Hungarian comes with an exhaustiveness operator similar to *only* (Szabolcsi 1981; É. Kiss 1998), that exhaustiveness in Hungarian is a matter of exhaustive identification (Szabolcsi 1994) or that Hungarian focus is only exhaustive in an event related manner (Onea 2007), or exhaustiveness could even be a pure pragmatic implicature (Wedgwood 2005).

The analysis proposed here is very similar to the event-based exhaustification analysis proposed in Onea (2007, 2010) for Hungarian. This similarity is not incidental, however. While in Hungarian there is only one type of *wh*-questions, Mongolian exhibits an analogon to focus-phenomena also in the

realm of *wh*-questions. It turns out that it is difficult or even impossible to apply any non-event-based analysis of Hungarian focus to the Mongolian questions, for it is, for instance, not at all obvious what it means for a question to be exhaustive. Consider, for instance, the oddity of (32) even in English, which straightly translates to Hungarian and Mongolian.

(32) Only whom did Peter kiss?

Also, the event-based exhaustification approach has a number of predictions that are hard to achieve in the competing theories. For instance, the prediction that there is a strong exhaustiveness difference between arguments and adjuncts (i.e. *why*-questions) and also the difference between proper names and other quantifiers. While these predictions seem empirically unclear for Hungarian according to Onea (2010), we have provided strong evidence that in Mongolian they are all borne out.

In addition, one particular prediction of Onea (2010) is that *wh*-questions may come either with existentially bound event variables or with anaphoric event variables, which can be modelled with the ι operator. Mongolian overtly distinguishes between these types of questions, if our analyis is on the right track. Contextual constraints on the possibility to use these types of questions suggest that the distinction is, indeed, real.

In a way, then, Mongolian suggests that focus exhaustiveness may generally be related to event-anaphors. A similar analysis, based on event anaphors, has been proposed by Hole (2011) for *shi...de clefts* in Chinese, and Grubic & Zimmermann (2011) for marked foci in Ngamo.

We conclude with a somewhat puzzling difference between Hungarian and Mongolian. While in Hungarian focused *all*-phrases cannot appear ex situ, that is to say, as immediate preverbal foci, in Mongolian, in some contexts, *all*-phrases can pop up as ex situ answers to *how-many*-questions, as shown in (33a) vs. (34a).

This fact seems to suggest that there are differences between Hungarian and Mongolian which have not been accounted for by the analyses of Onea (2010) and the present analysis. Whether this means that after all, it is only Mongolian and, crucially, not Hungarian to which the event-based analysis should apply or whether there is some independent explanation of this contrast, we leave for further research.

(33) Heden hün-ig Peter üns-sen be?
How-many person-ACC *Peter kiss*-PST Q
'How many persons did Peter kiss?'

a. Büh hün-ig Peter üns-sen.
all person-ACC *Peter kiss*-PST
'Peter kissed all the persons.'

(34) Hány lányt csókolt meg Péter?
*How-many girls.*ACC *kissed* PRT *Peter*
'How many girls did Peter kiss?' Hungarian

a. *Péter minden lányt csókolt meg.
*Peter every/all girl.*ACC *kissed* PRT
'Peter kissed every girl.'

We do hint, however, at the fact that even in Mongolian, *every*-phrases cannot be ex situ foci, which again, is similar to Hungarian, as shown in (35a).

(35) Heden hun-ig Peter üns-sen be?
How-many person-ACC *Peter kiss*-PST Q
'How many persons did Peter kiss?'

a. *Hün bolgon-ig Peter üns-sen.
person every-ACC *Peter kiss*-PST
'Peter kissed every person.'

So the solution of this asymmetry might come for free from a proper analysis of *büh* ('all')-phrases in Mongolian as compared to Hungarian. For instance, Guntsetseg (2010a) shows that as opposed to the single universal quantifier *minden* in Hungarian, and the three English quantifiers (*each, every, all*) Mongolian has four universal quantifiers which strongly differ in their semantic properties: *büh* ('all'), *bühen* ('generic every'), *bolgon* ('distr. every') and *bür* ('each').

References

Beaver, David & Brady Clark. 2008. *Sense and Sensitivity*. Oxford: Blackwell.

Bolinger, D. 1972. Accent is predictable (if you are a mind reader). *Language* 43. 633–644.

Büring, Daniel. 2003. On D-Trees, Beans, and B-Accents. *Linguistics & Philosophy* 26(5). 511–545.

É. Kiss, Katalin. 1998. Identificational Focus versus Information Focus. *Language* 74(2). 245–273.

Grubic, Mira & Malte Zimmermann. 2011. Conventional and free association with focus in Ngamo. In *Proceedings of sub15 Saarbrücken*, Saarbrücken.

Guntsetseg, Dolgor. 2009. Differential Object Marking in (Khalkha-) Mongo-

lian. In R. Shibagaki & R. Vermeulen (eds.), *Proceedings of the 5th Workshop on Altaic Formal Linguistics*, vol. 58 MIT Working Papers in Linguistics, 115–129. Cambridge MA.

Guntsetseg, Dolgor. 2010a. Differential Case Marking in Mongolian. MS. University of Stuttgart.

Guntsetseg, Dolgor. 2010b. The function of case in mongolian. In *Proceedings of the 6th workshop on altaic formal linguistics (wafl 6)* (MIT Working Papers in Linguistics (MITWPL) 61), 139–153. Cambridge MA.

Haida, Andreas. 2007. *The indefiniteness and focusing of wh-words*. Berlin: Humboldt Universität zu Berlin, dissertation.

Hole, Daniel. 2011. The deconstruction of Chinese shì…de clefts revisited. *Lingua* accepted.

Krifka, Manfred. 1989. Nominal reference, temporal constitution and quantification in event semantics. In J. van Benthem, R. Bartsch & P. van Emde (eds.), *Semantics and Contextual Expression*, 75–115. Dordrecht: Floris.

Onea, Edgar. 2007. Exhaustivity, Focus and Incorporation in Hungarian. In Maria Aloni, Paul Dekker & Floris Roelofsen (eds.), *Proceedings of the sixteenth amsterdam colloquium*, 169–174. Amsterdam: ILLC/Department of Philosopty University of Amsterdam.

Onea, Edgar. 2010. Hungarian focus and event anaphors. MS. University of Göttingen.

Poppe, N. 1951. *Khalkha-Mongolische Grammatik: mit Bibliographie, Sprachproben und Glossar*. Wiesbaden: Steiner.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* (1). 75–116.

Szabolcsi, Anna. 1981. Compositionality in Focus. *Acta Linguistica Societatis Linguistice Europaeae* (15). 141–162.

Szabolcsi, Anna. 1994. All quantifiers are not equal: the case of focus. *Acta Linguistica Hungarica* (42). 171–187.

Wedgwood, Daniel. 2005. *Shifting the Focus: From Static Structures to the Dynamics of Interpretation* Current Research in the Semantics Pragmatics Interface. Oxford: Elsevier.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 483–498. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Relevance Topics*

Sophie Repp
Humboldt-Universität zu Berlin
sophie.repp@rz.hu-berlin.de

Abstract. I present a speech act approach to relevance topics (RTs) that builds on Krifka's (2001) analysis of speech acts as operations on commitment states. RTs can be marked with separating phrases (*as for*) or as antecedents of relevance conditionals. They are speech acts of their own and are used in contexts in which the speaker wishes to address something that was not addressed immediately before. A RT must be followed by a speech act that is relevant in relation to the topical element (which subsumes relations of predication and frame setting). Without the RT the discourse would be incoherent because the prerequisites of the subsequent speech act (e.g. Gricean maxims of relevance) would be violated. RTs cannot introduce completely new discourse referents. They must be referential, which in the case of properties as RTs can be achieved by a type shifting operation, but they can also pick up portions of earlier discourse by quoting. I compare RTs to hanging topics, which are a different type of speech act, as well as to frame setters, which can be expressed by very similar formal means to RTs.

1 Introduction

The notion of (sentence) *topic* has proven difficult to define, the reason being that there are different semantic-pragmatic types of topics, e.g. aboutness topics, frame-setting topics or contrastive topics, that seem to share a kind of family resemblance but cannot be reduced to one unifying characteristic (e.g. Jacobs 2001). In this paper I am concerned with what often is called a *free topic* or *freies Thema* in German, and which, for reasons that will become clear instantly, I refer to as *relevance topics* (RTs). RTs are typically realized by 'separating constructions' like *was x betrifft* ('as regards x') in (1). The hanging topic construction illustrated in (2), which has a DP at the left periphery and whose referent is picked up by a pronoun in the main clause, is

* This work was supported by the German Research Foundation DFG as part of the Collaborative Research Centre (SFB) 632 'Information Structure' within project A2 at the Humboldt-Universität zu Berlin. Special thanks go to Andreas Haida & Stefan Hinterwimmer for valuable discussion. I also thank Manfred Krifka and the audiences at SuB 15, the International Conference of the SFB in July 2010, and the Computational Linguistics Colloquium at Osnabrück University. The corpus data are from the British National Corpus, licensed to the SFB 632.

often thought to be another instantiation of a free topic (e.g. Altmann 1981). In this paper I will show that the hanging topic construction has different semantic-pragmatic characteristics from RTs and is subject to different restrictions.

(1) Was[Peters Geburtstag $_{\text{TOPIC}}$] betrifft, er will einen Traktor.
what Peter's birthday regards he wants a tractor
'As regards Peter's birthday, he wants a tractor.'

(2) [Peters Geburtstag $_{\text{TOPIC}}$], wir wollen ihn nächste Woche feiern.
Peter's birthday we want it next week celebrate
'Peter's birthday, we want to celebrate it next week.'

For RTs like the one in (1) I will argue that they are clause-external and constitute a speech act of their own that must be followed by another speech act, in (1) this is the assertion that the referent of *er* wants a tractor. Between the RT and the subsequent speech act there needs to be a relation of relevance. Unlike aboutness topics RTs do not require a predication relation between the topic phrase and the main clause (comment), and unlike frame setters they do not need to restrict the domain of reality with regard to which the truth of the main clause is evaluated. But they *can* do both (cf. Jacobs 2001). The purpose of a RT is to create a coherent discourse if coherence cannot be established without the RT speech act. For instance, in (3) the phrase *with regard to* marks an RT. Truth-conditionally this RT can be left out without a meaning change. Discourse-wise, it is crucial: the discourse is incoherent without it.

(3) ...The relative amounts of ammonia, nitrite and nitrate depend on a number of factors of which the most important are pH and temperature. Below a pH of 8 the majority of ammonia is present in the non-toxic ammonium form. Above 8 the toxic form becomes increasingly more prevalent. ***With regard to [temperature*** $_{\textit{TOPIC}}$***]***, there is approximately five times as much toxic ammonia at a temperature of 20° than at 5°C. [From BNC-FBN *Practical Fishkeeping.* Peterborough, Cambs: EMAP Pursuit Publishing Ltd, 1992]

Thus, a RT has a discourse-managing function. It introduces a new discourse segment by taking up information that is in the common ground but which is not *addressed* in the immediately preceding context.

2 Relevance Topics as Speech Acts

The speech act view of topics is not new. Searle (1969) identifies a specific act of referring (≈ topic act) and an act of predication. Jacobs (1984) suggests

that 'free topics' (see above) constitute speech acts of their own. Endriss (2009) spells this out for aboutness topics. Ebert, Endriss & Hinterwimmer (2008) transfer these ideas to conditionals, where the antecedent serves as the topic act and the consequent as the second speech act.

Although all these proposals take a speech act view on topics they are underdefined as regards the actual illocutionary aspects of the speech act. According to Endriss (2009), for instance, the speech act character of topics manifests itself as follows. If a topic-comment structure is embedded under an illocutionary operator such as ASSERT and if the topical referent is not familiar the update of the common ground proceeds in two steps. In a topic act, a discourse referent/ storage address is created. Then, the comment is applied to it. If the topical referent is familiar it is identified with an existing address and then the comment is applied to it. If the operator is non-illocutionary (e.g. a verb like *announce*) the establishment of a discourse referent is part of the ordinary semantic content. In this account, the illocutionary aspects of the topic act are characterized in terms of its semantic update effects but not in terms of the social commitments of the discourse participants that arise from performing it. In this sense the account is only 'near-speech act' take on topics.

According to Krifka (2001) speech acts are operations that apply to a commitment state *s*, i.e. a set of social commitments between discourse participants, and deliver the commitments that characterize the resulting commitment state *s′*. A speech act is an *appropriate* act *A* for a state *s* if *s* fulfils the 'presuppositions' for the performance of *A*. I assume that such 'presuppositions' include felicity conditions, sincerity conditions and Gricean maxims (e.g. relevance). Some acts create the commitment to react with a corresponding act, e.g. questions commit the hearer to answer (cf. Krifka 2001: 13):

(4) If *s* is a neutral state and *Q* is a question act, then *Q(s)* = *s′* is a state in which an answer *A* is expected that will lead back to a neutral state:
A(Q(s)) = A(s′) = s″,
where *Q* is appropriate for *s*, and *A* is appropriate for *s′*,
and where *s* and *s″* are neutral states and *s′* is a non-neutral state

On the basis of this I suggest that the speech act character of RTs should be captured in the following way:

(5) **Relevance topics as speech acts**
$\text{ACT}^{sp}(\text{RTOP}_x^{sp}(s)) = \text{ACT}^{sp}(s') = s''$,
where RTOP_x^{sp} is appropriate for *s*, and
ACT^{sp} is appropriate for *s′* and relevant in relation to *x*.

Let *s* be a neutral conversational state and RTOP_x a relevance topic performative act. The speaker commitment delivered by RTOP_x is: *I will address x*, where *x* is the topical element. $\text{RTOP}_x(s) = s'$ is the resulting non-neutral state. s' requires another speech act ACT that leads back to a neutral state s''. The superscript *sp* both on RTOP_x^{sp} and ACT^{sp} in (5) indicates that the speaker of the RT act and the speaker of the subsequent speech act are the same. This is different for questions, which place a commitment on the hearer to answer (unless they are used as rhetoric devices in monologic discourse). The neutral state s'' is only achieved if ACT asserts something relevant in relation to *x*. For non-assertive acts, ACT also needs to be relevant in relation to *x*. However, it will not lead back to a neutral state but to a state that might require yet another speech act, e.g. in the case of questions. Furthermore, before the performance of RTOP_x the speaker did not address *x* (n.b. this does not mean that *x* was not mentioned in the previous utterance): ACT, if performed without the preceding RTOP_x, would have been inappropriate for *s*.

Applied to example (3) from above we can discern the following sequence of conversational states and speech acts:

(6) ⟨*s*⟩ [RTOP With regard to temperature] ⟨*s'*⟩ [ACT there is approximately 5 times as much toxic ammonia at a temperature of 20° than at 5°C] ⟨*s''*⟩

In the conversational state *s*, which is a neutral state, the performance of ACT (= Assert [...]) would not be appropriate due to a lack of relevance at this stage. $\text{RTOP}_{\text{temperature}}(s)$ is appropriate because *temperature* was not addressed immediately beforehand. The resulting state s' is a non-neutral state: It contains the commitment of the speaker to address *temperature*. ACT(s') now is appropriate because ACT addresses *temperature*. The resulting state s'' is a neutral state because the commitment has been fulfilled by ACT.

(7) and (8) illustrate how a RT can precede a question and a directive, respectively (also cf. Altmann 1981 for such data), which are relevant with respect to the topic act: a plausible reading of (7) is that the meeting was a meeting with the boss, and a plausible reading of (8) would be that the addressee has a problem with the boss and that the speaker recommends calling a friend for advice.

(7) Wegen deinem Chef, war Max eigentlich pünktlich beim Termin?
because.of your boss was Max actually on.time at.the meeting
'About your boss, was Peter actually on time at the meeting?'

(8) Wegen deinem Chef, ruf doch mal bei Sarah an!
because.of your boss call PART PART *with Sarah on*
'About your boss, go ahead and call Sarah!'

3 Different Shapes of Relevance Topics

The data in (9a-c)(i) suggest that, apart from being introduced with a separating phrase, a RT can be a hanging topic, see (9b)(i), and a relevance conditional (Ebert et al. 2008), see (9c)(i). (9a-c)(ii) reveal, however, that in contrast to the construction with a separating phrase and in contrast to the conditional the hanging topic construction is restricted to cases where the topical referent is taken up in the comment, as in (9b)(i), i.e. there must be a predication relation between topic and comment. (9b)(ii), where such a relation is missing, is unacceptable.

(9) a. Was Peters Gesundheit betrifft,--
what Peter's health concerns
'As regards Peter's health,--'

b. Peters Gesundheit,--
Peter's health
'Peter's health,--'

c. Wenn du etwas über Peters Gesundheit wissen willst,--
if you something about Peter's health know want
'If you want to know something about Peter's health,--'

a / b / c -- (i) sie hat in den letzten Jahren sehr gelitten.
she has in the last years very suffered
-- 'it suffered a lot in the last few years.'

a /#b / c -- (ii) es gibt jetzt eine Spenderniere.
it gives now a donor.kidney
-- 'the hospital has a donor kidney now.'

The example in (10) from Altmann (1981:49) might be taken to be a counterexample to this generalization about hanging topics but there might be independent reasons for its acceptability. The first is that (10) involves an epithet as the anaphoric device (*this face* by many speaker is viewed as an epithet of *slim blonde*) so that there actually is a predication relation between topic and comment here. Alternatively, we might assume that the face being a part of the topical referent is sufficient to establish a predication relation in this pointing scenario. These issues need closer scrutiny.

(10) Die schlanke Blondine da drüben, ich glaube, ich habe
the slim blonde there over.there I believe I have
dieses Gesicht schon einmal gesehen.
this face already once seen
'The slim blonde over there: I think I've seen that face before.'

Hanging topics differ from RTs with separating phrases also in their discourse characteristics: they can occur at the end of a discourse:

(11) Context: Peter ist in einem Modelleisenbahnverein. Er hat eine CB-Funkanalage, sammelt alte Faxgeräte und liest jeden Elektronikblog, den er finden kann. 'Peter is in a model train club. He has CB radio, collects old fax machines and reads every electronics blog he can get hold of.'

[$_{\text{HANGING TOPIC}}$ Peter], er ist ein ganz schöner Geek.
Peter he is a whole nice geek
'Peter, he is quite a geek.'

These data suggest that hanging topics are a different speech act from RTOP$_x$ let us call it *H-RTOP$_x$*. H-RTOP$_x$ does not come with the 'presupposition' of RTOP$_x$ that the speaker did not address *x* before the performance of RTOP$_X$. Furthermore, H-RTOP$_x$ requires the subsequent speech act to be <u>about</u> *x* in the predication sense and not just relevant in relation to *x*. I have not the space to elaborate on hanging topics here (see Frey 2004 for further observations).

4 Two Speech Acts – two Clauses: Relevance Topics in Comparison to Frames

The view that RTs constitute a separate speech act is corroborated by evidence for their extra-clausal position. It is instructive in this respect to compare RTs to frames. So far I have mainly looked at RTs that 'only' have a relevance relation with their subsequent speech act but RTs can also have a frame-setting relation with the subsequent speech act: if they restrict the domain of reality with regard to which the truth of the proposition expressed by that speech act is evaluated, as in the English (12). In such cases the content of the second speech act is trivially relevant for the domain of the frame.

(12) Changes in primary care: The imposition of the new GP contract. [...]

With regard to [the health care of older people $_{RT}$] the most salient feature of the new contract is that they will be required to annually invite each patient on their list aged 75 and over to participate in a consultation which should assess the health of the patient. [From BNC-ECE 1849 Victor, C. (1991) *Health and health care in later life.* Milton Keynes: Open University Press, 14-156.]

A corpus analysis investigating the most frequent separating phrases in English *(as for x, as far as x is concerned, as to, with regard to x)* revealed

that 42% of the investigated expressions had a frame-setting relation with the main clause.[1]

I suggest that frame setting is not automatically an instance of relevance topicality. In German, RTs can be clearly set apart from frames. To begin, consider that like in English, in German separating expressions can be used to mark a frame, see (13), which hosts the frame in Spec,C. (14) is the corresponding example with a frame adverb. (15) and (16) show that frames are not restricted to a syntactic position that would be characteristic of topics: they are not restricted to a left-peripheral position, or to one before the comment. Note that there does not need to be an intonational break between the frame-setting clause and the remainder of the sentence. The commas in (15) are an orthographical convention.

(13) [$_{CP}$ Was seine Gesundheit betrifft [$_{C'}$ geht [$_{IP}$ es Peter gut]]]
what his health concerns goes it Peter good
'As far as his health is concerned, Peter is fine.'

(14) [$_{CP}$ Gesundheitlich [$_{C'}$ geht [$_{IP}$ es Peter gut]]]
healthwise goes it Peter good
'Health-wise Peter is fine.'

(15) a. Peter geht es, was seine Gesundheit betrifft, gut.
b. Peter geht es gut, was seine Gesundheit betrifft.

(16) a. Peter geht es gesundheitlich gut.
b. Peter geht es gut gesundheitlich.

Next consider (17), where the separated phrase is not a frame – it does not restrict the domain with regard to which the truth of the proposition *that Peter has diabetes* is evaluated. Variants (b) – (d) show that the separated phrase must occur *before* Spec,C, which need not be a clause-external position but can be (cf. Frey 2004). Note that the judgements for (b) vary but for most speakers the presence of *so* ('so') is strongly preferred. Also note that

[1] The corpus analyzed was the British National Corpus. The frequencies of the most frequent clause-initial separating phrases were: *as for* - 15.9 per million words, *as far as* - 12.3 pmw, *as to* - 5.9 pmw, *with regard to* - 3.3 pmw. 42 % of the separated RTs had a frame-setting function, as indicated above, 23 % had a predication relation with the comment, and 35% had neither a frame nor a predication relation. Amongst the separating phrases, *as far as* was used more often than the other phrases to mark frames – 76% vs. 20% vs. 46% vs. 26% in the above order ($\chi^2 = 39.24$, $p < 0.0001$). The reason for this is that in contrast to the other separating phrases *as far as* can be used to mark what can be called a *judge*, or an *epistemic source:* a person that restricts the validity of the statement, e.g. *as far as I am concerned…, as far as he knows…*, which accounts for the great majority (88%) of frames in this category.

(c) and (d) improve for some speakers if a strong intonational break plus gesture(s) indicate that the separated phrase is inserted parenthetically post-hoc as a correction for mismanaged discourse. Such cases are irrelevant because they are not instances of RTs but – as just specified – correction measures. (18) gives the same set of data with the frame as an adverb, where all variants are completely unacceptable.

(17) a. Was seine Gesundheit betrifft, [$_{CP}$Peter [$_{C'}$ hat Diabetes]]
What his health concerns Peter has diabetes
'As far as his health is concerned, Peter has diabetes.'
b. Was seine Gesundheit betrifft, **[**$_{CP}$??(so) **[**$_{C'}$ hat Peter Diabetes]]
c. *[$_{CP}$ Peter hat, was seine Gesundheit betrifft, Diabetes]
d. *[$_{CP}$ Peter hat Diabetes, was seine Gesundheit betrifft]

(18) a. *Gesundheitlich, [$_{CP}$ Peter [$_{C'}$ hat Diabetes]]
health-wise Peter has diabetes
b. *Gesundheitlich (so) hat Peter Diabetes
c. *[$_{CP}$ Peter hat gesundheitlich Diabetes]
d. *[$_{CP}$ Peter hat Diabetes gesundheitlich]

I suggest that (17c-d) and (18), which contain potential frames but no RT, are deviant because restricting an eventuality by a frame to a domain only is allowed if the eventuality principally could be in some other domain (cf. Ernst 2004). Having diabetes can only be defined in the domain of health (in the absence of an easy-to-accommodate metaphorical relation). Note that it is not the presence of the vague predicate (*good*), that makes the difference in the frame-setting examples. Such a predicate could be argued to provide some variable that must be constrained by the frame. However, frames can co-occur with non-vague predicates (*midget*), see (19a), and a vague predicate (*fat*) without an alternative domain as in (19b) is just as impossible as a non-vague predicate without an alternative domain.

(19) a. He is a midget politically. (Ernst 2004: 106)
b. *He is fat physically.

Turning to binding we find clear indications that RTs are clause-external whereas frames are not. In (20) the separating phrase is before the CP and the comment is a CP with a filled Spec,C. The pronoun in the comment can be co-referential with the referent, resulting in a predication relation – another trivial instantiation of relevance. In (21), where the separated expression is in Spec,C, the binding options change and the separated expression is inter-

preted as a frame. The RT in (20) is clause-external, the frame in (21) is clause-internal.

(20) Was Max_i betrifft, [$_{CP}$ $er_{i/k}$ [$_{C'}$ hat sich als sehr nützlich erwiesen]]
what Max concerns he has REFL *as very useful turned.out*
'As regards $Max_{i/k}$, $he_{i/k}$ has turned out to be very useful.'

(21) [$_{CP}$ Was Max_i betrifft [$_{C'}$ hat $er_{*i/k}$ sich als sehr nützlich erwiesen]]
what Max concerns has he REFL *as very useful turned.out*
'$He_{*i/k}$ has turned out to be very useful as regards Max_i.'

5 Relevance Topics, Referentiality and Familiarity

The speech act view on RTs proposed above allows us to explain some characteristics of RTs that would come as a surprise otherwise. The type of expression that may occur as a RT is restricted in a different way than the type of expression that can occur as aboutness topics, which have been studied in some detail with respect to this issue and which have been assumed to be restricted to referential expressions (Reinhart 1981, Jacobs 2001) or quasi-referential expressions (e.g. Ebert & Endriss 2003; Endriss 2009). The latter essentially are indefinites with unmodified determiners. For these quantifiers a sensible representative can be formed from which a discourse referent can be created that can serve as an aboutness topic.

In this section I show that RTs must be individuals (type *e*) but can also be properties that are turned into individuals by type shifting. In addition, RTs can refer to previous portions of discourse (by quoting). These characteristics follow from the addressation function of RTs. Furthermore, the status of RTs as separate speech acts explains why RTs cannot be in the scope of propositional operators in the subsequent speech act (e.g. the generic operator). Finally, RTs must be familiar (in a way to be specified): they cannot introduce new discourse referents. This follows from their discourse management function. Let us start with the latter aspect.

(22) illustrates that specific indefinites are allowed as RTs if they come with the modifier *gewiss* ('certain') but not if they occur unmodified. Also note that if *gewiss* in (22) were replaced with its close relative *bestimmt* ('certain'), the result would be unacceptable.

(22) *Context: My neighbour has a secret affair with your friend Peter.*
Was einen *(gewissen) Freund von dir betrifft, meine Nachbarin
what a certain friend of you concerns my neighbour
war in letzter Zeit verdächtig häufig erst morgens daheim.
was in last time suspiciously often only in.the.morning at.home
'As far as a (certain) friend of yours is concerned, recently my neighbour's been getting home only in the wee hours of the morning.'

If we assume that RTs pick up familiar information (but not information that was immediately addressed before the utterance of the RT) the contrast in (22) follows: Let us take *familiarity* to mean *identifiability* as in Ebert, Ebert & Hinterwimmer (to appear), so that a referent is familiar to a speech act participant if s/he can distinguish it from other referents on the basis of a particular property it has. Ebert et al. argue that *gewiss* signals that the referent of the indefinite can be identified by the speaker, i.e. is familiar to the speaker. They also discuss cases, however, where it is required that both speaker and addressee can identify the referent. These cases are questions. An example is given in (23b), with a minimal variant that uses *bestimmt* instead of *gewiss* in (23a) (see Ebert et al. example (70) ff.):

(23) a. Geht Paul immer in eine bestimmte Kneipe?
goes Paul always in a certain pub
'Does Paul always go to a particular pub?'
b. Geht Paul immer in eine gewisse Kneipe?
'Does Paul always go to a certain pub?'

By asking (23a) the speaker enquires whether Paul goes to a specific pub on a regular basis, without being interested in the actual pub itself (it could be any pub, as long as Paul is a regular there). A felicitous answer could be *Yes, but I forget which one it is*. By asking (23b) the speaker indicates that it is a particular pub s/he has in mind and that the addressee knows which one that would be, with the pub at issue being noteworthy one way or another – it could be the pub where Paul's prospective girl-friend works. Answering (23b) with *yes, but I forget which one it is* is inappropriate. So by using *gewiss* the speaker indicates both speaker and hearer familiarity.

(22) suggests that this is exactly what licenses the *gewiss*-indefinite as a RT. The referent of the indefinite is picked up as familiar information from the common ground. If the hearer is not able to identify the referent, which s/he could signal by asking *Who are you talking about?* the purpose of the RT failed: the discourse was incoherent for the hearer. *Gewiss* cannot be replaced by *bestimmt* because *bestimmt* signals that the respective referent can be

identified by some salient agent, which means that it is not necessarily familiar to speaker and hearer (cf. Ebert et al. to appear). The discourse managing function of the RT would fail. If there is no modifier the specific indefinite introduces a brand-new referent. Again, this is not possible for a RT.

Let us turn to the felicitous use of specific indefinites in partitive constructions as in (24). In partitives, the indefinite is used to introduce an individual from a set that is already familiar, so in (24) the set of animals from which one animal is singled out must be part of the common ground. Note that the accent on *eins* ('one') is only one prosodic option, it is also possible to place the main accent in the RT on *Tiere* ('animals'), indicating the presence of (focus) alternatives for *animals*.

(24) Was EINS der Tiere betrifft, so mache ich mir Sorgen.
*what one the.*GEN *animals concerns so make I* REFL *sorrows*
'As far as one of the animals is concerned, I am quite worried.'

I suggest that familiarity with the set licenses the introduction of the discourse referent the indefinite refers to in cases like (24). Both speaker and hearer must be able to identify the set. Note, however, that the hearer can adequately react to (24) with *Oh yes, which one is it?*, which suggests that it is not necessary that the hearer can identify the individual introduced by the indefinite. Importantly, though, this *which*-question is only adequate if the hearer is at least somewhat familiar with the make-up of the set, i.e. knows which (or what) individuals are members of the set. I leave the particulars of this issue to future research.

Let us next turn to generic interpretations of indefinites, which like specific indefinites have been argued to be acceptable in aboutness topic positions like the left-dislocated position in German, illustrated below (Ebert & Hinterwimmer 2010):

(25) a. Ein Hund, der ist anhänglich.
b. Hunde, die sind anhänglich.
{a dog / dogs} PRON{SING/PL} *be*{SING/PL} *devoted*
'A dog is devoted. / Dogs are devoted.'

The RT counterpart of (25) is only possible with the bare plural:

(26) a. *Was einen Hund betrifft, er ist anhänglich.
What a dog concerns he is devoted.
'As for a dog, it is devoted.'
b. Was Hunde betrifft, sie sind anhänglich.
what dogs concerns they are devoted.
'As for dogs, they are devoted.'

Bare plurals like in (26b) have been argued to refer to kinds (Carlson 1977 and many others) and therefore have a referential reading. Singular indefinites cannot refer to kinds.[2] They are interpreted as one of the arguments of a generic operator whose other argument is delivered by the predicate of the sentence. If, as I argue, the RT is extra-clausal and constitutes a separate speech act the indefinite in (26a) cannot provide the (restrictor) argument required for the generic operator. Note that for the generic operator it is unreasonable to assume that the argument can be provided by the context as in the case of some other quantifiers. Further note that even though the pronoun *er* in the second speech act is problematic in (26a) – a speaker can only refer anaphorically with a singular pronoun to a referent denoted by an indefinite if s/he made an epistemically specific use of the indefinite (Kamp & Bende-Farkas 2006) – replacing this offending pronoun by a *d*-pronoun, analogously to the felicitous (25a), does not improve (26a).[3] Since Frey (2004) has shown convincingly that left dislocation in German is a monoclausal structure and since I assume that RTs are extra-clausal we can assume that it is indeed the missing restrictor that is the problem in (26a).[4]

Let us next look at the unspecific reading of indefinites. (27) can be used in a situation where the speaker wants to make clear that s/he will not buy a dog, and that for a good reason. From the use of the indefinite in (27)

---

[2] *Pace* sub-kind readings, which would be indicated by an accent on the determiner and under which (27)(a) improves, just as expected.

[3] Krifka et al. (1995:88) show that d-pronouns can be used to refer to kinds, which is not given here:

(i) Hans fuhr Mercedes$_i$. *Er$_i$ war grau. / Das$_i$ ist ein zuverlässiger Wagen.
'Hans drove (a) Mercedes$_i$. It$_i$ was grey. / That$_i$ is a reliable car.

[4] Construing sentences like (26a) without a pronoun invariably results in a reading of the indefinite as an unspecific indefinite, see (i), cf. (27) in the main text for a plausible context:

(i) As for a poodle, {a poodle / a dog} is demanding.

This is predicted by the above analysis. The generic operator takes as its arguments subject and predicate of the second speech act. The RT is still outside its scope. The unspecific reading is available for reasons given in the next paragraphs.

the existence of the individual does not follow: there is no particular dog under discussion here.

(27) Was einen Hund betrifft, meine Wohnung ist zu klein.
what a dog concerns my apartment is too small
'As far as a dog is concerned, my apartment is too small.'

If the unspecific indefinite does not introduce a referent we expect that we cannot refer anaphorically to it by means of a singular pronoun. This is confirmed by data like the following:[5]

(28) Wegen [einem Geschenk für Max]$_i$, ich war gestern einkaufen. #Es$_i$ hat 5 Euro gekostet.
'About a present$_i$ for Max, I went shopping yesterday. It$_i$ cost 5 euros.'

The behaviour of unspecific indefinites – to have no existential import – is of course familiar from intensional contexts, where indefinites are interpreted as properties without existential quantification (and where intensional verbs can be assumed to take properties of arguments, cf. Zimmermann 1993). Let us assume that unspecific indefinites as RTs are also interpreted as such properties, and let us see if other expressions denoting properties can occur as RTs as well. This is indeed the case, cf. (29). For reasons of space I illustrate with an English example with a verb in the gerund form, the observations carry over to German non-finite verbs.

(29) [From BNC-FR4 *The impact of social policy.* Wilding, P & George, V. London: Routledge & Kegan Paul plc, 1984.]

> The chances of an unskilled manual worker's child being a poor reader are six times greater than those of a professional worker 's child." There is no evidence

[5] The data are not totally clear here. If the second speech act is in subjunctive mood, anaphoric reference with a *d*-pronoun improves with unspecific indefinites, see (i)-(ii). One way to deal with this would be to say that we do not have unspecific indefinites here (or above) but 'formal' kinds, rather than 'conventional kinds' (Schubert & Pelletier 1989), since kinds can be picked up by *d*-pronouns (see footnote 3). Also see Krifka's (1995) notion of 'concept', which can also be applied to properties in general. Also cf. Müller-Reichau (2006). All this deserves thorough discussion for which there is no space here.

(i) Was eine neue U-Bahnlinie betrifft, die müssten wir dann nächstes Jahr in Planung nehmen (wenn wir sie realisieren wollen).
'As far as a new metro line$_i$ is concerned, we would have to start planning that$_i$ next year (if we want to build it).

(ii) Was ein Geschenk$_i$ für Peter betrifft, das$_i$ könnte ich bei Dussmann besorgen.
'As far as a present for Peter is concerned, I could buy that at Dussmann's'

> to show whether such differences have changed over the years. There is evidence, however, to show that these differences in school attainment at age 7 do not decrease, but rather increase as children get older. [new paragraph] *[As far as passing examinations is concerned* $_{RT}$*]*, the obvious applies. The proportion of children passing Ordinary and Advanced level examinations is positively correlated with social class.

I assume with Chierchia (1984) that non-finite verbs like in (29) denote individuals that are derived from the respective property by a nominalization function. Since this nominalization function applies to properties it also applies to unspecific indefinites like in (27) and (28) – but not to semantic objects denoted by adverbs, prepositions etc.[6] This accounts for the fact that adverbs or prepositions cannot occur as RTs (see section 4 for adverb data). Further note that Chierchia (1998) also accounts for the behaviour of kind-denoting expressions with the nominalization function (and the corresponding predicate function), a parallel which resounds in the behaviour of these different expressions as RTs.

The last type of expression I would like to look at are modified quantifiers which like unspecific indefinites are excluded as aboutness topics. As RTs they are acceptable:

(30) Was höchstens zwei Fehlschüsse betrifft,
what at.most two failures concerns
das Prüfungsamt ist gar nicht so streng.
the exam.office is at.all not so strict
'As for at most two failures the exam office is not quite so strict.'

(31) Was Peters mindestens 15 Freundinnen betrifft,
what Peters at.least 15 girl.friends concerns
das Großmaul lebt noch bei seiner Mutter.
the big.mouth lives still with his mother
'As for Peter's at least 15 girl friends, that bigmouth still lives with is mother.'

I suggest that the quantificational phrase in these examples is used as a quote. The quote is used as a name by which the speaker refers to the contents of a previous utterance (also cf. Searle 1969). For instance, in (31) that previous utterance could have been an assertion that Peter has had at least 15 girl

[6] We also find non-finite constructions with subjects, cf. (i). These can be analysed as zero-place propositional functions (Chierchia 1984).

(i) *[As for him having a permanent dwelling* $_{RT}$*]*, where is he supposed to live? [From BNC-K52 *Northern Echo*. Leisure material].

friends, or a question whether Peter indeed has had at least 15 girl friends. The RT picks up these utterances. For aboutness topics this is not possible because they must refer to semantic objects. RTs can designate a previous utterance as relevant.

6 Summary

I have characterized RTs in terms of their formal and their speech act properties. RTs constitute separate speech acts that function as discourse-structuring devices by committing the speaker to a subsequent speech act which is relevant with respect to the RT by adding information, asking a question etc. RTs are different from aboutness topics in that they are clause-external, and in that they have different restrictions with respect to the types of expressions that are licit RTs. I have put this down to the illocutionary characteristics of RTs. Frames need not occupy a structural position that would classify as a typical topic position: left peripheral, or before the topic. I have suggested that they are not topics unless they are also RTs.

References

Altmann, Hans. 1981. Formen der Herausstellung im Deutschen: Rechtsversetzung, Linksversetzung, freies Thema und verwandte Konstruktionen. Tübingen: Niemeyer.

Carlson, Gregory. 1977. *Reference to Kinds in English:* Amherst, University of Massachusetts. PhD thesis.

Chierchia, Gennaro. 1984. *Topics in the Syntax and Semantics of Infinitives and Gerunds*: Amherst, University of Massachusetts PhD thesis.

Chierchia, Gennaro. 1998. Reference to kinds across languages. *NaLS* 6. 339–405.

Ebert, Christian & Cornelia Endriss. 2003. Wide scope indefinites as aboutness topics. In *Proceedings of SuB 8*, 95–110. Univ. Konstanz.

Ebert, Christian, Cornelia Endriss & Stefan Hinterwimmer. 2008. A unified analysis of indicative and biscuit conditionals as topics. In *Proceedings of SALT XVIII*, 266–283. Ithaca, NY: Cornell University.

Ebert, Christian & Stefan Hinterwimmer. 2010. Indefinites as direct and indirect aboutness topics. In Caroline Féry & Malte Zimmermann (eds.), *Information Structure*, 89–158. Oxford: Oxford University Press.

Ebert, Christian, Cornelia Ebert & Stefan Hinterwimmer. To appear. The two German specificity markers "bestimmt" and "gewiss" In Hinterwimmer, Stefan & Cornelia Ebert (eds.), *Different Kinds of Specificity Across Languages.* Dordrecht: Springer.

Endriss, Cornelia. 2009. Quantificational Topics - A Scopal Treatment of Exceptional Wide Scope Phenomena. Dordrecht: Springer.

Ernst, Thomas. 2004. Domain adverbs and the syntax of adjuncts. In Jennifer R. Austin, Stefan Engelberg & Gisa Rauh (eds.), *Adverbials: The Interplay Between Meaning, Context, and Syntactic Structure*, 103–130. Amsterdam: Benjamins.

Frey, Werner. 2004. The grammar-pragmatics interface and the German prefield. *Sprache und Pragmatik* 52. 1–39.

Jacobs, Joachim. 1984. Funktionale Satzperspektive und Illokutionssemantik. *Linguistische Berichte* 91. 25–58.

Jacobs, Joachim. 1997. I-Topikalisierung. *Ling. Berichte* 168. 91–133.

Jacobs, Joachim. 2001. The dimensions of topic-comment. *Linguistics* 39. 641–681.

Kamp, Hans & Ágnes Bende-Farkas. 2006. Epistemic specificity from a communication-theoretic perspective. Ms. University of Stuttgart.

Krifka, Manfred. 1995. Common nouns: A contrastive analysis of Chinese and English. In Gregory Carlson & Francis J. Pelletier (eds.), *The Generic Book*, 398–411. Chicago: University of Chicago Press.

Krifka, Manfred. 2001. Quantifiying into question acts. *NaLS* 9. 1–40.

Krifka, Manfred, F.J. Pelletier, G. N. Carlson, G. Chierchia, G. Link, A. ter Meulen. 1995. Genericity: An introduction. In Gregory Carlson & Francis J. Pelletier (eds.), *The Generic Book*, 1–124. Chicago: University of Chicago Press.

Krifka, Manfred. 2008. Basic notions of information structure. *Acta Linguistica Hungarica* 55. 243–276.

Müller-Reichau, Olav. 2006. Sorting the world. On the relevance of the kind-level/ object-level distinction to referential semantics. University of Leipzig. PhD thesis.

Reinhart, Tanya. 1981. Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* 27. 53–94.

Searle, John. 1969. *Speech Acts: An Essay in the Philosophy of Language*. Cambridge: Cambridge University Press.

Schubert, Lenhart K. & Francis J. Pelletier. 1989. Generically speaking, or, using discourse representation theory to interpret generics. In Gennaro Chierchia, Barbara H. Partee & Raymond Turner (eds.), *Properties, Types and Meaning II,* 193–268. Dordrecht: Kluwer.

Zimmermann, Thomas Ede (1993). On the proper treatment of opacity in certain verbs. *NaLS* 1. 149–179.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 499–514. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Early Implicatures by Children and the Acquisition of Scalar Implicatures*

Stefanie Röhrig
Johannes Gutenberg-Universität Mainz
roehrst@uni-mainz.de

Abstract. Inquiries into the acquisition of scalar implicatures (SIs) have focussed on the question why children calculate SIs less often than adults. To answer this question several hypotheses, such as the Processing Limitation Hypothesis, the Reference-Set Hypothesis and the Pragmatic Delay Hypothesis have been suggested (Chierchia et al. 2005). All of these studies assume that implicatures are a late acquisition phenomenon, because individual types of implicatures are not distinguished. However, one should not treat all kinds of implicatures in the same way. This study shows that some types of implicatures occur very early and it proves that even 5-year-old children calculate implicatures – although different ones than adults. Based on these findings a new hypothesis on the acquisition of SIs is formulated.

1 Scalar Implicatures

Implicatures are additional and implicit meaning-components beyond the meaning of the explicitly uttered statement. Scalar Implicatures (SIs), a subgroup of conversational implicatures, are computed if scalar terms – terms which can be arranged on a scale according to the degree of their semantic strength and informativeness – occur in an utterance. SIs are based on the fact that the meaning of a weaker term is entailed in the stronger one and that the hearer relies on the Conversational Principles (Grice, 1975) and assumes that once a weaker term of the scale is uttered, the stronger one does not hold. Specifically, Grice's Maxim of Quantity "1. Make your contribution as informative as is required (for the current purpose of the exchange)." and "2. Do not make your contribution more informative than is required." (Grice 1975: 45) are involved in the interpretation of scalar terms and the computation of SIs. Depending on which of these two principles the hearer

* This paper is based on my MA-thesis. Special thanks to Regine Eckardt and Hildegard Farke for their supervision. I am grateful to Franziska Kretzschmar for commenting on an earlier version of this manuscript.

relies on, there are two kinds of scalar implicatures. Upper-bound SIs are inferences from the first Maxim of Quantity, while lower-bound SIs are inferences based on the second Maxim of Quantity.

(1) Some of us have been to the Christmas Market.

The implicature in statement (1) is based on the scale <*all, some, none*>. When hearing (1), the hearer compares the scalar term *some* to *all* and *none*, the stronger and weaker term of the same scale respectively, and infers that it is neiter true that all of the people went to the Christmas Market nore that none of them went there, since otherwise the speaker should have said *all* or *none*. This shows that statement (1) is lower and upper bound at the same time since the hearer expects the speaker to obey the Conversational Maxims and to make his contribution as informative as required but not too informative.

1.1 Acquisition Studies

The acquisition and development of implicatures, especially of SIs, has been widely discussed in literature (Chierchia et al., 2005; Noveck, 2005; Noveck et al., 2007a; Noveck & Sperber, 2007b). One of the first studies concerned with the acquisition of SIs was a study by Noveck (2001) that examined how French children interpret the scalar terms <*must – might*> and <*all – some*>. In this experiment children were confronted with three boxes. Two of the boxes were open, so that the participants could see the content. The third box was closed. Participants were then told: "A friend of mine gave me this box and said 'all I know is that whatever is inside this box looks like this box (experimenter pointed to the Horse + Fish Box) or what's inside this box (experimenter pointed to the Horse-only Box)'" (Noveck, 2001: 172). Based on this information participants had to evaluate statements about the possible and necessary content of the box. Among some neutral statements, which were designed to check whether the task was understood, there was the critical statement *In this box might be a horse*. This statement is under-informative, since there has to be a horse in the box. Noveck expected that participants who calculate SIs should reject this statement, since it is underinformative. Participants who do not draw a SI should accept it.

Noveck's findings were that 7-year-old children are the youngest ones that show overall competence in mastering this task and that 7- to 9-year-old children accept the weaker term of the scale <*must – might*> in a situation where the stronger term is more informative more often than adults. While 72% of the 5-year-old, 80% of the 7-year-old and 69% of the 9-year-old children accepted the statement *In this box might be horse* (the weaker scalar

term) although they knew that *In this box must be a horse* (the respective stronger statement) is more informative in this situation, only 35% of the adults did so. These results show that children accept underinformative statements more often and hence calculate SIs less often than adults.

In the following years, several studies on scalars such as <*all – some*>, <*finish – start*>, <*at least – at most*> and <*and – or*> were conducted in different languages such as English, Italian and Greek (Chierchia et al., 2001, 2005; Papafragou & Musolino, 2003; Guasti et al., 2005; Noveck et al., 2007a; Noveck & Sperber, 2007b). These studies confirm Noveck's findings and support the idea that children enrich underinformative statements less often than adults and thus calculate less SIs. Trying to explain these findings several hypotheses, such as the Processing Limitation Hypothesis and the Pragmatic Delay Hypothesis (Noveck 2001; Chierchia et al. 2005) have been proposed in the literature and will be introduced and discussed in 4.1.

2 German Replication Study

2.1 Linguistic Purpose

A modified replication study of the first experiment of Noveck (2001) was designed and conducted to see whether and from which age on German children calculate implicatures.

In other areas of language acquisition such as semantics and syntax children overgeneralize meanings, grammatical features or rules beyond its use in adult language before they start using it correctly. (cf. Lust, 2006) Over-generalizations are an important component in the process of language acquisition and children's understanding and discovery of how language works. I assume that overgeneralizations, which are part of the learning process, are also important for and part of the acquisition of pragmatics. Participants who overgeneralize the first Maxim of Quantity might interpret statements differently than expected. For example, if participants interpret the utterance heard in this experimental setting as exhaustive description of the content of the box and thus as the most informative statement, then a different kind of implicature might be calculated. Consequently, particular attention was paid to statements which might possibly trigger different kind of implicatures. To figure out, whether children stick to or overgeneralize the Conversational Principles and/or calculate other implicatures than adults (e.g. based on a different reading or understanding of the statements), close attention was paid to participants answers and comments.

Additionally, the formulation of the task was modified, so that it did not contain the conjunction *or*. This was done to avoid the use of a second scalar

term or any other critical term in the experiment since it could have an additional impact on the results of the reasoning experiment.
These changes in the experimental design and evaluation of the resulting data might also be informative with respect to the adequateness of the hypotheses about the acquisition of SIs. If it turns out that children stick to or overgeneralize the Conversational Principles, then the Pragmatic Delay hypothesis (see 4.1) could be rejected.

2.2 Methods

2.2.1 Participants

Seven 5-year-old children, eight 7-year-old children and seven 9-year-old children took part in the experiment. Their mean ages were 5;5 years, 7;6 years and 9;6 years. All participants were native speakers of German and recruited from a kindergarden and primary school in Thuringia.

2.2.2 Materials and Design

The materials were similar to the ones Noveck (2001) used in his study. However, the statements in my experiment were presented in German. Moreover, I only presented the positive statements and added the following additional statements to stress the contrast between the modal verbs *könnte* ('might') and *muss* ('must'): *In der Box muss auf jeden Fall A sein* ('In any case there has to be A in the box'); *In der Box könnte vielleicht A sein* ('There might possibly be A in the box'). This was done to see whether children are more likely to compute SI if the contrast between the statements is stronger. The statement *In der Box kann A und B sein* ('There might be A and B in the box') was added to see whether participants understood and were able to cope with the task. The task was formulated so that it did not contain the scalar term *or*, to avoid possible influences from other scalar terms.

2.2.3 Procedure

The session began with a short conversation and a pre-task. For the pretask participants were presented with two boxes. Box I contained item A, box II contained items A and B. Children were then given another box which was empty and asked to fill it in the way that it contains the same items as box I or box II in the end. The purpose of this pretask was to see whether the task or setting was too difficult for the participants, whether the logical term *or* has an impact on children's calculation of SI in the experiment and to familiarize the children with the situation and task of the experiment.

In the actual experiment subjects were shown three boxes (see figure 1). The first box contained A, e.g. a bear. The second box contained A and B,

e.g. a bear and a rabbit. Both boxes were opened so that the children were able to see the contents. The third box remained closed. Participants were given a glove-puppet which was supposed to help the child to evaluate the statements they were going to hear. They were told that the closed box contained the same toys as one of the two open boxes in front of them. Then one of the following six sentences was uttered in terms by two puppets that were controlled by the experimenter: *(1) In der Schachtel muss B drin sein.* (false)*; (2) In der Schachtel kann A und B drin sein.* (true)*; (3) In der Schachtel muss auf jeden Fall A drin sein.* (true)*; (4) In der Schachtel könnte vielleicht A drin sein.* (true)*; (5) In der Schachtel könnte vielleicht B drin sein.* (true)*; (6) In der Schachtel kann A drin sein* (true). The puppets were introduced so that the experiment appears like a quiz-game rather than a test to the children. The procedure was repeated so that each child had evaluated three sets of statements with different toys. Children were told to evaluate the statement either as *richtig* ('correct'), *halbrichtig* ('semi-correct') or *wrong* ('wrong').

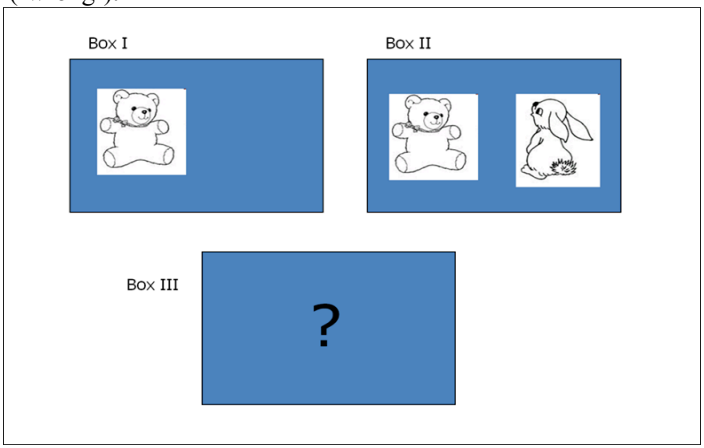


Figure 1**:** depicts the experimental design

To test whether children focus on truthfulness or falsity rather than on appropriateness when evaluating a statement, participants were confronted with an argument of the puppets at the end of the session. One puppet said that the statement *In der Schachtel kann/ könnte A sein* ('There might/ might possibly be A in the box') was true while the other claimed that the statement *In der Schachtel muss A sein* ('There has to be A in the box') was correct. Participants were asked to act as a mediator between the two glove puppets.

2.2.4 Expectations

If participants understood the task properly and in the expected way, they should reject *(1) In der Schachtel muss B sein*. If a statement is true for at least one of the open boxes, then it is also true for the covered box.

Additionally, SIs can be calculated for statement *(4) In der Box könnte vielleicht A drin sein*. If participants accept this statement, it indicates that they consider *könnte (vielleicht)* as compatible with *muss auf jeden Fall*. While the affirmation of this statement would show that the participant did not enrich the meaning of the weaker scalar term, the rejection of the statement in favour of the stronger scalar term would indicate that he computed a SI. If statements (4) and (6) are evaluated as semi-correct, it indicates that participants realized that these statements are underinformative but do not consider this violation as bad enough to reject the statements.

Statement *(6) In der Schachtel kann A drin sein* is a variation of statement *(4) In der Schachtel könnte vielleicht A drin sein*. If participants reject sentence (4) but accept (6), it would indicate that they compute SIs more easily if the distance on the Horn Scale[1] between the uttered scalar term and the most informative scalar term is bigger. Moreover, if SIs are calculated more easily if the distance on the Horn Scale is bigger and the scalar term *kann* ('might') should not be weak enough in this kind of reasoning experiment, then sentence (4) should be rejected while its variation (6) should be accepted.

Different kinds of implicatures may be calculated for some of the statements, if participants consider the statements about the covered box as exhaustive descriptions of its content. For example, if the hearer exploits the meaning of the uttered statements and interprets the utterances as upper-bound (as the most informative utterance), then she or he will, for example, not only focus on item B but also on other items that have to be in the box once B is in the box. This kind of interpretation affects the following statements: *In der Schachtel muss A sein; In der Schachtel kann/ könnte vielleicht A sein; In der Schachtel könnte B sein*.

If participants consider the statements as exhaustive descriptions of the content of the box then they are expected to reject statement *(5) In der Schachtel könnte B sein* because B can only be the content of the box if A is the content of the box as well. Under these circumstances statement *(3) In der Schachtel muss A sein* would also be false, since A alone is only possibly (not

[1] Horn Scales are named after the linguist Laurence Horn. Scalar terms are linearly ordered on this scale according to their semantic strength. The most informative term is presented at the left end of the scale, the weakest one at the right.

necessarily) true for the covered box. The statement *In der Schachtel kann/ könnte vielleicht A sein* is also true under these circumstances since A (alone) is only a possible content of the covered box.

In the puppets argument at the end of the experiment children, who evaluate a statement based on its truthfulness or falsity, rather than on appropriateness, are expected to say that both statements are right. Participants who evaluate a statement according to its appropriateness should say that the statement *In der Schachtel muss A sein* is the better one.

2.3 Results

In the pretask children's interpretation of the scalar term *or* in the setting of the actual experiment was tested. This was done to figure out whether a higher amount of 5-year-olds answered the statement *In der Schachtel könnte vielleicht A sein* of the actual experiment in the affirmative because they understood the task differently than adults. It can be said that nearly all of the participants mastered this pretask well and filled the empty box with the same items as in box I or in box II. The only exception was a 5-year-old girl, who had interpreted the task differently and changed the content of one of the open boxes as well. After the task was explained again she filled the empty box with the correct items. The results show that the vast majority of children interpreted *or* in this task as exclusive-*or* and suggest that young children's reasoning results are not influenced by a different reading of *or* if the disjunction was used in the actual experiment.

With respect to the expectations of the actual experiment mentioned above, it can be said that more SIs were computed for the weaker scalar term *könnte vielleicht* than for the stronger one *kann*. This shows that the distance on the Horn-Scale has an impact on the amount of calculated SIs. Moreover, some participants interpreted the uttered statements as exhaustive descriptions of the content of the covered box and calculated, based on this different interpretation of the statement, a different kind of implicature.

In the situation where participants had to act as mediator because two puppets were arguing whether the statement *In der Schachtel kann/ könnte vielleicht A sein* or the statement *In der Schachtel muss A sein* was right, 83% of the 5-year-old, 81% of the 7-year-old and 80% of the 9-year-old children favoured the more adequate statement *In der Schachtel muss A sein*.

The t-value for proportions was calculated with a non-directional test of significance. The results were then compared with the critical t-value of the t-distribution to see whether the results are significant.

The results of the reasoning experiment for each age-group are depicted in table 1. The answers of the 5-year-olds are significantly above chance level

in three out of six statements. In total the responses for possible conclusions is highly significant and the one for necessary conclusions are highly significant above chance level. This shows that even 5-year-old children are able to master the reasoning task. The 7-year-old children gave answers which are highly significant for four out of six statements. Their answers to necessary conclusions as well as possible conclusions are even highly significant above chance level. The oldest group of participants, the 9-year-old children, gave the expected answers for all of the statements except for *In der Schachtel kann/ könnte vielleicht A sein*. Most of their answers were highly significant above chance level, which shows that they are consistent in their answers and competent enough to master this task.

statement	answer	age (years)		
		5	7	9
necessary conclusions				
muss auf jeden Fall A	Yes	82.4**	66.6	94.4**
kann A	Yes	61.5	94.7**	44.4
könnte/ könnte vielleicht A	Yes	50	58.3	38.7
total		64.6*	73.2**	59.3
possible conclusions				
muss B	No	40	63.3	94.4**
könnte vielleicht B	Yes	80**	80.9**	83.3**
kann A und B	Yes	100**	91.3**	100**
total		74.5**	78.6**	92.3**

Table 1: shows the average of correct responses. In this table *yes* is considered to be the correct answer to the statements *In der Schachtel kann/ könnte A sein* although it underdetermines the fact that there actually has to be A in the covered box. This is because once a statement is true for at least one of the open boxes, it is also true for the covered box. *: $p < .05$; **: $p < .01$

2.3.1 Child-Implicatures

However, if one looks at the responses to the necessary conclusions in table 1, one can see that younger and older children give answers that are highly significant to different types of statements within the group of necessary conclusions. In order to figure out why the statements that got a correct answer, which is significantly above chance level, differ between the age

groups, the results and answers of all participants were looked at in more detail. It turned out that younger and older children evaluated the statements at rates that are significantly above chance level for different statements, because their results are influenced by a different interpretation of the statement and a different strategy to solve the task.

statement	age (years)		
	5	7	9
muss auf jeden Fall A	17.6	29.2	5.6
könnte vielleicht B	33.3	23.8	16.7

Table 2: average percentage of child-implicatures for each age group

Some participants, especially the 5-year-old children, appeared to consider the statements as exhaustive descriptions of the content of the box, because they believed that the utterance they heard about the covered box was the most informative one to describe its content. This had an impact on their response to *In der Schachtel muss A sein* and *In der Schachtel könnte B sein*. Therefore, they said that the statement *In der Schachtel könnte B sein* is wrong because in any case B can only be part of the content of the box. The statement *In der Schachtel muss A sein* was rejected, because it is only possibly but not necessarily true that there is only A in the box. Especially young children calculated this kind of implicature. Since this kind of early implicatures are especially calculated by young children, they are referred to as child-implicatures in this paper.

The data in table 2 shows that even children at the very young age of five do calculate implicatures, e.g. for the statement *In der Schachtel könnte B sein* and for the statement *In der Schachtel muss A sein*. Although some of the 9-year-old participants still calculate child-implicatures, this kind of implicature decreases with age. Child-implicatures are upper bound scalar implicatures and based on the first Maxim of Quantity (see above).

statement	age (years)		
	5	7	9
muss auf jeden Fall A	41.2	33.3	5.6
könnte vielleicht B	33.3	33.3	16.7

Table 3: percentage of participants who considered the statements as exhaustive descriptions of the content of the box

Table 3 shows the percentage of children who understood the uttered statements as exhaustive description of the content of the box. As mentioned

earlier, this interpretation is the prerequisite for the calculation of child-implicatures. Table 4 shows the percentage of children who calculated child-implicatures out of those children who interpreted the statements in the way that the content of the box must be exhaustive. The results show that children who considered the statements as exhaustive descriptions are – at least for the statement *In der Schachtel kann B sein* – in all age-groups very likely to calculate child-implicatures.

Moreover, some of the 5-year-old children calculated an implicature based on exhaustive reading for the statements *In der Schachtel kann/ könnte vielleicht A sein*. They evaluated the statement as *halbrichtig* because it describes only one of two possible contents of the box. Since this description of the content of the covered box would be wrong if it turns out that there is A and B in the box, they evaluated these utterances as semi-correct. This shows that the children did not only focus on the modal verb of the utterance but on the item mentioned and considered the statements as exhaustive descriptions of the content.

statement	age (years)		
	5	7	9
muss auf jeden Fall A	38.9	93.3**	33.3
könnte vielleicht B	100**	72.2	100**

Table 4: shows the average amount of calculated child-implicatures out of those children who interpreted the statements in the way that the content of the box must be exhaustive in percentage. *: $p < .05$; **: $p < .01$

Since the evaluations *falsch* and *halbrichtig* could indicate both an exhaustive reading of the statement and the calculation of SIs, it could – especially for the *halbrichtig*-answers – not always be clearly distinguished whether an implicature was calculated or an exhaustive reading was applied to the statement. Therefore, it cannot be said clearly how many percent of children understood this statement as exhaustive description. Moreover, only *no*-answers and those answers which came with an explanation and clearly indicated that SIs were calculated were included in the results of table 3.

2.3.2 Scalar Implicatures

Concerning children's calculation of SIs the following can be said: The results of this experiment show that a small but not representative minority of the 5-year-old participants calculated SIs for the statement *In der Schachtel könnte A sein*. This indicates that they are able to calculate SIs for this statement if they apply the expected (not exhaustive) reading to the statement.

The majority (94.7%, see table 1) of the 7-year-old participants did not reject the statement *In der Schachtel kann A sein*. This is a significantly higher amount than the one of the 5- and 9-year-old participants. This might be because they are equivocal between the exhaustive reading of the utterance and the reading that A is possibly part of the whole content of the box but do not calculate SIs. Table 5 shows that indeed only a small amount of 7-year-olds calculated SIs for this statement. However, for the slightly less informative statement *In der Schachtel könnte/ könnte vielleicht A sein*, a higher amount of 7-year-olds calculated SIs. This might be because this statement is even more underinformative and because the exhaustive reading is not as adequate for this statement as it is for the slightly stronger one *In der Schachtel kann A sein*.

statement	age (years)		
	5	7	9
kann A	7.6	5.3	44.4
könnte/ könnte vielleicht A	11.1	29.2	50

Table 5: Percentage of scalar implicatures calculated for the modal statements.

The 9-year-olds are the age-group that calculates the highest amount of SIs. This is probably because the vast majority of this age-group does not apply the exhaustive reading to the statements anymore. This realization is a perquisite to the discovery that the statements *In der Schachtel kann/ könnte vielleicht A sein* are underinformative. Therefore, this age-group calculates SIs much more often than the 5- and 7-year-old children do. It can be said that the amount of calculated SIs increases with the age of the participants. When one compares the results of both underinformative statements with each other, it can be said for all age-groups that the critical statement *In der Schachtel könnte/ könnte vielleicht A sein* is more likely to trigger implicatures (see table 5).

When children were asked to act as mediator between the puppets, some of them did indeed consider both statements as right but added that the more informative statement *In der Schachtel muss A sein* was more appropriate. 20% of the 5-year-old, 50% of the 7-year-old and 75% of the 9-year-old participants said that both statements *In der Schachtel kann A sein* and *In der Schachtel muss A sein* are right or that the latter one was more appropriate. The rest of the children said that the puppet who had said *In der Schachtel kann A sein* was wrong. This shows that more children recognize that this

statement is under-informative when they are confronted with both statements at the same time and forced to make a decision.

2.3.3 Scalar Implicatures Compared to Child-implicatures

If one compares the amount of calculated child-implicatures with the amount of calculated SIs among the age-groups (see tables 2 and 5) one can see that SIs are increasing with age, while the amount of calculated child-implicatures decreases. While 5-year-olds calculate child-implicatures more often than SI, roughly the same amount of 7-year-olds calculated SI's for the statement *In der Schachtel könnte A sein* as they considered the statement as exhaustive description of the content of the box and calculated child-implicatures for the statement *In der Schachtel muss A sein*. Moreover, 9-year-old children compute SIs much more frequently than child-implicatures.

The reason for this change in the calculated kind of implicature seems to be that the understanding of the task and the conversational maxims which participants focus on seem to differ. While older children and adults seem to value the second Maxim of Quantity and the third Maxim of Manner in this task and setting most, younger children seem value the first Maxim of Quantity and the second Maxim of Manner more than the other maxims. Therefore, the in this setting expected (adult-like) SIs are upper-bound while child-implicatures are lower-bound SIs.

3 Discussion

Let us finally turn to the question whether the present results support any of the acquisition hypotheses discussed in literature.

3.1 Acquisition Hypotheses

The *Pragmatic Delay hypothesis* states that children have semantic but lack pragmatic knowledge. This hypothesis was first proposed by Chierchia et. al (2001). The data of my study shows that 83% of the 5-year-old, 81% of the 7-year-old and 80% of the 9-year-old children favoured the more adequate statement *In der Schachtel muss A sein*, in a situation where two puppets were arguing whether the statement *In der Schachtel kann/ könnte vielleicht A sein* or the statement *In der Schachtel muss A sein* was right. These results as well as the data from Chierchia et al. (2005) show that children know and use the Maxim of Quantity, which is essential pragmatic knowledge for the calculation of SIs. Children even rely on the Maxim of Quantity and therefore assume that the speaker uttered the most informative statement concerning the content of the covered box. Based on this interpretation children calculate child-implicatures. In order to be able to do so, they have to use pragmatic

knowledge and the Conversational Maxims. The present findings suggest that the Pragmatic Delay hypothesis does not hold for the tested age groups since young children's evaluations are based on the exhaustive interpretation of the statements and not on a lack of pragmatic knowledge.

The *Processing Limitation hypothesis* suggests that children have a limited working memory and hence problems to keep and compare two represen-tations of a statement. Due to this disadvantage children are said to calculate implicatures less often than adults. According to Chierchia (2005), children who fail to compute SIs are expected to achieve worse results in a task that requires a good memory system than children who calculate SIs. On the first glance, the fact that older children, who are thought to have a more advanced working memory, calculate more SI than younger ones seems to support this hypothesis.

However, in connection with a different experiment about pragmatic enrich-ment processes in children, a working memory test was conducted with 5-, 7- and 9-year-old children. Children heard and had to repeat non-words of differing length (amount of syllables) and semantic relatedness to known words. This test measured the ability of repeating new and never heard non-words. In order to be able to repeat these non-words, participants have to memorize them based on their length and semantic relatedness to known words in the phonological working memory. First preliminary results show that there is no interaction between the amount of points that participants gained in the working memory test and the amount of implicatures calculated in the experiment (Röhrig, manuscript in preparation). This indicates that the hypothesis that children calculate less implicatures because they have a limited working memory does not seem to hold.

An *alternative hypothesis by Chierchia et al.* (2005) states that children make their judgements about a statement based on truthfulness or falsity of a statement rather than on appropriateness. If this thesis was right, then children who are confronted with statements *In der Schachtel kann/ könnte A sein* and *In der Schachtel muss A sein* are expected to say that both of them are right. Indeed, some participants of this study considered both statements to be right. However, they added that the more informative statement *In der Schachtel muss A sein* was more appropriate. These results support Chierchia's hypothesis in the way that they suggest that children do focus on truthfulness and falsity of a statement when making an evaluation. The important point however is that children do not neglect appropriateness in favour of truthfulness or falsity, instead they pay attention to appropriateness at the same time, though to a lesser extent.

3.2 A New Approach to the Acquisition of Scalar Implicatures

Based on the results of the study described in this paper, the following hypothesis is proposed. Before children calculate the expected SIs in the setting of the experiment described above, they calculate child-implicatures, based on exhaustive readings because they value different maxims of the Conversational Principles more than adults. In particular they overgeneralize the first Maxim of Quantity by using it in situations where it is less appropriate and hence interpret statements differntly than expected. This observation indicates that overgeneralizations, which are an important part of the learning process in many areas of languaguage acquisition, also play an important role in the acquisition of pragmatics.

In the first stage children rely on the Cooperative Principle and over-generalize the first Maxim of Quantity. Therefore, they interpret the statements as exhaustive descriptions of the content of the covered box. Moreover, they use a different strategy to solve the task since they try to match the statements heard with one of the open boxes and evaluate the statement as *richtig* ('right') if it is true for one of the open boxes.

In the second stage children still strongly rely on the first Maxim of Quantity and consider the statements as exhaustive description of the content of the covered box. What is new in this stage is that children begin to fully exploit the first Maxim of Quantity by calculating child-implicatures based on this maxim. In this stage children typically reject the statement *In der Box muss A sein* by either just saying *falsch* ('wrong') or by explaining *Nur A also. Das ist falsch* ('So only A. That is wrong.'). This shows that children are capable of calculating implicatures based on the first Maxim of Quantity. However, they are not aware that the speaker applies to the second Maxim of Quantity and says less than actually meant. Children's answers are based on the assumption that the speaker obeys the first Maxim of Quantity.

In the third stage children discover that the speaker violated the first Maxim of Quantity and applied to the second Maxim of Quantity as well as the third Maxim of Manner. This realization helps children to understand the uttered statements in a different way. They do no longer overgeneralize any of the Maxims. For this reason the exhaustive interpretation of the statements becomes less prominent and the amount of calculated child-implicatures decreases. Moreover, children do no longer match the sentences heard to one of the open boxes but consider the items mentioned in the statement as possible or necessary part of the content of the covered box. Children now interpret statements in the same way as adults do, but neglect the first Maxim of Quantity. Therefore, they do not calculate as many SIs as adults do.

In the fourth and final stage children are aware of both maxims of Quantity as well as the third Maxim of Manner. The amount of calculated scalar implicatures increases because children exploit the first Maxim of Quantity.

4 Summary and Outlook

In contrast to current research literature, I found that even young children are able to calculate implicatures given an appropriate setting although the statement which triggers an implicature and the type of implicature are not the same as the ones adults calculate. Child-implicatures are upper-bound SIs in this experiment and setting based on the exhaustive reading of statements. The differences between childlike and 'normal' or adult type of scalar implicatures in this setting, arise because the conversational maxims that children and adults value most differ. While adults seem to value the second Maxim of Quantity and the third Maxim of Manner most, children seem to value the first Maxim of Quantity and the second Maxim of Manner more than the other maxims of Grice's Conversational Principles. Therefore, I suggest that different kinds of implicatures should not be treated in the same way. The present results also suggest that implicatures cannot be considered a generally late acquisition phenomenon, because different types of implicatures, in this case child-implicatures and the 'adultlike' scalar implicatures, are acquired at different ages and thus have to be distinguished from one another.

References

Chierchia, Gennaro, Guasti, M. T., Gulamini, A., Meroni, L., Crain, S. & Foppola, F. 2005. Semantic and Pragmatic Competence in Children's and Adults' Comprehension of or. In Noveck, I. & Sperber, D. (eds.), *Experimental Pragmatics*, 293–300. Macmillan: Palgrave.

Grice, Herbert Paul. 1975. Logic and Conversation. In *Syntax and semantics* 3. Speech acts: 41–58.

Noveck, Ira, Pouscoulous, N., Politzer, G. & Bastide, A. 2007a. A developmental investigation of processing costs in implicature production. In *Language Acquisition* 14, Issue 4. 347–375.

Noveck, Ira. & Sperber, D. 2007b. The why and how of experimental pragmatics. The case of 'scalar inferences'. In *Pragmatics*, 184–212. Hampshire: Palgrave Mcmillan.

Noveck, Ira. 2001. When children are more logical than adults. Experimental investigations of scalar implicatures. In *Cognition* 78. 165–188.

Noveck, Ira. 2005. Pragmatic Inferences Related to Logical Terms. In Noveck, I. & Sperber, D. (eds.) *Experimental Pragmatics*, 301–321. Macmillan: Palgrave.

Papafragou, Anna & Musolino, J. 2003. Scalar implicatures. Experiments at the semantics - pragmatics interface. In *Cognition* 86. 253-282.

Röhrig, Stefanie. And = ∧?!. Ms. Mainz.

Röhrig, Stefanie. 2010. *The Acquisition of Scalar Implicatures*. Göttinger Schriften zur Englischen Philologie 3. Göttingen: Universitätsverlag.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 515–529. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Semantic Reconstruction and the Interpretation of Chains*

E. G. Ruys
UiL-OTS, Utrecht University
E.G.Ruys@uu.nl

Abstract. This paper explains three known constraints on scope reconstruction – reconstruction is blocked into wh-islands, after remnant movement, and after countercyclic merge – by postulating an underlying condition on semantic reconstruction, which follows naturally from minimalist assumptions on chain formation in combination with the principle of compositionality.

1 Introduction

In scope reconstruction, a moved element takes scope at, or close to the position it occupied before the movement. Consider (1):

(1) someone$_i$ is likely [$_{TP}$ t$_i$ to arrive]
   a. there is some person x s.t. it is likely that x arrives
   b. it is likely that there is some person x s.t. x arrives

This sentence allows the surface-scope reading (1a), and the reconstructed reading (1b), where *someone* seems to be interpreted in the position it occupied prior to Raising to Subject.

A major question discussed in the literature on scope reconstruction is whether it should be dealt with by syntactic or semantic means. May's (1977) solution for (1b) was syntactic: at LF, *someone* optionally undergoes a movement operation (Quantifier Lowering) that lowers it into the scope of *likely*. However, lowering movement is not otherwise attested and generally assumed to be impossible. Chomsky's (1993) copy theory of movement made a less problematic syntactic treatment available. On this theory, A-movement creates the structure in (2). Only one copy of *someone* must be retained at each of the interface levels PF and LF; deleting or ignoring the higher copy at LF, as in (2a), will yield the narrow scope, reconstructed reading.

(2) someone is likely [$_{TP}$ someone to arrive]

* I am grateful to Eefje Boef, Ora Matushansky, and audiences at SuB15 and the Utrecht Syntax Circle for comments and discussion. Naturally, all errors are my own.

a. ~~someone~~ is likely [$_{TP}$ someone to arrive]
b. someone is likely [$_{TP}$ ~~someone~~ to arrive]

The semantic treatment of scope reconstruction was made prominent by Cresti (1995), Rullmann (1995), and others. Such a treatment proceeds on the assumption that the syntactic representation invariably has *someone* in its surface position (or higher). The reconstructed reading can be derived by postulating that the trace left by movement can function not only as an e-type variable (which yields the surface scope reading, as shown in (3a)) but also as a variable of the type of a generalized quantifier. In this case, function-argument relations are reversed, and the result is the interpretation (3b) in which *likely* in effect scopes over *someone*.[1]

(3) someone$_i$ is likely [$_{TP}$ t_i to arrive]
a. someone (λx_i[likely(^ arrive(x_i))]) t_i is x of type e
b. (^someone) λX_i[likely(^ ·X_i(arrive))] t_i is X of type <s,<<e,t>, t>>
≡ likely(^someone(arrive))

The comparison of syntactic and semantic approaches to scope reconstruction in the literature has focused on which approach is better able to account for the interaction between scope reconstruction and reconstruction for binding theory, a topic I will touch on in section 5. In this article I want to provide support for the semantic approach with evidence of a different type. I want to apply to scope reconstruction the same strategy that was employed in evaluating the syntactic and semantic treatments of upward scope shift (Quantifier Raising): I will argue that several constraints on when scope reconstruction can and cannot take place, are best explained by one natural condition on semantic reconstruction. If this account is successful, it constitutes an argument in favor of the semantic approach.

The empirical material comes from three previously observed constraints on scope reconstruction. Longobardi (1987) observed that a wh-phrase extracted out of a wh-island does not reconstruct into the island. Barss (1986) showed that extraction followed by remnant movement does not reconstruct. Several authors have observed that late merger blocks scope reconstruction.

For each of these constraints, various explanations are available in the literature. So far, however, no unified account of the phenomena has been

[1] Assume, for concreteness, that a GQ-type variable is always intensionalized (type <s,<<e,t>,t>>), and composition can always add ^ and · when necessary (see Cresti 1995:fn 16). I will attempt to abstract away from this issue in my presentation.

proposed. The present paper proposes that they reflect a more general underlying constraint: semantic reconstruction of a DP into a trace position is possible only if it can be locally determined that the DP and the trace are identical. I will argue in the next section that this constraint makes perfect sense given a semantic approach to reconstruction. Absent an equally plausible syntactic rationale for such a constraint, it provides an argument for semantic reconstruction.

The remainder of this paper is organized as follows. Section 2 explains the constraint on semantic reconstruction I propose, and its relation to the interpretation of chains. Sections 3, 4, and 5 discuss the freezing effects induced by wh-islands, remnant movement, and late merger, respectively.

2 On the Interpretation of Chains

This section states the condition on scope reconstruction I propose, and shows how a rationale can be provided for it on the basis of the copy theory of movement and the semantic approach to reconstruction.

I assume the copy theory of movement, which is the standard in current syntactic theory. At the same time, I adopt the semantic approach to reconstruction. That is, I assume that the downstairs copy of a movement chain is always interpreted as a variable; reconstruction is achieved by manipulating its type. Let us consider what is required in order to interpret a movement chain under these assumptions. First of all, we need to obtain a variable in the place of the downstairs (struck-out) copy of the moved element. Secondly, we need to bind this variable from the landing site. Thirdly, we need to fix the type of this variable. I will deal with the two less crucial questions first.

Consider (4), the syntactic representation the copy theory derives for a simple case of A-movement:

(4) $[_{TP}$ some man $[_{T'}$ T $[_{VP}$ arrived ~~some man~~]]]

How do we obtain a variable at the foot of the movement chain? One option is to replace the struck-out copy of *some man* with a variable, or with a larger expression containing a variable (as does the Trace Conversion rule of Fox 2002:67). However, since such a move is at odds with Chomsky's (1995:225) Inclusiveness Condition, which provides the conceptual motivation for the copy theory, I will assume that traces are not replaced with variables or subject to any kind of trace conversion. A struck-out copy simply *is* a variable. Technically, what this means is that LF structures are interpreted relative to assignment functions which are defined as functions from syntactic

constituents to entities in the domain. Semantic composition in (4) proceeds in a bottom-up manner, starting from *man*. When the DP node dominating *some man* is reached, it is somehow discovered that this DP is a movement trace (exactly how is a technical question for the copy theory that is not particular to my proposal; assume for concreteness that the presence of unchecked uninterpretable features (Case in (4)) indicates that the element is (part of) a trace). Therefore, what composes with 'arrived' is not the regular semantic value ($\lambda X \exists x[man'(x) \wedge X(x)]$) computed so far; this is discarded in favor of g([$_{DP}$ some man]) (g the current assignment function).

The next step in interpreting a movement chain is to bind the variable from the landing site. In pre-minimalist syntax, which provided indexed variables at the foot of a movement chain, it was standard to assume that the sister of a moved element XP_i is interpreted via lambda-abstraction over the variable with index i. The implementation in Cresti (1995) (based on Heim 1993, among others) converted the index on the moved element into a separate syntactic node, as shown in (5):

(5) [$_{TP}$ [some man] [$_{T'2}$ i [$_{T'1}$ [$_{VP}$ arrived [$_{NP}$ t]$_i$]]]]

This allows for interpretation by familiar means: the index identifies the variable to be abstracted over, and triggers the semantic abstraction rule. There is, however, no syntactic evidence for the operation deriving (5), and it is at odds with the minimalist goal of doing away with indices. I therefore prefer to move the necessary complications into the composition rule for movement derived structures. The proposal is stated informally in (6):

(6) Given a structure [$_{HP}$ A B], where B has been the target of internal merge due to a relation of Attract between the label of B and a constituent D, $[\![\text{HP}]\!]^g$ is obtained by composing $[\![\text{A}]\!]^g$ with that function h s.t. for every d, $h(d) = [\![\text{B}]\!]^{g[D / d]}$.

This tells us to interpret the TP in (4) w.r.t. assignment g by composing $[\![\text{some man}]\!]^g$ with the function h s.t. for every d, $h(d) = [\![[_{T'} \text{ arrived } \sout{\text{some man}}]]\!]^{g[[\text{some man}] / d]}$.

The simple methods I have described for obtaining a variable at the foot of the chain, and for binding it, do not appear to be crucial for the treatment of scope reconstruction phenomena I want to propose. If the reader prefers, (s)he may assume instead, for instance, that a hidden morpheme is affixed to a struck-out copy which functions to replace it with a variable, which is then bound in the manner of (5). I would find this less elegant, but it would not necessarily be incompatible with the constraint on scope reconstruction proposed below.

This finally brings us to the key question: how does the grammar determine the type of the variable contributed by a trace? Consider an abstract example:

(7) $[_{HP}$ A λD.$[_{H'}$ ... $[_{Z'}$ Z ~~D~~]]]

In (7), D has moved, targeting H'. ~~D~~ is the struck-out bottom copy of the chain. As indicated, rule (6) causes the variable contributed by ~~D~~ to be abstracted over at H'. This lambda-expression then composes with A, which in most cases is just the moved element D, but not always, as we will see later. How is the type of ~~D~~ determined?

One option, of course, is to pick any random type. But in most cases, this would cause the composition to fail, if not at Z', then at the point where H' composes with A. This would force the derivational process to backtrack, until a fitting type happened to be chosen for ~~D~~. I want to abide by the minimalist tenet (which first became relevant in the context of Chomsky's (1995) rejection of global economy constraints, in favor of local ones) that backtracking is undesirable: choices in the derivational process are preferably made once and on the basis of local information.

What I want to propose therefore is this. Any type may be chosen for the variable ~~D~~, provided that we can be certain that this choice will not lead to a type-clash at the point where the variable is λ-bound, that is, where H' composes with A. If we cannot be certain that the type we pick will allow composition to proceed at HP, then we must default to the lowest possible type, which for a DP will be type e.

The next question is: when can we be certain that a type for ~~D~~ will fit at HP? There is one condition under which we can: namely if A=D. This is because, if A=D, we can pick for ~~D~~ any type that D itself could have (that is, the type of any regular, non-variable interpretation of D). For if we pick a possible type of D for the variable ~~D~~, then A, being identical to D, will be able to have this type as well.[2] And if Type(~~D~~) = Type(A), the composition at HP will always fit.

As a result, there are two cases in which we cannot be certain, at the point in the derivation where we are deciding the type of ~~D~~, which types will fit. One case is: when A≠D. For in this case, in order to determine whether the type we pick for ~~D~~ will fit at HP, we would need to calculate the type of A separately. But this would violate compositionality. At the point where we are deciding on the interpretation of ~~D~~, we do have access to the type of D

[2] There is one exception: if A=D, but A is itself a trace forced down to type e by (8) below. For cases I am aware of, regular type shifting will always make backtracking unnecessary.

(which we just interpreted, before deciding to discard it and replace it with a variable) but the principle of compositionality does not allow us to make the interpretation of ~~D~~ dependent on the interpretation of some distinct A somewhere higher up in the structure. Hence, in this case, ~~D~~ defaults to the lowest type (e). The other case in which we cannot pick all possible types of D for ~~D~~ is when A is outside the local domain of ~~D~~. Assuming that interpretation proceeds phase-by-phase (Chomsky 2000, 2001), we cannot "see A" at the point where we are interpreting D if A is not in the same phase as D, but in some higher phase. In this case, we do not know whether the expression resulting from λ-binding ~~D~~ will eventually compose with an A identical to D, hence we must again default to the lowest type (e).

In sum, we can pick a higher type for a variable, resulting in semantic scope reconstruction, just in case A=D and we can determine locally that A=D. This constraint is stated informally in (8):[3]

(8) If D is a trace then D is interpreted as a variable of some type τ. If D is attracted to a phase-accessible target B, and D is identical to the sister of B, then τ can be the type of any non-trace interpretation of D. Alternatively, τ can default to the lowest type compatible with the category of D.

I have argued that this constraint follows naturally from the interaction of standard minimalist assumptions and the principle of compositionality. In the next three sections, I will show how it applies to the data.

3 Why *wh*-Islands Block Scope Reconstruction

This section discusses the scope freezing effect found in island constructions. Consider (9) and (10):

[3] A formal implementation of (8) of course presupposes an implementation of Semantic Reconstruction. This is not entirely routine. Existing implementations (Cresti 1995, Rullmann 1995) create a syntactic ambiguity by postulating different traces that translate as variables of different types. In a copy theory, the same effect could be achieved by enriching a trace copy with a diacritic that marks its type; this would also, technically, remove the remaining tension between the compositionality principle and (8). But these are clearly coding tricks: there is no independent evidence that a moved DP can leave traces with different properties and indices. I agree with Rullmann (p. 177) that the complication is best moved into the interpretation rule. However, if we are to avoid representationalism, this presupposes a semantic treatment of traces as untyped variables. This can be done by making the type of a variable depend on the assignment function, and then letting the interpretation of an expression be defined only relative to assignment functions that treat the variable as being of the desired type. I must leave this issue for another occasion.

(9) How many people$_i$ do you think t_i I should talk to $\mathbf{t_i}$?
   a. For what n: there are n-many people x s.t. you think I should talk to x
   b. For what n: you think there should be n-many people that I talk to.

(10) How many people$_i$ do you wonder whether I should talk to $\mathbf{t_i}$?
   a. For what n: there are n-many people x s.t. you wonder whether I should talk to x
   b.* For what n: you wonder whether there should be n-many people that I talk to.

(9) allows both a wide scope reading for *n-many people*, paraphrased in (9a), and a narrow scope reading, paraphrased in (9b), which is apparently the result of scope reconstruction undoing the effect of wh-movement. In (10), in which wh-movement of *how many people* has crossed a wh-island, the reconstructed reading (10b) is blocked, as first observed by Longobardi 1987.

The discussion here can be brief because, for these data, the treatment I propose is a straightforward implementation of the generalization proposed by Frampton (1999), which was stated by Cresti (1995:103) as (11):

(11) *[… λ*P* … [$_{CP}$ *wh* [$_{IP}$ … *P* …]]] (*P* of the GQ type)

The question is how (11) can be explained. As pointed out by Cresti (1995:103), this is a filter that "needs to be defined on a non-local configuration." A variant is needed that can be locally checked. Frampton proposed a reduction of (11) to the ECP. Cresti (1995) proposes that (10) is derived via intermediate adjunction to the CP whose Spec is filled by *whether*. She then states a filter to the effect that traces so adjoined must be treated as type e. This entails that semantic reconstruction cannot be to a point lower than the filled Spec. This achieves the desired local configuration, but, as Cresti admits, her account does not explain why the constraint expressed by the postulated filter should hold.

I assume the syntactic representations for (9) and (10) in (12) and (13), respectively.

(12) [$_{CP}$ How many people do you [$_{vP}$ ~~how many people~~ [$_{vP}$ think [$_{CP}$ ~~how many people~~ [$_{IP}$ I should [$_{vP}$ ~~how many people~~ [$_{vP}$ talk to ~~how many people~~]]]]]]]?

(13) [$_{CP}$ How many people do you [$_{vP}$ ~~how many people~~ [$_{vP}$ wonder [$_{CP}$ whether [$_{IP}$ I should [$_{vP}$ ~~how many people~~ [$_{vP}$ talk to ~~how many people~~]]]]]]]?

In (12) *how many people* moves through the edge of every phase (CP, vP), presumably attracted by a P-feature inserted for this purpose (see Chomsky 2001). As a result, each trace has a local antecedent, hence can be type <et,t> by (8). In (13), the embedded Spec,CP is filled, so that the underlined trace cannot assess the type of the constituent that composes with its binder, which is two phases up. It therefore defaults to type e.[4]

I feel my treatment of these data is a slight improvement over earlier treatments. First, because it provides a local restatement of (11), with a rationale that makes it less stipulative than Cresti's filter. But more importantly, because the treatment extends to the scope freezing effects of remnant movement and late merger, which I discuss in the next two sections. No such extension seems possible for existing accounts of (10).

However, my account differs slightly in its empirical predictions from other implementations of (11). On the one hand, it shares the success of (11) and Cresti's implementation in accounting for the absence of other types of "higher order" readings for elements extracted from wh-islands. E.g., (14) does not allow the functional reading for *which book* paraphrased in (14a), where the trace is arguably a function-type variable:

(14) which book do you wonder whether every man dislikes t
   a. *for which function f mapping men to a book, do you wonder whether every man x dislikes f(x) [his oldest, his cheapest, …]

See Cresti (1995) for discussion. On the other hand, Cresti's implementation covers only filled Spec,CP islands, and does not extend to other weak islands that block reconstruction, such as negative islands. (15) is from Rullmann (1995:198):

(15) a. How many books was John able to read?
   b. How many books was John not able to read?

(15a) allows reconstruction, but (15b) has only the wide scope reading for *n-many books*. Rullmann proposes a semantic account in terms of maximality

[4] The question arises how (13) can be derived at all. If the wh-phrase does not move through the edge of CP, it is not clear that it can be attracted by the next phase head, given Chomsky's (2000) PIC; but if it does, then why does it not leave a trace in spec,CP, which will then be local to the trace inside the island? One possible solution is suggested by Sabel (2002): the embedded C attracts *how many people* to a (second) specifier, but this does generate a violation (English +wh C does not tolerate a specifier containing a trace). Hence, the trace in spec,CP is *-marked. The trace is subsequently deleted (as in Chomsky and Lasnik 1993), resulting in only a weak (subjacency level) violation. I will assume that some such solution is possible.

(which, in turn, does not extend to wh-islands); whether my account can cover (15) depends on whether NegP can be argued to delimit a local context (see Sabel 2002 for some discussion and references).

On the down side, Cresti implements Frampton's generalization more precisely than (8) does by requiring all traces in the offending configuration to be type e, not just DP-traces. This entails that adjuncts cannot be extracted from wh-islands at all, since they cannot bind e-type variables. My implementation could be adjusted to entail the same prediction: rephrase (8) so that a trace without a local antecedent does not default to the lowest type compatible with its category, but to type e. On the other hand, the prediction is not correct for all adjuncts, as discussed in Rullmann (1995). I will leave this issue for further research.

4 Why Remnant Movement Blocks Reconstruction

As (17) shows, A-movement out of a structure that is subsequently fronted does not reconstruct into the fronted constituent.

(16) some politician$_i$ is [$_{AP}$ likely [$_{IP}$ **t$_i$** to address every rally]]
   a. for some politician x: it is likely x addresses every rally
   b. it is likely that for some politician x: x addresses every rally
   c. it is likely that for every rally y: for some politician x: x addresses y

(17) [$_{AP}$ how likely [$_{IP}$ **t$_i$** to address every rally]] is some politician$_i$ t$_{AP}$?
   a. for which d, for some politician x: it is d-likely x will address every rally
   b. *for which d, it is d-likely that for some politician x: x will address every rally
   c. *for which d, it is d-likely that for every rally y: some politician x: x will address y

Whereas (16) allows both wide scope and narrow scope relative to *likely* for *some politician* (and, optionally, relative to *every rally* as well, following local QR of the latter), (17) allows only the wide scope reading roughly paraphrased in (17a), as observed by Barss (1986). Barss' explanation, based on a Quantifier Lowering theory of reconstruction, was that QL can only move straight down (into a c-commanded position), not sideward and down.

An explanation more in line with current understanding of movement phenomena was proposed by Sauerland (1999), Sauerland & Elbourne (2002) (q.v. for discussion of Barss' work). A-movement can take place either in syntax, or in the PF branch (provided that this yields an additional scope option); it does not reconstruct. Wide scope in (16) is the result of A-

movement in syntax feeding into LF. Narrow scope results from PF A-movement, with the pre-movement structure feeding into LF. Given some further assumptions, this approach to A-movement reconstruction predicts the freezing effect in (17), where A-movement is followed by A-bar-movement. Since A-bar-movement must take place in syntax, so must any A-movement preceding it; this yields the wide-scope reading.

There are several problems with this explanation. First, since the account of reconstruction applies only to reconstruction from A-movement, it does not explain why A-bar-movement also fails to reconstruct after remnant movement, as observed by Sauerland. More seriously, the analysis predicts that (under the right conditions) any A-moved element should be able to behave for all syntactic purposes (e.g. ECP effects, superiority, NPI licensing) as though it had not moved. There is no evidence that this is correct. Finally, details of the analysis aside, the explanation does not of course extend to the scope freezing effects in wh-islands and after late merger discussed in sections 3 and 5.

Sauerland & Elbourne (2002) do present the data in (18) as independent evidence for their theory.

(18) a. *?[Which constraint]$_i$ are [good examples of t_i]$_j$ always provided t_j?
b. [Which constraint]$_i$ are [good examples of t_i]$_j$ always sought t_j?

(19) 2x good examples of this constraint are always provided

They argue that (18b) fails to violate the Subject Condition that rules out (18a) because the object can delay raising to subject to PF, as this will allow it to remain in the scope of the intensional verb. However, the ambiguity of (19) shows that the presence of the quantificational adverb in (18a) should also be enough to license PF-movement. While I do not have an account for the contrast in (18), it does not appear to support Sauerland & Elbourne's theory of A-movement reconstruction.

Turning to my analysis, consider the abstract structure (20):

(20) $[_{CP}\ [_{XP}\ \ldots\ t_i\ \ldots\ ]\ \ [_{C'}\ C\ [_{TP}\ NP_i\ \ldots\ \sout{XP}\ ]]]$

On a semantic approach to reconstruction, we must interpret the top copy of XP. The bottom copy only contributes a variable. Whether NP reconstructs therefore hinges on the type assigned to its trace(s) in the top XP. Since the head of the NP chain does not c-command into the top XP, the λ-binder of the highest of these traces (if there is a λ-binder at all) must compose with something not identical to NP. (8) therefore blocks reconstruction, explaining Barss' observation.

Before we can make this analysis of (17) more concrete, we need to deal with a serious complication. The NP trace in the fronted copy of XP is unbound. On a syntactic reconstruction approach, this is not a problem: XP moves back down at LF, or we delete the upstairs copy of XP and retain the downstairs copy, and the trace becomes properly bound. But on the semantic reconstruction approach, we must interpret the top copy of XP, so we cannot avoid ending up with an unbound variable. This does not yield a correct interpretation. The phenomenon of remnant movement as such creates a serious problem, not just for my proposal, but for the entire semantic approach to reconstruction.

For a concrete illustration of the problem, and of the solution I propose, I will focus on some structurally simpler examples, from Huang (1993):

(21) a. $[_{VP}\ t_i$ love himself], John$_i$ never will t_{VP}
b. $[_{VP}\ t_i$ admire Stalin], noone$_i$ did t_{VP}

Huang proposed that the reconstruction effect in (21a), by which *himself* is licensed despite VP-fronting, is explained by the VP-internal Subject Hypothesis, which causes the VP to contain a trace of *John* that A-binds the anaphor. But how is the trace itself bound? Examples like (21b) show that the VP-internal trace must be able to function as a bound variable. The obvious solution is to invoke reconstruction. As noted, syntactic reconstruction solves the problem. On standard assumptions, however, semantic reconstruction is not able to produce the bound reading. We obtain for (21b) the (defective) interpretation in (22a), rather than the desired (22b).

(22) a. (admire(x,stalin)) λp_t[noone (λx.p)]
b. noone (λx.admire(x,stalin))

It is important to note that this problem exists independently of the proposed constraint on scope reconstruction. Quite generally, the apparent impossibility of deriving a meaning for (21a) or (21b) without syntactic reconstruction might be taken as damning evidence against any (exclusively) semantic approach to reconstruction. This problem – how to make a semantic reconstruction theory deal with constituents containing a variable, when they have been moved out of the scope of the variable's binder – has been addressed before. Sternefeld (2001) (q.v. for further references) proposes a solution in which traces are interpreted as variables over functions from assignment functions to normal denotations. It appears that this system might support a solution for scope freezing in (17) as well, although not in the way Sternefeld develops it. While the issue is mostly outside the scope of this

paper, I will sketch an alternative (partial) solution which fits better with the treatment of chains I am proposing.

The first possibility is to start from these assumptions: that any displaced element functions as a phase (as suggested by one of Chomsky's (2000) diagnostics for phases), and that an XP that is extracted out of a phase must first move into its edge. We can now propose the derivation (23) for (21b):

(23) $[_{vP}$ ~~*noone*~~ admire Stalin] $[_{C'}$**noone** $[_{T'}$ did $[_{vP}$ ~~noone~~ $[_{vP}$ ~~noone~~ ~~admire Stalin~~]]]]

a. $\lambda x_e[$ x admire Stalin] $\lambda X_{<e,t>}[_{C'}$ noone $\lambda x[_{T'}$ $[_{vP}$ ~~x~~ X]]]

b. $(\lambda x_e[\text{admire}(x,\text{Stalin})])\ \lambda X_{<e,t>}[_{C'}$ noone $(\lambda x[_{vP}\ X(\underline{x})\ ])]$

Noone first attaches to the vP phase, and then moves to Spec,TP. Subsequently, the lower segment of vP moves to Spec,CP, leaving the underlined trace and stranding the doubly underlined trace. The fronted vP now does not contain a free variable, because it is a movement target subject to the abstraction rule (6); it can undergo semantic reconstruction and then apply to the variable that is the doubly underlined trace of *noone*. (23a) schematically indicates how different traces function; (23b) clarifies the function-argument relations. The result is equivalent to (22b) by lambda-conversion.

Scope freezing falls out as desired. (24) is from Huang (1993):

(24) $[_{vP}\ t_i$ see everyone], (I am sure) someone$_i$ did $\quad \exists > \forall\ ,\ *\forall > \exists$

Everyone in (24) cannot scope over *someone*, which indicates that *someone* does not reconstruct, as per Barss' generalization. The full structure is given in (25a):

(25) a. $[_{CP}\ [_{vP}$ ~~*someone*~~ see everyone] $[_{C'}$ **someone** did $[_{vP}$ ~~someone~~ $[_{vP}$~~someone see everyone~~]]]]

b. $[_{CP}\ \lambda x_e[_{vP}\ x_e$ see everyone] $\lambda X_{<e,t>}\ [_{C'}$ someone $\lambda x_e[_{T'}$ did $[_{vP}$ ~~x~~ X]]]]

The boldfaced *someone* in (25a) cannot reconstruct. The lambda binder of the italicized trace (at the top of the fronted vP) does not compose with the "antecedent" of the italicized trace (the doubly underlined trace), but with the C'. Hence, (8) causes the italicized trace to default to type e; the result is (25b). The rationale is that one would need to inspect the semantics of the C'

to determine that, indirectly, the types would match for any possible type of *someone*. The considerations of compositionality built into (8) prevent this.[5]

This solution does not require any new semantic assumptions, but the syntactic assumptions are not unproblematic. First of all, it is unclear why the subject must move to Spec,vP (and how it can), given that it is already in the edge of the vP-phase. One possible answer is, that this movement step is needed precisely because the vP will otherwise contain a free variable after it is fronted. Another option is that what is fronted in VP-fronting is a constituent slightly bigger than vP (cf. Huang 1993); this constituent functions as a phase when it fronts, so that the subject must move through its edge. Another potential problem is that the analysis requires fronting of a segment of vP. Again, we may speculate that segment movement is allowed here, perhaps exceptionally, because fronting the complete category will front a free variable.

An alternative would be to implement essentially the same solution by manipulating the semantics. Assume that any fronted constituent containing traces in its edge will undergo "lambda-closure": all free traces in the edge are abstracted over in some fixed order. The terminal trace of the fronted constituent is raised in type accordingly, and then fed the same variables as arguments. This will also deal with cases where more than one element is extracted before remnant movement, although the syntactic treatment can be adapted to such cases as well. For reasons of space, I must leave an exploration of these options for another occasion.

5 Why Late Merger Blocks Scope Reconstruction

It has repeatedly been observed (Fox 1999, Fox & Nissenbaum 1999, Bhatt & Pancheva 2004) that counter-cyclic merger blocks scope reconstruction of the XP merged into. Consider just one example (from Fox & Nissenbaum 1999):

(26) I looked for [$_A$ a picture] very intensely [$_B$ a picture] by this artist
∃ > *look for* , * *look for* > ∃

Fox & Nissenbaum derive extraposition in (26) via movement of *a picture*, creating the chain (B, A), followed by late merger of the PP into B. A is

[5] The underlined trace may start out as type e, but also as type <et,t>, because it has a local antecedent (the doubly underlined trace). This means, that the vP trace starts out as ambiguous between types <e,t> and type <<et,t>,t> (those are the types of its "non-trace interpretations" in (8), so both those types are allowed for the vP trace as a variable). But the upstairs copy of the vP can only be type <e,t> (because the italicized trace cannot be <et,t>). This leaves only <e,t> as an option for the vP trace, as the higher type will lead to a mismatch.

realized at PF, but only B can be interpreted at LF: the countercyclic merger blocks the reconstructed reading. A syntactic theory of scope reconstruction along the lines of (2a) easily explains why: deleting B would leave the PP modifier dangling. On a semantic theory of scope reconstruction, the effect is unexpected, but it is explained by (8): the λ-binder of the variable A composes with a non-identical DP, so the variable defaults to type e. Fox's (1999) analysis of the correlation between reconstruction for scope and binding can be captured in this way, as well. I must defer discussion of these and related cases to another occasion.

6 Conclusions

I have argued that three constraints on scope reconstruction, which thus far had not received a satisfactory or unified explanation, follow naturally from one underlying condition on reconstruction. While this condition depends on the copy theory of movement (Chomsky 1993), it also relies crucially on the semantic approach to scope reconstruction (Cresti 1995, Rullmann 1995).

Further evidence might be found in the absence of scope reconstruction into Parasitic Gaps and in *tough* constructions. Further research is also needed into reconstruction in A-chains, and in the relation to Kennedy's puzzle, among other topics.

References

Barss, A. 1986. *Chains and Anaphoric Dependence*. PhD diss., MIT.

Bhatt, Rajesh, and Roumyana Pancheva. 2004. Late merge of degree clauses. *Linguistic Inquiry* 35. 1–45.

Chomsky, Noam. 1993. A minimalist program for linguistic theory. Reprinted in Chomsky (1995).

Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, Massachusetts: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: the framework. In *Step by Step: Essays on Minimalist Syntax in Honor of Howard Lasnik*, ed. by Roger Martin, David Michaels and Juan Uriagereka. Cambridge, Mass.: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: a Life in Language*, ed. by Michael Kenstowicz. 1–52. Cambridge, Mass.: MIT Press.

Chomsky, Noam, and Howard Lasnik. 1993. The theory of principles and parameters. Reprinted in Chomsky (1995).

Cresti, Diana. 1995. Extraction and reconstruction. *Natural Language Semantics* 3. 79–122.

Fox, Danny.1999. Reconstruction, variable binding, and the interpretation of chains. *Linguistic Inquiry* 30. 157–196.

Fox, Danny. 2002. Antecedent-contained deletion and the copy theory of movement. *Linguistic Inquiry* 33. 63–96.

Fox, Danny & Jon Nissenbaum. 1999. Extraposition and scope: a case for overt QR. In *WCCFL 18: Proceedings of the 18th West Coast Conference on Formal Linguistics*, ed. by Sonya F. Bird, Andrew Carnie, Jason D. Haugen and Peter Norquest. 132–144. Somerville, Massachusetts: Cascadilla Press.

Frampton, John. 1999. The fine structure of wh-movement and the proper formulation of the ECP. *The Linguistic Review* 16-1. 43–61.

Heim, Irene. 1993. Anaphora and Semantic Interpretation: A Reinterpretation of Reinhart's Approach. SfS-Report 07-93, Tübingen Working Papers, University of Tübingen.

Huang, C.-T. James. 1993. Reconstruction and the structure of VP: Some theoretical consequences. *Linguistic Inquiry* 24. 103–138.

Longobardi, Giuseppe. 1987. Extraction from NP and the proper notion of head government. In *The syntax of noun phrases*, ed. Alessandra Giorgi and Giuseppe Longobardi. 57–112. Cambridge: Cambridge University Press

May, Robert. 1977. *The Grammar of Quantification*, doctoral dissertation, MIT. Cambridge, Massachusetts.

Rullman, Hotze. 1995. *Maximality in the semantics of wh-constructions*. Doctoral dissertation, MIT, Cambridge, Mass.

Sabel, Joachim. 2002. A minimalist analysis of syntactic islands. *The Linguistic Review* 19. 271–315.

Sauerland, Uli. 1999. Scope Reconstruction without Reconstruction. *WCCFL* 17. 582–596.

Sauerland, Uli & Paul Elbourne 2002. Total Reconstruction, PF Movement, and Derivational Order. *Linguistic Inquiry*, Vol. 33, No. 2. 283–319.

Sternefeld, Wolfgang. 2001. Semantic vs. Syntactic Reconstruction. In H. Kamp, A. Rossdeutscher & Ch. Rohrer (eds.), *Linguistic Form and its Computation*. CSLI Publications Stanford, CA, pp. 145–182.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 531–546. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Be positive! Norm-Related Implications and Beyond

Galit W. Sassoon
University of Amsterdam
galitadar@gmail.com

Abstract. Negative degree questions such as *How short is John*?, and negative equatives such as *John is as short as Mary* imply that *John is short*. Existing theories explain this 'norm-related' implication by means of (i) a competition between unmarked and marked antonyms, and (ii) by introducing a standard-variable in parallel with the standard analysis of the positive form *John is tall*. This paper argues against these principles and in favor of an analysis, whereby the zero on the measurement scales of norm-related adjectives is relative, rather than absolute. This principle captures the fact that norm-related implications arise with many positive adjectives (alongside with their negative antonyms) and are cross-linguistically tied with non-licensing of measure phrases.

1 Introduction: Norm-Relatedness

What do we know about norm-relatedness to date? First and foremost, we know that degree questions and equatives with 'negative' adjectives trigger norm-related implications. For example, the question *how short is Bill* and equative *Bill is as short as Mary* imply that *Bill is short*, while the question *how tall is Bill* and equative *Bill is as tall as Mary* do not imply that *Bill is tall*. To explain these facts, linguists often exploit notions such as 'unmarked' vs. 'marked' antonyms; marked expressions have a limited distribution; in certain contexts they are either ungrammatical or infrequent, and their usage is characterized by an interpretation shift, e.g. norm relatedness (Lehrer 1985; Horn 1989). Evidence for the narrower distribution (hence, markedness) of negative adjectives includes in particular their non-licensing with measure phrases and ratio phrases, except in the comparative, as illustrated by the felicity of *twice as tall as* versus infelicity of *#twice as short as*, and by the contrasts in (1).

(1) a. Bill is 1 meter shorter than John; *Bill is 1.50meters short
b. Bill is 20 years younger than John; *Bill is 20 years young

A markedness-based analysis within formal semantics is proposed by Rett (2007, 2008), who argues that negative adjectives are banned from linguistic contexts in which their substitution with the positive ('unmarked') antonym

preserves truth conditions. For example, the neutral reading of *as short as* is banned, since individuals are equally tall iff they are equally short.

A main drawback of this view is that in many pairs of antonyms, the negative and positive members are both norm-related (Bierwisch 1989), as the following examples illustrate.

(2) [Bill and Mary are skinny]
  a. #Bill is as fat as Mary;
  b. #How fat is Bill?

(3) [Bill and Mary are fat]
  a. #Bill is as skinny as Mary.
  b. #How skinny is Bill?

(4) a. How rich is John? ⇒ John is rich
  b. John is as rich as Bill. ⇒ John is rich

(5) a. How poor is John? ⇒ John is poor
  b. John is as poor as Mary. ⇒ John is poor

(6) a. ?This ice-cream is as warm as that one.
  b. ?How warm is the ice-cream?
  c. ?How cold is the fire?

(7) a. How heavy is the bag? ⇒ The bag is heavy
  b. The bag is as heavy as the box. ⇒ The bag is heavy

(8) a. How light is the bag? ⇒ The bag is light
  b. The bag is as light as the box. ⇒ The bag is light

Furthermore, none of the members of these pairs licenses measure phrases, except in the comparative (Schwarzschild, 2005), and many of the positive adjectives resemble their negative antonyms in rarely licensing ratio phrases (Sassoon 2010). Thus, neither the positive nor the negative is 'unmarked'.

(9) a. Bill is 1 kg fatter/ skinnier than John; vs. *150kgs fat/ skinny
  b. Bill is 200$ richer/ poorer than John; vs. 1,000$ rich/ poor
  c. It is 2° warmer/ colder than yesterday; vs. 20° warm/ cold

Such pairs are prevalent in languages as diverse as English, German, Chinese, Hebrew and Esperanto (Bierwisch 1989; Breakstone 2009; Kennedy 2009). A corpora study of Esperanto, which users are native speakers of a variety of languages, suggests that they are prevalent even in this artificially construed language – most positive adjectives resemble their negative antonyms in rarely licensing ratio phrases (van Cranenburgh et al 2011).

Hebrew speakers' judgments concerning nominalizations exhibit parallel patterns (Breakstone 2009; Sassoon 2010). In many antonym pairs, both negative and positive members are marked, as (10b) and (12b) illustrate.

(10) a. Godel/??Katnut ha-bayit; 'The size/??smallness of the house'
b. Mishkal/??Koved ha-noca; 'The weight/?'heaviness' of the feather'

(11) a. Orex kaful/ shney meter; 'Double length; 2 meters of length'
b. *Katnut kfula/ shney meter; *'Double smallness/ smallness of 2ms'

(12) a. Mishkal kaful / 30kg; 'Double weight / weight of 30kg'
b. *Koved kaful / 2kg; *'Double heaviness / heaviness of 2kg'

Moreover, in languages like Russian, *all* adjectives not morphologically marked for comparison are norm-related and do not license measure phrases (Krasikova 2009). Even *tall* is marked, so to speak.

(13) *Катя низкая, она такая/настолько же высокая, как/насколько и Лариса;
'Katja is short, she is as tall as Larissa.'

(14) a. Насколько стол широкий?
'How wide is the desk?' (very, fairly, little, *20cm)
b. *Кровать 80 см *широкая/ *узкая/ шириной.
'The bed is 80 cm wide.'

Only adjectives morphologically marked for comparison (e.g., the Russian equivalents of English 'taller') are 'unmarked' – they are neutral and they license measure- and ratio-phrases. All other degree constructions, whereby the adjective occurs with no morphological marking (the Russian equivalents of 'tall', 'more tall', etc.) are norm-related and ban measure phrases.

(15) a. Катя не высокая, но она выше, чем Сергей.
'Katja is not tall, but she is taller than Sergej.'
b. *Катя не высокая, но она более высокая,чем Сергей
'Katja is not tall, but she is more tall than Sergej.'

These cross-linguistic generalizations call for a unified account of norm-relatedness in natural language, and its interactions with polarity and measure phrases.

2 Existing Theories

This paper utilizes a representation of background contexts c via context-sets W_c (sets of indices w consistent with the information in c; Stalnaker 1978),

such that a statement S is true in c iff $\forall w \in W_c$, S is true in w; S is false in c iff $\forall w \in W_c$, S is false in w, and S is undetermined in c, otherwise. Let D_x and D_r be the domain of possible individuals x and degrees r, respectively, and let gradable adjectives denote in indices w measure functions, f(P,w): $D_x \rightarrow D_r$; for example, f(tall,w) is a degree function (also symbolized as $f_{tall,w}$) – a mapping of entities $x \in D_x$ to values $r \in D_r$. The interpretation of a positive construction, *x is P*, is the truth value 'true' in w iff f(P,w)(x) exceeds P's standard in w, s(P,w) (Kennedy 1999).

The degree functions of positive adjectives are monotonic with respect to conventional measures, while those of negative adjectives are reversed with respect to those of their antonyms, e.g., the more height one has (wrt any possible measure), the taller one is, but the less short one is. Thus, the ordering imposed by $f_{short,w}$ is equivalent to the ordering imposed by the reversed height function $\lambda x \in D_x. - f_{tall,w}(x)$. Let us, then, represent this fact by assuming that for any c and $w \in W_c$, $f_{short,w}$ is roughly equivalent to $\cong \lambda x. - f_{tall,w}(x)$. However, the arguments in this paper do not hinge on this analysis of antonymy; they generalize to other contemporary analyses of antonymy (Kennedy 1999, 2001; Heim 2008, etc.)

Theories such as Rett (2008) seek to explain the data with two principles:

(16) a. Markedness (restricted distribution): Norm related implications are due to a competition between marked and unmarked forms. Marked (negative; 'reversed') adjectives can be used iff substitution with the 'unmarked' antonym does not preserve truth conditions.

b. **Null morphemes ('Pos'/'Eval'):** Norm related implications are explained by analogy with the positive construction, which is normally analyzed as containing a null morpheme – POS or EVAL – that introduces a membership-standard variable into the syntax and semantics. For example, 'Dan is tall' is analyzed as conveying that Dan is taller than tall's contextual standard (Kennedy 1999).

Therefore, since the neutral interpretations of, for example, *equally tall* and *equally short* are equivalent, by principle (16a), the latter is not licensed. However, when EVAL enters the derivations, the outcome consists of two non-equivalent norm related interpretation for the positive and negative equatives. Hence, both are licensed. For example, the negative equative *Dan and Bill are equally short* has a derivation of the form Equally(Eval Dan is short, Bill is Short), which conveys that Dan and Bill are equally short and Dan is shorter than the standard height norm, r_s. Likewise, the norm related

interpretations of negative and positive *as* equatives and degree questions are different so both are licensed.

This theory is appealing because it is economic and highly intuitive. Can we, then, use a modified version of it to explain the facts concerning antonym pairs whereby the negative and positive are both marked? The answer is no. Norm-related readings with positive adjectives cannot be based on comparisons with an 'unmarked' form, because their negative antonyms are also marked – they do not license ratio- and measure-phrases.

The moral is twofold. First, non-licensing of ratio and measure phrases cannot be explained merely as a result of the reversal characterizing negative antonymy, for otherwise the fact that many positive adjectives do not license ratio- and measure-phrases will remain unexplained. Second, norm-relatedness cannot be explained by relying on a notion as general as markedness. What we need to explain is why 'marked' adjectives have a constrained distribution in the first place, and the reasons explaining this would probably reveal why they tend to also be norm-related.

A theory that seeks to explain norm-relatedness in terms of reasons for non-licensing of measure phrases will be more explanatory. First, it will explain the cross linguistic patterns. Krasikova (2008), for example, adopts principles (16a, b) to account for the English data; this forces her to propose a different account for Russian, to capture the apparent role of degree morphology in this language. So she is forced to use separate accounts for an apparent cross-linguistic feature – norm relatedness always goes with non-licensing of measure phrases. Second, an account of norm-relatedness which is based on non-licensing of measure- and ratio-phrases has the potential advantage of explaining data pertaining to norm-relatedness in measure- and ratio-phrases. In particular, why is it that when people do use ratio-phrases, as in *This paper is twice as short as that one*, the result is neutral? After all, other modified equatives (e.g. *at least as short as*) are norm related.

Additional problems with existing analyses pertain to principle (16b) – the assumption that the derivation and semantics of equatives and degree questions is mediated by a standard variable. One problem pertains to the use of *for*-phrases in equatives (Sassoon and van Rooij 2011). *For*-phrases are adjective modifiers indicating what the implicit standard is, as illustrated with the positive construction in (17a). These modifiers cannot modify equatives (17b). When accepted, the *for*-phrase is an adjective modifier, which produces a shift in the adjective interpretation (17c). Due to this shift, (17c) does not at all entail that the two arguments are equally short.

(17) a. Dan is tall for his age

(= Dan is taller than tall's standard, namely his age's norm)

b. *Dan is as short as Bill for their age(s)
(≠ Dan is shorter than short's standard, namely his age's norm and Dan and Bill are equally short)

c. Dan is as short for his age as Mary is for her age
(≅ Dan is short for his age to the same degree as Mary is short for her age)

Why? A *for*-phrase can only modify the adjective occurring in an equative, thereby creating a between-adjective equative; Thus it produces a shift in interpretation, not necessarily towards a norm-related interpretation, but towards a deviation interpretation – the adjectival function is replaced with a function assigning to entities the distance between their value and the norm in their respective categories. The *for*-phrase does not and cannot modify the equative itself, which is straightforwardly explained if and only if no standard parameter is added by virtue of the use of an equative without *for*.

Similar problems arise with the use of standard boosters like *very* (compare, for example, the felicity of *Dan is very tall* to the utterly odd sentences #*Bill is as very short as Dan* and ?? *How very short is Bill?*). Why? Again, *very* cannot modify an equative or degree question by boosting the value of the norm variable, probably because there is no such value in their semantics. In conclusion, equatives and degree questions are inherently different from positive forms. Their derivations are mediated by neither a null morpheme, nor a standard variable (Sassoon and van Rooij 2011).

In sum, an account of norm related implications in these constructions cannot be based on principles (16a, b). Norm-related implications must derive from something else, which characterizes the interpretation of marked adjectives, including positive ones. The rest of this paper will provide an implementation of the idea put forward in this section, namely an account of norm-relatedness that bind it, rather than to a general notion of markedness, to a more specific, pervasive feature of norm-related adjectives crosslinguistically: non-licensing of measure phrases and rarity of licensing of ratio phrases.

3 Accounts Based on Licensing of Measure Phrases

I will make use of measurement theory's explanation of the distribution of measure phrases (Krantz et al 1971), whose relevance to linguistics has already been noted (Klein 1991; Krifka 1989; van Rooij 2010; Sassoon 2010). I will discuss specifically the difference between ratio- and difference-scales, which pertains to the status of the zero on a measurement scale and its

effects. On this proposal, the so-called 'norm related implications' are actually 'zero related implications', and the so called 'Unmarked-' versus 'Marked-adjectives' are adjectives with absolute- versus relative-zeros. Section 3.1 explains these notions in more detail.

3.1 Zero the Hero

Let the domain of degrees, D_r, include a special element, $0 \in D_r$. Let adjectival interpretations in indices w include, besides a cutoff point, also a zero point – the set of entities whose P value in w is 0: $zero(P,w) = \{x \in D_x: f(P,w)(x) = 0\}$. Like the cutoff point, also the zero can be either semantically determined or context relative. P's zero is ***absolute*** in c iff it is index invariant (i.e. the same extent of the given property is regarded as zero in every accessible index; (18a)) and it marks absence of P-hood by comprising P's absolute lower bound (18b). Otherwise, P's zero is ***relative***.

(18) Absolute zeros are index invariant lower bounds:
   a. $\forall w_1, w_2 \in W_c$, $zero(P,w_1) = zero(P,w_2)$
   b. $\forall w \in W_c, \forall x \notin zero(P,w)$, $f(P,w)(x) > 0)$.

What, then, distinguishes neutral adjectives (like English *tall* and *old*) from norm-related ones (*fat, rich, warm* and negative antonyms in general)? In the former, the zero is absolute. It marks complete absence of height, width, age, etc. Conversely, in the latter, the zero is relative. The 'out of the blue' context fails to determine precisely which entities cease to have any amount of the measured properties. Which entities are minimally fat? Rich? Short? At which point on the warm-cold scale are entities not even somewhat cold? Warm? Our linguistic capacity is as indeterminate with regard to the zero (or minimum) of these adjectives as it is with regard to the cutoff point of *tall*. If I do not want to be fat at all – not even minimally fat – what weight should I aspire for? If I want to warm up a soup so that it is not at all cold, what temperature should I aspire for?

Some of the adjectives lacking an absolute zero, e.g., *short*, have no minimum at all, because there is no maximal height. Others, e.g., *fat*, could have had an absolute zero – 0 weight – but in actuality, *fat* doesn't appear to measure mere weight, but rather – overweight. The point at which entities begin to have a noticeable amount of overweight ('minimum fatness') is context relative. So is the point at which entities begin to have noticeable deficits compared to the average height ('shortness') etc.

Significantly, relative zeros do not have to equal the membership norms. For example, while *somewhat open* entails *open* and *slightly wet* entails *wet*, one can be *somewhat fat, but not fat*, meaning that the reference point relative

to which we begin to measure overweight (*fat's* zero) may be different from *fat's* norm. Likewise, one can be *somewhat short, but not short*, meaning that the reference point relative to which we begin to measure height-deficit (the zero) may be different from *short*'s norm. Notice that according to the economy principle (Kennedy 2007), if there is a point that stands out on a scale (usually either a minimum or a maximum on the scale), the adjective's norm will be identified with it, rather than be context-relative. This is the case in *open/closed*; *dry/wet*, but not in *fat/skinny* and *tall*/*short*. They seem to reference midpoint standards, despite the fact that speakers easily recognize an absolute zero on the height and weight scales, and despite the role that this zero plays in the interpretation of adjectives like, e.g., *tall* – explaining their licensing of ratio- and measure-phrases (as illustrated shortly).

Finally, notice that sentences such as *The surface of the floor is zero (cms) tall* are funny or infelicitous, but they are easily interpretable, whereas corresponding examples, e.g., *The surface of the floor is zero (cms) short* are both funny and senseless (Sassoon 2010). This is because the degrees assigned by *short* – including those of entities whose height measures zero – are shifted by an unspecified value, which results in a relative zero. In typical contexts of use c, we do not know which entities belong in zero(short) in c (formally, for many w_1,w_2 in W_c, zero(short,w_1) ≠ zero(short,w_2)). No absolute 'zero' is available, only local zeros. So we have found a common denominator: All norm-related adjectives have relative zeros. We can describe their degree functions as shifted by an index-dependent value, symbolized below as 'Tran', from 'transformation value'. For example, the zero on the Kelvin scale is absolute. Nothing can get any colder. But the zero on the Celcius scale is arbitrary – frozen water exemplifies this degree. The Celsius scale can be defined in terms of Kelvin degrees plus a transformation by exactly 273 degrees. The scales of natural language adjectives can also be described as transformed, but by an undetermined (index relative) value.

(19) a. $\forall w \in W_c,\ \exists Tran \in D_r$: $f_{warm,w} = \lambda x.\ f_{Kelvin}(x,w) - Tran$
b. $\forall w \in W_c,\ \exists Tran \in D_r$: $f_{short,w} = \lambda x.\ Tran - f_{tall}(x,w)$

This is not to say that speakers always need to possess a representation of an additive temperature scale a kin to Kelvin; rather, the result of transforming Kelvin by different arbitrarily given values constitutes a correct description of the representations speakers do possess for temperature adjectives.

Measurement theory tells us that measure phrases are only licensed with ratio ('additive') scales, namely ones with absolute non-shifted zeros (Krantz et al 1971). To illustrate measurement with an absolute zero, consider for

example, an index w whereby *tall* maps entities whose height is 1 centimeter to 1, and assume that Sam and Dan's heights are 50 and 100 centimeters, respectively, and in accordance, they are mapped to the degrees 50 and 100, respectively. Since ratio-based scales have an absolute zero, they assign no negative values, and the values they assign adequately represent differences and ratios between entities' manifestations of the given property (e.g. height). For examples, we can say that *Dan is twice as tall as Sam* since the ratios on *tall's* scale are meaningful and indeed $100 = 2 \times 50$. We can also use units and measure phrases as in *Dan is 100 cms tall*, because the ratios on tall's scale are meaningful and Dan is in fact 100 times as tall as a centimeter.

By contrast, consider an index w whereby 'tall' is linked to a transformed function (which is, arguably, the case in Russian), for instance, one that maps entities whose height is 1 centimeter to 0 ($\lambda x.\ \text{height}(x,w) - 1$; so Sam and Dan are assigned 49 and 99, respectively). Since such transformed ('difference') scales have an arbitrary zero, they typically assign negative values, and the ratios between their values are not meaningful; so in Russian, we cannot felicitously say that Dan is twice as tall as Sam because indeed, e.g., $99 \neq 2 \times 49$. Likewise, we cannot felicitously say that Dan is 100 cms tall because 99 is not 100 times 0. For similar reasons, English speakers tend to avoid statements such as *Sam is twice as short as Dan*; reversed and transformed degrees do not capture ratios. Still, measure phrases are okay in morphologically-comparative adjectives in these two languages (e.g., we can say that *Dan is 50 cms taller than Sam*), because when calculating degree differences, the transformation values cancel out – the difference between Dan and Sam's *tall* degrees is 50, and so is the difference between their *short* degrees ($(1 - 100) - (1 - 50) = 50$); this value is precisely 50 times the value of a centimeter, as stated by the measure phrase (Sassoon 2010).

Absolute zeros are a relatively recent invention, and conceptually, difference scales are still more prominent than additive ratio-scales (Smith et al 2005). For instance, according to judgments of 7-year old children, dividing an object repeatedly will eventually make it disappear, or reduce its weight to zero. Why? Because children use difference-scales and subtraction instead of ratio-scales with division. Correct reasoning typically occurs at age 8-12 or latter, and latter for weight than for matter and space.

These findings are consistent with the linguistic data – most adjectives do not license measure phrases and rarely license ratio phrases (and they do so mainly with round numbers). Data from Esperanto suggest that there is no statistically significant difference between negative and positive adjectives in the frequency of ratio modifiers (as well as nominalizations; van Cranenburgh et al 2010), except for distance predicates like *tall*. This

suggests that all negative adjectives are non-additive, but so are also many positive adjectives. In addition, adjectives and their comparative and superlative forms (which do not require calculation of ratios) are acquired earlier than measure phrases (*Tall* > *Taller*, *tallest* > *2m tall*; Beck et al 2010). Finally, nominalization morphology is consistent with this view. After all, *height, weight, width* and *length* are all non-generative forms, while most other (non-additive) adjectives tend to combine with other, more generative morphemes, such as '-ness' and '-ity' (e.g., *highness*, *obesity*, etc.)

To summarize, 'markedness' in adjectives does amount not to negative antonymy, but to the notion of difference scales, meaning – scales with relative zeros, either by virtue of a transformation of an additive base (*tall-short*), or due to absence of an additive base in the first place (*glad-sad*). Transformed adjectives do not license measure phrases, but their comparatives do; they license *twice* only if context biases towards a non-dominant non-transformed interpretation; we are uncertain about their zero point, and – they are norm-related in equatives and 'how' questions. This last feature must be related to the previous features. An account based on this insight is presented in the next section.

3.2 Be Positive!

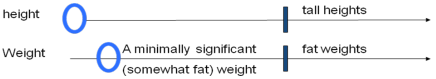
Norm related implications arise if the adjective's function is transformed. Why? One possibility is that denotation members always have to have positive degrees ($\forall w \in W_c$, $s(P,w) \geq 0$), but non-members may have negative degrees. In each context, entities' value fails to exceed 0 iff they fail to have a contextually noticeable or significant amount of the measured property. Thus, adjectives cannot be used to rank these entities:

(20) Be positive! Use adjectives P to rank entities whose value in P exceeds zero.

Formally, then, *x is P* is felicitous in c iff $\forall w \in W_c$, $f(P,w)(x) > 0$. This idea has been out there for a pretty long time; as Winter (2005) writes: "a possible explanation, discussed by Seuren and Kennedy, is that the scales of adjectives such as *fast* and *expensive* do not exhaust all the physically legitimate values" (Winter 2005: 39). Likewise, Heim and Kratzer (1998) and Kennedy (2007) have argued for various sorts of adjectival domain restrictions, covering among other things, also the role of zeros. But, to the best of my knowledge, the relations have never been worked out in detail, between zeros and norm-relatedness in positive and negative adjectives across languages (see Winter 2005 and Breakstone 2010 for previous discussions). This section includes a preliminary account of these relations and many questions for future research.

First, notice that the maxim in (20) can only be violated when, in denying P, its application turns P's negation unusable; i.e., it makes sense to apply *not P* of entities whose P value fails to exceed 0 in c iff *all* non Ps fail to do so ($\forall w \in C_c$, $s(P,w) \leq 0$), namely in minimum standard adjectives (cf. *the door isn't open* vs. *#the surface isn't tall*).[1] Furthermore, on the basis of (20) we can claim that transformation in negative adjectives has a purpose, namely to avoid negative values. By virtue of transformation, positive and negative antonyms may apply to slightly different domains. Thus, trans-formation is bad for ratio- and measure-phrase licensing, but it is good to tell apart negative- from positive-antonyms (Rett 2007; Tribushinina 2009). Besides these observations, this proposal has the following outcomes.

First, by (20), *tall* (whose zero is absolute, i.e. marks complete absence of height) can be used to rank entities iff they have some height, but not necessarily much height. Hence, *tall* is neutral. Conversely, almost only fat entities are surely 'somewhat fat' (have a noticeable overweight and so a positive degree). So we can only use *fat* 'safely' to rank denotation members, or at least 'somewhat fat' entities.



Second, the strength of an evaluative implication (e.g. *fat* vs. *somewhat fat*) varies with the location of the zero. For example, soon after switching on a slow oven to warm up some **cold** bread, one can ask *how warm is the bread?* (I am grateful to Ewan Klein for this observation). In this context, soon after the oven is switched on, some heat is added to the bread, rendering it at least 'somewhat warm', i.e. more than 'zero' warm. This is all that is required for an appropriate use of *warm* by (20). Similarly, after cutting some part of a **very long** rope to shorten it, we can ask *how short is the rope?* Even if the rope is still clearly not short. Also*, how brown* only implies *somewhat brown,* even out of the blue (Heim 2009). Stronger constraints, directly relating to cutoff points, cannot capture these judgments (Rett 2007, 2008).

Transformed adjectives may be partial in disguise, if their relative standard is taken to equal their relative zero – this is the case in contexts in

[1] Still, with negation, we find evidence for a weaker version, something like "be able to be positive!". For example, *The door isn't open* is okay because the door *might* be open. However, *#The surface isn't tall* is odd because a surface cannot possibly ever exceed zero height. Then again, consider a line X on a screen whose length varies with time and is now zero; reporting the ongoing changes X undergoes one may say that *right now, X isn't long* (because it might be long.)

which, for instance, *x is somewhat fat* is taken to imply *fat*. In such cases, we only use the adjectives (even in the comparative) in order to rank members. Thus, the present account converges with the account of norm-relatedness in comparatives of partial (minimum-standard) adjectives (Kennedy and McNally 2005); in contexts in which the relative zero and norm of *fat* are equated, *fatter* is norm related for the same reasons *sicker* or *more open* usually are – to count as Per one has to have some non-zero degree of P; when this suffices for P-hood, 'x is Per' entails 'x is P'. The standard is context relative, but entities below it are below 0 so they can't be ranked.

Third, languages like Russian provide additional evidence for relative zeros (even for adjectives like, e.g., *tall*). Combinations like '*entirely short*', whereby a maximizer modifies a relative adjective, are just fine in Russian. Yet they do not refer to *tall*'s absolute zero, but to some context dependent minimum height (Tribushinina 2009, 2010), namely *tall*'s relative zero. Again, this zero is clearly not the standard of *tall* and *short*. Similar evidence is provided by certain English negative, relative- or partial-adjectives, as in the felicitous and frequent combinations *completely different* and *entirely sick*.[2] We find similar Hebrew data (e.g., 'legamrey kar' 'entirely cold' is perfectly grammatical). Such maximizers occur not only with maximum-scale adjectives (*clean; closed; full; empty*), but also with relative adjectives, and they refer to the (possibly local) zero of those adjectives' antonyms.

Fourth, (20) is a restriction on the use of adjectives P, but not of other lexical items, including ones decomposed of P, like *unP* or *Per*. In fact, although the interpretation of the latter is mediated by P's degree function, they can be used without implying P-hood. Thus, (20) captures the role of morphology, including the fact that, for instance, *unhappy* doesn't imply *happy,* and *shorter* doesn't imply being *short*. Conversely, *less short*, *as short* and *how short* are correctly predicted to imply *short*. So (20) captures the role of comparative morphology in Russian, namely the fact that morphologically marked comparatives are neutral and they license ratio- and measure-phrases. Also, for Bierwisch (1989), Krasikova (2009) and Kennedy (2001), *more P* differs from *Per* in being norm-related, as (200 predicts.[3,4]

---

[2] Syrett (2007) shows that maximizers are a cue for the acquisition of standard type – invented labels are regarded as total (maximum-standard) adjectives if modified by maximizers like *completely*. But Syrett cites relative- or partial- (mininum standard) adjectives like *different* among the most frequent adjectives licensing maximizers like *entirely*.

[3] Why aren't measure-phrases licensed here, as in #*2m/twice more wide than long*? After all, the transformation values cancel out, so relative zeros cannot be the reason. Probably, this construction employs a richer semantics than a mere difference calculation. Independent evidence for this is the fact that noun phrases are freely licensed in this constructions across

Notice, however, that *er*-comparatives, being lexical entries in their own right, may have either an absolute or a relative zero. If *Per* has a relative zero, then only entity pairs whose values in P differ to a contextually noticeable or significant extent, count as somewhat *Per*. This explains why sometimes *Per* implies (somewhat) P; e.g ??*this feather is heavier than that one* is odd, because differences in weight between feathers (unlike, say, bags) are too fine grained for *heavier* to capture, rendering *heavier* semi norm-related. The sentence improves if, say, a wet feather is compared to a dry one, since their weights differ more notably (Ewan Klein, p.c.) On a similar vein, we can say that *The winter in Antarctica is warmer this year*, either if it feels noticeably warmer, or if we report about fine-grained scientific measures that render the two winters discernable.

Fifth, *it weighs* conveys *It weighs a lot,* rather than *It weighs something* (Bierwisch 1989) perhaps due to the triviality of the latter, which, by (20), holds true of all *weigh*'s domain. A question for the future is whether the meaning of adjectival positive forms (e.g. *x is tall*) can also derive from triviality (Fox and Hackl 2006; Heim 2009; Rett 2007).

Finally, this account is more explanatory than an account in terms of a mere competition between marked and unmarked forms, in that it generates predictions about cases we previously could not understand. In particular, it explains why ratio phrases are not norm-related (Rett 2007), e.g., a tall person can be *twice as short as* a house. Why? The licensing of ratio phrases requires an accommodation of a ratio-scale – an absolute zero must be accommodated, which means that the norm relatedness is eliminated.

Also, this account has implications even for mere exceptions to the cross linguistic generalization. Consider, for example, the pair *late-early*. It is obviously norm related – both *How late/ early is the train?* and *This train is as late/ early as that one* imply that *The train is late/ early*; still, it also licenses measure phrases – both *2 minutes late* and *two minutes early* are felicitous across many languages. These adjectives are also particularly amenable to deviation interpretations (Kennedy 2001). Other examples of deviation readings include, for instance, *2 month short of her birthday, 2 minutes short of time* (Schwarzschild 2005), and *Dan is (2cms) taller than Mary is short* which is a direct comparison of deviations (Kennedy 2001).

---

languages, as in *more a car than a truck* and *more a bird than a horse* (versus #*more bird* or #*birder*).

[4] This proposal predicts a difference in implications between *little fat, slightly fat* or *barely fat* and *rather skinney*, and between *slightly ful* and *rather empty*. Empirical research should ultimately determine whether this prediction is on the right track.

What explains the norm related implications? Importantly, time is a difference measurement. It has an unspecified or contextually chosen zero (recall that, for instance, year 1 is different in the Christian and Jewish calendars). However, *early* and *late* often select contextually determined zeros in an anaphoric or indexical way. For example, the zero may be defined by the time school's bell rings (the time of an event e_{bell}). In such contexts, $Tran_{late/early} = f_{Time}(e_{bell})$. These adjectives, then, are linked with a measure of deviation from the bell time, $f(late,w) = \lambda e.\ f_{Time}(e,w) - f_{Time}(e_{bell},w)$ and $f(early,w) = \lambda e.\ f_{Time}(e_{bell},w) - f_{time}(e,w)$ (where 'e' is a variable over events). These functions compare 'transformed' time values of two given entities; the transformation-values cancel out, and so measure phrases are licensed.

Too is a marker of deviation readings, e.g. in *You arrived late, but not too late*, the first occurrence of *late* has a relative zero and norm, while the second is interpreted relative to, e.g., the bell-ringing time, which functions as both the zero and the standard. In Dutch, the use of *te* ('too') is compulsory in these contexts, as in *Jullie moeten hier zijn voor de bel; Jullie zien *(te) laat* ('You must arrive before the bell rings; you arrived *(too) late'); *te* is obligatory for the meaning "after the bell" (cf. Syrett's 2007 treatment of *too* as a marker of minimum standard adjectives).

To conclude, directly connecting between non-licensing of measure phrases and norm-relatedness is fruitful. Empirical research is required to determine the precise implications from degree constructions – facts pertaining to sub-deletion comparatives with *more*; the connection between granularity and norm-relatedness, etc. Finally, maybe derivations with equatives and degree-questions (but crucially not *er* comparatives) involve a measure phrase variable M, e.g., a projection of the form *x is M Adj.* (cf. Doetjes 2009; Fox and Hackl 2006). Since negative adjectives like *short* do not license fine-grained neutral measure phrases like *two meters*, M can only be saturated by an evaluative entry like *very, fairly* and *for his age*. Crucially, even negative modifiers ('answers') such as *little short* or *not short* allow for, and perhaps even defeasibly suggest, *not tall* (for empirical findings see Paradis and Willners 2006 and references therein). This idea, too, captures norm relatedness in positive adjectives that fail to license measure phrases (such as *fat, warm* and *rich*, in English).

References

Beck, Sigrid, S. Krasikova, D. Fleischer, R. Gergel, C. Savelsberg, J. Vanderelst & E. Villalta. 2010. Crosslinguistic Variation in Comparison Constructions. MS (to appear in *Linguistic Variation Yearbook*).

Bierwisch, Manfred. 1989. 'The semantics of gradation'. In Manfred Bierwisch & Ewald Lang (eds.), *Dimensional Adjectives*. Springer-Verlag, Berlin.

Breakstone, Micha Y. 2010 Inherent Evaluativity, MS, MIT.

Fox, Danny, and Hackl, Martin. 2006. The universal density of measurement. *Linguistics and Philosophy* 29, 537–586.

Heim, Irene. 2008. Decomposing Antonyms? *Proceedings of Sinn und Bedeutung* 12. 212–225. OSLO.

Heim, Irene. 2009. Class notes, MIT.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar.* Malden, MA.: Blackwell.

Horn, Laurence. 1989. *A Natural History of Negation*, Chicago Uni. Press.

Kennedy, Christopher. 1999. *Projecting the adjective: the syntax and semantics of gradability and comparison*. Garland. NY. (1997 UCSC PhD thesis).

Kennedy, Christopher. 2001. Polar opposition and the ontology of degrees. *Linguistics and Philosophy* 24(1): 33–70.

Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable predicates. *Linguistics & Philosophy* 30.

Kennedy, Christopher and McNally, Louise. 2005. Scale structure and. the semantic typology of gradable predicates, *Language* 81: 345–381.

Klein, Ewan. 1991. Comparatives. *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, ed. by Arnim von Stechow and Dieter Wunderlich, 673–91. Berlin: Walter de Gruyter.

Lehrer, A. 1985. Markedness and Antonymy. *Journal of Linguistics* 21(2).

Paradis, Carita and Caroline Willners. 2006. Antonymy and negation – The boundedness hypothesis. *Journal of Pragmatics* 38(7): 1051–80.

Rett, Jessica. 2007. T. Friedman and M. Gibson (eds), *SALT* XVII 210–227, Ithaca, NY: Cornell University.

Rett, Jessica. 2008. *Degree modification in Natural language*. Doctoral dissertation. Rutgers, The State University of New Jersey.

Rotstein, Carmen and Yoad Winter. 2004. `Total adjectives vs. partial adjectives: Scale structure and higher-order modifers. *Natural Language Semantics* 12: 259–288.

Sassoon, Galit W. 2010. Measurement theory in Linguistics. *Synthese* 174(2): 151–180.

Sassoon and van Rooij 2011, Against the null morphem POS, paper in progress, ILLC, University of Amsterdam.

Smith, Carol, Gregg Solomon and Susan Carey. 2005. Never getting to zero: Elementary school students' understanding of the infinite divisibility of number and matter, *Cognitive Psychology* 51: 101–140.

Syrett, K. 2007. *Learning about the Structure of Scales: Adverbial Modifcation and the Acquisition of the Semantics of Gradable Adjectives*. Ph.D. thesis, Northwestern University

Tribushinina, Elena. 2010. Boundedness and relativity: A contrastive study of English and Russian. To appear in *Languages in Contrast* 11.

van Rooij, Robert. 2010. 'Vagueness and linguistics'. In G. Ronzitti (ed.), *The Vagueness Handbook*. Berlin/Heidelberg: Springer.

van Cranenburgh, Andreas, G. Sassoon and R. Fernandez. 2010. Invented Antonyms: Esperanto as a semantic lab. *IATL 26*, Bar Ilan Uni., Israel.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 547–563. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

English Comparative Correlatives, Conditionals, and Adverbs of Quantification

E. Allyn Smith
Northwestern University
esmith@northwestern.edu

Abstract. This paper argues that the similarities long observed between English Comparative Correlative sentences (CCs) such as *the bigger they are, the harder they fall* and English conditionals are the result of the conservativity of generalized quantification and not the identity of the quantifiers involved in conditionals and CCs. I review the similarities, noted by Thiersch (1982), Fillmore (1987) and Beck (1997), inter alia, before presenting new data showing differences in both the kind of quantification (universal/generic v. proportional) and the defeasibility of quantification on the basis of what kinds of Adverbs of Quantification are found with each and how they affect interpretation. I conclude that CCs are not merely a subclass of conditionals as previously theorized (cf. Beck 1997, Lin 2007 and Brasoveanu 2008), positing an alternative theory in which a proportional quantificational force is part of the lexical meaning of the first *the* in the CC.

1 Introduction

The following are examples of the English Comparative Correlative. Examples (1d)-(1g) are from Google, and (1a) is a common idiom.

(1) a. The bigger they come, the harder they fall.
b. The faster we drive, the sooner we'll get there.
c. The more a dog eats, the more it drinks.
d. The longer they remain, the greater the chances of disaster.
e. The larger the barrel, the bigger the curl.
f. The further the horizon, the greater the perceived scenic beauty.
g. The steeper the diagonal line, the tighter the folds will be in the swag.

Each CC under consideration here has two primary phrases separated by a comma, each beginning with *the*. These can be clearly clausal, as in, e.g. (1a)-(1d), or appear without verbs, as in (1e). In this paper, I will concentrate on the clearly clausal examples. I'll call the *the* that begins the first clause the_1 and the *the* that begins the second clause the_2.

The interpretation of the CC in (2) is paraphrased by Beck (1997) in the following way (in (3)). Though Beck is primarily analyzing the German CC, she is clear in her intention for its analysis to apply equally to English. I use her work as the exemplar analysis throughout this paper since it is the first detailed compositional analysis of the semantics of the CC in any language.

(2) The faster we drive, the sooner we'll get there.

(3) $\forall w_1 \forall w_2$ [[We drive faster in (w_1) than (w_2)] → [We get there sooner in (w_1) than (w_2)]]

In prose, (3) expresses that the meaning of the CC correlates increases of one kind with increases of another kind across situations/worlds/individuals; here, increases in speed and earlier arrival times are correlated. Though this particular example's correlation is governed by a natural law relating speed and time, in general, neither causation nor any particular kind of functional relationship are required. In other words, CCs in English can be used to express seemingly random correlations such as (4) and a variety of non-linear relations as in (5), which is exponential. In addition, a sentence like (6) is judged to be true in a model in which a one-degree temperature difference correlates with a three-goal increase, while a five-degree temperature difference correlates with a single-goal increase. Thus, linearity (among other proper-ties) should not be included as part of the semantic representation of the CC. For more on this and related issues, see Beck (1997).

(4) The more prolific the semanticist, the taller her husband.

(5) The greater a number, the greater its square.

(6) The warmer it was, the more goals the team scored.

Given a suitable sentence-level interpretation for the CC, the question is naturally how to compose it. All past work on the semantics of CCs, including Beck (1997), Hsaio (2003), Lin (2007) and Brasoveanu (2008) treat the English CC as a kind of conditional.[1] This paper argues that CCs are not a subclass of conditionals but rather that both CCs and conditionals are subclasses of the group of expressions that involve a generalized quantifier. In section 2, I review the compelling similarities between conditionals and CCs. In section 3, I focus on the differences, including new differences based on

[1] Brasoveanu does argue that not all CCs are conditional, but those that he excludes are Romanian equative-type CCs that mean something like 'the difference in height between mom and dad is the same as the difference in height between me and my brother', so the kind of CCs at issue here are still considered conditionals.

proportional interpretations (in 3.1) and adverbs of quantification (in 3.2). In section 4, I discuss the repercussions of these new differences for the compositional analysis of CCs.

2 Similarities between CCs and Conditionals

Thiersch (1982) observed the first similarities between CCs and conditionals, which were then taken up and added to by Fillmore (1987) and McCawley (1988) who were the first to hypothesize that CCs were a kind of conditional. What follows are some of the similarities between CCs and conditionals. First, both license donkey anaphora.

(7) If a farmer owns a donkey, he loves it.

(8) The more often a farmer milks a cow, the more he appreciates it.

Second, neither allow *will* as a future tense in the first clause.

(9) If a farmer (#will milk) milks a cow, he will make butter.

(10) The more often a farmer (#will milk) milks a cow, the more butter he can (will be able to) make.

Third, both allow backward pronominalization when the pronoun is in the antecedent but not the consequent.

(11) a. If he_i has to wait a long time, $John_i$ gets angry.
b. #He_i gets angry if $John_i$ has to wait a long time.

(12) a. The longer he_i has to wait, the angrier $John_i$ gets.
b. #He_i gets angrier, the longer $John_i$ has to wait.

Fourth, in both, tag questions can be formed only on the basis of the second (matrix) clause:[2]

(13) a. If Max has to wait, Lucy gets angry, doesn't she?
b. *If Max has to wait, Lucy gets angry, doesn't he?

(14) a. The longer Max waits, the angrier Lucy gets, doesn't she?
b. *The longer Max waits, the angrier Lucy gets, doesn't he?

[2] Whether the CC is an instance of a subordinate-matrix structure is a contentious issue in the literature on the syntax of the CC (cf. Culicover & Jackendoff 1999, Borsley 2004 and den Dikken 2005), but here, I will assume that the first clause of the CC is indeed a subordinate clause, which is the assumption of the semantics literature.

Beck adds additional similarities to the list. In both CCs and conditionals, the meaning of the subordinate clause restricts the domain of cases under consideration and the meaning of the matrix clause asserts something about those cases. Also in both, when quantification is over worlds, worlds where something miraculous or unexpected happens are ignored (so when you say *If he went to the store, he forgot his money*, you're excluding worlds in which he gets run over by a car on his way to the market). She says that counterfactual statements are possible in both, as in (15) and (16), though (16) sounds odd to me.

(15) If he had run faster, he would be more tired now.

(16) The faster he had run, the more tired he would be now.

Finally, Beck discusses adverbs of quantification (AQs). There is a long history of work on conditionals (see von Fintel 1994 and Bhatt & Pancheva 2006 for overviews), and one of its most influential observations is the extent to which conditional antecedents serve as domain restrictors of AQs such as *always, sometimes, usually, seldom, normally*, etc. Like conditionals, AQs show a wide range of quantification, leading Lewis (1975) to hypothesize that what is being quantified over with AQs (and conditionals and therefore, potentially, CCs) is a *case*. A case is any admissible value assignment for all the variables that occur free in an open sentence modified by an AQ (according to Heim). This importantly includes all participant, time, and world variables. So basically, the AQ is a kind of operator in a tripartite structure of the form [Operator] [Restrictor] [Nuclear Scope] (Heim 1982, Kamp 1981). In the case of AQs (and also modals), the restrictor is typically given by an *if*-clause, but it can be implicit, meaning that its value is determined almost entirely by context, as in examples like *Usually, I go to the store* where we're already talking about what I do after school, etc. Similarly, it is possible to have an *if*-clause restrictor without an explicit AQ or modal, as in (17a) and all of the examples of conditionals we have seen up to this point. Beck argues that CCs once again parallel conditionals in showing the same behavior, as in (18). This observation by Beck is crucial to her analysis, as we will soon see.

(17) a. If I buy fruit, I eat it before it goes bad.
b. Usually, if I buy fruit, I eat it before it goes bad.
c. If I can buy fruit, I eat it before it goes bad.

(18) a. The more fruit I eat, the less often I get sick.
b. Usually, the more fruit I eat, the less often I get sick.

c. The more fruit I can eat, the less chocolate I crave.

In both cases shown here, Beck argues that the (a) variant without an explicit AQ is understood as having universal (or possibly generic) scope. Beginning with Kratzer (1986), an implicit epistemic modal or universal/generic AQ has been posited as existing in sentences with a bare conditional antecedent. Similarly, then, it could be extended to the analysis of the CC, in which case the universal quantification in the CC would not be a part of the lexical meaning of *the*. This is the approach Beck takes. Looking at the form in (3) once again, her analysis ingeniously composes the meanings of *the*, the comparative morpheme, the adverb *fast*, and *we drive* to yield 'we drive faster in (w_1) than in (w_2)'. The same process is used to compose the meaning of the second clause. Thus, the only thing remaining to derive the form in (3) is the default universal/generic AQ that unselectively binds variables across these two expressions and provides the quantificational force and material conditional. This analysis makes a strong prediction that conditionals and CCs will pattern alike with respect to quantificational force and its defeasibility, which, as we will see in sections 3.1 and 3.2, is not borne out.

3 Differences between CCs and Conditionals

Despite the similarities listed in the last section, there are a number of ways in which the conditional and CC are known to differ. Beck notes the following. First, conditionals do not necessarily contain a comparative morpheme (or involve a comparative meaning), while CCs do.

(19) If a dog runs, it gets thirsty.

(20) *The a dog runs, the it gets thirsty.

Second, when conditionals do contain comparatives, *than* phrases are present, unlike the CC.

(21) If Fido runs faster than Spot, Fido will win the race.

(22) *The faster Fido runs than Spot, the more likely he is to win the race.[3]

Third, CCs require quantification over at least two variables, and conditionals, only one. To see this, compare the form in (3), with quantification over two worlds, to the interpretation of a hypothetical conditional, which would quantify over a single world. This last difference might be taken as a

[3] Though I have marked this as ungrammatical in keeping with Beck's judgment, see Smith (2010) for a complete discussion of the felicity of *than*-phrases in English CCs.

challenge to the sketch of Beck's analysis presented earlier, but Beck proposes that because the default quantifier for conditionals and CCs is unselective, it is additionally polyadic, binding as many variables as necessary (and thus is a single quantifier across the constructions). The other two differences are both cases of restrictions present in the CC but not the conditional, which form her basis for arguing that the CC is a restricted subclass of conditionals.

Another difference between the conditional and CC that does not weaken Beck's claim that CCs are a subclass of conditionals but is often overlooked is the following. The conditional paraphrase for the CC in (24) (which appears in (23)) is not equivalent in meaning to that CC.

(23) If you run faster, then you're more likely to win.

(24) The faster you run, the more likely you are to win.

Only (23) can be interpreted as a statement about one particular faster speed rather than as a generalization about any possible faster speed. We can easily construct situations in which (24) would be false but (23) true, showing a lack of synonymy between the two sentences. Suppose we are discussing marathons. In running a marathon, you actually don't want to run too fast or you'll run out of steam too early and not finish the race, so (24) is false because after some cutoff speed, you jeopardize finishing, let alone winning. But it could be that you are talking to a friend before the race and you know her normal marathon pace and also that she is capable of running a little faster without dropping out of the race. In this case, you can utter (23) and have it mean that if she runs one half of a mile faster per hour, she is more likely to win the marathon, without committing yourself to any statements about any other faster speeds or the truth of this statement on any other day or for any other race. In other words, if you uttered (24), you would be committing to the idea that running the fastest speed possible is the best way to win, in this race or any other, whereas uttering (23) merely commits you to the idea that there is some faster speed that would lead to better results but not that it is the fastest she is capable of running. This is likely related to the above-noted difference between single- and double-variable quantification requirements.

The next two subsections discuss differences that do get in the way of the picture presented thus far. In 3.1, I argue that quantification in the CC is proportional rather than universal/generic, and in 3.2, I show that the distribution of AQs is different with CCs v. conditionals, arguing that the proportional quantificational force should not merely be a default.

3.1 Proportional Interpretations

There is a well-known issue regarding what kinds of things to count (farmers? farmer-donkey pairs? etc.) in certain kinds of sentences, including conditionals.

(25) If a farmer owns a donkey, he is rich.

(26) If a farmer owns a donkey, he is usually rich.

In example (25), under a universal interpretation, it doesn't matter what you count because all farmers, pairs, etc. must verify the statement.[4] In (26), on the other hand, the presence of the proportional quantifier *usually* creates a problem in models like the following, from Heim 1990.

Model for (26): There are 100 farmers, 99 of whom each own one donkey and are poor; the remaining one owns 200 donkeys and is rich.

If we count by donkey-farmer pairs, there are more rich pairs than poor pairs, which should make the sentence true. If we count by farmers alone, it would be false, which is how native speakers judge this sentence (and thus, theories of conditionals are modified to reflect this fact). In this model, then, both (25) and (26) are judged to be false. A similar kind of test can be used here for the purpose of discerning whether there is a difference in quantificational force between the default universal/generic force, as in (25) and an overt proportional force, as in (26). If they are truth-conditionally different, we would expect that in a model where most but not all of the farmers, etc., fit the paradigm, (26) would be true while (25) would be false. Toward this end, I surveyed native speakers about examples like the following:

(27) If a dog knows a command, it is intelligent.

(28) If a dog knows a command, it is usually intelligent.

Model for (27) and (28): There are 200 dogs that know commands. 167 know one command and are intelligent. 33 know two commands and are dumb.

As predicted, across a range of sentences of this type, speakers say that examples like (27) are false or 'weird' in models like these, while examples like (28) are judged to be true.

[4] Kadmon 1990 disagrees, stating that donkey sentences without overt proportional quantifiers can still give rise to asymmetric (proportional) readings of the kind of interest here, but a survey of native speakers showed a judgment difference between examples like (25)/(27) and examples like (26)/(28) for every single participant.

Now that we have a test for the difference between universal/generic and proportional quantification, the question is which the CC patterns like. If the CC is a subclass of conditional, it should pattern with the universal/ generic conditionals in (25) and (27) in the default case where no overt proportional AQ is present with the CC. The same native speakers, however, rated CCs like (29) and (30) as they would examples like (26) or (28) where an overt proportional AQ was present. Speakers judge (29) to be false in its model and (30) to be true in its model (for the full list of examples and models tested, see Smith 2010).

(29) The more a man loves a woman, the more flowers he brings her.

Model for (29): We know five men. One has nine girlfriends, and his love for each depends upon her behavior. The nicer she is, the more he loves her, and the more flowers he brings her each week. The other four men each have one girlfriend, and even though their love for their girlfriends grows over time, they only bought them flowers during the first couple months of their relationship and now, years later, they don't buy flowers no matter what.

(30) The more a man likes a tie, the more money he paid for it.

Model for (30): There are 400 men who like at least one tie. 250 of the men have three ties each: one they like so-so and paid $10 for, one they like better and paid $20, and one that is their favorite and paid $30 for. The remaining 150 men own 2 dozen ties each and got some of the nicest ones on sale for less than some of the ones they like only so-so.

From this evidence, we see that CCs without an overt proportional quantifier pattern like conditionals *with* one. Quantificational force in the CC is therefore more restricted than in the conditional and is proportional. This is unexpected if CCs are a kind of conditional, though Beck and others could argue that the subclass of conditionals that CCs are a part of have a proportional rather than generic or universal default. In the next section, I show that even that revision would be untenable.

3.2 Adverbs of Quantification

As mentioned above, an overt AQ affects the quantificational force of a conditional. This is one of the reasons that Lewis (1975) and Kratzer (1986) originally proposed that *if* not be a generalized determiner itself, because the quantificational force of a conditional can vary. From the outset, however, not all kinds of forces can occur in the interpretation of the CC. We have already seen that conditionals can be statements about a particular instance, while CCs have to be generalizations about more than two differences (or

pairs for which there is a difference) of one kind correlated with more than two differences (or pairs for which there is a difference) of another kind. In other words, a form like that in (31) with a simple existential force simply does not model native speaker intuitions that correspond to any CC regardless of modification. (31) is not a possible interpretation of (32) with or without the AQ *sometimes*, for example, because (31) would be true in a situation where, of all the trips taken, there was only one where faster driving resulted in an earlier arrival, in which case, native speakers find it infelicitous to use a CC.

(31) $\exists w_1 \exists w_2$ [[We drove faster in (w_1) than (w_2)] → [We got there sooner in (w_1) than (w_2)]]

(32) Sometimes, the faster we drove, the sooner we got there.

Despite the fact that a true existential is not possible, the fact remains that we do find CCs modified by AQs like *sometimes*, as in (32). *Sometimes* is certainly closer to an existential than a universal, though the bare minimum it requires seems to differ between the conditional and the CC. This is puzzling; consider, for example, that when it comes to statistical significance, a correlation is either significant or it is not; it cannot be *somewhat* significant in technical terms (only *almost* significant). One might hypothesize, then, that CCs only occur with universal or proportional AQs requiring at least a majority of points to be correlated and that *sometimes* and other existential-type AQs might not be attested (the only examples Beck gives of AQ modification of CCs are with majority-force quantifiers).

To this end, I conducted a corpus search (of Google, given the large size needed to see significant counts of CCs). I searched for AQs in initial position only since they are unambiguously construed as wide-scope modifiers in that position (whereas, in situ, there is the potential for ambiguity and further work is required). For each AQ *X*, I used the search term *"X the more the"* for the CC and *"X if the"* for the conditional. I did the same search with the indefinite article and found similar results, so I am only reporting the results with the definite here. Note that this means that the results also don't cover CCs with bare plurals, prepositional phrases, etc. after *the more*, but I used the definite article because searching for *"the more"* by itself does not uniquely find CCs. Finally, I searched through dozens of pages worth of individual entries for each AQ looking for responses that were not the target, then ran the search again with a limitation that would rid the search of those unwanted responses. For example, the searches for *always the more the* and *always if the* turned up many responses with *not always*, which was

not the quantificational force of interest, so the searches were run again, excluding *not always*. The results of the March 2010 search are shown in two tables (for space purposes) below:

	Unmodified	Always	Usually	Often	Never
CC	111,000,000	38,100	5,290,000	7,070,000	5,950
Cond.	783,000,000	2,090,000	3,020,000	2,770,000	540,000

	Sometimes	Occasionally	Seldom	Rarely
CC	6,770,000	9	0	4
Cond.	5,090,000	730,000	2,230,000	6,390,000

Table 1: Results of the March 2010 search

In the first set, we see the universal-type AQs as well as *never*, which, with the CC, is like sentential negation due to the fact that in-situ negation is unambiguously narrow scope (cf. Beck 1997). Also, the first column gives the counts for the unmodified CC and conditional (i.e. *the more the* and *if the* by themselves) to give a sense of the general difference in their frequency. In the second set, we see the existential-type AQs.

There are two particularly important differences between the distributions of AQs with conditionals v. CCs. The first is that *usually, often,* and *sometimes* occur much more often with CCs than conditionals (especially when adjusted for their relative overall frequency). The second is that *occasionally, seldom*, and *rarely* occur only with conditionals and not CCs (the few results indicated with *occasionally* and *rarely* were not instances of the target; they were times when the AQ occurred at the end of one sentence and the next sentence was a CC). This is not consistent with a theory in which CCs are treated as conditionals. Because Google is notorious for fluctuating, I replicated these results at regular intervals. The following set of tables from six months after the original search show that, while there is certainly some variance, the general pattern remains intact, and both of the major differences are replicated.

	Unmodified	Always	Usually	Often	Never
CC	98,200,000	94,400	351,000	524,000	5,400
Cond.	381,000,000	1,480,000	3,130,000	2,390,000	517,000

	Sometimes	Occasionally	Seldom	Rarely
CC	1,050,000	17	5	10
Cond.	5,530,000	566,000	1,350,000	5,940,000

Table 2: Results of the September 2010 search

Again, none of the results for the CC with *occasionally, seldom*, and *rarely* were actually CCs modified by these AQs, but most of the results with the conditional were, as in (33)-(35).

(33) **Rarely, if the** cyst is near the main bile ducts, it can cause obstruction and jaundice.

(34) **Occasionally, if the** Committee is split in its opinion, they may send the vote to the floor with no recommendation.

(35) **Seldom, if the** subsidence has not been repaired, it can be solved by re-implantation or dorsal pedicle screw fusion of that lumbar segment.

The fact that all of the AQs that can occur with the conditional and not the CC are existential-type AQs adds strength to my contention that there is a proportional quantificational force (which is inconsistent with an existential) inherent to the CC but not the conditional. Similarly, the fact that *usually* and *often* occur with the CC much more often than with the conditional could be further evidence of the proportional force, but this will be discussed more below. The puzzling case is *sometimes* and why it does not pattern with other AQs like *occasionally*. In the March 2010 search, *sometimes* appears more often with CCs than conditionals, while in the September 2010 search, it appears with CCs and conditionals in more equal measure considering their overall difference in frequency, but either way, they clearly occur with CCs.
The following are examples of conditionals and CCs with the highest-frequency AQs: *usually, often*, and *sometimes*, which will help us shed light on this puzzle.

(36) The stiffer the skiboard, the more weight and lean you need to put into carving. Of course, side-cut factors in here too. **Often, the more** the side cut, like in skiboards with a deep parabolic cut, the easier it is to carve turns.

(37) **Usually, the more** the sole of the foot that makes contact (leaves a footprint), the flatter the foot. In more extreme cases, known as a kinked flatfoot, the entire inner edge of the footprint may actually bulge outward, where in a normal to high arch this part of the sole of the foot does not make contact with the ground at all.

(38) With layering, **sometimes the more** the better. When you layer a lot of black, you're like a walking Louise Nevelson sculpture, and that's pretty attractive.

(39) **Often, if the** cruise is canceled because of weather, the cruise line uses verbiage that allows the line to issue credits as it sees fit.

(40) **Usually if the** product was a freebie and they didn't say anything negative about it, I don't trust the review.

(41) **Sometimes if the** wealthy suffer a serious loss, they are probably not well-trained or socialized to cope well with that since they've been successful.

In the cases of *usually* and *often*, they seem to be used in both the conditional and CC merely to implicate that there are exceptions to the generalization they modify. This is consistent with the idea that all of these AQs form a Horn scale (Horn 1972) and that a proportional AQ would be used to implicate that no stronger statement (with a universal AQ like *always*) would be possible. Similarly, *sometimes* should implicate *only sometimes*, i.e. the majority of the time, this is not the case. However, this is where we see a difference. Though (38) is but one example, in all of the dozens of examples I looked at, *sometimes* with a CC implicates something stronger. In the case of (38), it implicates not merely that it is usually not the case that more layering is better (in which case it could be true that no particular relationship holds for the majority of data points); it implicates instead that usually the reverse is true, i.e. more layering is usually worse, but in the case of layering all black, more can be better. In fact, many of the examples on Google are cases where there are two CCs one after another. The first states the generalization, and the second states a generalization to be found among the outliers. Furthermore, within the minority of data points that do not fit the larger generalization, the majority of those must fit the counter-generalization in the

case where *sometimes* is used. In other words, when looking at the full set of situations in which there is a difference in amount of layering, it is true that only some of them are cases in which more layers are correlated with a better result, but it is also true of the majority of the outliers to the otherwise robust correlation between more layers and a worse result.

I conclude that the proportional quantificational force in the CC is not as easily overridden as that in the conditional. In the conditional, *sometimes* overrides the universal or generic force, as do a wide range of existential-type AQs. As we have seen, the CC does not occur with any existential AQs other than *sometimes*, and even then, *sometimes* is used to indicate a majority correlation among the data points that fall outside the stronger correlation in the other direction. I take this as evidence that the proportional force in the CC is part of the lexical meaning of *the*$_1$ rather than a default, as proposed for the conditional.

Though the differences between conditionals and CCs presented in this section are not an exhaustive list (e.g. the CC can clearly at least appear to be non-clausal, while the conditional cannot), these are the major differences that seem relevant for the broad semantics of the CC that is at issue here.

4 A New Theory

Given the evidence from the previous section, I define a quantificational operator CORREL that has a meaning similar to that of MOST/USUALLY to account for the fact that it must be a proportional quantifier. As it is defined in (42), its form is identical to that given for *most*, but that is just because, as for *most*, this is a rough approximation. An individual's idea of what it takes to establish a correlation may be more strict depending upon the person. It could also differ reliably from what someone would judge to be true for *most*, which is why I gave CORREL its own title.[5]

(42) CORREL(A)(B) = $|A \cap B| \supset |A - B|$

If CORREL were a phonologically null default quantifier with the CC, we would expect the CC and the conditional to have the same pattern as AQs, which they do not. I assume that if the quantificational force is not a default, it must be part of a lexical item. Thus, in the revised theory, it is part of the meaning of *the*$_1$, which heads the subordinate clause. In all other ways, the semantics of *the*$_1$ can be consistent with Beck's or others' analyses. If what is built as the meaning of the subordinate clause on those analyses is as in (44)

[5] Additionally, sets *A* and *B* here are sets of pairs, which is a further difference from the unary sets typically assumed to be the arguments of operators such as *MOST*.

for the CC in (43), the revised theory would instead yield (45). Then, in both the old and new theories, the meaning of the matrix clause would be as in (46), so whereas Beck and others take the meaning of the two clauses to be the same modulo the lexical meanings of the nouns and verbs that populate them, the new analysis gives them different meanings. This is actually an advantage of the new theory because *the*$_1$ and *the*$_2$ do seem to have a different status in the CC. When the clauses are reversed and the matrix comes first, its *the* does not appear, as in (47). Because the revised theory keeps the correlational force needed to compute the sentence meaning in the subordinate *the*, we would expect the subordinate *the* and not the matrix *the* to remain necessary.

(43) The faster we drive, the sooner we'll get there.

(44) $[\![$ *The faster we drive* $]\!] = \lambda w_1 \lambda w_2$ .we drive faster in (w_1) than (w_2)

(45) $[\![$ *The faster we drive* $]\!] = \lambda P_{<s,st>}$ .CORREL($\lambda w_1 \lambda w_2$ .we drive faster in (w_1) than (w_2))(P)

(46) $[\![$ *The sooner...* $]\!] = \lambda w_1 \lambda w_2$ .we'll get there sooner in (w_1) than (w_2)

(47) We'll get there sooner, the faster we drive.

(48) CORREL($\lambda w_1 \lambda w_2$ .we drive faster in (w_1) than (w_2))($\lambda w_1 \lambda w_2$ .we'll get there sooner in (w_1) than (w_2))

The revised sentence-level meaning for (43) is (48) (compare to (3)). This will be true just in case more than half of the pairs of worlds in which we go faster in the first than the second are also pairs of worlds in which we arrive sooner in the first world as compared to the other. This resolves the main problems raised by the data in sections 3.1 and 3.2 in that the quantificational force in the CC is proportional and indefeasible. The two remaining issues are how the CC's meaning interacts with the meaning of various AQs and how to account for the parallels between conditionals and CCs from section 2 now that they are given different analyses.

Though a theory of AQs is beyond the scope of this paper, it seems unlikely that all AQs behave similarly when it comes to the CC. If, as I have proposed, there is a lexically-specified quantifier that is part of the CC, any instance of an overt AQ would seem to be a case of multiple quantification. Cinque (1999) and others have studied this in more detail, suggesting that when there is more than one, each quantifier quantifies over different things: intervals v. subintervals, etc. It seems that this is what is going on in the case of *sometimes* but that it is somehow the 'chosen' existential AQ in that none

of the others occur with the CC. Since *sometimes* is used to signal a pattern among outliers, the others are simply infelicitous as they are taken to quantify over the same worlds, etc., as CORREL, which, if accepted, would create an inconsistency in the common ground (the implicature that no more than a few data points fit a generalization would clash with the entailment of CORREL). The other proportional and universal AQs, on the other hand, can quantify over the same worlds, etc., as CORREL without leading to a problem in the common ground since the meaning of the modified CC would entail the meaning of the unmodified CC. This kind of varied pattern (where some combinations are licit and others illicit) is in keeping with the literature on multiple quantification, though much more work needs to be done in this area to determine the validity of an argument along these lines.

As for the similarities between the conditional and the CC, it turns out that none of these are unique to these two constructions. They are true either of other subordinate-matrix constructions or of other constructions involving a conservative operator in the sense of Barwise & Cooper (1981), or both.

(49) **Conservativity** is the property of being a predicate (OP) on two properties such that OP(A,B) is equivalent to OP(A, A&B).

The conservative operator in the conditional is the default (or overt) AQ, and in the CC, it is CORREL. A generalized quantifier (GQ) analysis has already been applied to the adverbial domain by de Swart (1991), setting a precedent for this analysis. In fact, treating the first clause of CCs as a GQ *explains* the presence of donkey anaphora if Chierchia (1995) is right that conservativity is at the root of their donkey-sentence-hood. Regardless, sentences that are not conditional show the same patterns observed above, such as (50)-(51) for the lack of future *will* or *Every farmer who owns a donkey loves it* for the case of donkey anaphora.

(50) Cats that (*will) mate in the wild (will) have higher fertility rates.

(51) However often he (*will) greet(s) me, that's how often I will greet him.

Though Bhatt & Pancheva (2006) also treat relative clauses as in (51) as conditionals, their definition for what constitutes one is a structure "involving an adverbial clause interpreted as stating the conditions under which the proposition expressed by the main clause is true" (641). Since the matrix clause in the CC is not propositional (yielding a set of pairs of worlds), Bhatt & Pancheva are unwittingly excluding CCs from consideration, as I have argued one should.

References

Barwise, J. & Cooper, R. 1981. Generalized quantifiers and natural language. *Linguistics and Philosophy, 4*. 159–219.

Beck, Sigrid. 1997. On the semantics of comparative conditionals. *Linguistics and Philosophy* 20. 229–271.

Bhatt, R. & Pancheva, R. 2006. Conditionals. In M. Everaert & H. van Riemsdijk (Eds.), *The Blackwell companion to syntax* (1). 638–687. Oxford: Blackwell.

Borsley, R. D. 2004. An approach to English comparative correlatives. In S. Müller (Ed.), *Proceedings of the 11th International Conference on Head-Driven Phrase Structure Grammar*. 70–92.

Brasoveanu. 2008. Comparative Correlatives as Anaphora to Differentials. *SALT Proceedings.*

Chierchia, Gennaro. 1995. *Dynamics of Meaning: Anaphora, presupposition, and the meaning of grammar*. University of Chicago Press.

Cinque, G. 1999. *Adverbs and Functional Heads: A Cross-Linguistic Perspective.* Oxford: Oxford University Press.

Culicover, P. W. & Jackendoff, R. S. 1999. The view from the periphery: The English comparative correlative. *Linguistic Inquiry* 30. 543–571.

den Dikken, M. 2005. Comparative correlatives comparatively. *Linguistic Inquiry* 36(4). 497–532.

Fillmore, Charles. 1987. Varieties of conditional sentences. *ESCOL 3*. 163–182.

von Fintel, Kai. 1994. *Restrictions on quantifier domains.* University of Massachusetts at Amherst Phd. Thesis.

Heim, Irene. 1982. *The semantics of definite and indefinite noun phrases*. University of Massachusetts at Amherst Phd. Thesis.

Heim, Irene. 1990. E-Type Pronouns and Donkey Anaphora. *Linguistics and Philosophy* 13. 137–177.

Horn, L. 1972. *On the Semantic Properties of Logical Operators in English*. University of California at Los Angeles Phd. Thesis.

Hsiao, Shu-ying. 2003. On proportional correlative constructions in Chinese and Mongolian. *Journal of Taiwanese Languages and Literature* 1. 243–272.

Kadmon, Nirit. 1990. Uniqueness. *Linguistics and Philosophy* 13. 273–324.

Kamp, Hans. 1981. A theory of truth and semantic representation. In J. Groenendijk, T. Janssen and M. Stokhof, (eds.). *Formal Methods in the Study of Language (Part I)*. 277–322. Amsterdam: Mathematisch Centrum.

Kratzer, Angelika. 1986. Conditionals. *Proceedings from the Chicago Linguistics Society*.

Lewis, D. K. 1975. Adverbs of quantification. In E. L. Keenan (ed.), *Formal semantics of natural language*. 3–15. Cambridge University Press.

Lin, Jo-Wang. 2007. On the Semantics of Comparative Correlatives in Mandarin Chinese. *Journal of Semantics* 24(2). 169–213.

Smith, E. Allyn. 2010. *Correlational Comparison in English*. The Ohio State University Phd. Thesis.

de Swart, H. 1991. *Adverbs of Quantification: A Generalized Quantifier Approach*. Groningen University Phd. Thesis.

Thiersch, C. 1982. *The harder they come*…: A note on the double comparative construction in English. In W. Welte (ed.), *Sprachtheorie und angewandte Linguistik: Festschrift für Alfred Wollmann*.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 565–579. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

How many *Most*s?*

Stephanie Solt
Zentrum für Allgemeine Sprachwissenschaft
solt@zas.gwz-berlin.de

Abstract. This paper investigates the various contexts in which the lexical item *most* can be used (e.g. *Fred has read most/the most/at most 15 Shakespeare plays; Fred bought the most expensive book*), with the goal of determining to what extent they can be reduced to a single underlying core semantics. It is shown that *most* across its uses can be analyzed as the superlative form of *many* or *much*, an approach that builds on work by Hackl (2009). However, the adequate treatment of *most* as a proportional quantifier requires also positing a role for pragmatic strengthening of semantic meaning.

1 Introduction

The English lexical item *most* occurs in a wide range of contexts that on the surface are difficult to connect. In (1), *most* is a proportional quantifier meaning (roughly) more than half (the majority reading). *Most* in (2) acts as the superlative of *many*: the preferred interpretation of (2) is that Fred has read more Shakespeare plays than has any other member of some contextually determined set of individuals (the relative reading). In (3), *most* seems merely to spell out the superlative morpheme. Finally, in (4), *most* forms part of what is commonly called a superlative quantifier.

(1)	Fred has read most Shakespeare plays	**majority**
(2)	Fred has read the most Shakespeare plays	**relative**
(3)	Fred bought the most expensive book	**adjectival superlative**
(4)	Fred has read at most 15 Shakespeare plays	**superlative quantifier**

Within the semantics literature, the *most*'s in (1)-(4) have typically been treated separately, and the possibility that they might have a common semantics has not received much serious attention (exceptions being Yabushita (1999)

* Support for this research was provided by the European Science Foundation (ESF) and the Deutsche Forschungsgemeinschaft (DFG) under the auspices of the EUROCORES Programme LogICCC. For very helpful comments and suggestions, I would like to thank Anton Benz, Uli Sauerland and Hubert Truckenbrodt, and especially the audiences of Sinn und Bedeutung 15 and of LENLS7, where this work was also presented.

and Hackl (2009), who each treat a subset of the data in (1)-(4)). The objective of the present paper is to investigate the connections between the four *most*'s exemplified above. Specifically, the question addressed is to what extent all of these occurrences of *most* can be reduced to a single underlying core meaning.

It will be shown that *most* across all of the uses exemplified here can be analyzed as the superlative form of *many* or *much*, an approach that builds on a recent proposal by Hackl (2009). However, majority *most* presents an additional complication that suggests we must also posit a role for a mechanism of pragmatic strengthening of semantic meaning.

2 Hackl (2009): Unifying Majority and Relative *Most*

Let us begin by considering the relationship between majority and relative *most*, as exemplified in (1) and (2). Note first that while these two sentences are superficially similar, they are truth-conditionally distinct. For example, if Fred has read 12 of the 37 attested Shakespeare plays, and no other contextually relevant individual has read more than 10, (2) is true but (1) is false. Conversely, if Fred has read 28 but Barney has read 30, (1) is true but (2) is false.

Yet despite their divergent truth conditions, Hackl (2009) proposes that majority and relative *most* can receive a unified analysis as superlative forms of *many*. Hackl relates the two readings to a well-known ambiguity in superlatives. For example, (5) can mean either that Fred climbed the highest mountain in existence (the so-called absolute reading) or that he climbed a higher mountain than any other contextually relevant individual (the relative reading).

(5) Fred climbed the highest mountain

Building on Heim's (1999) influential analysis of the superlative, Hackl proposes that the distinction between majority and relative *most* (like the distinction between absolute and relative readings of superlatives) derives from a difference in the LF scope of the superlative morpheme *-est*. On the majority reading of *most* (like the absolute reading of superlatives), *-est* has DP-internal scope (6a). On the relative reading of *most* (and of superlatives generally), *-est* has wider scope, at the VP level (6b):

(6) a. Majority:
Fred has read $[_{DP}\ [_{NP}$ -est$_1$ $[_{NP}\ d_1$-many Shakespeare plays]]]

b. Relative:
Fred $[_{VP}$ -est$_1$ $[_{VP}$ has read $[_{DP}$ the $[_{NP}\ d_1$-many Shakespeare plays]]]]

The scope difference in turn corresponds to a difference in argument structure. On this approach, the superlative morpheme *-est* is analyzed as a degree operator that takes three arguments: an individual x, an expression relating individuals to degrees D, and a set of individuals C representing a comparison class.

(7) $[\![\text{-est}]\!]\left(C_{\langle et\rangle}\right)\left(D_{\langle d,et\rangle}\right)(x_e) = 1$ iff
$\forall y \in C\,[y \neq x \rightarrow \exists d\,[D(d)(x) \wedge \neg D(d)(y)]]$
... defined iff $x \in C$ and C has multiple members

When *-est* is interpreted DP-externally, as is the case with the relative reading of *(the) most*, the comparison class argument C is contextually provided, consisting of a set of individuals of which the individual argument is a member. For example, in (2), the comparison class might be as in (8a). This yields the logical form in (8b), which in simple terms states that Fred has read more Shakespeare plays than any other member of C:

(8) Fred has read the most Shakespeare plays
a. $C = \{Fred, Barney, Sue, Theresa, \ldots\}$
b. $\forall x \in C[x \neq Fred \rightarrow \exists d[\exists y[S.play(y) \wedge read(Fred,y) \wedge |y| \geq d]$
$\wedge\neg\exists y[S.play(y) \wedge read(x,y) \wedge |y| \geq d]]]$

On the other hand, when *-est* is interpreted DP-internally, as is the case with majority *most*, the comparison class C is equated with the denotation of the noun phrase. Thus in the case of (1), the comparison class is the set of pluralities of Shakespeare plays, as in (9a), and the resulting logical form is that in (9b):

(9) Fred has read most Shakespeare plays
a. $C = \{Hamlet \sqcap Lear, Othello \sqcap Lear \sqcap Macbeth, \ldots\}$
b. $\exists x[S.play(x) \wedge read(Fred,x) \wedge \forall y : S.play(y)[x \neq y \rightarrow \exists d[|x| \geq$
$d \wedge \neg |y| \geq d]]]$

The formula in (9b) states that Fred has read a plurality of Shakespeare plays that is larger than any other plurality of Shakespeare plays. Initially, this does not seem to be what we want (Fred does not need to have read the largest plurality of Shakespeare plays, i.e. all of them, for it to be true that he read 'most' Shakespeare plays). But Hackl argues that non-identity of pluralities ($x \neq y$) should in this case be interpreted as non-overlap ($x \sqcap y = \emptyset$). On this interpretation, (9b) means that Fred has read a plurality of Shakespeare plays that is larger than any non-overlapping plurality of such plays. That is, (9b)

is equivalent to the simpler (10), which states that the number of Shakespeare plays that Fred has read is greater than the number he hasn't read, the appropriate interpretation for majority *most*.

(10) $|\text{S. plays Fred has read}| > |\text{S. plays Fred hasn't read}|$

The analysis of *most* as a superlative thus offers the possibility of uniting its majority and relative occurrences. Before considering in greater depth whether this analysis is fully adequate, in the next sections I will examine how other instances of *most* can also be brought into the fold.

3 Degree-Based Analysis of *Many/Much*

In extending the analysis to additional cases, I begin with a modification of Hackl's proposal, based on the degree-based account of adjectives of quantity developed in Solt (2009, 2010). I take *most* to be the superlative form of both *many* and *much* (Bresnan 1973). *Many* and *much* themselves I analyze not as quantifiers (as for example in Barwise & Cooper 1981) or adjectival elements (as assumed by Hackl), but rather as degree operators. This approach is motivated in particular by examples such as (11), in which *many* cannot be treated as either a quantifier or a cardinality predicate, but rather describes the difference between two points on a scale.

(11) Many fewer than 100 students attended the lecture

Specifically, I propose the following lexical entry:[1]

(12) $[\![\text{many}]\!] = [\![\text{much}]\!] = \lambda d \lambda P_{\langle d\alpha \rangle}.P(d)$

Here, *many* and *much* take as arguments a degree d and an expression P whose first argument is a degree argument, and apply P to d. In the quantificational uses of these terms, the role of linking degrees to individuals is played by a null measure function MEAS, introduced by a functional head of the same name (per Schwarzschild 2006); quantificational force arises via existential closure (see Solt 2009 for a more detailed presentation of this analysis).

With these elements in place, the previously discussed examples of majority and relative *most* receive analyses equivalent to those obtained under Hackl's proposal. For example, for relative *most* we have the LF structure in (13), where *many* has raised from its DP internal position to take VP scope,

[1] Here I do not address what distinguishes *many* from *much*. In Solt (2009), I argue the difference is one of dimension: *many* is specialized for the dimension of cardinality, while *much* is used for other dimensions.

and *-est* has subsequently raised out of the QP containing *many*:

(13) Fred [$_{VP}$ -est$_2$ [$_{VP}$ [$_{QP}$ d_2-many$_1$] [$_{VP}$ has read [$_{DP}$ the d_1-MEAS Shakespeare plays]]]]

The lower VP in (13) has the interpretation in (14a), denoting an expression of type $\langle d, et \rangle$, the right type to serve as an argument of *many*. After application of d_2-*many* and lambda abstraction over the trace d_2 of *-est*, the resulting interpretation is that in (14b), equivalent (notation aside) from the earlier expression. Application of *-est* now yields the same results as in (8).

(14) a. $[\![\text{has read the } d_1\text{-MEAS Shakespeare plays}]\!] =$
$= \lambda d_1 \lambda x.\exists y[S.play(y) \wedge read(x,y) \wedge |y| \geq d_1]$

b. $[\![d_2\text{-many}]\!]([\![\text{has read the } d_1\text{-MEAS Shakespeare plays}]\!]) =$
$= \lambda d_2 \lambda x.\exists y[S.play(y) \wedge read(x,y) \wedge |y| \geq d_2]$

Majority *most* can be handled similarly.

While the degree-operator treatment of *many/much* does not offer immediate advantages in the analysis of relative and majority *most*, it proves crucial to extending the analysis, as described in the next sections.

4 Adjectival Superlative *Most*

Let us turn to *most* in its adjectival superlative use, as in (3), repeated below:

(3) Fred bought the most expensive book **adjectival superlative**

What is puzzling about examples such as this is that *most* seems only to spell out the superlative morpheme, without adding any additional semantic content. For example, (15a) and (15b) are parallel in interpretation, suggesting that *most* is semantically equivalent to *-est*.

(15) a. Fred is the smart est student
b. Fred is the most intelligent student

Note also that adjectival superlatives formed with *most* exhibit the same absolute/relative ambiguity as those formed with *-est*; for example, (3) can either mean that Fred bought the most expensive contextually relevant book (absolute) or that he bought a more expensive book than any other contextually relevant individual (relative).

The analysis presented in the preceding section is able to account for these patterns. With the entries in (12), *many* and *much* are essentially semantically

empty. This is seen clearly in the derivation in (14), where *many* acts as an identity element, taking as argument an expression of type $\langle d, et \rangle$ and returning (after further lambda abstraction) the same expression. Adjectival superlative *most* can be analyzed as containing a similarly null *much*. Specifically, an example such as (3), on the relative reading, has the LF structure in (16), where there are again two stages of raising:

(16) Fred [$_{VP}$ -est$_2$ [$_{VP}$ [$_{QP}$ d_2-much$_1$] [$_{VP}$ bought [$_{DP}$ the d_1-expensive book]]]]

The lower VP has the interpretation in (17a). Just as in the previous example, application of *much* followed by lambda abstraction yields the same expression, as in (17b). The superlative morpheme *-est* may now take this expression as an argument, yielding the final logical form in (18), the identical result as would have obtained if *-est* had composed directly with the lower VP.

(17) a. $[\![\text{bought the } d_1\text{-expensive book}]\!] =$
$= \lambda d_1 \lambda x.\exists y[book(y) \wedge bought(x,y) \wedge COST(y) \geq d_1]$

b. $[\![d_2\text{-much}]\!]([\![\text{bought the } d_1\text{-expensive book}]\!]) =$
$= \lambda d_2 \lambda x.\exists y[book(y) \wedge bought(x,y) \wedge COST(y) \geq d_2]$

(18) $\forall x \in C[x \neq Fred \rightarrow$
$\exists d[\exists y[book(y) \wedge bought(Fred,y) \wedge COST(y) \geq d]$
$\wedge \neg \exists y[book(y) \wedge bought(x,y) \wedge COST(y) \geq d]]]$

The analysis of *most* as the superlative form of an essentially null degree operator *much* thus allows the unified analysis to be extended also to adjectival superlative *most*, which receives an interpretation that is fully parallel to that of superlatives with *-est*.

5 Superlative Quantifier *Most*

Modified numerals of the form *at most n* have been the subject of considerable study in the semantics literature (see for example Krifka 1999; Geurts & Nouwen 2007; Nouwen 2010). But while the term 'superlative quantifier' is now standard, there has to my knowledge been little attempt to connect their analysis to canonical examples of superlatives.[2] There is, in fact, considerable evidence that such a connection should be made.

First, superlative quantifiers can be paraphrased by explicit superlatives.

[2] Though see Krifka (2007) for relevant discussion, and especially Penka (2010) for an analysis similar to the one developed here.

For example, the original example (4), repeated below, can be paraphrased as 'the largest number of Shakespeare plays that Fred could have read is 15'.

(4) Fred has read at most 15 Shakespeare plays **superlative quantifier**

Beyond this, other superlatives have a very similar use in expressing a maximal value:

(19) a. Fred is 30 at the oldest
b. Fred will arrive by 11 at the latest

And it is not only in English that the meaning of a superlative quantifier is expressed with a transparently superlative form. German for example uses the superlative form not of *many*, but of *high* (*höchstens*, 'highest'), as in the following, the equivalent of (4):

(20) Fred hat höchstens 15 Stücke von Shakespeare gelesen

Perhaps most significantly, Nouwen (2010) points out that superlative quantifiers are necessarily interpreted relative to a range of values. For example, (21a) implies that the speaker does not know precisely how many people Fred has invited. It would be infelicitous if uttered by a speaker who knew the exact number of invitees (say, 27), but acceptable in the case where the speaker's knowledge was uncertain. By contrast, (21b) and (21c) are both felicitous even in the situation of full speaker knowledge.

(21) a. Fred invited at most 30 people
b. Fred is allowed to invite at most 30 people
c. Classes at our institute have at most 30 students

What distinguishes the acceptable uses is that there is a range of actual or possible values under consideration, and not just a single value. This constraint mirrors a restriction on the superlative to situations where the comparison class has multiple members. For example, (22a) would be infelicitous if Fred is the only student I have, and (22b) is odd for a similar reason.

(22) a. Fred is the smartest student I have
b. ?You're the best mother I have

I would like to propose that these restrictions derive from the same source. The semantics of superlatives inherently involve picking the extreme value out of a (non-singleton) set of values. In this respect, superlative quantifiers behave just like any other superlatives. In the approach to the superlative adopted in this

paper, the non-singleton requirement is captured as a presupposition on *-est* that the comparison class it introduces have multiple members (per (7)). This suggests that superlative quantifier *most* – like other instances of *most* – should likewise be analyzed as based on a superlative morpheme that introduces a comparison class presupposed to have multiple members.

In Section 2 it was proposed that relative *most* invokes a comparison class of individuals, while majority *most* invokes a comparison class of pluralities. What sort of comparison class might we have in the case of superlative quantifier *most*? Here, the most obvious possibility is that it is a comparison class of numbers. Informally speaking, the comparison class C in (4) might be taken to be the set of numbers n such that Fred might have read n Shakespeare plays. The sentence could then be analyzed as conveying that 15 is larger than any other other member of this class or, to put it slightly differently, that 15 has more of the property 'large-ness' or 'many-ness' than does any other member of C. This implies that the primary descriptive content of the sentence serves somehow to provide the comparison class argument of *-est*.

In formalizing this, I assume to start the LF syntax in (23), where the superlative quantifier has raised from its base-generated position to take sentential scope (here I do not attempt to specify the structure of the QP *at many+-est 15*, nor do I discount the possibility that certain of its elements raise further out of the QP at LF):

(23) $[_{\text{IP}}\ [_{\text{QP}}$ at many+-est 15$]_1\ [_{\text{IP}}$ Fred has read d_1-MEAS Shakespeare plays]]

Turning to the interpretation of this structure, the semantics given previously for the superlative morpheme are those in (7), repeated below:

(7) $[\![\text{-est}]\!]\left(C_{\langle et\rangle}\right)\left(D_{\langle d,et\rangle}\right)(x_e) = 1$ iff
$\forall y \in C\,[y \neq x \rightarrow \exists d\,[D(d)(x) \wedge \neg D(d)(y)]]$
... defined iff $x \in C$ and C has multiple members

The preceding discussion suggests that in the case of superlative quantifiers, all of the arguments of *-est* must range over something in the domain of degrees. As a first attempt, suppose that all of the type e arguments in (7) are replaced with arguments of type d:

(24) $[\![\text{-est}]\!]\left(C_{\langle dt\rangle}\right)\left(D_{\langle d,dt\rangle}\right)(x_d)$

With this modification, the numeral occurring in the quantifier (in the above example, 15) could, as an expression of type d, saturate the 'individual' (i.e. x)

argument of *-est*. Putting aside for a moment the question of where the main degree predicate D comes from, we would then seem to have a good candidate for the comparison class argument C, namely the set of degrees formed by lambda abstraction over the trace of the quantifier in the lower IP of (23).[3]

(25) $C = \{d : \exists x[S.play(x) \wedge read(Fred,x) \wedge |x| \geq d]\}$

But here we have a problem. The comparison class as defined in (25) is well formed. In all but the trivial case in which Fred has read no Shakespeare plays, C has multiple members, a consequence of the semantics of the 'greater than or equal' operator $\geq$. And even if $\geq$ were replaced by $=$, the presence of the existential quantifier $\exists$ would still guarantee that C is not a singleton set: if there exists a plurality of 15 Shakespeare plays that Fred has read, there also exists a plurality of 14 such plays that he has read, a plurality of 13 that he has read, and so forth. Thus we have no account for the fact that an example like (4) is infelicitous in the situation where the speaker knows exactly how many Shakespeare plays Fred has read, and only felicitous when there is some sort of epistemic uncertainty.

A solution to this problem can be developed by drawing on the analysis of *many* and *much* introduced in Section 3. Recall that on the definition in (12), *many/much* has a flexible type, taking as arguments a degree d and an expression P whose first argument is of type d. Up to this point in the analysis, we have been working with a version of *many/much* in which P is of type $\langle d, \langle et \rangle \rangle$. But another possible instantiation of this schema is the following, where *many*'s second argument has the simpler type $\langle dt \rangle$:

(26) $[\![\text{many}_{\langle d,\langle dt,t\rangle\rangle}]\!] = \lambda d \lambda P_{\langle dt \rangle}.P(d)$

Returning to the semantics of *-est* in (7), if its type e arguments are replaced with arguments of type $\langle dt \rangle$, as shown below, then *many* as defined in (26) has the right type to saturate its degree predicate D argument.

(27) $[\![\text{-est}]\!] \left(C_{\langle dt,t\rangle}\right) \left(D_{\langle d,\langle dt,t\rangle\rangle}\right) \left(x_{\langle dt \rangle}\right)$

And this seems intuitively right, in that, as noted above, the interpretation of (4) seems to involve comparing the 'many-ness' of 15 with that of other members of the comparison class. Continuing along these lines, if we let the numeral 15 in this case denote not a single degree but rather the set $\{d : d \leq 15\}$, then it can satisfy the x argument.[4] For the comparison class C we then require a set

[3] Here and in what follows I alternate between lambda and set notation.

[4] In Solt (2009) I provide further evidence that numerals should sometimes be analyzed as denoting sets of degrees, or equivalently scalar intervals, rather than degrees.

of sets of degrees. The only set of degrees that seems to be available is that in (25), so perhaps C has the form in (28), where I is a variable that ranges over sets of degrees:

(28) $C = \{I : I = \{d : \exists x[S.play(x) \wedge read(Fred,x) \wedge |x| \geq d]\}\}$

But this is of course a singleton set, and hence would fail to satisfy the presupposition that C have multiple members.

However, there is a way to derive a well-formed comparison class. Following Nouwen (2010), I take examples such as (4) to be covertly modal, in that they incorporate a variable that ranges over (epistemically) accessible worlds. The comparison class can then be taken to be not (28) but rather the following:

(29) $C = \{I : \exists w \in Acc[I = \{d : \exists x[S.play(x) \wedge read(Fred,x) \wedge |x| \geq d]_w\}]\}$

So long as there are epistemically accessible worlds that differ in the number of Shakespeare plays that Fred has read in them (that is, so long as there is uncertainty as to the number he has read), the set in (29) will have multiple members. For example, if the possible number he has read is between 6 and 8, the members of C are $\{d : d \leq 6\}$, $\{d : d \leq 7\}$ and $\{d : d \leq 8\}$. Epistemic uncertainty is thus required to satisfy the presupposition on *-est*, from which follows the implication of (4) that the speaker does not know the exact number.

Formally, (4) receives the following truth conditions, where C is defined as in (29):

(30) $[\![(4)]\!] = 1$ iff $[\![\text{-est}]\!](C)([\![\text{many}_{\langle d,\langle dt,t\rangle\rangle}]\!])(\lambda d.d \leq 15) = 1$
...iff $\forall I \in C[I \neq \lambda d.d \leq 15 \rightarrow \exists d'[d' \leq 15 \wedge \neg I(d')]]$

In simpler terms, the final formula in (30) says that the maximum number of Shakespeare plays that Fred has read in any accessible world is 15. This corresponds correctly to the intuitive interpretation of (4).

To conclude this section, I have argued here that superlative quantifier *most* can and should receive an analysis that aligns it to superlatives more generally. The elements that make this analysis possible are, once again, the decomposition of *most* into *many/much* plus the superlative morpheme, and the analysis of *many/much* itself as a type-flexible degree operator which, in this case, provides one of the arguments of *-est*. The benefits here are twofold: not only can we extend the unified account of *most* to the case of superlative quantifier *most* as well, but we also are able to derive constraints on the use of superlative quantifiers from an independently attested property of superlatives.

There are, to be certain, questions that remain to be explored. The analysis developed above is not fully compositional, particularly with respect to the derivation of the set that serves as the comparison class. And I have not addressed how the analysis might be extended to cases with overt modals (21b) and plural noun phrases (21c). I must leave these as topics for future work. But the results to this point are promising.

6 Majority and Relative *Most* Revisited

Having considered how adjectival superlative and superlative quantifier *most* can be analyzed, let us return to the relationship between majority and relative *most*, discussed in Section 2. There is a lot to be said in favor of the unified, scope-based account presented here. It first of all relates the identical form of the two *most*'s to an identical underlying meaning. Furthermore, these parallels are not limited to English. As discussed by Bošković & Gajewski (2008), it is common cross-linguistically for these two meanings to be conveyed by the superlative form of *many*, further evidence that the English facts are not a matter of coincidence. From a different perspective, Hackl demonstrates that the compositional analysis of majority *most* as the superlative of *many* provides an account for the absence of a corresponding 'minority' *fewest*: while *most* characterizes a subset of a set that is larger than all non-overlapping subsets, *fewest* would characterize a subset that is smaller than all non-overlapping subsets – an impossibility. In short, there are reasons to think that this approach is fundamentally correct.

But side by side with the points in favor of the unified account, there is also a significant issue with it, a divergence in the behavior of majority and relative *most* that it does not, on the surface, account for. The logical form derived in (9) renders majority *most* logically equivalent to *more than half*. But in fact, speakers find *most* infelicitous for proportions very close to 50%. For example, (1) would be inappropriate in the situation where Fred has read 19 Shakespeare plays, even though this number exceeds 18, the number he did not read; for felicity, we would require a more substantial difference in the size of these two sets. That is, the comparison in (9) is tolerant to small differences in set size. In this, majority *most* behaves quite differently from relative *most*, which allows precise comparisons; for example, if Fred read 19 Shakespeare plays and John read 18, (2) could be true.

This is a non-trivial characteristic that sets majority *most* apart from relative *most* (and the other *most*'s discussed here), and it seems to argue against the unified analysis, in favor of an account that treats majority *most* as a separate lexical item. But in light of the other points in favor of unification, it is

worth exploring whether this aspect of its interpretation can be accounted for within the framework of the analysis developed so far. In the remainder of this section, I outline one possible way that this might be accomplished.

In Solt (2011), I argue that majority *most*'s typical 'tolerant' interpretation arises as a result of pragmatic strengthening to an interpretation relative to a more weakly ordered degree structure than the cardinal numerals. To see why this might be the case, note first that the strong tendency for the use of *most* to be restricted to situations where there is a significant difference between set sizes is reminiscent of cases of what Horn (1984) terms R-based implicature, where a more general predicate is pragmatically restricted or narrowed to stereotypical instances. Such implicatures derive from Horn's R-Principle 'say no more than you must'. Examples of R-based implicatures discussed by Horn include the strengthening of ability modals (such that 'John was able to solve the problem' R-implicates that he in fact solved it) and the restriction of lexical causatives such as *kill* to cases of direct causation.

For such an approach to be extended to *most*, we must have reason to think that the prototypical or stereotypical case of a 'greater than' relationship between two set sizes is the one where the difference is a significant one. Here, findings from research on numerical cognition provide relevant insights. It is now well established that in addition to the capacity to represent precise number, humans have a separate and more basic 'approximate number system' (ANS) that is involved in the representation and manipulation of quantity information (for an overview of research in this area, see especially Dehaene 1997). In this system, (approximate) quantities are thought to be represented as patterns of activation on the equivalent of a mental number line. These essentially analog representations are sufficient to support approximate arithmetic as well as, importantly, the comparison of quantities. The hallmark of the operation of the ANS is its ratio dependence: the differentiability of two values improves in proportion to the ratio between them, and two values insufficiently distant from each other (in terms of ratio) are indistinguishable, or perhaps distinguishable only in a noisy and error-prone way.

The ANS is evolutionarily and developmentally more basic than the ability to represent and compare number precisely, being present not just in literate adults but also in preverbal infants, members of societies without complex number systems, and even animals. That is, a mode of comparison that is sensitive only to 'significant' differences in values is a core component of our most primitive numerical capabilities. As such, it is a good candidate for a stereotypical interpretation of a 'greater than' relationship.

The sort of approximate representations of numerosity generated by the ANS can be modeled via a scale structure in which degrees are conceptualized

not as points but rather ranges, with the 'greater than' relationship between two degrees requiring non-overlap of their ranges. Formally, such a degree structure corresponds to a semi-order (van Rooij 2011), an ordering structure in which the 'greater than' relationship is transitive but the indifference relationship is not. Turning back to the interpretation of majority *most*, when a logical form such as that in in (9b) is interpreted relative to a semi-ordered degree structure of this sort, truth will obtain only when the set in question is 'significantly' larger than any other non-overlapping subset of the domain. This in turn will be the case only if the proportion in question is significantly greater than 50%, exactly the situation in which *most* is typically used.

Pietroski et al. (2009) provide evidence that the verification of sentences containing *most* at least sometimes proceeds via the ANS. My claim here is that this system plays an even more fundamental role in the interpretation of majority *most*. Specifically, the logical form for *most* can be assessed relative to a scale whose structure mirrors the output of the ANS. Furthermore, since this corresponds to our most basic or primitive mode of quantity comparison, the interpretation of *most* tends to be pragmatically strengthened via R-based implicature to this type of interpretation even in the case where precise number is available, resulting in the tolerant interpretation discussed above.

We are then left with the question of why similar pragmatic strengthening does not occur in the case of relative *most*. While I have no conclusive explanation, one possibility relates to a subtle difference in logical form between the two *most*'s. The relevant portions of the logical forms are shown below:

(31) a. Fred has read most Shakespeare plays **Majority**
$\lambda x.S.play(x) \wedge \forall y : S.play(y)[y \neq x \rightarrow$
$\exists d[|x| \geq d \wedge \neg |y| \geq d]]$

b. Fred has read the most Shakespeare plays **Relative**
$\lambda x.\forall y \in C[y \neq x \rightarrow \exists d[\exists z[S.play(z) \wedge read(x,z) \wedge |z| \geq d]$
$\wedge \neg \exists z[S.play(z) \wedge read(y,z) \wedge |z| \geq d]]]$

The formula for majority *most* in (31a) is based on the pairwise comparison of pluralities (specifically, pluralities of Shakespeare plays) with respect to their cardinalities. It is this sort of comparison that I have argued tends to receive a strengthened stereotypical interpretation that corresponds to our basic capacities for approximate comparison of set sizes. But the corresponding formula for relative *most* in (31b) is different. Nowhere in this formula are two pluralities compared directly. Rather, it is individuals (readers) that are compared, the parameter of comparison being the number of Shakespeare plays each has

read. I hypothesize that this sort of comparison does not stand in the same relationship to our approximate numerical capabilities as the previous one. Put differently, there is no stereotypical case of a comparison of this nature, and as such no potential for pragmatic strengthening. The interpretation thus remains that provided by the semantics.

The main point of this section is that the 'tolerant' interpretation of majority *most* can be given a pragmatic account, one that aligns it to other instances of R-based implicature, and which is motivated by insights into how numerosity is mentally represented. I have proposed one possible explanation for the absence of similar strengthening for relative *most*. This pattern would certainly benefit from more in-depth exploration, and here experimental work on speaker's interpretation of the various *most*'s could be useful. Provisionally, however, I conclude that the particular interpretative properties of majority *most* discussed here can be accommodated within the unified account.

7 Conclusions

Most occurs in a variety of contexts that have traditionally been analyzed separately. I have shown here that despite their surface differences, the various *most*'s share a common core meaning. A unified semantic analysis has been developed by drawing on two proposals which are independently motivated: i) the decomposition of *most* into *many* or *much* plus the superlative morpheme *-est*; ii) the analysis of *many/much* themselves as semantically inert degree operators. In closing, let me mention two possible extensions of the present analysis. The first involves the use of *most(ly)* as an adverbial element (e.g. *'the paper is mostly finished'*, *'the circle is mostly red'*), which shares with the cases discussed here an element of superlative meaning. The second is the previously discussed usage of other superlatives to express the maximum in a range (e.g. *'30 at the oldest'*). I leave these as topics for the future.

References

Barwise, John & Robin Cooper. 1981. Generalized quantifiers and natural language. *Linguistics and Philosophy* 4. 158–219.

Bošković, Željko & Jon Gajewski. 2008. Semantic correlates of the NP/DP parameter. In *Proceedings of the 39th Meeting of the North East Linguistic Society (NELS39)*, Ithaca, NY.

Bresnan, Joan. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4. 275–343.

Dehaene, Stanislas. 1997. *The number sense: How the mind creates mathematics*. Oxford: Oxford University Press.

Geurts, Bart & Rick Nouwen. 2007. *At least* et al.: The semantics of scalar modifiers. *Language* 83. 533–559.

Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: *Most* versus *more than half*. *Natural Language Semantics* 17. 63–98.

Heim, Irene. 1999. Notes on superlatives. Unpublished manuscript.

Horn, Laurence R. 1984. Toward a new taxonomy for pragmatic inference: Q-based and R-based implicature. In Deborah Shiffrin (ed.), *Meaning, form and use in context: Linguistic applications*, 11–89. Washington, D.C.: Georgetown University Press.

Krifka, Manfred. 1999. At least some determiners aren't determiners. In Ken Turner (ed.), *The semantics/pragmatics interface from different points of view*, 257–291. Oxford: Elsevier.

Krifka, Manfred. 2007. More on the difference between *more than two* and *at least three*. Paper presented at University of California, Santa Cruz.

Nouwen, Rick. 2010. Two kinds of modified numerals. *Semantics and Pragmatics* 3(3). 1–41.

Penka, Doris. 2010. A superlative analysis of superlative scalar modifiers. Paper presented at *Sinn und Bedeutung 15*.

Pietroski, Paul, Jeffrey Lidz, Tim Hunter & Justin Halberda. 2009. The meaning of 'most': semantics, numerosity and psychology. *Mind and Language* 24(5). 554–585.

van Rooij, Robert. 2011. Implicit versus explicit comparatives. In Paul Égré & Nathan Klinedinst (eds.), *Vagueness and language use*, New York: Palgrave Macmillan.

Schwarzschild, Roger. 2006. The role of dimensions in the syntax of noun phrases. *Syntax* 9. 67–110.

Solt, Stephanie. 2009. *The semantics of adjectives of quantity*: City University of New York Ph.D. dissertation.

Solt, Stephanie. 2010. *Much* support and *more*. *Amsterdam Colloquium 2009 (LNAI 6042)* 446–455.

Solt, Stephanie. 2011. On measurement and quantification: the case of *most* and *more than half*. Unpublished manuscript.

Yabushita, Katsuhiko. 1999. The unified semantics of *mosts*. In Sonya Bird, Andrew Carnie, Jason D. Haugen & Peter Norquest (eds.), *WCCFL 18: Proceedings of the West Coast Conference on Formal Linguistics*, Cascadilla Press.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 581–595. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Psycholinguistic Evidence for Presuppositions: On-line and Off-line Data

S. Tiemann, M. Schmid, N. Bade, B. Rolke, I. Hertrich, H. Ackermann,
J. Knapp, S. Beck

Abstract. This paper presents three self-paced reading studies on the processing of presuppositions. In these studies, we investigated the predictions a classical theory of presuppositions would make for the cognitive processing of presuppositions. This concerns mainly the triggering of presuppositions, their verification in a given context and their accommodation in cases where they are not supported by the context. Our studies revealed not only that presuppositions are evaluated on-line, but also that the classical theory of presuppositions makes solid predictions about their processing.

1 Motivation

For decades, presuppositions (PSPs) have been a vital topic in the semantic and pragmatic literature (see Beaver & Geurts (to appear) and the literature discussed therein). Up to the present, however, very basic issues surrounding the notion of PSP have not yet been resolved. They primarily concern the linguistic source of PSPs ("triggering problem") and their behaviour in compound sentences ("projection problem"). It seems fair to say that there is as yet no agreement on what the right theory of PSP is. In recent years, a venue of PSP theory has developed which involves empirical studies, using psycholinguistic methods. These efforts seek to understand PSPs via the way they are processed and evaluated by speakers (e.g. Schwarz 2007, Chemla 2009, Chemla & Bott 2010). Most of these studies deal with very elaborate questions concerning PSPs such as projection in quantified sentences or local versus global accommodation. The goal of our three studies is to go to the very core of PSP processing. This means that we first want to clarify basic questions such as whether it is possible to capture the processing of PSPs at all. Schwarz's (2007) findings suggest that the processing of PSPs can be made visible within a self-paced reading paradigm. We therefore set up our three experiments to be self-paced reading studies as well, albeit with more basic questions such as 'When are PSPs triggered?' (trigger study), 'When are PSPs validated within a context?' (verification study), and 'When does accommodation take place?' (accommodation study). In this paper, we present the predictions that a classical theory of PSPs makes about their

processing and report the results from three studies that were conducted to test these predictions.

2 Theoretical Background

In the following subsections, we will lay out what we call a classical theory of PSPs (cf. Heim 1990, Stalnaker 1973, Heim & Kratzer 1998), and the predictions this theory makes for sentence processing.

2.1 Classical Theory of Presuppositions

PSPs are restrictions on appropriate contexts. This means that (1) is only felicitous in a context that entails that Sue is a linguist.

(1) Pete knows that Sue is a linguist.

It is generally assumed that the PSP is encoded in the lexical entry of the PSP trigger. Therefore the definition of the PSP trigger *know* in (2) entails that the truth value of a sentence containing the trigger may be undefined in a world.

(2) [[know]] = λw. λp. λx: p(w) = 1. x believes p in w

The compositional outcome of our example in (1) in the notation of Heim & Kratzer (1998) would then be:

(3) λw: Sue is a linguist in w. Pete believes that Sue is a linguist in w

This means that the PSP as definedness condition is inherited by the whole sentence. As mentioned before, (1) can only be uttered felicitously in a context which entails that Susan is a linguist. (4) states this restriction more precisely where c is Stalnaker's context set. This is the set which contains all "possible worlds where all the propositions that are the background assumptions of speakers are true" (Stalnaker 1973: 450).

(4) $c \subseteq \{w: \text{Susan is a linguist in } w\}$

A sentence S can only be added to c if c entails the PSP of S, more formally:

(5) S is only felicitous in c if for all $w \in c$: [[S]] (w) is defined

This explains how a PSP as undefinedness (the output of semantic computation) is mapped to appropriateness in a context. Von Fintel (2003) calls (5) Stalnaker's Bridge. For our example in (1) this means that it can be added to a context only if the context establishes the PSP (that Sue is a linguist). If so, it gets updated with the proposition that Pete believes that Sue is a linguist.

(6) λc: c ⊆{w: Sue is a linguist in w}.c∩{w':believe(w')(λw.Sue is a linguist in w)(Pete)}

2.2 Predictions

With the classical theory as a starting point, we can derive three predictions with respect to the processing of PSPs. In a sentence like (7) we identified three key areas where we expect semantic peculiarities which should be reflected in the processing.

(7) Pete *knows* that Sue is a **linguist**, while Kim's job is unknown.

The first area of interest is the trigger itself (here: *know*). Because the PSP that is semantically encoded in the trigger alerts the reader that she will have to look back at the preceding context, we would expect higher processing costs for a trigger in contrast to a word which does not trigger a PSP, e.g. *believe*. This should then be reflected in longer reading times on the trigger when compared with a non-trigger. We investigated this prediction in our trigger study.

The second area where the theory leads us to expect an effect is the critical word (here: *linguist*). This is the point at which it is known what the content of the PSP is. Thus, a verification process with the context should be started. Our hypothesis is that the explicit falsification of a PSP in the context causes higher processing costs at this point than the explicit verification. Therefore we expect longer reading times on the critical word in a context where the PSP of the sentence (that Sue is a linguist) is falsified than in a context where this PSP is verified. Our verification study aims at exploring this prediction.

The last interesting area is the sentence continuation (everything from the critical word onwards). This is so, because in the case when a PSP is neither falsified nor verified in the context, accommodation should kick in (Lewis 1979). In order to make sense of the sentence, the addressee will update the context with the information conveyed by the PSP. The expectation would thus be that this part of a presuppositional sentence should be harder to process when its PSP is neither verified nor falsified by the context (we will call this kind of context a *neutral context*). In our accommodation study, we investigate whether the continuation of a presuppositional sentence in a neutral context evokes longer reading times than in a falsifying or verifying context.

3 Studies

The following section reports three studies which test the predictions of the classical theory. Since we expected different triggers to behave differently (cf. Abusch 2009), we selected a range of different triggers from the literature (iterative: *wieder* (again), definite NP: *sein/e/s* (his), additive particle: *auch* (too), aspectual verb: *aufhören* (to stop), factive verb: *wissen* (to know)). These triggers were the same throughout all the experiments.

3.1 General Procedure

Participants were seated comfortably in a sound-attenuated room. The stimulus material was presented on a computer screen in white on a blue background. First, participants read a global context which introduced the acting people in the test material. Then the trials were presented. A trial began with the presentation of a warning signal followed by a context sentence, which was depicted as a complete sentence in the middle of the computer screen. After participants had read the context sentence, they pressed a button to request the test sentence. The test sentence was presented word-by-word in a self-paced manner, i.e., the participants demanded each word by a button press. Reading time was measured on-line. After reading the test sentence, participants rated the acceptability of the test sentence within the given context on a four-point scale. This scale ranged from very bad (1) to very good (4). Before each experimental session, participants worked on practice trials to get familiar with the experimental procedure. At the end of each session, they answered yes/no questions. These comprehension questions were included to ensure that participants processed the sentences attentively at a semantic level.

3.2 Trigger Study

3.2.1 Methods and Material

Thirty native speakers of German (24 women; mean age = 21.9; age range = 19-29) participated in this experiment. Most of them were students from the University of Tübingen. They had normal or corrected to normal vision. They were paid 20 Euros or got course credit for participation.

Sixty sets of experimental sentences were constructed. Each set consisted of a context sentence and three test sentences. The context sentence served as neutral context (8). The test sentences contained either a PSP trigger (9), a neutral word at the same position as the trigger which makes the sentence se-mantically acceptable (10), or a word at the same position that makes the sentence semantically unacceptable (11).

(8) Tina ist mit einer guten Freundin shoppen.
Tina is with a good friend shopping.
'Tina is shopping with a good friend.'

(9) Sie kauft wieder rote Handschuhe.
She buys again red gloves.
'She buys red gloves again.'

(10) Sie kauft heute rote Handschuhe.
She buys today red gloves.
'She buys red gloves today.'

(11) *Sie kauft freundlich rote Handschuhe.
She buys friendly red gloves.
'She buys red gloves friendly.'

We created twelve experimental sentence sets for each of our 5 PSP triggers (resulsting in a total of 60 sets). The stimulus material was randomly divided into three parts. The three test sentences of one experimental sentence set were presented in different sessions on different days. The order of presentation was balanced according to a balanced latin square. This was done to make the design and conditions non-obvious to the participants. To avoid response strategies and to mask the purpose of the study, thirty filler sentence sets were constructed. The filler sentence sets were designed similarly to the experimental sentence set concerning their acceptability, but did not include PSP triggers. They were randomly intermixed in the experimental sessions. At the end of one session, twenty out of sixty yes/no comprehension questions (e.g. "Did Tina buy blue gloves?") were presented.

The design included the factors SENTENCE CONDITION (PSP, acceptable, unacceptable) and TYPE OF TRIGGER (*wieder, auch,* definite NP*, aufhören, wissen*). Besides the off-line measures of the acceptability, the reading time of the word before the trigger (trigger -1), the trigger itself, the word following the trigger (trigger + 1) and the final word of a sentences as well as the reading time of the whole sentence (total, mean of all words within a sentence) was measured as on-line data and calculated per letter as dependent variable. The statistical analyses were carried out by analyses of variance (ANOVA). To investigate specific differences between conditions, contrast analyses were performed.

3.2.2 Results

For the acceptability judgments we focused on the influences by the CONTEXT/ SENTENCE CONDITION and TYPE OF TRIGGER, as well as on the in-

teraction of the two factors. For the reading times we report only the influence of CONTEXT/ SENTENCE CONDITION.

Off-line Data

The statistical analysis revealed that the factor SENTENCE CONDITION influenced the acceptability judgements (F (2, 58) = 574.69, p < .01). The contrastive analysis showed that all context conditions differed from each other (p < .01) in the way that acceptable sentences were judged best, followed by the sentences with a PSP trigger, and the unacceptable sentences (see Figure 1 left side). TYPE OF TRIGGER additionally influenced acceptability judgments (F (4, 116) = 51.76, p < .01). There was also an interaction between SENTENCE CONDITION and TYPE OF TRIGGER (F (8, 232) = 23.86, p < .01).

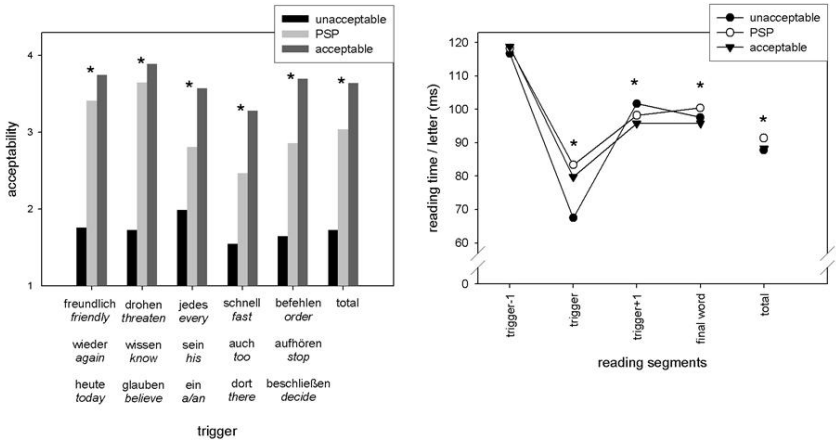


Figure 1. Left side: Mean Acceptability values for target sentences. Right side: Reading times for the words of interest. The asterisk marks significant differences between sentence conditions.

On-line Data

Reading times for the words of interest are presented in Figure 1 (right side). There was no effect of SENTENCE CONDITION for the word before the trigger (F (2, 58) = 1.38, p > .25). Importantly, however, reading times differed depending on SENTENCE CONDITION for the PSP trigger (F (2, 58) = 179.62, p < .01). The longest reading times were needed for the PSP trigger, less long reading times for the word of the acceptable condition and the least long reading times for the word of the unacceptable condition (all ps < .01). SENTENCE CONDITION evoked a further effect on the word following the

trigger (F (2, 58) = 12.74, $p < .01$). The reading times were longest for the words of the unacceptable sentence condition, less long for the words of the sentences with a PSP and least long for the words of the acceptable sentence condition (all $ps < .05$). An effect of SENTENCE CONDITION was also observed on the final word (F (2, 58) = 3.82, $p < .05$). Longer reading times were needed for the words of the PSP condition compared to the words of the acceptable conditions ($p < .05$). The reading time of the unacceptable condition did not differ from the others (all $ps > .09$). The reading times for the whole sentence also differed depending on SENTENCE CONDITION (F (2, 58) = 21.52, $p < .01$). They were longer for sentences containing a PSP compared to the other conditions ($p < .01$), but the other two conditions did not differ ($p > .33$).

3.3 Verification Study

3.3.1 Methods and Material

Twenty-five native speakers of German (18 women; mean age = 24.68; age range = 19-67) participated in the second experiment. Most of them were students from the University of Tübingen. They had normal or corrected to normal vision. They were paid 16 Euros or got course credit for participation. The data of one participant had to be excluded from the analysis because he did not reach 75% correctness for the comprehension questions.

In this study we constructed two different context sentences. Each context sentence (12, 13) was paired with two test sentences (A, B) in such a way that the content of the test sentence's PSP was verified (12A, 13B) or falsified (12B, 13A) by the context. If the content of the PSP of a test sentence was verified by one context sentence, it was falsified by the other context sentence and vice versa. This design allows the comparison of the same test sentences under a verified and a falsified PSP. Altogether, sixty sets of experimental sentences (twelve sets for each trigger type) were created.

(12) Susanne hat dieses Jahr bereits rote Handschuhe gekauft.
Susanne had this year already red gloves bought.
'Susanne had already bought red gloves this year.'

A Heute hat Susanne wieder rote Handschuhe gekauft und sie gleich angezogen.
Today has Susanne again red gloves bought and them immediately put on.
'Today, Susanne bought red gloves again and put them on right away.'

B Heute hat Susanne wieder keine roten Handschuhe gekauft
Today has Susanne again no red gloves bought

und ärgert sich.
and is very upset
'Today, Susanne didn't buy red gloves again and is very upset.'

(13) Susanne hat bisher nie rote Handschuhe gekauft.
Susanne had until now never red gloves bought
'Susanne had never bought red gloves until now.'
B Heute hat Susanne wieder keine roten Handschuhe gekauft
Today has Susanne again no red gloves bought
und ärgert sich.
and is very upset
'Today, Susanne didn't buy red gloves again and is very upset.'
A Heute hat Susanne wieder rote Handschuhe gekauft und
Today has Susanne again red gloves bought and
sie gleich angezogen.
them right away put on
'Today, Susanne bought red gloves again and put them on right away.'

To avoid repetitions of sentences of the same set, the stimulus material was divided into four sessions. Each possible pair of a context and a test sentence was presented in a different session. Participants completed each session on a different day.

The experiment included the factors CONTEXT CONDITION (PSP verifying context vs. PSP falsifying context) and TYPE OF TRIGGER. Acceptability judgments and reading times (per letter) of single words were collected analogous to Study 1. We expanded the analysis to one additional word, the so-called critical word. This is the word on which the content of a PSP is known to be verified or falsified by the context. In the above mentioned example it is the verb *bought*.

3.3.2 Results

Off-line Data

CONTEXT CONDITION influenced the acceptability judgments (F (1, 23) = 484.53, $p < .01$) in that sentences in a PSP verifying context were judged better than sentences in a PSP falsifying context. The factor TYPE OF TRIGGER additionally influenced acceptability judgments (F (4, 92) = 213.40, $p < .01$) and there was also an interaction between CONTEXT CONDITION and TYPE OF TRIGGER (F (4, 92) = 91.79, $p < .01$). Acceptability judgments are presented in Figure 2 (left side).

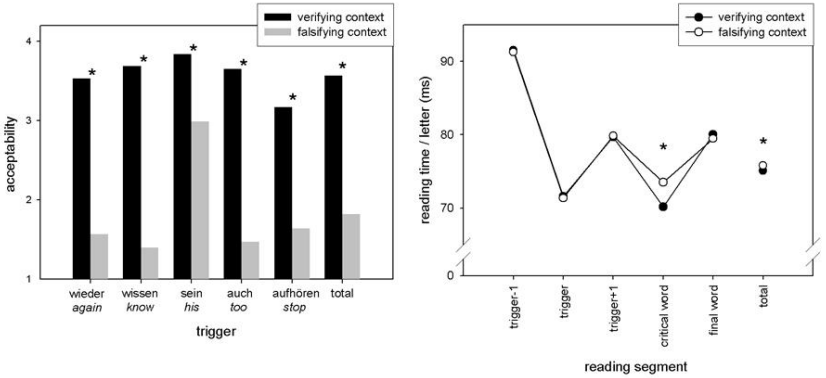


Figure 2. Left side: Mean Acceptability values for target sentences. Right side: Reading times for the words of interest. The asterisk marks significant differences between sentence conditions.

On-line Data

Reading times for the words of interest are presented in Figure 2 (right side). There were no effects of CONTEXT CONDITION on reading times for trigger –1, trigger, trigger + 1, and the final word (all *ps* > .59). Most importantly, however, reading times differed depending on CONTEXT CONDITION on the critical word (F (1, 23) = 12.66, $p < .01$). Longer reading times were needed for the falsifying context condition compared to the verifying context condition. This effect propagates to the whole sentence as longer reading times were needed for the falsifying context condition than for the verifying context condition (F (1, 23) = 4.87, $p < .05$).

3.4 Accommodation Study

3.4.1 Methods and Material

Thirty native speakers of German (21 women; mean age = 25.33; age range = 19-38) participated in the third experiment. Most of them were students from the University of Tübingen. They had normal or corrected to normal vision. They were paid 15 Euros or got course credit for participation.

Sixty sets of experimental sentences were created. One set consisted of three different context sentences (14, 15, and 16) and one test sentence (17) that contained a PSP. Each context sentence of a given set was presented with the test sentence. The context sentence verified the content of the PSP of the test sentence (14), falsified the PSP's content (15), or was neutral with respect to the PSP (16). Hence there were three different context conditions.

This design again allows the comparison of the same sentence in different experimental conditions. The stimulus material was presented in three sessions, where each context sentence of an experimental sentence set was presented in a different session. Participants worked on the sessions on different days and the order of sessions was balanced across participants.

(14) Susanne hat bereits rote Handschuhe gekauft.
Susanne had already red gloves bought.
'Susanne had bought red gloves before.'

(15) Susanne hat bisher nie rote Handschuhe gekauft.
Susanne had until now never red gloves bought.
'Susanne had never bought red gloves until now.'

(16) Inge hat bisher nie rote Handschuhe gekauft.
Inge had until now never red gloves bought.
'Inge had never bought red gloves until now.'

(17) Heute hat Susanne wieder rote Handschuhe gekauft und sie
Today has Susanne again red gloves bought and them
gleich angezogen.
immediately put on
'Today, Susanne bought red gloves again and put them on right away.'

Analogous to Experiment 1 and Experiment 2, thirty filler sentence sets were designed in parallel to the experimental sentence sets but without a PSP. At the end of each session, twenty out of sixty yes/no comprehension questions were presented.

The experiment included the factors CONTEXT CONDITION (PSP verifying context, PSP falsifying context, PSP neutral context) and TYPE OF TRIGGER. The same words that were investigated in the second experiment were also investigated in the third experiment.

3.4.2 Results

Off-line Data

As in the previous Studies, the factor CONTEXT CONDITION influenced the acceptability judgements (F (2, 46) = 377.20, p < .01). The contrastive analysis showed that all context conditions differed from each other significantly (all ps < .01) in that sentences with a verifying context were judged best, followed by the sentences with a neutral context, and the sentences with a falsifying context (see Figure 3 left side). TYPE OF TRIGGER additionally influenced acceptability judgments (F (4, 92) = 35.30, p < .01).

An interaction between CONTEXT CONDITION and TYPE OF TRIGGER was observed (F (8, 184) = 61.41, p < .01).

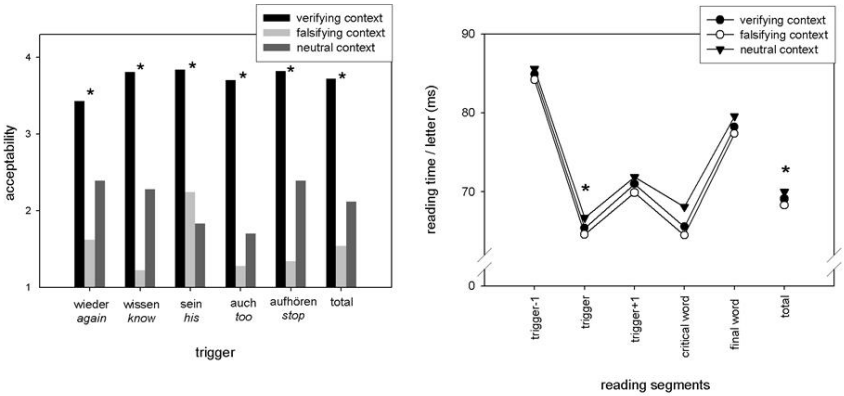


Figure 3. Left side: Mean Acceptability values for target sentences. Right side: Reading times for the words of interest. The asterisk marks significant differences between sentence conditions.

On-line Data

Reading times for the words of interest are presented in Figure 3 (right side). There were no meaningful significant effects of CONTEXT CONDITION on reading times for trigger – 1, trigger + 1, the critical word, and the final word (all *ps* > .07). Reading times differed depending on CONTEXT CONDITION for the PSP trigger (F (2, 46) = 3.96, p < .01). Longer reading times were needed in the neutral context condition compared to the falsifying context condition (p < .01). The reading time of the verifying context condition did not differ from the others (all *ps* > .08). A similar pattern was present in reading times for the whole sentence (F (2, 46) = 3.68, p < .01). Reading times were longer in the neutral condition than in the falsifying condition (p < .01), but the reading times of the verifying context condition did not differ from the others (all *ps* > .15). A theoretical interesting trend of CONTEXT CONDITION on reading times on the critical word was observed (F (2, 46) = 2.83, p < .08).

4 Discussion

Off-line Data

The off-line data of the trigger study and the accommodation study provide further interesting results for the theory of PSP triggers. In both experiments, *auch* (too) and *sein* (his) got the lowest acceptability ratings in neutral con-

texts. The result for *auch* is not very surprising since the additive particle is commonly regarded as a "hard-core" trigger (Kadmon 2001: 207) whose PSP is very hard to accommodate. The appearance of *auch* is thus highly inappropriate in a context which does not entail its PSP. It is however interesting that the definite NP patterns with *auch* in this respect. The definite article is commonly seen as a soft trigger which does not impose a lot of difficulties when uttered in a context which does not entail the PSP of the sentence. In fact, Spenander (2002) found in a corpus study that 58% of the definite determiners in spoken language are used in a context which does not provide a salient referent. Yet, the acceptability rates of the two experiments show us that the use of the definite determiner in a neutral context does not go through as smoothly as expected. A theoretical discussion of these results would go beyond the scope of this paper, but it becomes apparent that the class of PSP triggers is not as homogenous commonly assumed. This has already been discussed in Abusch (2009) and should receive further attention in future theoretical considerations.

Surprising are the relatively good acceptance rates for the definite determiner in supposedly falsifying contexts in the verification and the accommodation study. It has to be noted that in 50% of the falsifying contexts, we tried to explicitly falsify the uniqueness condition of the definite determiner (e.g. "Fritz has two dogs. Susanne fed his dog."). Bade (2010) concludes that these results suggest "that the uniqueness condition for singular definite descriptions is not a very strong one". They thus support Heim (1983) in denying Russell (1905) and claiming that definites "presuppose existence but not uniqueness" (Heim 1983: 233).

On-line Data

The hypotheses we started out with on the basis of the classical theory of PSPs are repeated below and on the next page.

I. **Trigger:** Needs more attention because it alerts the reader that she will have to look back at the preceding context
⇒longer reading time of a trigger vs. a neutral word

II. **Critical Word:** It is known what the content of the PSP is. A verification process is started immediately.
⇒longer reading time when verification fails vs. succeeds

III. **Continuation:** Accommodation in case the PSP is neither verified nor falsified in the context

⇒longer reading time in neutral contexts vs.
verifying/falsifying contexts

The trigger study provides supporting evidence for prediction I. The results of this experiment revealed that words which trigger a PSP evoked significantly longer reading times than words which do not trigger a PSP. A cautionary remark: It is obvious that we have to deal with the fact that we are talking about three different words here. We tried to match them in frequency using the CELEX database (Baayen, Piepenbrock, & van Rijn 1993) and length, but this was not always possible. However, the effect we find on this word cannot be due to a frequency effect, which would predict that more frequent words are read faster, since the PSP trigger was always the most frequent word (M = 1334.10 in 6 million), the word in the acceptable condition was the second most frequent word (M = 379.31 in 6 million), and the word in the unacceptable condition the least frequent word (M = 85.98 in 6 million). A further interesting effect emerges after the word of interest. In the semantically unacceptable condition, reading times increase after the word of interest but decrease relatively quickly after that. In the PSP condition however, reading times are significantly longer compared to the control condition with the semantically acceptable word throughout. In other words, whilst the semantically unacceptable condition imposes processing difficulties for a rather short time span, the PSP condition is more difficult to process once the PSP trigger is known. This is also reflected in the reading times on the whole sentence where only the PSP condition differs significantly from the other two conditions. Since the sentences with a PSP were presented in a context which was neutral with respect to the content of the PSP, the processing difficulties can be assumed to reflect the cost that arises when the reader tries to incorporate the content of the PSP in the context. That is when the reader goes through the process of accommodation. This observation is supported by the results of the accommodation study.

In the verification study, we saw that a sentence carrying a PSP in a falsifying context needs longer to read on the critical word than in a verifying context. This study provides us thus with supporting evidence for the second prediction. Our hypothesis about this region of the sentence is that at this point, Stalnaker's Bridge applies and it becomes evident that a sentence is used inappropriately in the case where the PSP is explicitly falsified by the context. This conflict between the PSP of the sentence and the context is mirrored in the longer reading times on the critical word in the falsifying condition. The verification study reveals that PSP justification is checked as soon as the reader encounters the critical word.

The accommodation study shows that sentences carrying a PSP in a neutral context take longer to read on the critical word than the same sentence within a context which explicitly falsifies or verifies the content of the presupposition. This is to be expected from the theory, because at some point, the processor will start to search the context set for the relevant information. In the verifying context, the information is readily available. In the falsifying context, the PSP is established to be false. In the neutral context, however, the relevant information cannot be found in the context but it is also not explicitly not there. In order to make sense of the sentence, an accommodation process should be started. The fact that there is a trend on the critical word strongly suggests that this process happens immediately. Especially in the light of the trigger study, where a sentence carrying a PSP in a neutral context needed significantly longer to read than a sentence which did not trigger a PSP at all, we are very optimistic that further studies will provide us with more solid evidence for the third prediction.

5 Conclusion and Outlook

In accordance with Schwarz's (2007) findings, the results of the three conducted studies strongly suggest that the processing of PSPs can be captured in psycholinguistic experiments. We have seen that PSP processing happens on-line. As a next step, we plan to stabilize the results with follow-up studies. These will be further reading time experiments as well as ERP experiments. Once we get to the core of how PSPs are triggered (trigger study), validated within a context (verification study), and accommodated (accommodation study), we will eventually be able to tackle more controversial theoretical questions such as the projection problem or the differences between PSPs and implicatures.

References

Abusch, Dorit. 2002. Lexical alternatives as a source of pragmatic presupposition. In B. Jackson (ed.), *Proceedings of SALT XII*. CLC Publications: Ithaca NY.

Baayen, R. Harald, Richard Piepenbrock & Hedderik van Rijn. 1993. *The CELEX lexical database* [CD-ROM]. Philadelphia, PA: Linguistic Data Consortium, University of Pennsylvania [Distributor].

Bade, Nadine. 2010. *How are presuppositions triggered? Evidence from presupposition processing.* MA Thesis. Tübingen.

Beaver, David & Bart Geurts. 2011. Presupposition. In E. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*.

Chemla, Emmanuel. 2009. Presuppositions of quantified sentences: Experimental data. *Natural Language Semantics* 17. 299–340.

Chemla, Emmanuel & Lewis Bott. 2010. Processing presuppositions: Dynamic semantics vs. pragmatic enrichment. Ms. IJN, LSCP, Cardiff University.

von Fintel, Kai. 2003. *Pragmatics: Notes on presupposition.* MIT, MA.

Geurts, Bart & Rob van der Sandt. 1991. Presupposition, anaphora and lexical content. Text Understanding in LILOG, Integrating Computational Linguistics and Artificial Intelligence, Final Report on the IBM Germany LILOG-Project. 259–296.

Heim, Irene. 1983. On the projection problem for presuppositions. In D. Flickinger et al. (eds.), *Proceedings of the Second West Coast Conference on Formal Linguistics*. 114–125.

Heim, Irene. 1990. Presupposition projection. In R. van der Sandt (ed.), *Reader for the Nijmegen Workshop on Presupposition, Lexical Meaning, and Discourse Processes*. University of Nijmegen.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar.* Oxford University Press.

Kadmon, Nirit. 2001. *Formal pragmatics*. Blackwell: Oxford.

Karttunen, Lauri. 1974. Presupposition and linguistic context. *Theoretical Linguistics* 1. 181–194.

Lewis, David. 1979. Scorekeeping in a language game. In R. Bauerle, V. Egli, and A. von Stechow (eds.), *Semantics from Different Points of View*. Berlin: Springer Verlag.

Russell, Bertrand. 1905. On denoting. *Mind, New Series* 14. 479–493.

van der Sandt, Rob. 1992. Presupposition projection as anaphora resolution. *Journal of Semantics* 9. 333–377.

Schwarz, Florian. 2007. Processing presupposed content. *Journal of Semantics* 24. 373–416.

Stalnaker, Robert. 1973. Presuppositions. *Journal of Philosophical Logic* 2. 447–457.

Spenader, Jennifer. 2002. *Presuppositions in spoken discourse.* Doctoral Dissertation, Computational Linguistics, Stockholm University.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 597–612. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Verification Strategies for Two Majority Quantifiers in Polish[*]

Barbara Tomaszewicz
University of Southern California
barbara.tomaszewicz@usc.edu

Abstract. We provide experimental evidence suggesting that the logical structure of linguistic expressions can directly influence aspects of non-linguistic cognition. Specifically, we show that quantifier semantics provides a set of instructions to visual verification processes. Each of the two Polish majority quantifiers *większość* and *najwięcej* biases a distinct verification strategy that is used as a default under time pressure. Each canonical verification strategy overrides other alternative strategies for truth verification as proposed in Lidz et al. (2009).

1 Introduction

Lidz et al. (2009) propose that the lexical semantics of natural language quantifiers is transparently associated with canonical procedures for the verification of the truth/falsity of sentences in which they appear. In particular, Lidz et al. (2009) and Pietroski et al. (2008) provide experimental evidence that when processing the proportional quantifier *most* in the context of a visually presented scene, English speakers are biased towards using a certain verification strategy rather than an alternative. This is taken to be evidence in favor of a particular semantic representation of *most*, which in turn provides a direct set of instructions to the visual system that can override other cognitively available verification strategies.

We provide further experimental evidence that quantifier semantics is transparently associated with a canonical verification strategy. We tested the processing of two majority quantifiers in Polish in a task similar to that of Lidz et al. The proportional *większość* has the semantics of English *most,*

[*] I would especially like to thank Roumi Pancheva and Elsi Kaiser, as well as Barry Schein and Toby Mintz, for their invaluable comments and/or help with the experiments. Thanks are also due to Hagit Borer, Jeff Lidz, Victor Ferreira, Jon Gajewski, Robin Clark, Tom Buscher, Katy McKinney-Bock, Mary Byram, Ed Holsinger, Krzysztof Migdalski, Dorota Klimek-Jankowska, Grzegorz Jakubiszyn, Ewa Tomaszewicz, Marcin Suszczyński and the students of IFA at Wrocław University and WSF Wrocław. My work was partially supported by an *Advancing Scholarship in the Humanities Grant* from USC to R. Pancheva.

while the relative *najwięcej* has the meaning of 'the largest subset'. We obtained three notable results. First, the proportional *większość* is associated with the same pattern of accuracy as English *most*, directly replicating the findings of Lidz et al. for Polish. Second, the relative *najwięcej* is verified by a distinct strategy directly related to its semantics. Third and most important, each strategy is canonically followed during the processing of the respective quantifier. In principle, given that both strategies are easily available to speakers of Polish, when participants judge a scene, where either would yield the correct truth value, they could switch to the more efficient strategy. This is, however, not what happens: participants always perform in accordance with the strategy associated with the quantifier in the stimulus sentence.

Our findings illustrate that two closely related quantifiers can be associated with distinct verification procedures, in line with their lexical semantics, and that each procedure is used consistently as an instruction to the visual system. The conclusion is that the logical structure of linguistic expressions can directly influence aspects of non-linguistic cognition.

2 Background Research Question

Lidz et al. (2009) advance a novel hypothesis that there is more to meaning than just empirical *adequacy* and *compositionality*. There can be several truth-conditionally equivalent compositional specifications of a linguistic expression, but not all of them form equally "good psychological hypotheses" about how the derived truth-conditions are verified.[1]

The proportional quantifier *most* can be specified in at least three truth-conditionally equivalent ways, as shown in (1). Pietroski et al. (2008), Lidz et al. (2009), and Hackl (2009) devised experiments to look "beyond" the truth conditions of (1) to see how the meaning of a sentence containing *most* constrains the way people verify it against a visual scene.

(1) Most of the dots are yellow.
  (a) |Dot(x) & Yellow(x)| > 1/2 |Dot(x)|
  (b) |Dot(x) & Yellow(x)| > |Dot(x) & ~ Yellow(x)|
  (c) OneToOnePlus({Dot(x) & Yellow(x)}, {Dot(x) & ~ Yellow(x)})

The semantic specifications in (a) and (b) both provide instructions to the visual cognition system to estimate the cardinality of the set of yellow dots

[1] Note that judging a sentence to be true/false in a given context involves: (i) compositionally determining what the truth conditions are; and (ii) determining whether these conditions obtain in the context. This means that verification procedures can in principle be independent of the algorithms that produce truth conditions, as discussed in Pietroski et al. (2008).

and to compare it with the cardinality of another set. They differ in what that other set is. (1a) requires that the cardinality of the total set of dots be obtained (and its half calculated). In effect, it calls for an algorithm equivalent to that of *More than half of the dots are yellow*. (1b), on the other hand, is linked to an algorithm for verification that requires an estimate of the cardinality of the non-yellow set (which may employ an estimate of the total but does not need to). The alternative in (1c) does not require an estimate of cardinalities or comparison, but relies on matching the yellow dots with the non-yellow dots. The strategies in (1a-c) are semantically equivalent, but not all of them turn out to be psychologically viable options for the verification of the truth value of sentences containing *most* against visual stimuli of arrays of dots.

Hackl (2009) used a self-paced counting paradigm with rows of dots in two colors to establish that *most* and *more than half* are processed differently. His results exclude (1a) as a representation of the meaning of *most* and, consequently, as a verification strategy associated with *most*, at least as far as explicit counting is involved.[2] Pietroski et al. (2008) further tested the two alternative options in (1b-c) and found that even when the arrangement of dots favored verification by the one-to-one correspondence relation (dots were arranged in pairs, with some yellow dots unpaired with the dots in the other color), the response accuracy patterns did not differ from the condition where the dots were scattered on the screen. No change in accuracy patterns across conditions indicates that (1c) was never used to verify (1).

(1b) can be straightforwardly used to verify (1) when the displayed dots are in two colors only, e.g., yellow and blue, as they were in the experiments of Hackl (2009) and Pietroski et al. (2008). The cardinality of the target yellow set can simply be compared to the cardinality of the blue set, i.e. the non-yellow set in (1b). When the non-yellow set contains dots of multiple colors, obtaining its cardinality requires further computation. Lidz et al. (2009) used multiple colors in their experiment to test whether this computation is based on the components directly expressed in the meaning of (1). Lidz et al. propose that the second argument of the ">" relation in (1b) can be transparently computed by subtraction as stated in (2a) below. Otherwise, the set of all non-yellow dots has to be selected as specified in (2b).

[2] However, the assessment of cardinality does not always require explicit counting but can be obtained by the Approximate Number System (ANS) (Dehaene 1997, Feigenson et al. 2004). Halberda et al. (2008) have shown that children who have not yet learned to count are perfectly able to understand sentences containing *most*.

(2) Two alternative computations of
|Dot(x) & Yellow(x)| > |Dot(x) & ~ Yellow(x)|
(a) Subtraction strategy:
|Dot(x) & Yellow(x)| > |Dot(x)| – |Dot(x) & Yellow(x)|
(b) Selection strategy:
|Dot(x) & Yellow(x)| >
|{Dot(x)&Red(x)}∪{Dot(x)&Blue(x)}∪{Dot(x)&Green(x)}∪…|

Lidz et al. (2009) point out that the Selection procedure in (2b) is not plausible for psychophysical reasons. A heterogeneous set of non-yellow, multi-colored dots that are scattered among yellow dots is not automatically selectable as its specification involves a negation of an early visual feature, the color yellow (Wolfe 1998). The Subtraction procedure in (2a), on the other hand, is based on the psychological evidence from Halberda et al. (2006) that multiple color sets can be enumerated in parallel, but crucially, this is possible only for the total set of dots and two color subsets (i.e. total, target and one color distractor sets), but no more.

Given this psychophysical evidence, Lidz et al. (2009) hypothesize that *most* is verified using the Subtraction strategy in (2a), at least in the general case. The strategy involves the following steps: (i) selecting the superset of all dots and estimating its cardinality; (ii) selecting the set of yellow dots and estimating its cardinality; (iii) subtracting the cardinality of the yellow set from that of the superset to obtain an estimate of the cardinality of the set of non-yellow dots; and (iv) comparing the cardinalities of the sets of yellow and non-yellow dots. Since the selection of the superset and one color subset is done automatically, the Subtraction strategy should always be available, independently of how many color sets there are on the screen. However, on screens with dots in only two colors, Selection becomes a viable strategy as well. Given the findings of Halberda et al., both the yellow set of dots and the distractor color set of e.g., blue dots, are automatically selected and their cardinalities can be directly compared. Moreover, in this special case Subtraction involves more steps than Selection and thus may turn out to be dispreferred (see (3)).

(3) The steps in the computation of Subtraction vs. Selection

Subtraction (irrespective of no. of colors)	**Selection** (two colors)
1. Estimate the **total**.	1. Estimate the **target** set.
2. Estimate the **target** set.	2. Estimate the **distractor** set.
3. **Subtract** the target set from the total.	3. Compare with the target set.
4. Compare the difference with the target set.	

Lidz et al. (2009) presented participants with the sentence *Most of the dots are blue*, and they had to judge it true or false against a visual display of dots in 2 to 5 colors in varying ratios of blue to non-blue dots. The array of dots appeared on the computer screen for 150ms.[3] Lidz et al. predicted that if participants use the Selection strategy they should be successful when there are only two colors on the screen. With higher numbers of colors, their performance should rapidly decline, given that they would need to determine the cardinality of each subset of non-blue dots (e.g. red, green, etc.) and subsequently sum the results. The Subtraction hypothesis, on the other hand, predicts no difference in accuracy between screens with dots in two colors and those with 3-5 colors, because the cardinality of the non-blue set is obtained solely on the basis of the cardinality of the total and the blue sets.

The results of Lidz et al.'s experiment support the Subtraction hypothesis because the participants' performance did not differ in accuracy as a function of the number of colors in the display, but only as a function of the ratio (in adherence to Weber's law). Crucially, on screens with just two colors, the alternative Selection strategy is in principle available to the visual system, and it would even be computationally less costly and more accurate (cf. (3)). Yet, even here Subtraction was used, since the accuracy was not higher on the two color screens. Thus, Lidz et al. conclude that Subtraction is the default procedure for verifying *most* under time pressure. On the basis of this finding they formulate the Interface Transparency Thesis (4):

(4) "A declarative sentence is semantically associated with a canonical procedure for the verification of its truth value that is biased towards those algorithms that directly compute the relations expressed in the meaning." (Lidz et al. 2009: 2)

3 Polish *Most1* and *Most2* Majority Quantifiers

We address the question why Subtraction, as in (2a), is the verification strategy for (1). One reason could be that under time pressure, the Selection strategy (2b) is only possible when there are two color sets, given the findings of Halberda et al. (2006). The Subtraction strategy (2a) is usable under time pressure independently of the number of distractor color sets, and because of

[3] Under time pressure, counting is impossible, as typical rates of overt and covert counting have been reported to be about 240ms per item (Whalen el al. 1999). The ANS is not subject to such speed limitations. It generates an approximate representation of the number of items in a set in adherence to Weber's law: the discriminability of two quantities is a function of their ratio. Numbers can thus be represented as 'noisy magnitudes' for the purposes of basic arithmetic operations like addition and subtraction (Wiese 2003).

this universality it can be adopted as the canonical verification strategy for *most*. On this view, Selection in (2b) is excluded not by the semantics of *most* but by the properties of visual cognition. We show that the Selection procedure is possible under time pressure, with more than two colors if performed step-wise, yet it is used only when directly specified in the meaning.

We extend the predictions of the Interface Transparency Thesis to crosslinguistic data, providing evidence that the Polish counterpart of the English quantifier *most* also comes with a verification strategy defined by Subtraction as in (2a). The result is further – and directly – supported by a control condition with a closely related quantifier, which unambiguously requires a Step-wise Selection strategy defined below.

(5) Step-wise Selection strategy:
|Dot(x) & Yellow(x)| > |Dot(x) & Red(x)|, &
|Dot(x) & Yellow(x)| > |Dot(x) & Blue(x)|, &
|Dot(x) & Yellow(x)| > |Dot(x) & Green(x)|, & …

This control condition in a within-subjects design, where the same group of participants is tested on both items, provides additional evidence for the Interface Transparency Thesis. Comprehenders appear to be biased towards the use of one particular verification strategy that is associated with a given lexical item. They continue to use it even when an alternative strategy, biased by a closely related item, is cognitively available and could even be less computationally costly.

Polish has two majority quantifiers: *większość* (from now on *Most1*) is a counterpart of English *most*, while *najwięcej* (*Most2*), has the meaning of "the largest subset". *Most2* is true when the cardinality of the target set is greater than the cardinality of each of the distractor sets separately; therefore its interpretation necessarily involves multiple selection and comparison with each distractor set. The two quantifiers are closely related morphologically.

(6) The morphology of *Most1* and *Most2*
(a) Most1: *większość*, 'majority'

więk-	*-sz-*	*- ość*
'many/great'	adjectival comparative'-er/more'	nominalizer

(b) *Most2: najwięcej*, 'largest subset / the most'

naj-	*-więc-*	*-ej*
adverbial superlative '-est/most'	'many/great'	adverbial comparat. '-er/more'

(c) *wiel-e / więc-ej / naj-więc-ej*; *wielk-i / więk-szy/ naj-więk-szy*
many more most great greater greatest

3.1 Materials and Methods

We conducted an on-line visual verification task, asking twenty native speakers of Polish to evaluate the truth of (7) and (8) against 200ms displays of arrays of colored dots, manipulating (i) the ratio between the target color set and the (largest) distractor sets and (ii) the number of distractor color sets.

(7) Większość kropek jest żółta.
Most1 dots is yellow
'Most dots are yellow.'

(8) Najwięcej jest kropek żółtych.
Most2 is dots yellow
'Yellow dots are the largest subset.'

Each participant judged 360 displays presented in 2 blocks (180 for each quantifier, half requiring a 'yes' and half a 'no' response). Participants saw the test sentence for 7s, and after each stimulus was flashed for 200ms, they had 3.8s to respond 'yes' or 'no' by a button press. Yellow dots were present on every display, together with 1 (e.g., Fig. 2), 2 or 3 (Fig. 1) other distractor color sets. Ratios of yellow and non-yellow dots were 1:2 (Fig. 2), 2:3 (Fig. 1) or 5:6.[4]

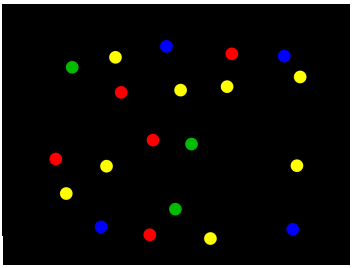
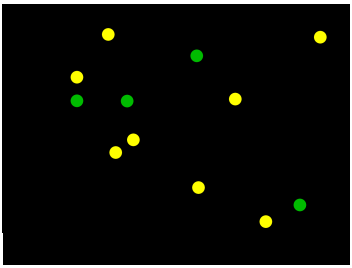
Fig. 1 

Fig. 2 

[4] On the true screens for *Most1* the cardinality of the yellow set was more than half of the total. For *Most2* the yellow set never exceeded the half but was bigger than the largest competitor color set. False screens were costructed analogously. Thus, *Most1* and *Most2* had identical screens only on the two color set condition. If with *Most2* the largest subset was bigger than the half of the total, we would have no way of checking if the participants switched between strategies.

3.2 Predictions

By the Interface Transparency Thesis (4) each quantifier should come with its own verification strategy, which should be used even when the alternative would yield the correct truth value. There is a body of psychological evidence pointing to the fact that the selection of a target by the visual system is affected by the strategy adopted either consciously or unconsciously (Trick 2008). From this perspective, an empirical finding that *Most1* and *Most2* induce selective attention differently would underscore the importance of fine-grained compositional semantics in real-time sentence processing.

Given that Polish *Most1* has exactly the same meaning as English *most*, we predicted that the Polish sentence in (7) should result in the same pattern of accuracy.

The semantics of *Most2* involves Stepwise Selection of each color set and comparison between the target set and each distractor set as defined in (5). Therefore, we expected to find a significant effect of distractor in addition to a significant effect of ratio. The semantic specification of *Most2* suggests that selective attention should discriminate more than two target color sets, but if this is not possible under time pressure, the performance on the screens with more than two colors will greatly decline as hypothesized by Lidz et al. (2009).

Direct comparison of *Most1* and *Most2* on the screens with dots in two colors can have two predicted outcomes. Since both strategies are used by the speakers of Polish, on two color screens participants could use whichever strategy is computationally less costly and more accurate under time pressure. The computation by Selection requires fewer steps than Subtraction when there are dots in two colors only, as shown in (9).

(9) Subtraction procedure and Stepwise Selection procedure

(a) Subtraction (irrespective of no. of colors)	Stepwise Selection	
	(b) multiple colors	(c) two colors
1. Estimate the **total**.	1. Estimate the **target** set.	1. Estimate the **target** set.
2. Estimate the **target** set.	2. Estimate **1st distractor** set.	2. Estimate **1st distractor** set.
3. **Subtract** the target set from the total.	3. Compare with the target set.	3. Compare with the target set.
4. Compare the difference with the target set.	4. Estimate **2nd distractor** set.	
	5. Compare with the target set.	
	6. Estimate **3rd distractor** set.	
	7. Compare with the target set.	
	8. …	

If the semantic representation guides verification, then with *Most2* the non-yellow set should be selected directly and the accuracy should be greater than with *Most1* where the non-yellow set is computed through Subtraction. Alternatively, if the accuracy is the same with both quantifiers on the same screens, it would mean that Subtraction is not used globally for *Most1* and participants are able to switch to the Selection strategy in favorable circumstances. The crucial findings for English *most* were that the OneToOnePlus pairing and the Selection strategy were *never* used. In Polish, however, Stepwise Selection is used for *Most2*, which makes it possible that participants can switch between Subtraction and Selection for the two color screens where the two quantifiers lead to the same truth value. Such a finding would argue against the Interface Transparency Thesis.

If participants are overall successful with *Most2* just as with *Most1* but their performance differs on two color screens, it would suggest that it is not the case that Selection is cognitively 'harder', but that it depends on how selective attention is induced by the specifics of the linguistic input. Such a result would also suggest that canonical verification strategy is directly computable from the relations specified in the semantics of a sentence that is sensitive to sublexical components. Individual morphemes could be taken to contribute not only to the meaning of *Most1* vs. *Most2* but also to the interface with visual cognition.

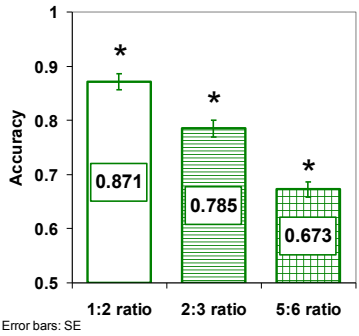
3.3 Results

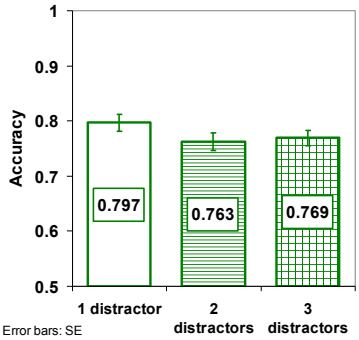
3.3.1 *Most1 (Większość)*

We conducted a 3x3x2 Repeated Measures ANOVA crossing the three levels of ratio and the three levels of number of distractor and truth/falsity of screens (i.e. whether 'yes' or 'no' is the correct answer). Our predictions were met – there was a significant effect of ratio ($F(2, 38) = 76.072$, $p < .001$), but no significant effect of distractor ($F(1.47, 27.98) = 1.637$, $p = .215$) (means can be seen in (10)). There were no significant interactions. The truth/falsity of screens with respect to the test sentence had no effect on the accuracy of participants' judgments, which can be seen in (11).

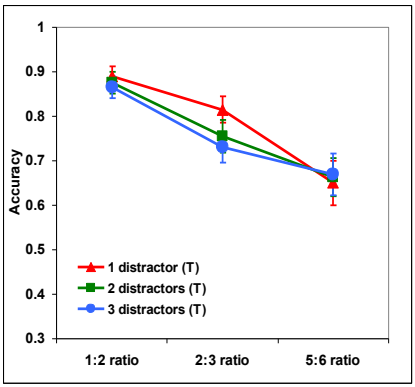
The significant effect of ratio and no significant effect of distractor for *Most1* is the same as the findings for English *most* in Lidz et al. (2009). *Most1* is thus compatible with the Subtraction verification procedure in (2a). The selection of the target and the total is not affected by the number of distractor sets, but only by the ratio between the target set and the distractors.

(10) Accuracy of responses for *Most1*

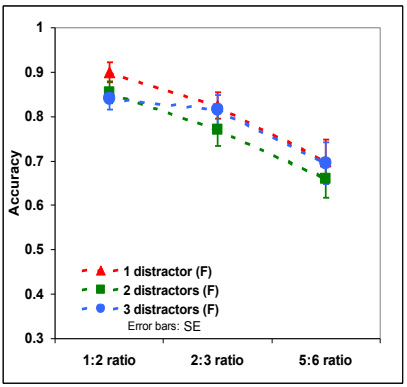




(11) *Most1* on true and false screens



Most1 – true screens only



Most1 – false screens only

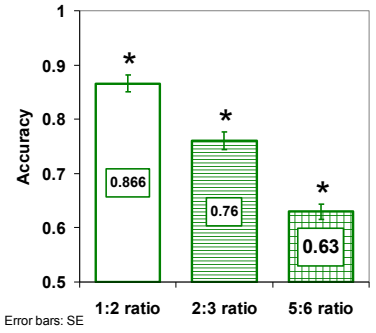
In the experiments of Pietroski et al. (2008) and Lidz et al. (2009), participants showed a bias towards a particular verification strategy for *most*, which resulted in a different pattern of accuracy than if a hypothesized alternative procedure had been used. We provided a control condition where an alternative verification procedure is necessary. We show that Subtraction continues to be used even on those conditions, where Selection can easily be performed and would in fact yield more accurate results.

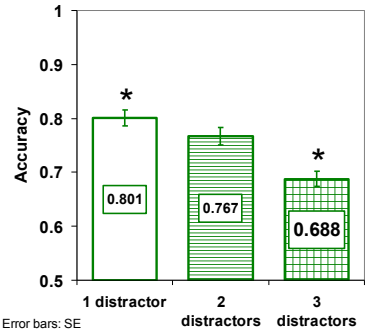
3.3.2 *Most2 (Najwięcej)*

Our predictions were borne out: in addition to the effect of ratio $F(2, 38) = 124.77$, $p < .001$, there was a significant effect of distractor $F(2, 38) = 17.34$,

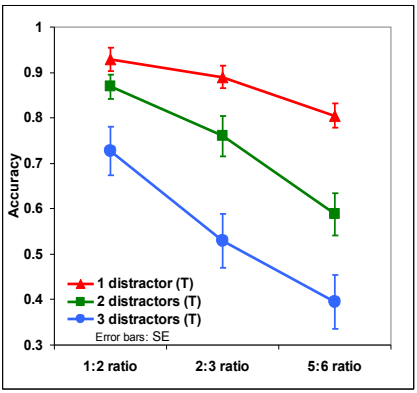
$p < .001$ (mean responses are in (12)). There was also a borderline significant interaction between ratio and distractor $F(4, 76) = 2.48$, $p = .051$.

(12) Accuracy of responses for *Most2*

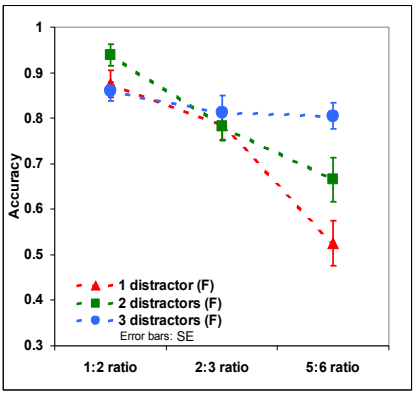




(13) *Most2* on true and false screens



Most2 – true screens only



Most2 – false screens only

The graph in (13) shows a difference in accuracy patterns between true and false screens. There is no significant main effect of truth/falsity of screens (the overall mean for true screens .721, for false .783), so it is not the case that making a false judgment is easier. However, the significant interactions between distractor and truth/falsity, $p < .001$, and between ratio, distractor and truth/falsity, $p < .001$, indicate that participants made judgments

differently for true and false screens depending on the ratio and number of distractor colors.[5]

While accuracy rates with *Most1* were affected only by the ratio, accuracy rates with *Most2* were affected both by ratio and by the number of color sets. These results for *Most1* and *Most2* are consistent with the verification strategies in (2a) and (5), respectively. Since Subtraction (2a) does not depend on the number of distractor color sets, its computational cost remains the same as the number of distractors increases. Stepwise Selection (5), on the other hand, does become more computationally costly as the number of distractors increases.

Thus, *Most1* is not verified by Selection, as defined in (2b), although Selection is a psychologically plausible strategy given its use in (5). It is not psychophysics that forces the Subtraction strategy for *Most1* and English *most*. The instructions for the visual system are obtained directly from the relations expressed in the semantics. With *Most1* attention is never directed towards the individual distractor color sets, as predicted by the Interface Transparency Thesis. Further support for the thesis comes from the comparison of accuracy patterns on the condition when the screens for *Most1* and *Most2* were identical.

3.3.3 *Most2* vs. *Most1* on Two Color Screens

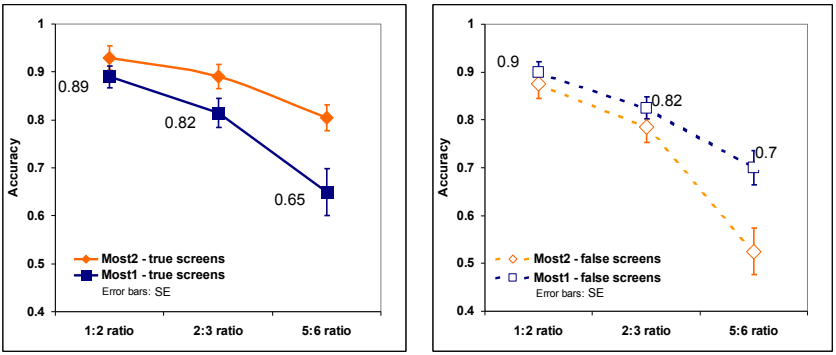
Lidz et al. (2009) argued for English *most* that the fact that accuracy was not greater on the two-color condition means that the information automatically computed by the visual system was not used. Therefore, the reason for the failure to directly select the comparison set must be the semantic representation of the sentence. Our results provide more direct evidence for this conclusion. Our participants behaved differently depending on which quantifier was used, even though the screens they judged were the same and either strategy would provide the correct judgment.

The patterns of accuracy for each quantifier were very different. In both cases the accuracy rates were a function of the ratio, but on true screens participants were significantly more accurate when selecting 'yes' with *Most2*. When selecting 'no' on false screens, they were more accurate with *Most1*.

[5] This is not surprising since the Selection and comparison procedure is different at each step for the confirmation and disconfirmation of (8), i.e. *Yellow dots form the largest subset*. E.g., on a screen with 8 yellow, 10 blue, 7 green, 6 red dots, it is enough to notice that blues form the largest subset to disconfirm (8). With 8 yellow, 7 blue, 6 green, 5 red dots, comparison with each color set is needed to make sure that yellows are the most. What is surprising is the low accuracy with the disconfirmation of (8) on the two color screens. Apparently, judging that (8) is false with 8 yellow and 10 blue dots is harder than judging (8) true with 10 yellow and 8 blue dots.

Separate ANOVAs for true and false screens yield a significant main effect of quantifier type ($F(1, 19) = 10.49$, $p = .004$ for true screens and $F(1, 19) = 11.122$, $p = .003$ for false screens.

(14) *Most1* and *Most2* on the two-color condition



true screens only **false screens only**

The different performance with each quantifier is fully predicted on the account that each involves a distinct verification strategy that is consistently used even when the screens are exactly the same. Different behavior (depending on the quantifier used) on the very same screens indicates not only that participants do not switch to a more efficient procedure, but that the way the procedures differ is specified by the semantics.

On screens with two color sets the computation for both *Most1* and *Most2* requires the comparison between the yellow and the non-yellow set. The instructions for how to perform this comparison are different for each quantifier, even though the components for the computation provided by the visual system are the same: the yellow set, the non-yellow set, the superset.

The accuracy with *Most1* was no different on true and false screens; the means for each ratio were almost identical. This result if fully predicted by Subtraction – the same computation is performed for both positive and negative judgments: e.g., with 8 yellow and 7 blue dots (true) and 8 yellow and 10 blue dots (false) (i) estimate the target yellow set, 8, (ii) estimate the total, 15 (true) or 18 (false), (iii) subtract the target from the total 15-8 or 18-8, (iv) compare the cardinalities from (i) and (iii) $8 > 7$ (true) or $8 > 10$ (false).

With *Most2*, in order to confirm that yellow dots form the larger of the two sets, the non-yellow set is selected directly. This results in higher accuracy than confirmation with *Most1* where the non-yellow set is computed. A 'no' judgment with *Most2*, however, results in significantly more

errors than with *Most1*, e.g., on a screen with 8 yellow and 10 blue dots.[6] Despite this puzzling effect of accuracy drop with *Most2* on false screens, it is clear that each quantifier relies on a dedicated strategy for verification. Participants do not switch to the more advantageous strategy (e.g., they do not use Selection to more accurately confirm the truth of sentences with *Most1*, or Subtraction to more accurately disconfirm the truth of sentences with *Most2*). The two distinct accuracy patterns provide strong evidence that the lexical meaning of the functional morphemes that build up *Most1* and *Most2*, and their logical syntax, are interfacing with the visual cognition during the verification process.

4 Conclusions

Our experiments indicate that semantics provides a direct set of instructions to visual cognition processes. Each of the two Polish quantificational expressions *większość* (*Most1*) and *najwięcej* (*Most2*) biases a particular verification strategy that is used as a default under time pressure. Each canonical verification strategy overrides other cognitively available strategies for truth verification as proposed in Lidz et al. (2009). The following predictions were met:

(i) Polish *Most1,* like English *most,* is verified using the Subtraction strategy. The accuracy in the verification of a sentence containing *Most1* is sensitive to (i) the ratio between the cardinality of the target color set and (ii) the cardinality of the set of dots in other colors. Response accuracy was unaffected by the number of distractor color sets. The significant effect of ratio and no effect of the number of distractors with Polish *Most1* directly replicate the findings of Lidz et al. (2009) for English *most*.

(ii) A closely related quantifier *Most2* requires the Stepwise Selection strategy. The response accuracy with *Most2* depends on both the ratio and the number of distractors. The availability of Stepwise Selection with *Most2* indicates that it is not psychophysics that precludes the use of Selection with *Most1* and English *most*. This result provides direct evidence for the Interface Transparency Thesis put forth by Lidz et al. (2009), according to which verification procedures bias those algorithms that directly compute the semantic representation.

[6] This result could be related to the so-called "confirmation bias" observed in psychology (Nickerson 1998), so that participants were more likely to overestimate the yellow set and underestimate the non-yellow set. On the 5:6 ratio condition the difference between the yellow and the non-yellow set was only 1-2 dots.

(iii) Our results also suggest that each verification strategy is canonical in that it is followed consistently for each lexical item. Specifically, this is indicated by the finding that the same group of participants behaved differently depending on the quantifier. On the two color condition where sentences with *Most1* and *Most2* were either both true or both false, participants did not switch to the more effective strategy; rather, the properties of the linguistic input directly influenced the unconscious decision making system associated with visual cognition.

Importantly, the results confirm and extend the proposals and findings of Pietroski et al. (2008), Hackl (2009), Lidz et al. (2009) that the compositional semantics of quantifiers interacts in predictable ways with the visual system during verification.

References

Dehaene, Stanislas. 1997. *The number sense: How the mind creates mathematics*. New York: Oxford University Press.

Feigenson, Lisa, Stanislas Dehaene & Elizabeth Spelke. 2004. Core systems of number. *Trends in Cognitive Sciences* 8(7). 307–314.

Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: *most* versus *more than half*. *Natural Language Semantics* 17(1). 63–98.

Halberda, Justin, Len Taing & Jeffrey Lidz. 2008. The development of "most" comprehension and its potential dependence on counting-ability in preschoolers. *Language Learning and Development* 4(2). 99–121.

Halberda, Justin, Sean F. Sires & Lisa Feigenson. 2006. Multiple spatially overlapping sets can be enumerated in parallel. *Psychological Science* 17. 572–576.

Lidz, Jeffrey, Paul Pietroski, Tim Hunter & Justin Halberda. 2009. Interface Transparency and the Psychosemantics of *most*. Article in press. *Natural Language Semantics*.

Nickerson, Raymond S. 1998. Confirmation bias: a ubiquitous phenomenon in many guises. *Review of General Psychology* 2. 175–220.

Pietroski, Paul, Jeffrey Lidz, Tim Hunter & Justin Halberda. 2008. The meaning of *most*: Semantics, numerosity and psychology. *Mind and Language*, 24(5). 554–585.

Trick, Lana M. 2008. More than superstition: Differential effects of featural heterogeneity and change on subitizing and counting. *Perception and Psychophysics* 70(5). 743–760.

Whalen, John, C.R. Gallistel & Rochel Gelman. 1999. Nonverbal counting in humans: The psychophysics of number representation. *Psychological Science* 10(2). 130–137.

Wiese, Heike. 2003. *Numbers, Language, and the Human Mind*. Cambridge: Cambridge University Press

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 613–628. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Accomplishments: their Telos and their Structure*

Lucia M. Tovena
Université Paris VII
tovena@linguist.jussieu.fr

Abstract. This paper explores the relevance of a goal directed characterisation of the internal structure of accomplishments. The notion of 'plan' enables us to talk about the homogeneity and the continuity of the activity phase at a sufficiently abstract level, and about non-homogeneity when one consider the structure of instances of accomplishments in global terms, i.e. including culminations. Evidence is provided for this intensional characterisation that enriches a definition the aspectual class based on temporal conditions.

1 Introduction

In this paper we examine arguments for appealing to event-centred criteria in characterising accomplishments and more generally in identifying subevents. Initial motivation for our inquiry came from facets of the interpretation of sentence (1) highlighted by two situations in which it is appropriate.

(1) Max repaired the radio in one hour.
   a. Max took to pieces only half of the device, worked on that half and put it all back into one functioning unit in an hour.
   b. Max fiddled around with the device for 15 minutes, sat still for 15 minutes and then worked with his hands actively on the device for 30 more minutes and succeeded.

In the situation described in (1a) the theme is not incrementally fully affected, and in the situation described in (1b) action is not visible throughout the hour. The first issue has been raised by Rothstein (2004) and presented as a problem for the analysis of the telicity of accomplishments based on the notion of incremental theme proposed by Krifka (1998). The second point, in our opinion, raises a problem for Rothstein's analysis based on temporal schemata, in which the notion of incremental activity is characterised by a chain structure. In this paper, we look at existing analyses in a perspective that gives prominence to

* Many thanks to the audiences at VIII Workshop on Formal Linguistics, Sinn & Bedeutung 15, DIP-colloquium at University of Amsterdam, and to B. Copley, J. Guéron and D. Van de Velde for comments and remarks.

the goal oriented internal structure of accomplishments in their intensional definition. We point out how the distinction between conceptual intensional events and real extensional ones is fruitful for discussing the relation between the parts within an accomplishment, not just between partial and completed events, as done w.r.t. progressivised accomplishments. The notion of 'plan' – a term referring to the conceptualisation of an event driven by a goal – enables us to talk about the homogeneity and the continuity of the activity phase of accomplishments at a sufficiently abstract level, and about their non-homogeneity when one consider the structure of instances of these events in global terms, i.e. including the culmination. In section 2, we provide a quick review of key notions on the aspectual class of accomplishments established by Vendler in his classic contribution. In section 3, Krifka's and Rothstein's analyses are summarised and the issues raised by example (1) are further discussed, then in section 4 we present a goal directed view of accomplishments and the proposal by van Lambalgen & Hamm (2005). Empirical traces of plans and interaction between plans and temporal information are discussed in section 5.

2 Accomplishments in Vendler's Classification

Vendler (1967) has defined four classes that help us to classify the English verbs according to the most common time schemata they imply. They are *states, activities, achievements*, and *accomplishments*. Duration and homogeneity are two crucial properties in his classification. *Duration* is taken to explain the compatibility of accomplishments and activities with the progressive, which involve periods of time. In this, they contrast with states and achievements, which involve time instants. *Homogeneity* is exploited for distinguishing accomplishments from activities: "Any part of the process is of the same nature as the whole"(Vendler 1967: p.101) only for the latter class, cf. their different behaviour when combining with temporal adverbials of the form *in # time/ for # time*. Activities go on in time in a homogeneous way. If Max ran for an hour, then it is true that he ran at any time during that hour. On the contrary, accomplishments are not homogeneous. If Max built a sand castle in an hour, then it is not true that he built one at any time during that hour.

Grounding aspectual distinctions exclusively on temporal properties of moments and intervals of time is not satisfactory, as Vendler himself noted. The non-homogeneity of accomplishments follows from their characterising property, i.e. their proceeding "toward a terminus which is logically necessary to their being what they are"(Vendler 1967: p.101). As a consequence, their temporal structure is organised into ordered parts, none of which includes this terminus, apart from the very last one. This view naturally meshes with

our conceptualisation of the event as made up of parts that are causally related at some level. In short, order and a local form of homogeneity are the ingredients of Vendler's notion of incrementality. Incrementality is relevant for accomplishments and activities, as it goes together with duration, which sets achievements aside, and with a form of change, which sets states aside.We turn to it next.

3 Telicity and Incrementality of Accomplishments

3.1 Incrementality via a Homomorphism between Part Structures

Krifka (1998) characterises telicity (2) as the property of an event predicate X that if it applies to an event e, then it does not apply to a part of e that begins or ends at a different time. Thus, all parts of e that fall under X are initial (INI) and final (FIN) parts of e.

(2) $\forall X \subseteq U_E[TEL_E(X) \leftrightarrow \forall e,e' \in U_E[X(e) \wedge X(e') \wedge e' \leq_E e \rightarrow INI_E(e',e) \wedge FIN_E(e',e))]]$

Quantised predicates, as opposed to *cumulative* ones, fall in the group of telic event predicates. If an entity is in the denotation of a quantised predicate, it does not have proper parts that also are in the denotation of the predicate. Quantisation and cumulativity are relevant also for nominal predicates. The transfer of properties from arguments to the event is regulated by conditions on the thematic roles of the participants. They are mappings from the structure of the object to that of the event and vice versa.

(3) *mapping to subevents* (MSE)
For all x, y in the domain of entities P and all e in the domain of events E, MSE(θ) iff $\theta(x,e) \wedge y <_P x \rightarrow \exists e'[e' <_E e \wedge \theta(y,e')]$

(4) *mapping to subobjects* (MSO)
For all x in the domain of entities P and all e, e' in the domain of events E, MSO(θ) iff $\theta(x,e) \wedge e' <_E e \rightarrow \exists y[y <_P x \wedge \theta(y,e')]$

Strict incrementality is a property of theta roles and is defined by the joint effect of MSE, MSO, a constraint that requires subevents that correspond to subobjects to be unique, a constraint that requires parts of an object to be participants in unique subevents, and by excluding situations where both object and event are atomic. The net result is that the extent of the incremental accomplishment described in (5) is determined by the extent of the theme and the eating of the last part of the apple marks the culmination of the eating event.

(5) Max ate the apple.

As the event grows temporally in (5), the part of the path related to the event via a theta role also grows (Krifka 1998). The path determines the incremental structure of the event. However, one can truthfully utter sentence (1) to describe situation (1a) where the theme is not incrementally fully affected, and telicity would have to come from a quantised theme without MSE property.

(1) Max repaired the radio in one hour.
   a. Max took to pieces only half of the device, worked on that half and put it all back into one functioning unit in an hour.

Krifka is aware that the extent of the theme is too narrow a domain for the homomorphism characterising the accomplishment, and has proposed to use property scales measuring an abstract dimension rather than physical entities, and considered specific pragmatic requirements.[1] Krifka's proposal might be modified by using very abstract property scales to measure events, not objects, but this results in a departure from the appealing initial intuitions behind the mappings between theme and event, that are the essence of his proposal.

3.2 Incrementality as Accumulating Quantities of a Process

Rothstein (2004) has claimed that the generalisation developed by Krifka does not suffice to cover the reading (1a) where the theme is only partially involved. In her analysis, an accomplishment is an activity paired with a BECOME event, which is a change of state that 'accompanies' it.[2] It has an incremental structure built with stages[3] (Rothstein 2004: 38), and its crucial role is to measure the accomplishment's progression. The activity part is related to the developmental

[1] E.g. the eating in (5) is taken to be completed before the disappearance of the whole apple because the core is disregarded. However, this type of pragmatic requirement concerns the identification of the borders of the object, not its progressive coverage.

[2] Dowty's (1979) BECOME operator applied to Φ yields formulae true at non-minimal intervals s.t. $\neg\Phi$ is true at the initial bound and Φ at the final one. Rothstein's BECOME events characterise the incremental part of change events 'from φ to ϕ, where φ is a state which entails $\neg\phi$'(Rothstein 2004: p.155) and ϕ is the state lexically specified by the accomplishment predicate. It is not clear how φ can be characterised other than as the stative antonym of ϕ by stipulation.

[3] Rothstein's proposal uses the notion of *stage* from (Landman 1992), which is an event e that 'develops into' e' and shares with it relevant properties of the event description, i.e. not just any part of e' qualifies as a stage. For the purpose of accomplishments, a stage is a subevent e of the process part that can be described by the same property that would be used to describe the process part. The notion of stage helps Landman (1992) to ground the notion of normality, needed in his modal analysis of the progressive, in the properties of the event descriptions. In this way he gets around the problem noted in the literature that if a plan is associated with an agent, it cannot be used for establishing truth conditions when there is no agent planner, e.g. with inanimate subjects.

structure of the BECOME event via an incremental relation INCR[4] that fixes the order of the parts. In other words, an accomplishment is an incremental process defined to be isomorphic to a chain lattice that encodes two essential bits of information, namely incrementality and culmination. The incremental component is represented via the chain structure and is defined w.r.t. an order provided by pragmatics and associated to the activity part of the event. The upper bound of the chain is said to coincide with the culmination that is to be assigned to the activity part to build the whole accomplishment. The template for accomplishments is as in (6).

(6) $\lambda y \lambda e \exists e_1, e_2 [e =^{s} (e_1 \sqcup e_2)$
$\wedge$ ACTIVITY$_{<X>}(e_1) \wedge Ag(e_1)=x \wedge Th(e_1)=y$
$\wedge$ BECOME$_{<Y>}(e_2) \wedge Arg(e_2)=Th(e_1)$
$\wedge$ INCR$(e_1, e_2, C(e_2))]$ (Rothstein 2004: p.108)

The radio lying untouched is a problem for Krifka's proposal.[5] Max's being idle is one for Rothstein's because it does not fit in her chain structure of homogeneous stages. One can truthfully utter (1) to describe situation (1b) where action is not visible throughout the hour, and the theme is not directly affected at times like in (1a).

(1) Max repaired the radio in one hour.

b. Max fiddled around with the device for 15 minutes, sat still for 15 minutes and then worked with his hands actively on the device for 30 more minutes and succeeded.

Rothstein's positing an incremental process amounts to grounding on the event and on pragmatics the incrementality that Krifka grounds on the theme, but when the activity part is not locally homogeneous, incrementality cannot be grounded on it. Landman's notion of stage is the counterpart of Dowty's activities downward closure postulate on intervals, as both characterise activities and capture a local form of homogeneity in accomplishments.

[4] INCR$(e_1, e_2, C(e_2))$ in (6) reads as e_1 is incrementally related to e_2 w.r.t. the chain $C(e_2)$.

[5] It might be one for Rothstein too, because the BECOME event is constrained to be a change of state 'which happens to the theme' (Rothstein 2004: p.108). The situation is not entirely clear, because either the BECOME event simply provides a temporal constraint and ensures the transition from $\neg$P to P, in which case it could be disconnected from the theme; Or it defines a change in the theme that should be incrementally regular, because of the chain structure.

4 The Structure of Complex Events

4.1 The Link between the Parts

Both Krifka's and Rothstein's analyses pursue previous work. Krifka's proposal develops Dowty's (1979), who models accomplishments and their telicity in thematic terms. For Dowty, the attainment of a certain result state is caused by the culmination of a process under the impetus of an agent. The operator CAUSE he uses in the logical structure, helps him coding the difference between achievements and accomplishments thematically, in terms of causation and not in terms of temporal properties of the event. In his view, "accomplishments are partly defined by the changes of state with which they terminate" (Dowty 1979: vii). In Dowty's proposal, causality is expressed as a relation between propositions rather than subevents, and is based on Lewis's theory of causal dependence according to whom a counterfactual dependence among events is a counterfactual dependence among the corresponding propositions.[6] According to Krifka, the culmination of the event is introduced indirectly in the characterization of the event by identifying it thanks to the quantization of the theme.

Rothstein's proposal is reminiscent of Vendler's aspectual classification based on the temporal properties of the predicates. As seen above, for Vendler two components are related, i.e. an accomplishment is a process terminated by a finishing point expressed in the predicate, and the telicity that characterises this type of predicates is brought about by a change corresponding to the transition to a resulting state. But he adds that "Somehow this climax casts its shadow backward, giving a new colour to all that went before" (Vendler 1967: 102). In a way, the whole event is named after the last link in a causal chain. Rothstein explicitly rejects any causal link between process and resulting state. She leaves to pragmatic the task of saying something about the nature of this link, but uses a sum of events to enforce temporal contiguity. In her proposal, the increment in the event is computed w.r.t. a 'natural and inherent order' of the parts of the event determined by real-world knowledge and represented by the order in the chain structure of the BECOME event.

In Krifka's and Rothstein's analyses, the processive part and the culmination are not directly linked, they just belong to the same unit. The unity of the event is constructed either all in the theme or all in the temporal structure. There

[6] As a potential exception to his proposal, Dowty mentions the class 'creation of a performance object', exemplified by *produce a play, perform a sonata*. Dowty notes that 'the state of having reached the end of the performance of a sonata does in a sense define the successful completion of *perform a sonata*'(Dowty 1979: p.186), but adds that this is little enlightening (in contrast with the crucial role of the coming into existence of a letter in the truth conditions of *write a letter*).

is a form of identity that boils down to structural similarity. In the following, we explore a way to capture the link in the spirit of Vendler's quotation above. The unity of accomplishments is grounded in their being events described as goal driven. The notion of plan is not meant to place conditions directly on what the process leading to the culmination consists of, rather it provides an intensional definition that associates constraints on what can be going on at intermediary stages with constraints on what the global view on the situation has to be.

4.2 Goal Oriented Actions and Plans

Suppose that Max is thinking about the problem during the 15 minutes of pause sitting still in (1b). One may suggest that some repairing activity goes on all the same. We still seem to have a problem in Rothstein's approach, because the incremental structure is defined in a way that can be read as a constraint imposing homogeneity in a local form, via Landman's notion of stage, while barring it in a general form, since the telos must be excluded. Stages have been devised by Landman to deal with the progressive, where coidentification of (sub)events is possible because the model provides the set of possible extensions. But (1b) highlights the difficulty in getting at an intensional characterisation of the aspectual class by looking at the extensional parts.

Continuity w.r.t. a goal is the second aspect of accomplishments to which example (1) draws our attention. The continuity suggested by taking 'sitting still' to mean 'progress in the repairing by thinking about the problem' is a feature accomplishments share with activities. The change that marks the culmination of an accomplishment is due to a force that drives the elements of the whole structure continuously. The goal is an ingredient of the representation of the event, but it is not a temporal relation on its parts. It is what enables us to make sense of the complex internal structure of the event, since it reconciles the activity part, which in itself needs not be strictly homogeneous – no divisive lexical predicate is applied to it – but is seen as incremental, with an entity being created, be it an abstract one like the state of a functioning radio or a performed sonata, or less so abstract like a house. Lexical aspect classes identify types of situations, which can then be described with linguistic expressions. Plans are goal driven conceptualisations of eventualities and the expression of a plan relies on the fact that 'Aktionsart' choices are ways to encode an event type while simultaneously possibly indicating related preceding and/or subsequent event types. Rothstein's incremental process and isomorphic chain lattice amount to the unfolding of the plan and could be made to correspond to the traversal of an abstract path in Krifka's terms.

We are interested in plans to which we can refer with verbs and the constituents they form. Plans lexicalised by predicates can be viewed as intensional

characterisations of streamlined sequences of subevents. In intensional semantics in the style of Lewis, expressions are represented by arbitrary functions of (worlds and other) indices to sets of objects. Moschovakis (1994) has explored an alternative view that may be more promising from the cognitive point of view, according to which the intension of an expression is the algorithm that computes its extension. An algorithm is a semantic object, a form of knowledge representation that shows one how to use a set of operations she already knows to compute a result.

A plan allows us to enforce the presence of some structure within the event and may express a cause relation, but not necessarily one that is found in the physical reality. We draw inspiration from the work of van Lambalgen & Hamm (2005: 36), who say "Planning means setting a goal and computing a sequence of actions which provably suffice to attain the goal." In this framework, a correct plan is like an abstract procedure according to which a goal is surely achieved in every world in which the premises are met. We would add that it is perceived as standardized at this abstract level.[7]

The plan is part of the description conveyed by the verb and is not the making of a sentient agent, therefore it should be kept separate from contingent epistemic considerations. It embodies the intensional property of telic situations and (complex) activities. The fact that an agent may have partial knowledge of the world and the presence of contingent facts become relevant in the realisation/implementation of a plan. Partial knowledge opens the possibility of there being unexpected events that may affect the realisation of a plan, because they may change properties in the context. Van Lambalgen and Hamm's definition relates to the notion of minimal model, where the events that happen are all and only those required to happen by the axioms of the system. This rests on the idea that all changes must be due to a cause, and a property persists unless an event causes its change. Normality is envisaged in terms of consequences of a set of premises. In this way, it is possible to keep distinct the plan, which is defined exclusively with respect to the goal, from its actualisation, which is determined also by other states of affairs arising or falling back and which can alter the compatibility of a world with the minimal model. In using a predicate, the speaker commits herself to the validity of the intensional characterisation w.r.t. her knowledge state. The commitment w.r.t. the actualisation is mediated by temporal information, and progressivised accomplishments illustrate one of the several nonmonotonic phenomena in natural language, cf. section 5.3.

[7] The algorithmic process for a plan is far from standardized, as van Lambalgen (p.c.) points out. When people agree on what the goal state is, variation could arise when defining what causes this goal state, so as to perform the appropriate sequence of actions to get at it.

4.3 Causes and Plans

We follow van Lambalgen & Hamm (2005) in seeing causation as a notion pertaining to the physics of events, but relevant to humans in structuring a cognitive plan from which (the description of) an event originates. Van Lambalgen and Hamm implement Moschovakis idea of meaning as algorithm in an event calculus in order to represent the semantics of verbs. They primarily use *fluents*, which are time-dependent properties as well as partial changing objects, and time-independent event types, which can initiate and terminate fluents.[8] They characterise expressions in aspectual classes via an eventuality structure that is a quadruple like in (7). Each element may be left empty or be filled with an object of the appropriate category, i.e. e for an event and f for a fluent. All the four elements are necessarily instantiated in eventualities representing verbs in the accomplishment class.

(7) An eventuality is a structure (f_1, f_2, e, f_3), where
f_1=cause: represents an activity, something that exherts a force;
f_2=theme: represents a parametrised object or state, which is driven by the force f_1;
e=culmination: is the culminating event, representing the canonical goal;
f_3=result state: represents the state of having achieved the goal.

Eventuality structures are used to build scenarios, which are a conjunction of statements that state the specific causal relationship holding in a given situation. An elaborate internal structure is specified for each entry, and variation from person to person is allowed to a certain extent. These statements are expressed in their event calculus, which contains a truth-predicate stating that a fluent f holds true at a time point t, and four primitive predicates that are determined by axioms or definitions.[9] This apparatus is sufficient for the first of two different notions of cause van Lambalgen and Hamm use in defining the internal structure of scenarios associated with lexical entries. This notion is concerned with *instantaneous change*, e.g. a collision. The other notion is concerned with change induced by ongoing action or due to a force that exherts its influence continuously and culminates in the result state, e.g. filling a bucket or pushing a cart. *Continuous change* is concerned with incremental processes and is modelled using two other primitive predicates of the calculus, devised for changing

[8] The entity event represents actions with or without being initiated by an agent. A fluent is the transformation of first-order formulae into terms. Events happen and fluents hold, so that they can be arguments for the truth-predicate.

[9] They concern: i) a fluent that is true initially in the discourse considered and not interrupted or terminated; ii) an event type e that happens at time point t (thus becoming an event token); iii) an event that initiates a fluent or iv) terminates it.

partial objects. *Trajectory* states that if a fluent holds from time point t to $t+d$, then at $t+d$ another fluent starts to hold. This predicate establishes the causal link and allows us to represent e.g. a force whose influence changes the degree of completion of a house in a building event, with no need to assume a full house in some possible world. *Release* states that the law of inertia[10] is suspended so that a force can have an impact on a fluent. This predicate allows a modification of the stages of an object without specification of concomitant occurrences of events causing the changes, hence it captures the intuition that e.g. there aren't separate actions that initiate and terminate the fluents *height(x)* for various values of x in an event of filling a bucket. Together, they enable us to represent the situation in (1) both if the functioning property is viewed as acquired gradually or all at once at the end.

In accomplishments, the force is the tension toward the goal and this gives conceptual unity and homogeneity to a potentially disparate set of subevents. In particular, the identification of the goal is what enables us to apply the same description, e.g. 'build a house', to different sets of subevents, cf. the different building processes followed in different cultures. The increment needs not correspond to fluents representing physical properties of a theme, as illustrated by example (1). Differences are all the more evident in the case of non-conventionalised accomplishments. The different streamlined sets of subevents correspond to different programs that implement Moschovakis's abstract algorithm corresponding to Frege's sense or intension, and to our plan, which they all share. Such sets or programs compute/determine the denotation of the term, Frege's referent, and justify its belonging to a specific coherent class.

5 Plan's Empirical Traces and Other Considerations

5.1 The Plan's Continuity: Gaps, Lulls and Superevents

As pointed out above, sentence (1) can be used to describe situation (1b) where action might not be visible throughout the time interval. We have proposed that the change that marks the culmination of an accomplishment is presented as due to a force that exherts its influence continuously. The plan encodes the continuity of the tension towards the goal of repairing the radio, and is unaffected by Max's sitting and thinking. His searching the space of causes of faulting functioning is part of the progression towards the goal.

This view of plans as encoding a tension towards the goal extends to activities, where the goal is the actualisation of the activity itself. In this sense, activities can be viewed as culminating at each minimal subinterval. In our

[10] Expressible as 'normally, nothing changes', this law takes care of the properties that do not change as the result of an action, cf. the Frame Problem identified in artificial intelligence.

view, this tension is at the root of the homogeneity Landman (2008) is after in his discussion of lulls in a Vienna waltz, during which a person is 'dancing' also when standing still, at particular points in the sequence of steps. Landman identifies two axes that we interpret as follows. There is an *incremental axis* of progression for the event, along which the plan of the waltzing is mapped, and which is projected onto a *segmental axis* for time along which the actualisation is plotted. Landman insists that progression on the incremental axis is possible as long as we are willing to say that the same event is continuing. We link such willingness to the adherence to the plan. Specifications on the intention of the agent may be added. In his example, dancing a Vienna waltz is a complex activity socially defined according to a plan. The dancers must stand still at given times, but the temporal trace of the event contains no gaps because of this, because all subevents of the object under description in the incremental axis are parts that can be added along the segmental axis.

Gaps usually come from other events, and correspond to subintervals whose length should not be added to the duration of a given event. But negligible interruptions cannot be told apart from non negligible interruptions merely in temporal terms, because they may or may not be seen to belong to the incremental axis, as illustrated by the phenomenon of event-internal pluractionality (Tovena 2010). The plan needs to be taken into consideration. Consider first an accomplishment. Sentence (8a) is not understood to say that Luisa never ever stopped in her eating the apple, e.g. to scratch her nose. Sentence (8b) also does not bar negligible interruptions, yet it presents the eating as being discontinuous in a way (8a) is not. The same modification is possible in activities, cf. (9). The goal oriented view tells us how to sort subevents into parts that belong to a bigger event, and gaps that do not. The verb in (8b) helps one to make precise that the event contained lulls that come under the same event description, hence cannot be neglected in computing the duration although the 'rule' that gaps are not taken into account applies as usual. In a *mangiucchiare*-event, the eating is 'purposefully' disrupted w.r.t. its canonical unfolding, in the sense that these idle times are presented as relevant for the standard communicative goal for which that type of sentence can be used. The suffix on the verb in (8b) overtly marks that the plan has been modified with respect to its canonical form.

(8) a. Luisa ha mangiato la mela. (Italian)
'L. ate the apple.'
b. Luisa ha mangiucchiato la mela.
'L. ate the apple on and off.'

(9) a. Luisa ha dormito tutto il giorno.
'L. slept the whole day.'

b. Luisa ha dormicchiato tutto il giorno.
'L. dozed (fitfully) the whole day.'

Going back to situation (1a) once more, we see that the continuity of the plan is preserved even in case there are some false starts or failed attempts, in the sense of wrong diagnosis of the problem, which is not the case for the incremental process the way is defined by Rothstein. A goal oriented view of accomplishments makes it possible to see the analogy between false starts and the case of events that have parts that do not directly affect a portion of the theme, e.g. putting up or taking down the scaffolding in an event of building a house, which (Rothstein 2004: 9) considers to be a serious problem for Krifka's theory of incrementality.

Up to here, what said was useful for 'plain' and progressivised accomplishments alike. Example (10) shows an interesting discrepancy w.r.t. identifying superevents. The issue was discussed by Ogihara (1989), who talks of the need of seeing a (coherent) unit for the agent when an amalgamation of some atomic events counts as collective event.

(10) Max ate/ #was eating three rolls.

Ogihara refers to the agent's intention, which is external to our notion of plan. However, the simple past presents iteration of atoms and unique superevent as equivalent interpretive options, while the latter is the one required for the progressive and not directly supported by a plan. This observation boosts the idea of algorithm as a piece of descriptive knowledge with a classificatory role more than as a way to compute uses and get extensions. van Lambalgen and Hamm's treatment seems to ascribe equal felicity to the options in (10).

5.2 Agency and Accomplishments

Prototypical accomplishments can be combined felicitously with manner adverbs, cf. (11). The modification can be seen as introducing an additional condition which is the availability of an agent. Yet, the notion of plan is not inherently associated with that of a (volitional) agent. The data in this section show that this is the typical case but it is not the expression of a constraint.

(11) Louise intentionally crossed the street.

Accomplishments with inanimate subjects, seem not to naturally occur as the complement of *finir* (finish), which is a typical test for telicity, cf. (12).[11,12]

[11] Thanks to Brenda Laca for the observation and the example.

[12] The complement of *finir* must be introduced by *de* for the telicity test to work. When it is introduced by *par* we get the inchoative reading, which is fine for the corresponding form of (12a).

(12) a. #Les vagues ont fini de creuser un trou dans le rocher. (French)
'The waves finished digging a hole in the rock.'
b. Les vagues ont creusé un trou dans le rocher.
'The waves digged a hole in the rock.'

The problem could be due to *finir* and its requirement for a volitional agent subject, rather than to telicity. However, first, note that (12a) remains odd even if we add a volitional agent (13). Second, inanimate subjects are not completely ruled out, if the unfolding of the event follows a program (14). Furthermore, the telicity of the predicate in (12b) is not so well established although it passes the test with *in # time*, see (15) where *tout* works as an egressive marker.

(13) #Max a fini de creuser un trou dans le rocher.
'M finished digging a hole in the rock.'

(14) La machine a fini de laver le linge.
'The washing machine finished washing (the linen).'

(15) #Max/#Les vagues ont creusé tout un trou dans le rocher.
'M/The waves digged up a hole in the rock.'

The contrast between (12a) and (14), and the marginality of (15), are explained away in terms of whether it is possible to add to the implementation of a plan a constraint defining an action terminating the process which is not specified only contextually. The vagueness of *creuser un trou* does not seem to interfere with the need for picking a time at which the result state of a hole being there holds (12b), but it does interfere when such a time should mark the completion of the digging (15). In other words, we may not be sure of when exactly the predicate starts to hold, but we feel confident enough to judge when the time is inside the interval at which the sentence is taken to express a true proposition. When the identification of such an exact time is relevant, as in (12a) and (15), the vagueness of the predicate affects the felicity of the sentence. Recall also Dowty's observation that the conventional implicature of *finish* should include the 'definability' of the property describing the whole event in terms of the properties of its steps. Typically, the characteristics of a perspective taken on a situation are the intentional state of the agent, but they can also be the characteristics of the physical layout of the relevant actors in the situation, cf. (16).

(16) The tomatoes finished ripening.

Tomatoes do not 'plan' to ripen, but it is in the nature of fruit to do so, and the scenario would contain actions that are natural events with no specified agent.

Culmination is determined by a given value in the dimension along which the progression is recorded. The terminating point is the onset of the state denoted by the adjective from which the deadjectival verb is derived, cf. (Kearns 2007).

5.3 Plans and Temporal Information

The notion of normality mentioned above, envisaged in terms of consequences of a set of premises and axioms, is relevant for the expression of a plan via the assertion of a proposition expressed by a sentence containing given lexical expressions. Hence, the speaker commits herself to the feasibility of the plan in the actual world at speech time with respect to reference time. Normality concerns the applicability of a plan. Actualisation usually requires normality up to completion. When speech time precedes the final time of the eventuality under discussion, a second form of normality checking is possible and concerns the actualisation of the plan. Here is where unexpected events enter the scene and nonmonotonicity is relevant. A first case to mention is due to the progressive aspect and is known as the 'imperfective paradox'. Although PROG φ entails φ for atelic predicates, such as *run* – e.g. (17a) entails (17b) – this entailment seems not to hold for telic predicates, such as *build a hut* in (18), in which an event's anticipated culmination is at issue.

(17) a. Max was running.
b. Max ran.

(18) a. Max was building a hut.
b. Max built a hut.

In possible worlds modal-style analyses (cf. Dowty 1979; Landman 1992), progressive creates an intensional context, and it is enough for completion to take place in worlds in the set of inertia worlds or in the closest world to which it is reasonable to move. Instead, we suggest that by assuming that plans come with sets of conditions that must be met when the scenario starts, the speaker commits herself to the feasibility of the plan in the actual world at utterance time w.r.t. reference time, not to its completion. The point of interruption past which one would move counterfactually can only be brought about by unexpected events, which are external to the commitment. Truth conditions for sentences with progressive forms must include compatibility between the world at reference time and the conditions on the model imposed by the predicate, but no commitment is taken on the full realisation, i.e. on the stability of the model. The counterfactual move is not required in a nonmonotonic approach (Hamm & van Lambalgen 2003).

Futurate sentences contain verbs in present tense form and convey that a future-oriented eventuality is planned (19). They are another relevant configuration. Here speech time precedes the initial time of the eventuality.

(19) Exams begin next week.

Futurates assert the existence of a plan providing for the actualisation of an eventuality according to Copley (2008). Our notions of plan differ, and we think that the commitment is not so strong, although it is heavier than in the case of choosing a progressivised accomplishment predicate. The plans behind accomplishments are not concerned with positioning goals in time. The futurate reading looks as if the speaker commits herself to the fact that the premisses are satisfied at utterance time w.r.t. reference time concerning an event that is to be started in the future. She minimally commits herself to not foreseeing events that could interfere with the applicability of the plan, throughout the interval up to the beginning of the actualisation, temporally suspending nonmonotonicity.

References

Copley, Bridget. 2008. The plan's the thing: Deconstructing futurate meanings. *Linguistic Inquiry* 39. 261–274.

Dowty, David R. 1979. *Word meaning and montague grammar*. Dordrecht: Reidel.

Hamm, F. & M. van Lambalgen. 2003. Event calculus, nominalisation, and the progressive. *Linguistics and Philosophy* 26. 381–458.

Kearns, Kate. 2007. Telic senses of deadjectival verbs. *Lingua* 117. 26–66.

Krifka, Manfred. 1998. The origins of telicity. In Susan Rothstein (ed.), *Events and grammar*, 197–235. Dordrecht: Kluwer.

van Lambalgen, Michiel & Fritz Hamm. 2005. *The proper treatment of events*. Oxford: Blackwell.

Landman, Fred. 1992. The progressive. *Natural Language Semantics* 1. 1–32.

Landman, Fred. 2008. 1066: On the differences between the tense-perspective-aspect systems of English and Dutch. In S. Rothstein (ed.), *Theoretical and crosslinguistic approaches to the semantics of aspect*, 107–166. Amsterdam: Benjamins.

Moschovakis, Yiannis. 1994. Sense and denotation as algorithm and value. In *Logic colloquium '90*, 210–249. Berlin: Springer.

Ogihara, Toshiyuki. 1989. The semantics of the progressive and the perfect in English. DYANA deliverable R2.3.A, ESPRIT BR3175.

Rothstein, Susan. 2004. *Structuring events*. Oxford: Blackwell.

Tovena, Lucia M. 2010. Pluractionality and the unity of the event. In Maria Aloni & Katrin Schulz (eds.), *Amsterdam colloquium 2009*, 465–473. Heidelberg: Springer.

Vendler, Zeno. 1967. *Linguistics in philosophy*. Ithaca: Cornell.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 629–644. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Nominal Reference in two Classifier Languages*

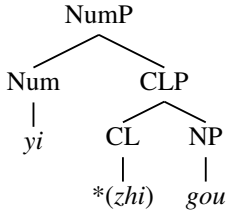
Tue Trinh
Massachusetts Institute of Technology
tuetrinh@mit.edu

Abstract. In this paper, we first present observations that have been made concerning the distribution and interpretation of nominals in Mandarin Chinese and propose an account for them. We will then contrast Mandarin Chinese with Vietnamese, and show that differences with respect to the syntax and semantics of noun phrases between these two languages can be reduced to the fact that they differ minimally in lexical resource. Implications of the analysis for a theory of semantic variation are also discussed.

1 Mandarin Chinese

Mandarin Chinese is a "classifier" language of the East Asian variety. Thus, count nouns in this language cannot combine directly with numerals without the mediation of grammatical morphemes: the classifiers (cf. Ren 1968; Cheng & Sybesma 1999, 2005; Lee 1986; Li & Thompson 1989; Shyu 1995; Tang 1990; Tsai 1994, 2001; Xu 1996). For example, 'one dog' has to be expressed as *yi zhi gou*, where *yi* is the numeral 'one' and *gou* is the word for 'dog'. The word *zhi* is the classifier which enables *gou* to combine with *yi*, so to speak. I am going to assume, following several works, that the numeral c-commands both the classifier and the noun, and that the classifier c-commands the noun, as in (1).

(1)



It turns out that each constituent of NumP can appear independently in sentences. For example, the bare noun *gou*, the classifier phrase *zhi gou* and the numeral phrase *yi zhi gou* can all be arguments of verbs. However, these categories differ both in distribution and interpretation. This fact is captured suc-

* I thank Irene Heim and Gennaro Chierchia for valuable discussion.

cinctly in a quote from Cheng & Sybesma (2005: 263): "In Mandarin, bare NPs can be interpreted as definite, indefinite or generic. Num-CL-NPs [numeral phrases] and CL-NPs [classifier phrases] are invariably indefinite [...] All indefinites occur in postverbal position only."[1] Cheng and Sybesma's observation is replicated by several other researchers, and will be illustrated with examples in the following subsections. Some facts which pertain to the use of nominals as predicatives (i.e. complements of the copula verb) will also be presented. These, to the best of my knowledge, are novel.

1.1 Interpretation of NP

The sentences in (2) exemplify the interpretation of NP in subject positions: (2a) shows that bare nouns (NPs) can be definite, singular or plural, and (2b-c) evidence the generic reading of NP, both as arguments of individual-level predicates such as 'to be intelligent,' and kind-predicates such as 'to be extinct.'

(2) a. Gou yao guo malu (Cheng & Sybesma 1999: 510)
dog want cross road
'The dog(s) / *a dog / *dogs want(s) to cross the street'

b. Gou hen jiling (Yang 2001: 20)
dog very smart
'The dog(s) / dogs is/are intelligent'

c. Gou juezhong le (Rullmann & You 2006: 176)
dog extinct ASP
'Dogs are extinct'

The sentences in (3) are examples of NP in post-verbal position. We can see that NP in object positions has all the readings that NP in subject positions has, plus the indefinite reading, which is number-neutral. Thus, *kanjian gou* (see dog) can mean 'see the dog,' 'see the dogs,' 'see a dog,' or 'see (some) dogs.'

(3) a. Wo kanjian gou le (Rullmann & You 2006: 176)
I see dog ASP
'I saw the dog(s) / a dog / dogs'

[1] As can be seen from their examples, Cheng and Sybesma intended the term "generic" to mean both 'kind-refering' (or 'D-generic'), as in *dogs will be extinct*, and 'characterizing' (or 'I-generic'), as in *dogs like meat* (Krifka 1987; Krifka, Pelletier, Carlson, ter Meulen, Chierchia & Link 1995). We will use "generic" in the same way here. Note, also, that we exclude from the discussion the so-called "quantity interpretation" of numeral phrases ('five children cannot finish ten bowls of rice'), under which these phrases can occupy subject positions (Li 1998). If the analysis proposed below is correct, numeral phrases in this reading must have more structure than that represented in (1). I leave this topic to future research.

b. Wo xihuan gou (Cheng & Sybesma 1999: 510)
I like dog
'I like dogs'

c. Turing faming dyannao (Leo Chen personal communication)
Turing invent computer
'Turing invented the computer'

(4a) and (4b) illustrate the use of NP as predicatives (Leo Chen, T.-C. James Huang, Zhang Min personal communication). Again, we witness number-neutrality: the bare noun *gou* can be predicated of a singular subject like Fido, or a plural one like Fido and Pluto.

(4) a. Fido shi gou
Fido be dog
'Fido is a dog'

b. Fido he Pluto shi gou
Fido and Pluto be dog
'Fido and Pluto are dogs'

1.2 Interpretation of CLP

The next category, CLP [classifier phrase], can only appear in post-verbal positions, as evidenced by the contrast in (5). In addition, it can only be interpreted as a singular indefinite: (5a) has the implicature that the speaker bought one but not two books.

(5) a. Zuotian wo mai le ben shu (Rullmann & You 2006: 175)
yesterday I buy ASP CL *book*
'I bought a book yesterday'

b. *Zhi gou yao guo malu (Cheng & Sybesma 2005: 262)
CL *dog want cross road*

Just like NP, CLP can function as predicatives. However, it differs from NP in that it requires a singular subject: *zhi gou* can be predicated of a singular individual such as John, but not of a sum individual such as Fido and Pluto (Leo Chen, T.-C. James Huang, Zhang Min, personal communication).

(6) a. John shi zhi gou
John be CL *dog*
'John is a dog'

b. *Fido he Pluto shi zhi gou
Fido and Pluto be CL *dog*
('Fido and Pluto are dogs')

1.3 Interpretation of NumP

The numeral phrase has basically the same syntax and semantics as the classifier phrase: it can only appear in post-verbal positions, and interpreted as an indefinite, as (7) shows.

(7) a. Wo kan le san ben shu (Yang 2001: :133)
I read ASP *three* CL *book*
'I read three books'
b. *Sange xuesheng zai xuexiao shoushang le (Li 1998: :694)
three student at school hurt ASP
('Three students were hurt at school')
c. *yi zhi gou xihuan chi rou (Cheng & Sybesma 2005: :262)
one CL *dog like eat meat*
('A dog (generally) likes to eat meat')

NumP can also appear post-copula, in which case the subject must match the predicative in number. (8) shows that the phrase *liang zhi gou* (two CL dog) can be predicated of Fido and Pluto, but not of Fido alone.

(8) a. Fido he Pluto shi liang zhi gou
Fido and Pluto be two CL *dog*
'Fido and Pluto are two dogs'
b. *Fido shi liang zhi gou
Fido be two CL *dog*

1.4 Summary

The facts just described are summarized in (9). The generalization is that all nominal categories can be indefinites or predicatives, but only bare nouns can be generic or definite. Furthermore, Mandarin Chinese does not allow indefinite subjects.

(9) Generalizations about Chinese NP, CLP and NumP
a. Indefinite and predicative: all categories
b. Definite and generic: NP
c. Subjects cannot be indefinite

1.5 The Universe of Discourse

We turn now to the analysis. The starting point will be a domain of quantification U which contains both singularities and pluralities ($U = \{a, b, c, ..., a + b, b + c, a + b + c, ...\}$), as assumed in many previous works (Chierchia 1998; Landman 1989; Link 1983; Schwarzschild 1996). The sum operator $+$ which

maps singular to plural individuals, and the 'part of' relation $\leq$ which partially orders U, are understood in the usual way (i.e. $x+x=x, x+y=y+x, (x+y)+z=x+(y+z), x\leq y \leftrightarrow x+y=y$).

It would help to define two notions which will feature in the analysis to be developed below. First, given any subset P of U, an atom of P, or a P-atom, will be a P-individual which has no proper part which is itself a P-individual.

(10) Atoms of P
$x \in AT(P)$ iff $x \in P \wedge \forall y((y \in P \wedge y \leq x) \rightarrow (y = x))$
$\Rightarrow$ 'x is a P atom iff x is P and has no proper part which is P'

Second, the maximal element of P will be that individual which has every element of P as part. This definition employs the notion 'supremum of P', which is defined in (12).

(11) Maximal element of P
$MAX(P) = SUP(P)$ if $SUP(P) \in P$, undefined otherwise
$\Rightarrow$ 'The maximal element of P is that individual in P which has every individual in P as part'

(12) Supremum of P
$x \in P \rightarrow x \leq SUP(P)$ and $\forall y(y \in P \rightarrow y \leq z) \rightarrow SUP(P) \leq z$
$\Rightarrow$ 'The supremum of P is the smallest individual that has every element of P as part'

To illustrate, suppose $P = \{a, b, a+b\}$. Then, $MAX(P) = SUP(P) = a+b$. If $P = \{a\}$, then $MAX(P) = SUP(P) = a$. If $P = \{a, b\}$, $SUP(P) = a+b$ but $MAX(P)$ is undefined. A consequence of (11) is that if $P = AT(P)$, then $MAX(P)$ is defined only if P is a singleton.[2]

Last but not least, I assume that U contains a set G of kinds. Following Chierchia (1998) and Chierchia & Turner (1988), I assume that kinds are atoms of the universe, i.e. $G \subseteq AT(U)$. At the same time, they are intensional entities, or more precisely, they are individual concepts, i.e. $G \subseteq U^W$. The idea is that each kind k is an individual correlate of a property P: it maps each possible world w to the sum individual which encompasses all individuals which are P in w. This will be made more precise below.

[2] To see this, let $P = AT(P)$ and $MAX(P)$ be defined. It follows from the definition of *MAX* (11) that there is some x such that (i) $MAX(P) = x$, (ii) $x = SUP(P)$, and (iii) $x \in P$. Given that $P = AT(P)$, it follows that (iv) $x \in AT(P)$. Now suppose P is not a singleton. Then there is some y such that (v) $y \in P$ and (vi) $y \neq x$. Given the definition of *SUP* (12), it follows from (ii) and (v) that (vii) $y \leq x$. Given the definition of *AT* (10), it follows from (iv), (v) and (vii) that $y = x$. But (vii) contradicts (vi). Thus, P is a singleton. QED.

1.6 Semantic Interpretation

1.6.1 Predicatives

I turn now to the semantics of nominals in Mandarin Chinese. Following Chierchia (1998), I assume that nouns in classifier languages are "cumulative" predicates, and that the function of *CL* is to make predicates "atomic." The definitions of "atomic" and "cumulative" are given in (13). Basically, X is an atomic predicate if the extension of X necessarily consists of atoms of X, and X is a cumulative predicate iff the extension of X is necessarily a set closed under the sum operation (cf. Krifka 1989; Quine 1960).

(13) X is an atomic predicate iff $[\![X]\!]_w = AT([\![X]\!]_w)$
X is a cumulative predicate iff $[\![X]\!]_w = +AT([\![X]\!]_w)$[3]

The classifier *CL* is defined as in (14). It denotes the atomizing function AT, which applies to a set and yields the atoms of this set.

(14) $[\![CL]\!]_w \subseteq D_{<e,t>} \times D_{<e,t>}$
$[\![CL\,X]\!]_w = AT([\![X]\!]_w)$

From the definition of *CL* in (14), we can derive the theorem that classifier phrases are atomic predicates.

(15) Theorem 1
$[CL\,X]$ is an atomic predicate[4]

We can now explain the predicative use of NP and CLP. Since NP is cumulative, its extension includes both singularities and pluralities, which means it can be true of both singular and plural individuals, as shown in (16a-b). Since CLP is atomic, it can be true of only singular individual, as shown in (16c-d). Assuming that analytically false sentences are ungrammatical (cf. Von Fintel 1993; Gajewski 2003; Abrusán 2007) we explain the contrast seen in (6).

(16) a. $[\![\text{Fido shi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w \in \{a, b, c, a+b, b+c, a+c, a+$

[3] $+P$ is the closure of P under $+$, i.e. $+P = \{SUP(Q) : Q \subseteq P\}$. For example, if $P = \{a, b, c\}$ then $+P = \{a, b, c, a+b, b+c, a+c, a+b+c\}$. In this and all subsequent definitions, free variables are to be understood as universally quantified over.

[4] We prove Theorem 1 by proving that $[\![CL\,X]\!]_w = AT([\![CL\,X]\!]_w)$. Given the definition of *CL* (14), this means proving that $AT([\![X]\!]_w) = AT(AT([\![X]\!]_w))$, or more generally that $AT(P) = AT(AT(P))$, i.e. that $x \in AT(P)$ iff $x \in AT(AT(P))$. Now it follows from the definition of AT (10) that if $x \in AT(AT(P))$ then $x \in AT(P)$. The same definition implies that we can prove the other direction by showing that if $x \in AT(P)$ then $((y \in AT(P) \wedge y \leq x) \rightarrow (y = x))$, i.e. that if (i) $x \in AT(P)$, (ii) $y \in AT(P)$ and (iii) $y \leq x$, then $y = x$. Given, again, the definition of AT (10), it follows from (ii) that (iv) $y \in P$, and from (i), (iv) and (iii) that $y = x$. QED.

$b+c\}$

b. $[\![\text{Fido he Pluto shi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w + [\![\text{Pluto}]\!]_w \in \{a,b,c,a+b,b+c,a+c,a+b+c\}$

c. i $[\![\text{Fido shi zhi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w \in \{a,b,c\}$

d. $[\![\text{Fido he Pluto shi zhi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w + [\![\text{Pluto}]\!]_w \in \{a,b,c\}$, i.e. iff $\perp$

As for the numeral phrase NumP, we follow Ionin & Matushansky (2006) and assume that only individuals of the same cardinality can be counted. One way to flesh out this idea is to require that the predicate P which is the complement of a numeral necessarily contain only individuals of the same number of P-parts. This is written into the definition of numerals, as exemplified by the definition of *liang* in (17).[5]

(17) $[\![\text{liang}]\!]_w \subseteq D_{<e,t>} \times D_{<e,t>}$
$[\![\text{liang } X]\!]_w$ is defined iff $\exists n(\forall w'(\forall u(u \in [\![X]\!]_{w'} \rightarrow |u|^{[\![X]\!]_{w'}} = n)))$
If defined, $[\![\text{liang } X]\!]_w = \lambda x(x \in +[\![X]\!]_w \wedge |x|^{[\![X]\!]_w} = 2)$

From (17) we can derive the theorem that the complement of *liang* must be an atomic predicate, and also that the numeral phrase itself is an atomic predicate.

(18) Theorem 2 - $[\![\text{liang } X]\!]_w$ is defined iff X is an atomic predicate[6]

(19) Theorem 3 - $[\![\text{liang } X]\!]_w$ is an atomic predicate[7]

The predicative use of NumP follows: as *liang zhi gou* (two CL dog) denotes a set of pluralities of dogs, or more precisely a set of duos of dogs, only a plural individual like Fido and Pluto can be in that set. A singular individual like Fido cannot be in the extension of *liang zhi gou*. Again, assuming that analytically false sentences are ungrammatical, we explain the contrast seen in (8).

(20) a. $[\![\text{Fido he Pluto shi liang zhi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w + [\![\text{Pluto}]\!]_w \in \{a+b,b+c,a+c\}$

[5] Notationally, $|x|^P$ denotes the number of P-parts of x, i.e. $|x|^P = \#\{y|y \in P \wedge y \leq x\}$.

[6] Theorem 2 is proved as follows. Suppose X is not atomic. From the definition of "atomic" (13), it follows that for some w', $AT([\![X]\!]_{w'}) \neq [\![X]\!]_{w'}$, hence $AT([\![X]\!]_{w'}) \subset [\![X]\!]_{w'}$. This means that there exists some $u \in [\![X]\!]_{w'}$ such that $u \notin AT([\![X]\!]_{w'})$, which means there is some $v \in [\![X]\!]_{w'}$ such that $v < u$, i.e. such that $|v|^{[\![X]\!]_{w'}} \neq |u|^{[\![X]\!]_{w'}}$. It follows from (17) that $[\![\text{liang } X]\!]_w$ is not defined. Now suppose X is atomic. Then for all w', $[\![X]\!]_{w'} = AT([\![X]\!]_{w'})$, hence for all w', $|u|^{[\![X]\!]_{w'}} = 1$ for all $u \in [\![X]\!]_{w'}$, which means that $[\![\text{liang } X]\!]_w$ is defined. QED.

[7] Here is the proof. Suppose $[\![\text{liang}X]\!]_w$ is not an atomic predicate. Then for some w', $[\![\text{liang}X]\!]_{w'}$ contains v and u such that $v \neq u$ and $v+u = u$. By assumption, $|v|^{[\![X]\!]_{w'}} = |u|^{[\![X]\!]_{w'}} = 2$. As $v+u = u$, $|v+u|^{[\![X]\!]_{w'}} = |u|^{[\![X]\!]_{w'}} = 2$, which means $v = u$. This contradicts our assumption. QED.

b. $[\![\text{Fido shi liang zhi gou}]\!]_w = 1$ iff $[\![\text{Fido}]\!]_w \in \{a+b, b+c, a+c\}$, i.e. iff $\perp$

1.6.2 Generics

We now come to the generic reading of nominals. First, let us consider D-genericity, i.e. kind-predication exemplified by sentences such as 'dogs are extinct' or 'dogs are related to wolves.'

Chierchia (1998) advances a theory of kind reference which include the following assumptions. (i) There is a linguistic operator – which we will symbolize as "K" in this paper – that maps nominal predicates (i.e. expressions of type $< e,t >$) into names of kinds (i.e. expressions of type e). (ii) Kinds are "individual concepts of some sort [...] functions from worlds [...] into pluralities, the sum of all instances of the kind [...]." (iii) The operator is a partial function, which means that some nominal predicates are not in its domain, i.e. "not all individual concepts are going to be kinds" (Chierchia 1998: 349-350).

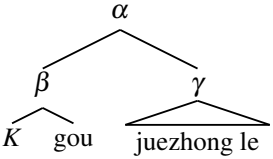
We will adopt these assumptions. We flesh out Chierchia's idea in the following definition of K.

(21) $[\![K]\!]_w \subseteq D_{<e,t>} \times G$
$[\![K\ X]\!]_w = \lambda w(MAX([\![X]\!]_w))$ if $[\![K\ X]\!]_w \in G$, undefined otherwise

Thus, K combines with a predicate X and yields an individual concept, a function from each possible world w to the maximal X-individual in w. Furthermore, the individual concept denoted by $[K\ X]$ must be a kind: $[K\ X]$ is undefined if it does not denote a kind.

Given the definition of K, it is clear how to generate kind-predication sentences, i.e. the D-generic reading. The LF of 'dog extinct' will be something like (22a), which will have the meaning that the kind dog, or canis, is extinct.

(22) a.



b. $[\![\alpha]\!]_w = 1$ iff canis $\in [\![\text{extinct}]\!]_w$

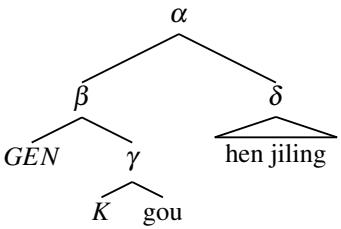
Let us now turn to the I-generic reading, as exemplified by sentences such as "dogs are intelligent." We will assume, following several works, that the I-generic reading comes about via a generic operator, *GEN*, which takes a kind and returns a generalized quantifier (Krifka 1987; Krifka et al. 1995; Chierchia 1998). Basically, *GEN* takes a kind and a predicate and returns true iff instances

of the kind generally fall under the predicate. The definition of *GEN* is given in (23).[8]

(23) $[\![GEN\ X]\!]_w$ is defined iff $[\![X]\!]_w \in G$
If defined, $[\![GEN\ X]\!]_w = \lambda P_{<e,t>}(generally_x(x \leq [\![X]\!]_w(w) \rightarrow x \in P))$

So a sentence such as 'dogs are intelligent' will have the LF in (24).

(24) a.



b. $[\![\alpha]\!]_w = 1$ iff $generally_x(x \leq [\![K\ \text{gou}]\!]_w(w) \rightarrow x \in [\![\text{hen jiling}]\!]_w)$, i.e. iff it is generally the case that instances of canis in w are intelligent in w.

We have explain how bare nouns can have the generic reading, i.e. how they can denote kinds and restrict *GEN*. It remains to explain why classifier and numeral phrases cannot be generic. Again, we will base the explanation on an idea in Chierchia (1998: :350), namely that "something which is necessarily instantiated by just one individual [...] would not quality as a kind" (Chierchia 1998: 350). We explicate this idea by postulating the constraint in (25), which basically says that $[K\ X]$ would denote a kind only if for some world w', the sum individual which represents $[K\ X]$ in w' is plural. We have defined $[K\ X]$ as function from worlds to $MAX(X)$. This means that $[K\ X]$ is a kind only if $MAX(X)$ consists of more than one X-atoms in some possible world.

(25) $[\![K\ X]\!]_w \in G$ only if for some w', $|MAX([\![X]\!]_{w'})|^{AT([\![X]\!]_{w'})} > 1$.

Thus, a predicate like *gou* 'dog' can combine with K because there is a possible world where the maximal dog consists of more than one dog-atom. But a predicate like 'being identical to Gennaro Chierchia' will not be able to combine with K, because in every world, the maximal element in this predicate consists of exactly one Gennaro atom. Given (25), we can prove that K cannot combine with an atomic predicate, because if X is an atomic predicate, $MAX(X)$ is

[8] The generic operator assumed in Chierchia (1998) also selects a kind as its restrictor, even though this is not stated explicitly in Chierchia's paper (I thank Gennaro Chierchia for pointing this out to me). For how the word "generally" in the definition of *GEN* is to be understood, see Krifka (1987); Krifka et al. (1995).

either undefined or contain just one X-atom.[9]

(26) Theorem 4
$[\![K\ X]\!]_w$ is undefined if X is an atomic predicate

Because genericity is expressed via kind-reference, and kind reference requires cumulative predicates, it follows that classifier phrases and numeral phrases cannot have a generic interpretation, because as we have proved, both of these categories are atomic predicates.

1.6.3 Definites

We come now to the definite reading of nominals. Recall that in Chinese, only bare nouns can be definite. Given that only bare nouns can denote kind, this fact suggests that definiteness is also expressed via kind-reference in Chinese. It turns out that there is a very natural way that this can be done. We have defined kinds as function from worlds to maximal individuals, and it is run of the mills to analyze definiteness in terms of maximality (cf. Kadmon 1990; Roberts 2003; Sharvy 1980). So all we have to do is to define an operator EXT which takes an individual concept and applies it to the evaluation world.[10]

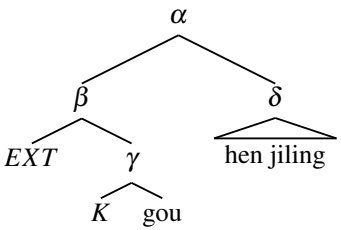
(27) $[\![EXT\ X]\!]_w = [\![X]\!]_w(w)$

This means that EXT combined with $[K\ X]$ will give us the meaning of 'the X.' It also means that only $[K\ X]$ can combine with EXT, because only $[K\ X]$ denotes an intension. And since only bare nouns can combine with K, only bare nouns can be definite. So the LF in (28a) will give us the meaning 'the dog is intelligent' in a world where there is exactly one dog, and the meaning 'the dogs are intelligent' in a world where there are more than one dogs.

[9] Theorem 4 is proved as follows. Let X be an atomic predicate and w' be a world. Given the definition of "atomic predicate" (13), $[\![X]\!]_{w'} = AT([\![X]\!]_{w'})$. We have proved in footnote 2 that $MAX([\![X]\!]_{w'})$ is defined only if $[\![X]\!]_{w'}$ is a singleton. Thus, $|MAX([\![X]\!]_{w'})|^{AT([\![X]\!]_{w'})} = n$ only if $n = 1$. Since w' is an arbitrary choice, no w'' is such that $|MAX([\![X]\!]_{w''})|^{AT([\![X]\!]_{w''})} = n$ and $n \neq 1$. This means that no w'' is such that $|MAX([\![X]\!]_{w''})|^{AT([\![X]\!]_{w''})} > 1$. Given the constraint on G (25), $[\![K\ X]\!]_w \notin G$, and given the definition of K (21), $[\![K\ X]\!]_w$ is undefined. QED.

[10] In this sense, EXT has the same function as the operator $^\vee$ of Montague (1973).

(28) a.

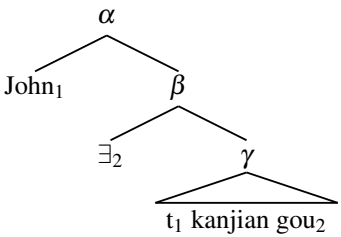


b. $[\![\alpha]\!]_w = 1$ iff $MAX([\![\text{gou}]\!]_w) \in [\![\text{hen jiling}]\!]_w$, i.e. iff the dog(s) in w is/are intelligent in w

1.6.4 Indefinites

Indefinite reading is only available to object nominals in Chinese. To account for the possibility of indefinite objects, we assume that verbs and objects in Chinese can compose via the rule of Restrict (Chung & Ladusaw 2004), and Existential Closure applies at the VP level, binding free variables in it (Heim 1982; Diesing 1992). To account for the impossibility of indefinite subjects in Chinese, we assume that subjects in Chinese cannot reconstruct into VP (Tsai 2001), hence cannot be existentially closed. The LF of *John kanjian gou* 'John saw dog' is given in (29a), its truth conditions in (29b).

(29) a.



b. $[\![\alpha]\!]_w = 1$ iff $\exists_x(saw(j,x) \wedge x \in [\![gou]\!]_w)$

By hypothesis, $[\![gou]\!]_w$ contains both singular and plural dogs, which means *John kanjian gou* is true iff John either saw a single dog, or he saw a plurality of dogs. This is the result we want (cf. (3)). If instead of *gou* 'dog,' we have the classifier phrase *zhi gou* 'CL dog' or the numeral phrase *yi zhi gou* 'one CL dog', we predict the sentence to have the implicature that John saw a single dog (cf. Zweig 2009).

2 Vietnamese

Vietnamese is a classifier language, just like Chinese. The two languages resemble each other with regard to every aspect of nominal syntax and semantics save the expression of definiteness. Recall that in Chinese, NPs (bare nouns)

can be definite, while classifier phrases (CLP) and numeral phrases (NumP) cannot. Vietnamese differs from Chinese in a rather bizarre way: it shows the exact opposite. Classifier and numeral phrases can be definite in Vietnamese, while bare nouns cannot.

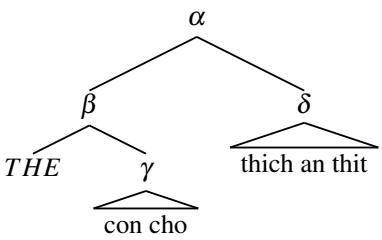
(30) a. Cho thich an thit
dog like eat meat
'Dogs / *The dog(s) like(s) to eat meat'
b. Con cho thich an thit
CL *dog like eat meat*
'The dog likes to eat meat'
c. Hai con cho thich an thit
two CL *dog like eat meat*
'The two dogs like to eat meat'

Our account of this difference has two components. The first is the assumption that Chinese and Vietnamese differ with respect to lexical resource: instead of EXT, Vietnamese has THE, which is defined in (31).

(31) $[\![THE]\!]_w \subseteq D_{<e,t>} \times U$
$[\![THE\ X]\!]_w = MAX([\![X]\!]_w)$

This allows CLP's and NumP's to have the definite reading. The LF for (30b), for example, would be that in (32).

(32)



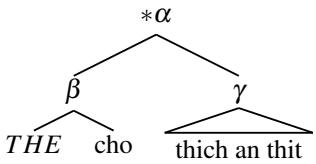
The second component of the account is a preference principle which says that when both K and THE *can* be used, i.e. when neither of them causes type mismatch, K *must* be used.[11]

[11] Chierchia (1998) proposes the same preference of the kind operator over the definite article. Chierchia's framework makes it possible to motivate this preference. The account developed here is incapable of this task. Thus, we will leave (33) as a primitive for the present.

(33) Preference Principle
Prefer K to THE!

The LF in (34) would then be ill-formed. This explains why bare nouns cannot be definite in Vietnamese.

(34)



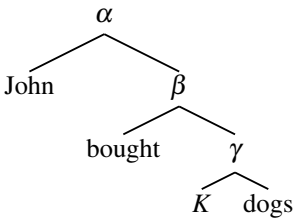
3 Remaining Issues and Conclusion

3.1 Inventory of Semantic Rules

The contrast in (35) in English motivates Chierchia's (1998) rule of Derived Kind Predication (DKP). (36) shows the LF of (35a) and how it is interpreted under application of DKP.

(35) a. John bought dogs
b. *John bought dog

(36) a.



b. $\text{DKP}([\![\alpha]\!]_w) = \exists_x(bought(j,x) \wedge x \leq [\![K \text{ dogs}]\!]_w(w))$

Crucially, DKP requires the relevant nominal in the input to be a kind term. As *dogs* can and *dog* cannot denote a kind, we predict that DKP is inapplicable in (35b), while it is in (35a). Now in order to rule out (35b), we also have to say that English cannot express indefiniteness by way of Restrict/Existential Closure, since of it could, (35b) would be well-formed with the meaning of 'John bought a dog.'

Can we use DKP for Chinese and Vietnamese instead of Restrict and Existential Closure to effect the indefinite reading for bare nouns? The answer seems to be negative. Recall that we take numeral phrases in these languages to be of type $< e,t >$, and to be atomic predicates. This means that DKP cannot apply, since atomic predicates cannot be mapped to kinds. We would then pre-

dict that numeral phrases cannot be interpreted as indefinites, which is wrong. Now suppose we say numeral phrases are generalized quantifiers, i.e. expressions of type $< et, t >$. Then we would correctly predict the indefinite reading of these phrases to be possible, but we would also predict - incorrectly - that indefinite numeral phrases are possible in subject positions.

Thus, what we have to say is that English has DKP but not Restrict /Existential Closure, and Chinese and Vietnamese have Restrict/Existential Closure but not DKP. In other words, we have to assume that languages vary not only with respect to lexical representation, but also in the inventory of interpretive rules.

3.2 Conclusion

Research on how the mass count distinction plays out in different languages promises to inform our understanding of the relation between grammar, cognition and the physical world. Investigation of the contrast between number marking and classifier languages, and of the micro variation among languages of both types, should be of special relevance. A vast amount of work in the semantic literature has been devoted to the meaning of noun phrases in number marking languages. Analyses of classifier languages, however, have been fewer and less rigorous, and the micro variation between them has not received much attention. In this paper, we attempt to take a small step toward eliminating this discrepancy: we present a set of facts concerning the distribution and interpretation of nominals in two classifier languages – Mandarin and Vietnamese – and derive these facts from precisely formulated assumptions. Our proposal builds entirely on suggestions that have been made in previous works. Thus, we contribute no "new idea." Our aim is rather to show which old ideas can be selected – and explicated in certain ways – to capture the observations, and what implications this has for the parametric theory of language.

References

Abrusán, Martha. 2007. *Contradiction and Grammar: the Case of Weak Islands*: MIT dissertation.

Cheng, L.L.S. & R. Sybesma. 1999. Bare and not-so-bare nouns and the structure of NP. *Linguistic Inquiry* 30(4). 509–542.

Cheng, L.L.S. & R. Sybesma. 2005. *Classifiers in four varieties of Chinese* 259–292. Oxford University Press.

Chierchia, G. 1998. Reference to kinds across language. *Natural language semantics* 6(4). 339–405.

Chierchia, G. & R. Turner. 1988. Semantics and property theory. *Linguistics and Philosophy* 11(3). 261–302.

Chung, S. & W.A. Ladusaw. 2004. *Restriction and saturation*. The MIT Press.
Diesing, M. 1992. *Indefinites*. MIT Press.
Gajewski, J. 2003. L-analyticity in natural language.
Heim, I.R. 1982. The semantics of definite and indefinite noun phrases. *Doctoral Dissertations, UMass Amherst* .
Ionin, T. & O. Matushansky. 2006. The composition of complex cardinals. *Journal of Semantics* 23(4). 315.
Kadmon, N. 1990. Uniqueness. *Linguistics and Philosophy* 13(3). 273–324.
Krifka, M. 1987. An outline of genericity. Partly in collaboration with C. Gerstner. SNS-Bericht, Universität Tübingen.
Krifka, M. 1989. *Nominalreferenz und Zeitkonstitution: Zur Semantik von Massentermen, Pluraltermen und Aspektklassen*. W. Fink.
Krifka, M., F.J. Pelletier, G.N. Carlson, A. ter Meulen, G. Chierchia & G. Link. 1995. Genericity: an introduction. *The generic book* 1–124.
Landman, F. 1989. Groups, I. *Linguistics and philosophy* 12(5). 559–605.
Lee, T.H. 1986. *Studies on quantification in Chinese*: UCLA dissertation.
Li, C.N. & S.A. Thompson. 1989. *Mandarin Chinese: A functional reference grammar*. Univ of California Pr.
Li, Y.A. 1998. Argument determiner phrases and number phrases. *Linguistic Inquiry* 29(4). 693–702.
Link, G. 1983. The logical analysis of plural and mass nouns: a lattice theoretic approach. *Meaning, use and interpretation of language, de Gruyter, Berlin* 302–323.
Montague, R. 1973. The proper treatment of quantification in ordinary English. *Approaches to natural language* 49. 221–242.
Quine, W.V.O. 1960. *Word and object*. The MIT Press.
Ren, C.Y. 1968. *A grammar of spoken Chinese*. University of California Press.
Roberts, C. 2003. Uniqueness in definite noun phrases. *Linguistics and Philosophy* 26(3). 287–350.
Rullmann, H. & A. You. 2006. General number and the semantics and pragmatics of indefinite bare nouns in Mandarin Chinese. In Klaus von Heusinger et al. (ed.), *Where semantics meets pragmatics*, Amsterdam: Elsevier.
Schwarzschild, R. 1996. *Pluralities*. Springer.
Sharvy, R. 1980. A more general theory of definite descriptions. *The philosophical review* 89(4). 607–624.
Shyu, S. 1995. *The syntax of focus and topic in Mandarin Chinese*: University of Southern California dissertation.
Tang, C.C.J. 1990. *Chinese phrase structure and the extended X'-theory*. UMI Dissertation Information Service, Ann Arbor, Michigan.

Tsai, W.T.D. 1994. *On economizing the theory of A'-dependencies*: MIT Dissertation dissertation.

Tsai, W.T.D. 2001. On subject specificity and theory of syntax-semantics interface. *Journal of East Asian Linguistics* 10(2). 129–168.

Von Fintel, K. 1993. Exceptive constructions. *Natural Language Semantics* 1(2). 123–148.

Xu, Lie-jiong. 1996. Limitation on subjecthood of numerically quantified noun phrases: A pragmatic approach.

Yang, R. 2001. *Common nouns, classifiers, and quantification in chinese*: Rutgers, The State University of New Jersey dissertation.

Zweig, E. 2009. Number-neutral bare plurals and the multiplicity implicature. *Linguistics and philosophy* 32(4). 353–407.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 645–660. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

On the Rise and Fall of Declaratives

Tue Trinh
MIT
tuetrinh@mit.edu

Luka Crnič
MIT
crnic@mit.edu

Abstract. This paper argues for a new way of thinking about semantic and pragmatic effects of particular sentence intonation patterns. The main focus of the paper is on the so-called rising declaratives, i.e. sentences that have the surface structure of a declarative sentence but are pronounced with a rising pitch contour. Rising declaratives differ from both declaratives with a falling pitch contour and questions in their pragmatic effect. Our goal is to account for this difference. We propose that rising intonation contour is syntactically realized. Its semantic import is to determine the resolution of a variable in the speech act projection, i.e. rising intonation operates on speech acts. The pragmatic effects associated with rising declaratives are shown to follow from this minimal assumption and the independently motivated tenets of speech act theory.

1 Introduction

Rising declaratives are declarative sentences with a rising pitch contour, which we indicate with a question mark in the following examples. They are known to exhibit pragmatic effects distinct from those of declarative sentences with a falling pitch contour (e.g. Gunlogson 2003). Most prominently, rising declaratives elicit a a yes/no response from the addressee, similar to polar interrogatives. This is shown in (1) where the utterance by A is naturally followed by B's response with yes or no. An utterance of a falling declarative does not generally require such a response.

(1) Elicitation of response
A: John has a sister? / Does John have a sister?
B: Yes. / No.

However, besides the obvious similarity in function between rising declaratives and polar interrogatives, there are several facts that distinguish these two classes of expressions. These facts suggest that rising declaratives express propositions in a way polar questions do not. In this respect, rising declaratives resemble falling declaratives. As seen in (2a), a rising declarative can be picked up by the propositional anaphor *that* and claimed to be true in the actual world. Clearly, this is not possible with polar questions: they denote sets of propositions and, accordingly, are not true or false (Hamblin 1973; Karttunen 1977).

This is illustrated in (2b) where the indicative *be correct* cannot be felicitously predicated of the anaphor. Although polar questions may make certain propositions salient, these do not enjoy the same discourse status as the propositions introduced by rising declaratives. This is shown by the B' response in (2b) where the use of subjunctive mood is obligatory.

(2) Predication of correctness

a. A: John smokes? / John smokes.
   B: That's correct.

b. A: Does John smoke?
   B: #That's correct.
   B': That would be surprising.

Furthermore, (3a) shows that consent to and dissent from a conjunction of two rising declaratives is equivalent to affirming or negating a conjunction of two propositions, respectively. For example, a positive reply to A's utterance in (3a) entails that I smoke and I drink, while a negative reply entails that either I don't smoke or I don't drink. On the other hand, a single yes or no response to a conjunction of two interrogatives is not possible, as is shown by the infelicitous discourse in (3b). Thus, rising declarative discourses but not polar question discourses parallel (dis)agreement patterns found with conjoined falling declaratives (4).

(3) Conjunction

a. A: You smoke? And you drink?
   B: Yes. (I smoke and drink.) / No. (I smoke but don't drink.)

b. A: Do you smoke, and do you drink?
   B: #Yes. / #No.

(4) A: John smokes and he drinks.
   B: Yes. (He smokes and drinks.) / No. (He drinks but doesn't smoke.)

Another property which assimilates rising declaratives to falling declaratives is the inability to license NPIs, as illustrated by the unacceptable (5a). The inability to license NPIs sets rising declaratives apart from regular interrogatives since the latter can license NPIs, as is shown in (5b).

(5) NPI licensing

a. *John lifted a finger to help?

b. Did John lift a finger to help?

Finally, rising declaratives differ from interrogatives in being 'prejudiced' or 'biased.' There are many types of examples in the literature that illustrate this. We focus on three examples discussed by Gunlogson (2003) which we take to be representative. (6) shows that a rising declarative is inappropriate in contexts where the speaker is supposed to be neutral, e.g. in an unbiased committee hearing. In such a neutral setting, the polar interrogative in (6a) is appropriate, indicating that the speaker does not know about the political affiliations of the hearer. On the other hand, it is inappropriate to use a rising declarative in such a context. Intuitively, this is because a rising declarative leaves the impression that the speaker suspects the hearer to be a communist, which is incompatible with the hypothesized neutrality of the hearing.

(6) Committee hearing
   a. Are you a member of the Communist Party?
   b. #You are a member of the Communist Party?

(7) shows that rising declaratives cannot be used as conversation openers. An utterance of a rising declarative in (7) requires there to have been a preceding exchange between the speaker and the hearer concerning the whereabouts of Laura. This is incompatible with an out-of-the-blue context.

(7) Initiating a phone conversation
   a. Is Laura there?
   b. #Laura's there?

A similar point is raised by (8). Suppose I am sitting in a windowless room and my friend comes in. If I want to know whether it is raining outside, I can ask for this information by uttering a polar interrogative (8a). However, it would be strange for me to use a rising declarative in this context – unless my friend is holding an umbrella or is all wet. Thus, the use of rising declarative requires the speaker to have reasons to believe that the expressed proposition is true.

(8) Windowless room
   a. Is it raining?
   b. #It's raining? (appropriate only in the presence of an umbrella...)

We have presented four types of differences between rising declarative and polar interrogatives. These differences relate primarily to what types of objects seem to be made available by the respective phrases (propositions vs. sets of propositions) and to what conditions rising declaratives and polar questions impose on the context (bias). On the other hand, we have also seen differences

between rising and falling declaratives: only the former elicit a yes/no response. An adequate theory of rising declaratives should provide an account of these asymmetries. The goal of this paper is to provide such a theory.

In Section 2, we review three previous accounts of rising declaratives and some of their difficulties. In Section 3, we present our analysis and derive the facts described in Section 1. The analysis builds on two ideas: (i) speech act operators are syntactically represented and parameterized and (ii) rising intonation may constrain/determine their parameters. We also show that our proposal is immune to the objections to previous accounts that we discuss in Section 2. In Section 4 we discuss some extensions of the proposal and conclude.

2 Previous Accounts

This section reviews three representative accounts of rising declaratives and some of the issues that they face. The first is Gunlogson's commitments account (2002; 2003); the second is Šafářová's modal account (2005; 2007); the third is that of Truckenbrodt (2006).

2.1 Gunlogson's Account

Gunlogson (2002; 2003) models the context of conversation as a pair $< cs, ca >$, where *cs* represents the public commitments (public beliefs) of the speaker and *ca* represents public commitments of the addressee. The main component of Gunlogson's proposal are the update rules in (9), which say that a falling declarative updates *the speaker's* public commitments, while a rising declarative updates *the addressee's* public commitments. Thus, Gunlogson establishes a sort of form-function parallelism, in the sense that all declaratives are uniformly propositional and are used to update public commitments of discourse participants. In the following, we use $\uparrow$ to indicate rising intonation and $\downarrow$ to indicate falling intonation.

(9) Update rules
$< cs, ca > + \downarrow \phi = < cs \cap [\![\phi]\!], ca >$
$< cs, ca > + \uparrow \phi = < cs, ca \cap [\![\phi]\!] >$

However, the update rules in (9) do not on their own explain why rising declaratives are perceived as biased questions. Gunlogson addresses this issue by proposing specific definitions of 'bias' and 'question.' Specifically, she proposes that a context $< cs, ca >$ is 'biased toward a proposition p' iff p can become public commitment of both speaker and addressee, but $\neg p$ cannot. In other word, c is biased toward p iff at least one discourse participant has committed herself to p.

(10) Bias
$< cs, ca >$ is biased toward p iff for some x, $cx \subseteq p$

The notion of 'question' is defined as 'not changing the commitment set of any discourse participant.' This is formulated in (11).

(11) Question
ϕ counts as a question iff $< cs, ca > + \phi = < cs, ca >$

According to these definitions, it holds that a rising declarative counts as a question just in case there is bias, i.e. if the addressee has publicly committed herself to the propositional content of the declarative.

(12) $\uparrow \phi$ is a question iff $ca \subseteq [\![\phi]\!]$

An example that Gunlogson presents to support this treatment is the exchange in (13). With her utterance, A publicly commits herself to the proposition that she has a sister. Upon A's utterance, B knows that A has a sister. Nevertheless, B can follow A's utterance with a rising declarative. According to Gunlogson, B's utterance feels like a question exactly because A has publicly committed herself to having a sister.

(13) A: I have to pick up my sister from the airport.
B: You have a sister?

The main problem with this account is that it predicts that whenever a rising declarative is used as a question, it must be clear to both speaker and addressee that the answer will be yes. Thus, it is not clear what B is asking in (13): B cannot be asking whether A has a sister, since after A's utterance, B knows that A will give a positive answer. Now, suppose that B pretends not to know this. Gunlogson then predicts that B's utterance is not a question anymore. This is because to pretend not to know that A has a sister, B must also pretend that A has not committed herself to the proposition that A has a sister. According to the characterization in (12), B's utterance can then not be intended as a question.

Another problem for Gunlogson's theory is that it predicts that a negative answer to a rising declarative is always a contradiction. Imagine that A responds with "no" to B in (13). A would clearly be contradicting herself. Gunlogson predicts that any negative answer to a rising declarative should feel the same way. This does not seem correct in the light of the following data.

(14) A: I bought Critique of Pure Reason yesterday
B: You read Kant?
C: No. I just want to have it on the shelf.

Finally, we believe that Gunlogson's definition of 'question' is unmotivated. It is true that questions have been defined in such a way that they do not contract or expand the context set (e.g. Groenendijk 1999). But isolating this feature and elevating it, in contrast to some other features of question, to the *defining* property of questions requires further support.

2.2 Šafářová's Account

Šafářová (2005, 2007) develops a modal analysis of rising intonation where she treats the final rise as a modal operator of epistemic uncertainty akin to *might*. In her account she utilizes update semantics (Veltman 1996) and a modified Groenendijk & Stokhof semantics of the question operator, whereby the context is modeled as an equivalence relation on a set of possible worlds. The updates are defined as in (15).

(15) a. $c[p] = c \cap \{(i,j) | [\![p]\!](i) = [\![p]\!](j) = 1\}$
b. $c[\Diamond\phi] = c$ if $c[\phi] \neq \emptyset$, otherwise $c[\Diamond\phi] = \emptyset$
c. $c[?\phi] = c \cap \{(i,j) | (i,i) \in c[\phi]$ iff $(j,j) \in c[\phi]\}$

The next three ingredients in Šafářová's system are the definitions of strength and answerhood and a formalization of Grice's maxims of conversation.

(16) ϕ is stronger than ψ iff $c_0[\phi] \subset c_0[\psi]$[1]

(17) ψ is a answer to $?\phi$ iff either (a) or (b) holds:
a. $\psi = \phi$
b. There is an answer χ such that $c_0[\psi][\chi] = \emptyset$ and there is no answer χ' such that χ' is a formula of propositional logic (i.e. contains no ? or $\Diamond$) and ψ is stronger than χ'.

(18) Maxims of conversation
a. Relation: every statement is an answer to an unresolved question (explicit or accommodated)
b. Quality I: every statement is the strongest statement with respect to *cs*

[1] To be more precise, iff $dom(c_0[\phi]) \subset dom(c_0[\psi])$, where $dom(\delta) = \{i | (i,i) \in \delta\}$. For expository purpose, we will write '$c[\phi]$' instead of '$dom(c[\phi])$', when it is intuitively clear what is meant.

With these concepts in hand, Šafářová (2007: 311) proposes the following analysis for rising declaratives:

> [W]e take the meaning of the final rise to be that of [...] Veltman's (1996) $\Diamond$-operator [...] [U]ttering [$\Diamond\phi$] accommodates [the question ?$\Diamond\phi$] which has $\Diamond\phi$, ϕ and $\neg\phi$ among its answers. In a rational conversation, participants cooperate on finding the strongest possible answers to questions that have been raised (whether overtly or accommodated). Therefore, if a ?$\Diamond\phi$ question has been raised and there is a participant who knows that either ϕ or $\neg\phi$ is the case, she has to say so. Thus, a rising declarative [..] will frequently be followed by a 'response'. Crucially, this response is not an answer to the rising declarative but to the question accommodated due to the use of the rising declarative.

The proposal faces certain issues. The most apparent issue, acknowledged by Šafářová, is the difference between a rising declarative and a sentence headed by *might*, which is what Veltman's $\Diamond$ was intended to model. More to the point, it is not clear why rising declaratives and existential modal sentences trigger such distinct conversational effects.

Furthermore, the derivation of the positive bias of rising declaratives is problematic in her system. To do this, Šafářová employs the following maxim:

(19) Quality II: every ϕ is non-redundant
(ϕ is redundant iff $cs[\neg\psi] = c[\neg\psi]$, where ψ results from stripping ϕ of all instances of $\Diamond$)

Given the assumption that $cs \subseteq c$ (the speaker believes what is common ground), it follows from Quality II that the speaker of $\Diamond\phi$ "believes $\neg\phi$ to be less likely" in the sense that "there are less $\neg\phi$ worlds in c than in cs" (Šafářová 2005: 365). Namely, for $\Diamond\phi$ to be non-redundant, it must hold that $cs[\neg\phi] \neq c[\neg\phi]$; this means, assuming $cs \subseteq c$, that $cs[\neg\phi] \subset c[\neg\phi]$. However, it is not clear how this reasoning explains the bias of rising declaratives. Suppose $c = \{i, j, k, ...\}, cs = \{i, k\}$ and $c_0[\neg\phi] = \{i, j\}$. Then $\Diamond\phi$ is not redundant (as $cs[\neg\psi] \neq c[\neg\psi]$), but $\neg\phi$ is likelier in cs than in c, which contains a whole sequence of $\neg\psi$ worlds, starting with k. Furthermore, in both c and cs, $\neg\psi$ is at least as likely as ψ.

2.3 Truckenbrodt's Account

Truckenbrodt (2006) develops an account that builds on two ideas. The first relates to the semantic import of intonation: using a falling declarative $\downarrow \phi$ commits the speaker to ϕ, similar to Gunlogson; using a rising declarative $\uparrow \phi$ simply indicates the absence of this commitment, unlike in Gunlogson. The second idea is that uttering a declarative $\downarrow \phi$ or $\uparrow \phi$, the speaker conveys that he wants the hearer to make it common ground that ϕ. Truckenbrodt elegantly employs these notions to derive the pragmatic effects discussed above. Namely,

by uttering $\uparrow \phi$ the speaker, on the one hand, indicates that it is not the case that she believes ϕ and, on the other hand, indicates that she wants the hearer to make it common ground that ϕ. If the speaker believes that the hearer does not believe that ϕ, it is not possible to expect her to make it common ground that ϕ. Thus, the speaker who utters $\uparrow \phi$ must believe that the hearer believes that ϕ, and this is the bias that Gunlogson claims accompanies rising declaratives.

What we think is problematic for Truckenbrodt's theory is the fact that rising declaratives elicit a response in a way falling declaratives do not. Truckenbrodt could claim that the ability of rising declaratives to elicit a response follows from the speaker not believing that ϕ and her expressed desire that ϕ be made common ground: this desire would not be satisfied if the addressee does not utter $\downarrow \phi$. However, this raises the question why the same does not hold for falling declaratives. In both cases the addressee plays a crucial role in making ϕ common ground; it is not clear why the belief states of the speaker should make a difference.

To summarize, we have presented three representative accounts of rising declaratives. Although all three approaches shed important light on rising declaratives, we pointed out issues that they face. The first was the account by Gunlogson (2002, 2003). We have argued that its main difficulty was to come to terms with the questioning nature of rising declaratives in a non-ad-hoc manner. The second account was the modal treatment of rising declaratives by Šafářová (2005, 2007). Besides pointing to dissimilarities between modals and rising declaratives, we have argued that it is not entirely successful in accounting for the positive bias of rising declaratives. The third approach was by Truckenbrodt (2006). We pointed out an issue with deriving elicitation accompanying rising declaratives. In the following section, we develop a novel treatment of rising declaratives that avoids the issues described in this section.

3 Analysis

This section introduces our analysis of rising declaratives. We share with Gunlogson and Truckenbrodt the idea that the bias of rising declaratives supervenes on the belief of the hearer in the propositional content of the sentence. Unlike in Gunlogson, beliefs enter our analysis only indirectly, via the logic of assertion. This resembles the strategy pursued by Truckenbrodt. We begin this section by looking at the speech act of assertion and the Performative Hypothesis. We propose that rising intonation 'inflects the performative prefix,' i.e. we argue that the semantic import of rising intonation is to determine the interpretation of a variable in the speech act projection. We conclude by deriving the facts discussed in the first section.

3.1 Ingredients: Assertion, Belief, Performative Hypothesis

Assertion is one of the most studied topics in linguistics. Accordingly, there are many theories dealing with it. However, all theories seem to agree that assertion has at least the two properties discussed in this subsection. It is these two properties that form the basis of our account. First, asserting a proposition *p* requires believing that *p*. We call this principle the Sincerity Principle, adopting Searle's terminology.

(20) Sincerity Principle (cf. Searle 1969; Grice 1975)
Assert only what you believe

The second principle is a constraint proposed by Robert Stalnaker. It says that an assertion must be false in some worlds of the context set. In other word, assertion of *p* means that *p* is not in the common ground, i.e. not presupposed. We call this principle the Informativity Principle.

(21) Informativity Principle (Stalnaker 1978)
Assert only what is not mutual belief, i.e. what is not presupposed

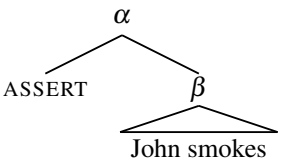
The next ingredient of our theory is the assumption that speech act theory is part of semantic theory. This is subsumed by the Performative Hypothesis which says that sentences are headed by speech act operators and that the investigation of speech acts is just the investigation of the meaning of these operators. This idea is explicitly expressed in a quote by Gazdar (1979: 18f):[2]

> Every sentence has a performative clause in deep or underlying structure [...] The subject of this clause is first person singular [...] Illocutionary force is semantic (in the truth-conditional sense) and is fully specified by the meaning of the performative clause itself.

We assume that declaratives used as assertions are headed by a speech act operator, ASSERT, which incorporates the logic of assertion delineated above (cf. Ross 1970; Lakoff 1970; Sadock 1974; Gazdar 1979; Krifka 1995, 2001; Tenny & Speas 2004: among others). These assumptions are illustrated on a concrete example, the sentence *John smokes*, in the following. The LF of the sentence is given in (22). We have an ASSERT operator c-commanding the proposition-denoting constituent. The semantic import of the whole sentence is that the speaker asserts that John smokes. This entails, given the Sincerity and Informativity Principles, that the speaker believes that John smokes and that it is not presupposed that John smokes.

[2] It is important to point out that Gazdar did not endorse the Performative Hypothesis.

(22) a.



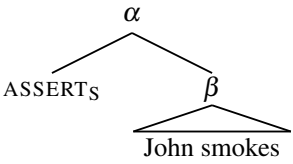
b. $[\![\phi]\!]^c$ = 1 iff the speaker in c asserts that John smokes
⇒ the speaker in c believes that John smokes
⇒ that John smokes is not in the common ground in c

All variants of the Performative Hypothesis tend to have it as part of the meaning of the ASSERT operator that the assertor is the speaker; this is reflected in Gazdar's quote above. However, in contrast to other approaches, we propose that ASSERT can inflect for person and that this inflection is reflected in the intonation of the sentence. In particular, rising intonation indicates that ASSERT has a second person feature, while falling intonation indicates that the assertor is the first person, i.e. the speaker.

(23) Falling declaratives

a. John smokes ↓

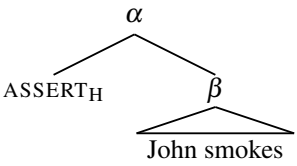
b.



(24) Rising declaratives

a. John smokes ↑

b.



The question that now arises is how the sentences headed by ASSERT, such as (24b), are used. They are descriptions of the world, so they are either true or false. So uttering a sentence is giving a description of the world. Now, giving a description of the world is proposing that that description be accepted as accurate. Thus, we assume the following rule for using declaratives:

(25) Rule for using declaratives
A declarative ϕ is used in context c to propose that c be updated to $c \cap [\![\phi]\!]$.

It follows immediately from this rule that the speaker of (24b) is proposing to make it common ground that the hearer asserts that John smokes.

(26) Corrolary
A rising declarative $\uparrow \phi$, i.e. a sentence with the structure $[\text{ASSERT}_{\text{H}}\ \phi]$, is used in context c to propose that c be updated with the proposition that the hearer asserts that ϕ.

3.2 Deriving the Facts

With the above tools in hand, we can now return to the facts described in Section 1. The first fact that we need to account for is the response elicitation effect of rising declaratives.

(1) A: John has a sister? / Does John have a sister?
B: Yes. / No.

In our system, this is due to the fact that uttering a rising declarative means making a proposal. A response is expected when a proposal is made. This is particularly pressing with rising declaratives where it is proposed that *the hearer* asserted something and has thus committed herself to a particular proposition. In the case of falling declaratives, where the agent parameter is resolved to the speaker, a proposal is made as well. The self-verifying nature of this latter case makes a response from the hearer either redundant or inappropriate.

The second fact involves the difference between polar interrogatives and rising declaratives with respect to making available propositional antecedents.

(2) a. A: John smokes? / John smokes.
B: That's correct.
b. A: Does John smoke?
B: #That's correct.
B': That would be surprising

In (26a), the anaphor *that* picks up the proposition-denoting complement of ASSERT (27). As we can see in (28), it is not unusual that *that* can refer to embedded propositions.

(27) a. $\text{ASSERT}_{H}\ [_{\phi}$ John smokes]
b. That_{ϕ} is correct

(28) A: Mary thinks [$_\phi$ John smokes]
B: That$_\phi$ is correct

However, as we can see in (29), an embedded question seems not to be able to deliver a unique salient proposition that can be anaphorically referred to by *that*.

(29) A: Mary knows [$_\phi$ whether John smokes]
B: *That$_\phi$ is correct

Now, suppose that the question in the (b)-example in (2) consists of a speech act operator QUEST and a question-denoting constituent ϕ. We correctly expect that ϕ cannot be picked up by *that*.

(30) a. QUEST$_S$ [$_\phi$ whether John smokes]
b. *That$_\phi$ is correct

A related set of data was observed in responses to conjoined rising declaratives. Unlike with polar interrogatives, a single response to conjoined rising declaratives is possible, similar to what we find in (dis)agreement with falling declaratives.

(3) a. A: You smoke? And you drink?
B: Yes. (I smoke and drink.) / No. (I smoke but don't drink.)
b. A: Do you smoke, and do you drink?
B: #Yes. / #No.

Namely, a rising declarative expresses a proposition, so a conjunction of two rising declaratives will also express a proposition; this proposition can be agreed with or contested.

(31) a. You smoke? And you drink?
b. [[ASSERT$_H$ you smoke] and [ASSERT$_H$ you drink]]
c. H asserts that H smokes and H asserts that H drinks

If the response to conjoined rising declaratives is yes, we commit ourselves to the same inferences as when agreeing to conjoined falling declaratives or, more appropriately, a falling declarative where the complement of ASSERT is a conjunction.

Now, disagreeing with a falling declarative $\downarrow \phi$ is not contesting that the speaker asserted ϕ but contesting the content of ϕ. Although it is intuitively clear why this should be the case (it is non-sensical to contest that the speaker asserted ϕ), it is puzzling that no can then be treated as contesting the proposi-

tion embedded under ASSERT. We propose that this is also what is going when contesting rising declaratives. In particular, by a negative response to a conjunction of rising declaratives, one is contesting at least one of the conjuncts and, accordingly, the propositional content embedded under the assertion operator. A more thorough investigation of negative responses to and disagreement with rising and falling declaratives is left for further work.

The strategy just outlined is not available for conjoined polar interrogatives. Following the standard treatments of questions, a conjunction of two polar questions is either a four-way partition (cf. Groenendijk & Stokhof 1984) or a set of four propositions in Hamblin semantics. Now, a yes or no response requires a bi-partition or a set of two propositions (one being the negation of the other) – otherwise yes or no cannot identify the appropriate cell or proposition as an answer. Accordingly, we predict a yes or no response to be infelicitous after a conjunction of polar interrogatives.

The inability of rising declaratives to license NPIs also follows straightforwardly since changing the person feature of ASSERT does not create an affective environment which would license NPIs.

(5) a. *John lifted a finger to help?
b. Did John lift a finger to help?

As for the bias of rising declaratives, here is how we account for it. First, it is natural to assume that when the speaker S proposes that the hearer H asserts that ϕ, S must believe that the conditions for H's assertion of ϕ are satisfied. One of these conditions, as we have seen, is that H believes that ϕ (Sincerity Principle). Accordingly, a rising declarative $\uparrow \phi$ gives rise to the inference that the speaker believes that the hearer believes that ϕ and will acquiesce to the assertion. In the committee hearing example the reasoning proceeds in the following way: if I utter (32b), I make the proposal that you assert that you are a communist; this means I must believe that you are in a position to assert that you are a communist, i.e. I believe that you believe that you are a communist. This is exactly the prejudice that we want to account for.

(32) a. Are you a member of the Communist Party?
b. #You are a member of the Communist Party?

Note that we also account for the fact that rising declaratives can be used to signal an "informative presupposition", as seen in (33), repeated in (33).

(33) A: I have to pick up my sister from the airport.
B: You have a sister?

B's utterance is a proposal that A asserts that A has a sister. The principle of Informativity dictates that what is asserted is not presupposed. Thus, B in effects proposes to make the information that A has a sister non-presupposed information, which is intuitively the case here: B does not doubt that A has a sister, but only lets A know that this fact was not mutual belief.

Finally, our system does not face the issues that we have presented for the accounts of Gunlogson and Šafářová. First, our system does not preclude negative responses to rising declaratives. However, more work is needed to understand how the negative response gets to be interpreted as contesting the radical of the speech act; this constitutes a well-known problem for all proponents of the Performative Hypothesis. Second, we derive bias from the core principles of the logic of assertion. Third, the response-eliciting behavior of rising declaratives is shown to follow from general properties of conversation – we rely on the intuitive idea that certain proposals to add something to the common ground require agreement (rising declaratives), while others are automatically accepted due to their self-verifying nature (falling declaratives).

4 Conclusion and Outlook

We proposed a new analysis of rising declaratives in English. Its core ingredients are the ideas that the speech act operator ASSERT is part of the structure of the sentence (the Performative Hypothesis) and that it is parameterized. One of the parameters of ASSERT is the agent/authority of the speech act. We proposed that rising intonation conditions this parameter to be second person, i.e. rising intonation 'inflects the performative prefix'. Falling intonation, on the other hand, lets the parameter be resolved to default first person. We have shown that an assortment of facts follows from this assumption once we couple it with the standard logic of assertion; we have also shown it to be immune to the main problems of some other approaches. However, since we adopt the Performative Hypothesis, we do inherit some of its issues, e.g. the puzzle of disagreement or negative response. We plan to address these issues at a different occasion.

There is a natural extension of our theory from sentences describing assertions to sentences describing other speech acts. That is, we hypothesize that not only ASSERT but also QUEST and IMP operators are parameterized and some of their parameters can be shifted. This seems desirable, in particular in light of the data in (34) and (35), which need to be explored further.

(34) A: Are you going home?
B: Am I going home?
A: Yes, are you going home?

(35) A: Open the window!
B: Open the window?
A: Yes, open the window!

Finally, there is a salient fact concerning rising intonation that our proposal on its own does not account for: rising intonation is a root phenomenon, i.e. its effects cannot be restricted to embedded clauses.

(36) Mary knows John came ↑
≠ 'Mary knows that you assert that John came'

There is an obvious route that we could take: since we have characterized rising intonation as an operator/modifier on speech acts, we could stipulate that speech acts cannot be embedded. This would require further argumentation.

References

Gazdar, G. 1979. *Pragmatics: implicature, presupposition and logical form*. New York: Academic Press.

Grice, P. 1975. Logic and conversation. *Syntax and semantics* 3. 41–58.

Groenendijk, J. 1999. The logic of interrogation: Classical version. *Proceedings of Semantics and Linguistic Theory IX* 109–126.

Groenendijk, J. & M. Stokhof. 1984. *Studies on the Semantics of Questions and the Pragmatics of Answers, unpublished Ph. D*: University of Amsterdam dissertation.

Gunlogson, C. 2002. Declarative questions. *Proceedings of Semantics and Linguistics Theory* 12. 144–163.

Gunlogson, C. 2003. *True to form: Rising and falling declaratives as questions in English*. Routledge.

Hamblin, C. 1973. Questions in Montague English. *Foundations of Language* 10. 41–53.

Karttunen, L. 1977. Syntax and Semantics of Questions. *Linguistics and Philosophy* 1. 3–44.

Krifka, M. 1995. The semantics and pragmatics of polarity items. *Linguistic Analysis* 25(3-4). 209–257.

Krifka, M. 2001. Quantifying into question acts. *Natural Language Semantics* 9(1). 1–40.

Lakoff, G. 1970. Linguistics and natural logic. *Synthese* 22(1). 151–271.

Ross, J.R. 1970. On declarative sentences. R. Jacobs and P. Rosenbaum. *Readings in English transformational grammar* 222–272.

Sadock, J.M. 1974. *Toward a linguistic theory of speech acts*. Academic Pr.

Šafářová, M. 2005. The semantics of rising intonation in interrogatives and declaratives. In *Proceedings of Sinn und Bedeutung 9*, 355–369.

Šafářová, M. 2007. Nuclear rises in update semantics. In M. Aloni, A. Butler & P. Dekker (eds.), *Questions in dynamic semantics*, 295–314. Elsevier.

Searle, J.R. 1969. *Speech acts: An essay in the philosophy of language*. Cambridge University Press.

Stalnaker, R. 1978. Assertion. *Syntax and Semantics* 9. 315–332.

Tenny, C.L. & P. Speas. 2004. The interaction of clausal syntax, discourse roles, and information structure in questions. In *Workshop on Syntax, Semantics and Pragmatics of Questions, Université Henri Poincaré*, 12 p.

Truckenbrodt, H. 2006. On the semantic motivation of syntactic verb movement to C in German. *Theoretical Linguistics* 32. 257–306.

Veltman, F. 1996. Syntax and Semantics of Questions. *Journal of Philosophical Logic* 25. 221–261.

In Reich, Ingo *et al*. (eds.), *Proceedings of Sinn & Bedeutung 15*,
pp. 661–676. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Degree Possession Is a Subset Relation (as Well)*

Zhiguo Xie
Cornell University
zx28@cornell.edu

Abstract. The structure and meaning of possessive verbs have received several competing analyses in the literature. Almost all the analyses were developed based on the English 'have' and were intended to apply crosslinguistically. In this paper I consider the peculiar degree use of the Chinese possessive verb *yǒu*, in the 'X+ *yǒu* + Y + G(radable predicate)' construction. This degree use of *yǒu* takes a covert small clause as the underlying object that specifies a subset relation between two degree intervals. In this use, *yǒu* does not make semantic content contribution, and only provides a formal mechanism for its subject to bind a variable in the covert small clause object. The degree use of *yǒu* shares the same structure and meaning as its other uses. In addition, I argue that no existing alternative analysis of possessive verbs can capture the degree use of *yǒu*. In this sense, the paper locates among several analyses of possessive verbs the most explanatorily adequate one, through examining a language-specific phenomenon.

1 Introduction

The structure and meaning of possessive verbs have received a considerable amount of discussion in the literature. It is well-accepted that they can appear in a variety of surface constructions and have a rather unconstrained range of meanings. Intuitively, the meanings of the English verb 'have', for example, range from being very clear (1a-c), to being less clear (1d-e), to being very vague (1f-g) (Cowper 1989, Belvin 1993, Ritter & Rosen 1997).

(1) a. John has a new car. (possession)
b. John **has** a headache today. (experience)
c. John **had** a talk with his son. (event)

* I am indebted to Mats Rooth and John Whitman for valuable discussion at various stages of the research. Thanks go to Zhong Chen, Ed Cormany, John Hale, Xiao Li, Liangyue Lu, Sarah Murray, and Ming Xiang, who gave me useful suggestions on how to present the idea. Different versions of the paper were delivered at the 8th GLOW in Asia (Aug. 2010, Beijing), the 15th Sinn und Bedeutung (Sept. 2010, Saarbrücken), Cornell University (Jan. 2011), and the Ohio State University (Feb. 2011). I thank the audiences of all these occasions, Kjell J. Sæbø and Qiongpeng Luo in particular, for comments and questions. Of course, all remaining errors are my own.

d. John **had** many visitors today. (experience?)
e. John **had** a guy shouting at him. (event?)
f. The baby often **has** a story at bedtime. (?)
g. The shirt **had** a button pop off of it. (?)

This heterogeneous range of surface meanings of 'have' is not unique to English (see Gutiérrez-Rexach 2006 for similar data in Spanish). In Chinese, the exact meaning of the possessive verb *yǒu*, often taken to be the equivalent of the English 'have', can too fall anywhere between being very clear and being pretty murky, as illustrated below.

(2) Zhāngsān **yǒu** yī liàng xīn chē. (possession)
Zhangsan have one CL new car
'Zhangsan has a new car.'

(3) hěnduō dìfang dōu **yǒu** zhè zhǒng qíngkuàng. (existence)
many place all have this CL situation
'This kind of situation exists in many places.'

(4) Wáng yīshēng jīntiān **yǒu** hěnduō bìngren. (experience?)
Wang doctor today have many patient
'Dr. Wang has many patients today.'

(5) tā guāng běijīng jiù qù le **yǒu** hǎojǐ tàng. (?)
he alone Beijing EMP go ASP have quite a few round of trip
'He went to Beijing quite a few times, (let alone other places.)'

(6) tāde chènyī **yǒu** ge niǔkòu diào le. (?)
his shirt have CL button pop off ASP
'His shirt has a button pop off of it.'

Given the divergent surface meanings that possessive verbs like 'have' and *yǒu* can express, it is reasonable to ask Question 1 below. On the intuitive level, the different uses of possessive verbs appear to be related in terms of the structure and meaning. Therefore, it is an interesting research topic to explore whether and how they are reducible to a common syntactic representation and semantic derivation.

Question 1: Do possessive verbs in the variety of surface patterns have a single underlying structure and a single core meaning?

There have already been several competing proposals in the literature that attempt to give a unified analysis of possessive verbs (Freeze 1992, Landman

2004, Partee 1999, Ritter & Rosen 1997, Sæbø 2009, Iatridou 1996, among others). Almost all of the analyses were developed based on the English 'have'. They were nevertheless intended to apply crosslinguistically. Though empirical evidence within English probably can help pick one analysis over the others, language-specific patterns from other languages may be of more immediate use for the purpose. In this paper, I discuss the degree use of the Chinese possessive verb *yǒu*. While using Chinese data to address Question 1, I also hope to answer another related question given below.

Question 2: Is there any independent, crosslinguistic evidence to validate one analysis of possessive verbs and rule out the others at the same time?

In Chinese there exists a construction – what I call the possessive degree construction – where the possessive verb *yǒu* takes a degree-denoting object. The construction provides an essential clue to answering the two questions raised above. In the next section, I present the general pattern and properties of the possessive degree construction. Then, in section 3 I discuss some non-degree uses of *yǒu* to motivate the small clause-based analysis of possessive verbs (Sæbø 2009, Iatridou 1996). This is the analysis that I adopt for non-degree uses of *yǒu* and that I hope to extend to its degree use. In section 4, I analyze the possessive degree construction and argue that the overt degree-denoting object of *yǒu* in the construction is always supplemented by an appropriate covert predicate. The predicate specifies a subset relation between two intervals of degree, and contains a variable that is eventually bound by the subject of *yǒu*. *Yǒu* does not have any semantic content. Rather, it only provides a formal mechanism to make the binding possible. Moreover, the binding is necessary because otherwise the subject would be redundant (Sæbø 2009). In this sense, the degree use of *yǒu* is not different from its non-degree uses, in that for all the uses the verb embeds a small clause as the underlying object. In section 5, I discuss three existing alternative analyses of possessive verbs and show that they all face some empirical or theoretical challenges when being extended to the possessive degree construction.

2 Chinese Data

The Chinese possessive verb *yǒu* can embed a similar variety of linguistic expressions to its English counterpart 'have'. In addition, the Chinese verb can appear in the construction in (7), to express that X exceeds or equals Y in terms of the dimension specified by the gradable predicate G.

(7) X + **yǒu** + Y + G

The sentence in (8) is a concrete illustration of the general pattern. Here *zhāngsān* corresponds to the X element, *Lǐsì* the Y element, and *gāo* the G element. The sentence means that, to put it a bit verbosely, Zhangsan exceeds or equals Lisi in terms of the dimension specified by 'tall' (i.e. height).

(8) Zhāngsān **yǒu** Lǐsì gāo.
Zhangsan have Lisi tall
'Zhangsan is at least as tall as Lisi.'

It is worth some space to discuss a few essential restrictions on the individual components in the construction. First, the construction expresses comparison between X and Y along the dimension specified by G. For the comparison to be meaningful, the referents of X and Y must be comparable with respect to the dimension. Otherwise, pragmatic infelicity would arise. The infelicity of (9) is due to the mundane fact that sunlight cannot be measured along the dimension specified by *zhòng* 'heavy' (i.e. weight).[1]

(9) %yángguāng méi **yǒu** zhuōzi zhòng.
sunlight not have table heavy
'%The sunlight is not as heavy as the table.'

Second, in addition to being an entity- or event-denoting expression, the Y element also can be a measure phrase. In this case, G can be omitted if the context is clear regarding the dimension for the measure phrase. For example, if the speaker and hearer are explicitly discussing the height of individuals and excluding width and thickness, the adjective *gāo* 'tall' in (10) is optional:

(10) Zhāngsān **yǒu** liù yīngchǐ (gāo).
Zhangsan have six foot tall
'Zhangsan is at least six feet tall.'

Third, because the G element specifies a dimension against which X and Y are measured, G must be an element that expresses a gradable notion. Non-gradable predicates cannot characterize a dimension and thus cannot act as G. The sentence in (11) is ungrammatical, because something is either imported or not, and there is nothing in between. When the gradability requirement is met, G can be an adjective, adverb, or verb phrase ((8), (10), (12), (13)).

[1] The '%' symbol indicates pragmatic infelicity, and '*' indicates ungrammaticality.

(11) *zhè ge páizi **yǒu** nà ge páizi jìnkǒu.
this CL brand have that CL brand imported
'*This brand is at least as imported at that one.'

(12) Zhāngsān pǎo de **yǒu** Lǐsì kuài.
Zhangsan run DE have Lisi fast
'Zhangsan runs at least as fast as Lisi does.'

(13) Zhāngsān méi **yǒu** Lǐsì zūnjìng lǎoshī.
Zhangsan not have Lisi respect teacher
'Zhangsan does not respect teachers as much as Lisi does.'

Fourth, a demonstrative pronoun such as *zhème* 'this' and *nàme* 'that' can intervene between Y and G, without affecting the meaning. The sentence in (14) contains *nàme* between *Lǐsì* and *gāo* and has the same meaning as (8).

(14) Zhāngsān **yǒu** Lǐsì nàme gāo.
Zhangsan have Lisi that tall

The possessive degree construction has been discussed in many Chinese grammar books and descriptive linguistics literature (Lü 1980, Zhu 1982, inter alia). However, as far as I know, it has received no theoretical analysis so far, despite the fact that possessive verbs in general have drawn considerable theoretical attention over the past two decades. In particular, there exist four major groups of analyses of possessive verbs. The gist of each group is given in (15). Because almost all the discussion is based on the English 'have', in (15) I use 'have' to represent possessive verbs. None of the analyses explicitly address the question of whether they are applicable to the possessive degree construction, probably because English does not have the exact equivalent of the construction. In this sense, the possessive degree construction deserves serious consideration. It is likely that it can be used as a test to tell which analysis or which analyses of possessive verbs is/are on the right track. In this paper I show that the construction does indeed endorse the small clause analysis over the three alternative analyses. In the next section, I will first cite some non-degree uses of *yǒu* as empirical motivations for the small clause analysis.

(15) a. **Locative existential** (Freeze 1992)
'Have' sentences and existential sentences have the same underlying structure and are similarly derived.

b. **Semantic incorporation** (Landman 2004):
'Have' denotes a 'contentless' relation saturated by its relational object.
c. **Type-shifting analysis** (Partee 1999):
'Have' specifies some relational property to its object.
d. **Small clause analysis** (Sæbø 2009, Iatridou 1996):
'Have' embeds a small clause that links the subject and the object.

3 Motivating the Small Clause Analysis

Sæbø (2009) and Iatridou (1996), among several others, proposed that the underlying object of possessive verbs is a small clause (SC), which can be either pronounced or unpronounced. The SC object consistently contains a variable, either in the argument or in the predicate of the SC. Possessive verbs make no content contribution. They only make it possible and necessary for their subject to bind a variable in the SC object.

It is a legitimate question to ask at this point whether the SC analysis, originally developed based on English 'have', can be extended to the Chinese possessive verb *yǒu*. Because of the similar behaviors of non-degree uses of *yǒu* and 'have', as evident from the example sentences in (1-6), the analysis can be maintained (at least) for non-degree uses of *yǒu.* Out of space consideration, in this section I discuss just a few pieces of evidence from Chinese to support this claim.[2]

First, non-degree uses of *yǒu* can take an explicit SC as the object. In this case, the SC must contain a variable which the subject of *yǒu* can bind. This variable is usually the internal argument of a relational noun in the SC. For example, in (16) the overt object of *yǒu*, *yīxiē língjiàn huài le* 'some parts broken', expresses a proposition on its own and is an SC. The noun *língjiàn* 'a (mechanical) part' expresses a relational notion because a part is always a part to some host (a computer, a car, etc.). The internal argument of the relational noun *língjiàn* behaves like a variable which needs to be bound by the matrix subject. The sentence can be paraphrased as (17), which does not contain the verb *yǒu* and has the internal argument of *língjiàn* 'a part' filled by *jīqì* 'a machine'. The equivalence of meaning indicates that in the original sentence (16) *yǒu* has no semantic role to play. It only provides a mechanism such that the matrix subject can fill the internal argument of the relational noun. Sæbø (2009) has explicitly argued that the saturation is achieved through the matrix subject binding a variable in the SC object.

[2] Chinese has no morphological tense or semantic tense (Lin 2005). Thus in Chinese it is difficult to tell small clauses from regular clauses. For simplicity I stick to using the term 'small clause'.

(16) jīqì **yǒu** yīxiē língjiàn huài le.
machine have some part broken ASP
'The machine has some parts broken.'

(17) yīxiē jīqì língjiàn huài le.

Second, when non-degree uses of *yǒu* take a definite phrase in its object, the phrase must be followed by an overt predicate. The overt predicate has to include a covert variable for the matrix subject to bind. For example, in (18) *xià chǎng bǐsài* 'the next competition' refers to one particular competition and is a definite expression. Its presence in the sentence is ungrammatical unless it is supplemented by a predicate such as *yào cānjiā* 'has to attend'. Crucially, the predicate itself contains a variable which corresponds to the agent role for *cānjiā* 'attend'. The matrix subject binds the covert variable. *Yǒu* makes the binding possible and necessary. The sentence, just like in (16), can be paraphrased as (19) without the verb *yǒu* but with the subject of *yǒu* filling the subject position of the resulting clause. Again, the equivalence of the two sentences suggests that *yǒu* makes no semantic contribution to the meaning of the sentence, except for providing a formal mechanism whereby the subject of *yǒu* binds a variable in the SC object.

(18) tā hái **yǒu** xià chǎng bǐsài *(yào cānjiā).
he still have next CL competition must attend
'He still has the next competition *(to attend).'

(19) tā hái yào cānjiā xià chǎng bǐsài.

The two cases that I have considered both involve an overt SC as the object of *yǒu*. There exist many cases in which *yǒu* embeds a surface DP object without an overt supplementing predicate. For such cases, the surface DP can be understood to be supplemented by an implicit predicate. For instance, for the 'canonical' possessive use of *yǒu*, its surface object is a DP (20). With the SC analysis of possessive verbs, the possessive interpretation does not come from the verb *yǒu* per se. Rather it is contributed by a covert predicate which requires the referent of the subject to be in possession of the referent of the object. Crucially, the predicate cannot be a random one, but is restricted by an essential attribute of the object with respect to the subject. A person and a book, for example, are essentially related by the possessor-possessee relation (Gutiérrez-Rexach 2006). On the other hand, the predicate contains a variable for the matrix subject to bind; otherwise the subject would be redundant. Given all the considerations, the covert predicate for the canonical possessive

interpretation of possessive verbs is something like 'belonging to *e*', with the variable *e* being bound by the matrix subject.

(20) Mǎlì **yǒu** yī běn shū [shǔyú *e*].
Mary have one CL book belong to
'Mary has a book.'

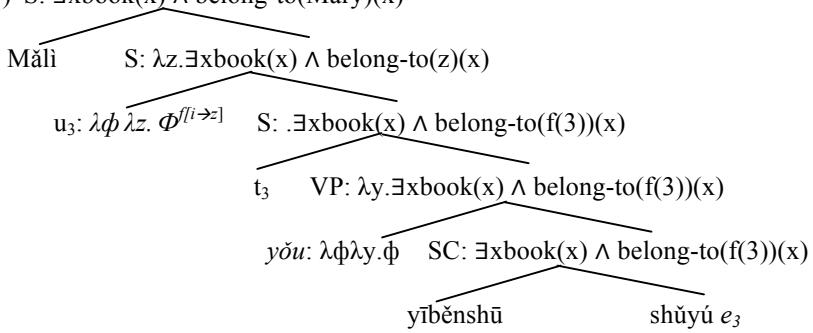
To cast the above discussion in a more formal manner, I follow Sæbø's (2009) syntactic specification and semantic representation of possessive verbs. In his analysis, possessive verbs assume the semantic role of abstraction. They transform the SC object into a predicate by abstracting over a variable x_i co-indexed with the matrix subject. However, in order to avoid *yǒu* making counter-intuitive direct reference to variable indexing, the matrix subject undergoes Quantifier Raising ((21), from Büring 2004). The predicate transformed out of the SC absorbs the trace of the QR-ed subject. The trace variable binder introduced by the QR, via variable assignment, makes the variable coming from the SC bound by the subject (23). The matrix subject has to bind the variable in the SC, to avoid the fate of being redundant. As an illustration, the Logical Form and semantic derivation of the sentence in (20) is given in (24), with some irrelevant details omitted.

(21) i. substituting a trace t_i for a DP Q_i;
ii. adjoining Q (without the index) to a dominating node;
iii. adjoining a trace binding operator u_i to the sister of Q.

(22) $[\![\text{have}]\!] = \lambda\phi_{(st)}\lambda x_e.\ \phi$ (*s* is the type of states)

(23) $[\![u_i]\!]^f = \lambda\phi\,\lambda z.\ [\![\Phi]\!]^{f[i\rightarrow z]}$ (*f* is a variable assignment function.)

(24) S: ∃xbook(x) ∧ belong-to(Mary)(x)



Hopefully, thus far I have established that the SC analysis of possessive verbs can provide a successful account of non-degree uses of Chinese *yǒu*. The

most natural next step is to examine whether this analysis can be main-tained for the possessive degree construction. This step is a logical variant of Question 1 raised in section 1. In the next section, I show that the SC analysis indeed can be extended to the possessive degree construction.

4 Analyzing the Degree Use of *yǒu*

One essential component of the SC analysis of possessive verbs is, obviously, that their underlying object is consistently an SC. In an attempt to apply the analysis to the possessive degree construction, the first task should be to determine the SC for the construction. For convenience of reference I will use (8) as my example sentence.

(8) Zhāngsān **yǒu** Lǐsì gāo.
Zhangsan have Lisi tall
'Zhangsan is at least as tall as Lisi.'

It is worth pointing out that *Lǐsì gāo* in the overt object position of (8) cannot be an SC. Here is some evidence for the claim. First, suppose it is an SC, then it would express some proposition. Because *yǒu* does not affect entailment, one would then expect (8) to entail the proposition expressed by *Lǐsì gāo,* whatever it is.[3] However, the entailment does not go through.

Second, as discussed in section 2, a demonstrative pronoun such as *nàme* 'that' and *zhème* 'this' can optionally intervene between *Lǐsì* and *gāo*, without affecting the meaning. In Chinese, these demonstrative pronouns cannot make reference to a proposition. This is another piece of evidence that *Lǐsì gāo* does not denote a proposition and cannot be an SC.

Third, a limited number of dimension nouns can act as G. For example, in (25) the Y element *zúqiú* 'a soccer ball' is followed by the dimension noun *dàxiǎo* 'big-small, size'. It is obvious that *zúqiú dàxiǎo* is not an SC. Rather it denotes a degree, the size of a soccer ball.

(25) nà ge mógū **yǒu** zúqiú dàxiǎo.
that CL *mushroom have soccer ball size*
'The mushroom is at least as big as a soccer ball.'

From the evidence discussed above, I conclude that the 'Y + G' chunk itself is not an SC. Instead it denotes a degree, viz. Y's degree on the dimension specified by G. For example, in (8) *gāo* provides the dimension (i.e. height)

[3] I deliberately remain vague here, because, if used as a clause, *Lǐsì gāo* can mean 'Lisi is tall' or 'Lisi is taller', depending on the context in which it is used.

against which Lisi is measured. *Lǐsì gāo* denotes Lisi's height, not the proposition 'Lisi is tall' or some other proposition.

We have already seen that the possessive degree construction expresses some comparative relationship. For a comparison to make sense, the two comparison items have to be comparable in the first place. For the possessive degree construction, one comparison item is Y's degree on the dimension specified by G (e.g. Lisi's height for (8)); the other comparison item has to be some degree associated with X.

Furthermore, the degree denoted by the other comparison item cannot be just any random degree associated with X (e.g. Zhangsan's width for (8)). Rather, it is X's degree along the dimension specified by G (e.g. Zhangsan's height for (8)). This restriction is guaranteed by the fact that Chinese does not allow cross-dimension comparison using a comparative construction. For example, while (26) is perfect in English, its Chinese equivalent is not grammatical. The interested reader can refer to Kennedy (2007) for discussion on this crosslinguistic contrast.

(26) The door is taller than the table is wide.

(27) *mén gāo bǐ zhuōzi kuān.
door tall than table wide

Thus, the two comparison items of the possessive degree construction are degrees on the same dimension. Independently, a degree on a dimension is modeled as an interval that ranges from the minimum point on that dimension to where the degree ends. It is not the maximum point of the degree interval (Seuren 1978, von Stechow 1984, Kennedy 1997, 2001). One motivation for this representation of degree comes from the Cross-Polar Anomaly (CPA) as illustrated by (28), which involves positive and negative pairs of adjectives. Treating degrees as points cannot explain the anomaly. In addition, in the interval-based representation, degrees are classified into two types: positive degrees vs. negative degrees. The CPA is anomalous because it involves comparison of degrees of opposite polarity (Kennedy 1997, 2001).

(28) *The computer is more expensive than the book is cheap.

It follows that the possessive degree construction compares two degree intervals. Moreover, the two degree intervals fall on the same dimension and have the same starting point. I assume that possessive verbs generally characterize essential relations (e.g. possession, kinship, part-whole, etc.) between the subject and the object. Only when an essential relation is impossible will an 'accidental' relation (e.g. location, custody) come to rescue (Gutiérrez-

Rexach 2006). The most essential relation that can exist between two intervals as specified above is one interval being the sub-interval of the other. But which one is the sub-interval, and which one is the super-interval? To answer this question, it is helpful to look at some other uses of possessive verbs for hints.

Possessive verbs can express the part-whole relation. On the intuitive level, the part-whole relation coincides with the subset relation. For example, (29) says that the three relevant doors exist as part of the house. It is equivalent to saying that the set whose elements are the three doors is a subset of the set that contains all the constituents of the house. Possessive verbs can characterize the kinship relation as well. The kinship relation can also be construed as a subset relation. For (30), the set that contains the cousins is a subset of the set that contains, say, all John's relatives. In addition, the locative use of possessive verbs, as exemplified in (31), characterizes a 'part-whole' relation that is restricted to a location (e.g. 'on his left leg') (Gutiérrez-Rexach 2006). Hence the locative use can be understood as involving a subset relation, too. For space consideration, I will not discuss how other non-degree uses of possessive verbs characterize the subset relation. The discussion based on the English 'have' applies to (at least the non-degree uses of) the Chinese *yǒu*.

(29) The house has three doors.

(30) John has cousins.

(31) John has a birthmark on his left leg. (Gutiérrez-Rexach 2006)

It is clear that the set associated with the object is the subset, and the set associated with the subject is the superset. That is, the subject of possessive verbs is 'super-ordinate' to the object. I assume that the same consideration applies to the possessive degree construction. In addition, the subinterval relation is tantamount to the subset relation.[4] Therefore, for the possessive degree construction 'X + *yǒu* + Y + G', X's degree on the dimension specified by G is the superinterval/superset; Y's degree on the dimension is the subinterval/subset. My analysis thus far predicts that for the possessive degree construction to be true, X's degree on the dimension specified by G is a superinterval/superset of Y's degree on the same dimension. More concretely, for (8) to be true Zhangsan's height has to be a superinterval of Lisi's height. This prediction conforms to native intuition.

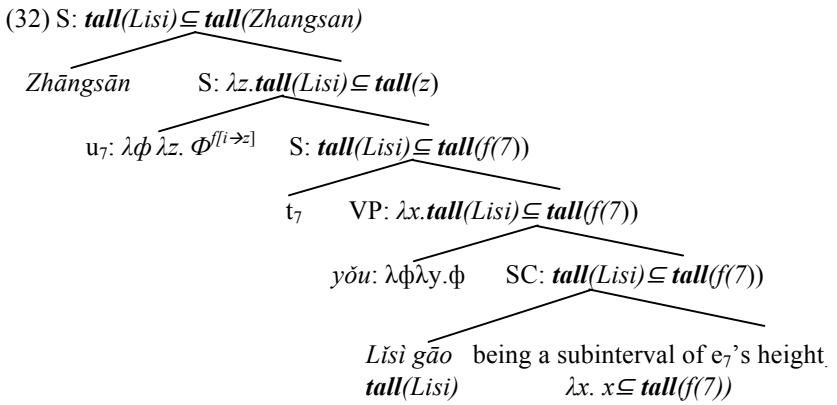
[4] In this paper, I chose to use 'subinterval' rather than 'subset' when discussing the possessive degree construction, simply because I think it more intuitive to use the former.

Under the SC analysis of possessive verbs, *yǒu* cannot directly set up the subinterval/subset relation between the two degrees in the possessive degree construction. Moreover, the 'Y + G' chunk explicitly contributes one of the two comparison items, but there is nothing in the surface construction that contributes the other comparison item, viz. X's degree on the dimension specified by G. Under the SC analysis of possessive verbs, both the second comparison item and the subinterval relation should have an independent place in the representation.

More explicitly, the second comparison item and the subinterval relation are given by the covert predicate supplementing the overt object of *yǒu* and the binding of a variable in the covert predicate by the matrix subject. In general, the covert predicate supplementing the 'Y + G' chunk is something like 'being a subinterval of *e*'s degree on the dimension specified by G', with the variable *e* being bound by the subject. For (8), the covert predicate is 'being a subinterval of *e*'s height'.

Under this specification, the degree use of *yǒu* also takes a covert SC as its underlying object, which contains a variable in the predicate for the matrix subject to bind. Just like its non-degree uses, the degree use of *yǒu* makes no content contribution to the semantics of the sentence in which it appears. It provides a formal means to make not only possible but also necessary the binding of the variable in the SC object by the matrix subject.

The formal syntactic representation and semantic derivation for (8) are given in (32). Here I assume *gāo* 'tall' to be a function from an individual to the height of that individual. Obviously, (32) is exactly parallel to (24). This suggests that the degree use of *yǒu* is not different from the non-degree uses in terms of the syntax and semantics. All the verb accomplishes is abstraction: it indirectly contributes a lambda for a variable in its object, which is always an SC on the underlying level.



As an interim summary, the SC analysis of possessive verbs not only explains the non-degree uses but also the degree use as exemplified by the Chinese possessive degree construction. Hence, the analysis is explanatorily adequate in treating all uses of possessive verbs. The adequacy of the SC analysis suggests that possessive verbs have a single underlying structure and a single core meaning in the variety of surface patterns where they appear. The discussion so far has answered Question 1 raised in section 1.

As pointed out earlier in this paper, the SC analysis is just one of the proposals that are available in the literature regarding the syntax and semantics of possessive verbs in general (see (15)). Can any of the three competing analyses provide an equally satisfactory account of the possessive degree construction? If the answer is negative, then the possessive degree construction is a good test to endorse the SC analysis and rule out the alternative analyses. The next section shows that this is indeed the case.

5 Competing Analyses

In section 2, I divided the analyses competing against the SC analysis into three groups: Locative Existential (Freeze 1992), Semantic Incorporation (Landman 2004), and Type-shifting Analysis (Partee 1999). In this section I give a brief summary of each proposal and explain why it cannot be extended to the Chinese possessive degree construction.

According to the Locative Existential analysis, possessive sentences of various kinds are existential sentences with a locative argument in the subject position. Extending the proposal to the possessive degree construction, it amounts to saying that, just like existential sentences in Chinese, the construction has an underlying structure in which the matrix subject starts as a

preposition phrase of some form. This runs afoul of native intuition. More explicitly, if the subject of the possessive degree construction is a preposition phrase in the underlying structure, it would have to predicate of the location of the degree denoted by the 'Y + G' chunk (e.g. *Lǐsì gāo*). A degree is not an individual but an interval on a dimension. It cannot be predicated of or restricted by a preposition phrase. This is evident from the ungrammaticality of the sentence in (34), as compared to (33).

(33) yī běn shū zài zhuōzi shàng.
one CL book at table on
'There is a book on the table.'

(34) *wǔ mǐ zài zhuōzi shàng.
five meter at table on

The semantic incorporation analysis proposed by Landman (2004) holds that 'have' denotes a 'contentless' relation between two entities and a state. The object of 'have' denotes a 'contentful' counterpart of such a relation. After the object intersects with 'have', the result is exactly the same as the object. The rest of the proposal does not matter for the purpose of this paper. As Landman himself admitted, the analysis is restricted to cases where 'have' embeds relational nouns. It cannot be extended to the possessive degree construction, because the 'Y + G' chunk does not express a relational notion of any sort. Lisi's height (*Lǐsì gāo*), for example, is a degree that exists on its own right and does not have to relate to anything else for it to be degree.

The type shifting analysis by Partee (1999) differs from Landman's in that there is a division of labor between 'have' and its object. Both are ascribed relational denotations. In addition, in its semantics 'have' specifies some property for its object. One general drawback of this analysis is an unnatural prediction it makes, viz. that 'have' is lexically ambiguous among all the possible properties that it can establish for its object. There is another more specific problem with the analysis when extending it to the Chinese possessive degree construction. Because the semantics of 'have' is defined with reference to what object it takes, the analysis requires the degree use of *yǒu* to include in its semantics the gradable predicate G. Intuitively, it is undesirable for a possessive verb to incorporate an adjective, an adverb or a verb in its semantic denotation.

6 Conclusions

The degree use of *yǒu* is not different from its other uses in terms of the structure and meaning. They all take a small clause as the underlying object,

which can be either overt or covert. *Yǒu* is a functional item that does not have semantic content on its own. It just provides a formal mechanism for its subject to bind a variable in its small clause object. The small clause analysis provides a satisfactory explanation of the degree use of *yǒu*. I have shown that other alternative proposals available in the literature all face empirical or theoretical challenges. The discussion suggests that the small clause analysis best captures the whole range of uses of possessive verbs.

References

Belvin, Robert. 1993. The two causative *have*s are the two possessive *have*s. In *Proceedings of the Chicago Linguistics Society* 29–1. 61–75. Chicago: CLS.

Büring, Daniel. 2004. Crossover situations. *Natural Language Semantics* 12. 23–62.

Cowper, Elizabeth. 1989. Thematic underspecification: the case of *have*. In *Toronto Working Papers in Linguistics* 10. 85–93.

Freeze, Ray. 1992. Existentials and other locatives. *Language* 68. 553–595.

Gutiérrez-Rexach, Javier. 2006. Beyond the (in)definiteness restriction: A unified semantics for *have*. In *Proceedings of Sinn und Bedeutung 11*. 291–304. Barcelona: Universitat Pompeu Fabra.

Iatridou, Sabine. 1996. To have and have not: On the deconstruction approach. In *Proceedings of WCCFL XIV*. 185–201. Stanford: CSLI.

Kennedy, Christopher. 1997. *Projecting the adjective: the syntax and semantics of gradability and comparison*: UCSC Phd. Thesis.

Kennedy, Christopher. 2001. Polar opposition and the ontology of degrees. *Linguistic & Philosophy* 24. 33–70.

Kennedy, Christopher. 2007. Modes of comparison. In *Proceedings of the Chicago Linguistic Society* 43–1. 141–165. Chicago: CLS.

Landman, Fred. 2004. *Indefinites and the type of sets*. Oxford: Blackwell.

Lü, Shuxiang. 1980. *Xiandai hanyu babai ci* [Eight hundred words of modern Chinese]. Beijing: Commercial Press.

Partee, Barbara. 1999. Weak NPs in HAVE-Sentences. in *Compositionality in Formal Semantics*. 282–291. Oxford: Blackwell.

Ritter, Elizabeth & Sara Thomas Rosen. 1997. The function of *have*. *Lingua* 101. 295–321.

Sæbø, Kjell Johan. 2009. Possession and pertinence: the meaning of *have*. *Natural Language Semantics* 17. 369–397.

Seuren, Pieter A.M. 1978. The comparative revisited. *Journal of Semantics* 3. 109–141.

von Stechow, Arnim.1984. Comparing semantic theories of comparison. *Journal of Semantics* 3. 1–77.

Zhu, Dexi. 1982. *Yufa jiangyi* [Lecture notes on grammar]. Beijing: Commercial Press.

In Reich, Ingo et al. (eds.), *Proceedings of Sinn & Bedeutung* 15,
pp. 677–690. Universaar – Saarland University Press: Saarbrücken, Germany, 2011.

Divergent Approximators*

Erin Zaroukian
Johns Hopkins University
zaroukian@cogsci.jhu.edu

Abstract. We often mark uncertainty in our utterances with words like *maybe*, but when we mark uncertainty on numerals, some surprising effects, including approximation, result. This paper describes these unexpected effects and provides a possible world semantics analysis. This analysis will in turn inform our view on other scalar modifiers, like *approximately*. Additionally, it will help identify a complication for so-called *slack regulators* (e.g. *loosely speaking*, *exactly*), pointing to the unexplored importance of modality in differentiating approximators. I will propose that some approximators, like *maybe*, have modal components and behave differently from non-modal approximators, like *approximately*, most noticeably in their ability to accommodate contextual information.

1 Introduction

Language allows us to express ourselves with varying degrees of precision (i.a. Lakoff 1973; Lasersohn 1999; Krifka 2009). Some words like *tall* have a meaning that varies with context, while other words like *heap* lack a precise meaning altogether. Furthermore, there are terms with precise meanings that can be used imprecisely, where context allows. For example, the numeral *twenty* can be used to refer to something that costs $20.00 exactly, or where contextually appropriate a speaker could round and use *twenty* to refer to something that cost $19.50. Additionally, there are countless modifiers that affect precision, such as *roughly*, *more-or-less*, and *exactly*.

Various authors have highlighted these different types of imprecision in their analyses. For example, Sauerland & Stateva (2007) distinguish forms with a precise meaning from those which lack a fixed precise meaning. This separates the numeral *twenty*, which has a precise meaning of $20.\bar{0}$, from the adjective *tall* and the noun *heap*, which have no such meaning. Similarly, Syrett, Kennedy & Lidz (2010) distinguish forms that tolerate imprecision pragmatically from those that are semantically context dependent. This separates the

* Many thanks to Kyle Rawlins, Charley Beller, Kristen Johannes, Mike Oliver, and Lilia Rissman for their invaluable discussion. Thanks also to the audience at the Mid-Atlantic Colloquium of Studies in Meaning, as well as the audience and reviewers at Sinn und Bedeutung 15. This research was supported by an IGERT grant to the Cognitive Science Department at Johns Hopkins University.

numeral *twenty*, which can be used in a round sense where context allows, from the adjective *tall*, which varies depending on what it modifies (e.g. *tall person* vs. *tall building*), but does not vary depending on the level precision appropriate to the context the way *twenty* does.

Here I propose an additional distinction, one that differentiates between modal and non-modal approximators. I will illustrate this by first examining the modal *maybe* as a marker of uncertainty, which, in the right context (viz. when applied to a scalar), leads to an approximate reading. We will then compare this type of approximation to that which arises from the use of the non-modal *approximately*. The differences between these two approximators will follow largely from their differing modal statuses, with the most striking difference being their differing abilities to accommodate contextual information. We will then compare these types of approximation to pragmatic halos (Lasersohn 1999), which suffice for non-modal approximators, but which cannot sufficiently describe approximators with a modal component.

2 Uncertainty and Approximation

An approximate reading can arise when scalars are marked as uncertain. This can be seen most clearly with scalar numerals combined with the modal *maybe*.

2.1 Uncertain Numerals

When we use words like *maybe* to mark our uncertainty with respect to an item, our interlocutor might entertain alternatives to this uncertain item. For example, in the exchange in (1) Bill thinks John won the race, but he is not certain, which he expresses through his response *maybe John*.

(1) a. Ann: Who won the race?
Bill: Maybe John.
b. {John, Mary, Peter}

As a result of Bill's uncertainty, Ann may entertain other likely winners, as sketched in (1b).

When the uncertain item is a numeral, we find a strong tendency for the set of alternatives to resemble approximation, as in (2).

(2) a. Ann: How many people competed?
Bill: Maybe twenty.
b. {18, 19, 20, 21, 22}

This approximation becomes even more salient if we consider a similar response Bill could have made, namely *approximately twenty*, where the alterna-

tives entertained by Ann would again look like (2b).

Approximation, however, does not occur with all uncertain numerals, as demonstrated in (3). When giving the number of the player with the most fouls, Bill indicates his uncertainty with *maybe*, again uttering *maybe twenty*.

(3) a. Ann: Which player has the most fouls?
Bill: Maybe twenty.
b. {20, 6, 77, 15}

Here, however, this uncertain numeral is unlikely to give rise to approximation. Instead, Ann may consider other players likely to have numerous fouls, independently of their number.

Additionally, we find that when this approximation effect occurs, the range of alternatives depends on the numeral. For example, if *twenty* in (2) is replaced with *twenty-seven*, the range of alternatives tends to be smaller.

(4) a. Ann: How many people competed?
Bill: Maybe twenty-seven.
b. {26, 27, 28}

In summary, uncertain numerals lead to three questions: why do uncertain numerals give rise to approximative readings, as in (2), why do some uncertain numerals fail to give rise to approximative readings, as in (3), and why do some uncertain numerals give rise to more approximate readings than others, as in (2) vs. (4)?

2.2 Uncertain Numerals Explained

These puzzles can be given a formal explanation using a possible world semantics, such as the one described in Kratzer (1991), along with Krifka's (2009) conception of numerals. Here we will consider alternatives to be sets of possible worlds (i.e. worlds consistent with the epistemic modal base). These sets of worlds will be ordered in terms of their plausibility by an ordering source, as sketched in figure 1.

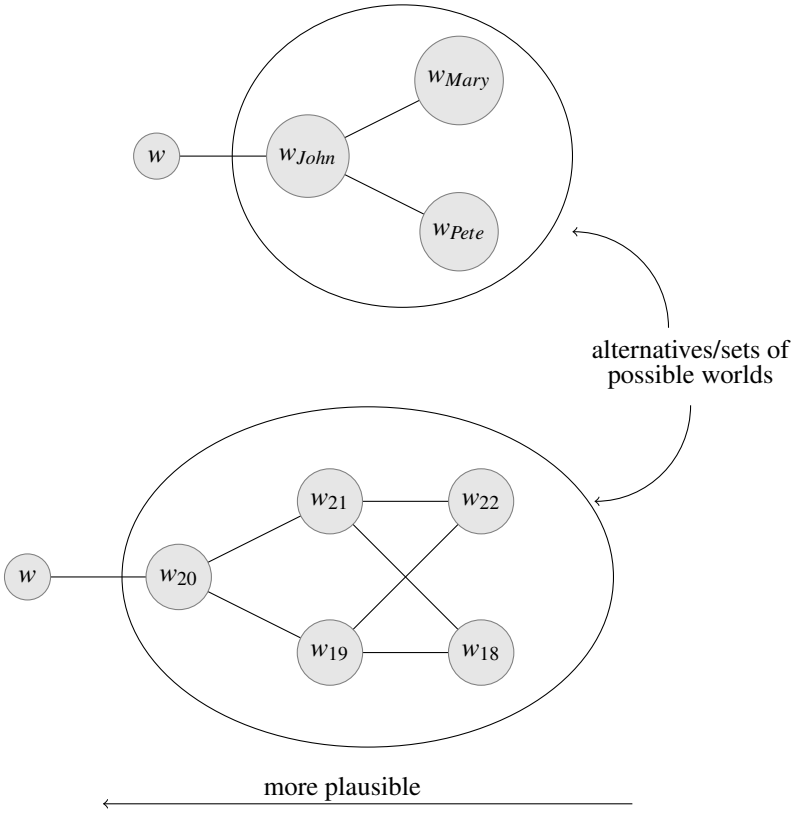


Figure 1: Alternatives as sets of worlds, ordered according to a modal base. Here, for example, w_{John} represents the set of worlds where John won the race, and w_{20} represents the set of worlds where twenty people competed.

Following Krifka (2009) we will assume that numerals represent a range which can be characterized as the values which fall within one standard deviation (σ) of the uttered numeral (μ) on a normal distribution over the number line. For example, *twenty* in the sentence *This book cost twenty dollars* used in a relatively imprecise context can be considered to have $\sigma = 2$, such that *twenty* then represents values in the range $\mu \pm \sigma$ or $[18-22]$, as shown in fi-gure 2. The normal distribution represents the probability of each value being true, with probability decreasing as the distance from μ increases. Beyond one standard

deviation (i.e. beyond the shaded area in figure 2), probability is assumed too low for consideration.[1]

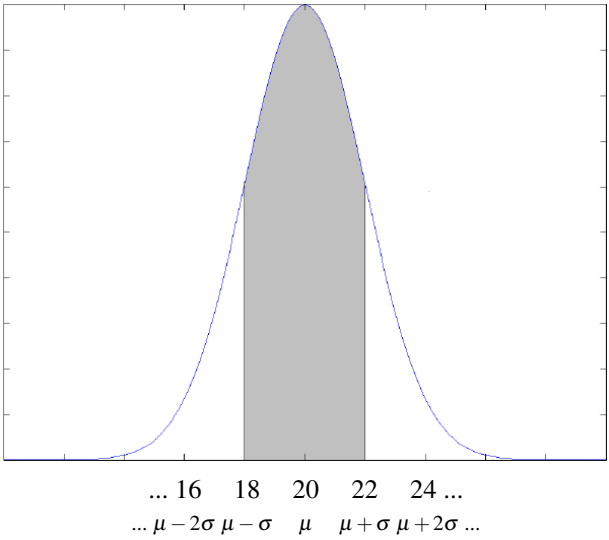


Figure 2: A normal distribution centered at 20 with $\sigma = 2$

This range information can be expressed as the propositions p_σ in (5), which picks out worlds where the value intended by the speaker (y) falls within one standard deviation (σ) of the uttered numeral (μ), and a family of functions p_x in (6), which picks out worlds where the intended value (y) falls within $\sigma - x$ of that number (μ) for $0 < x < \sigma$.[2] We will let y assign to any world the numeric value intended by the speaker in that world, representing public uncertainty about what value the speaker intends.

(5) $p_\sigma = \lambda w.y(w) \in \{[\![\mu - \sigma]\!], ..., [\![\mu + \sigma]\!]\}$

(6) $p_x = \lambda w.y(w) \in \{[\![\mu - x]\!], ..., [\![\mu + x]\!]\}, 0 < x < \sigma$

We can see how this works in the example sentence from above *This book cost*

[1] For simplicity we will assume strict cut-offs at $\mu \pm \sigma$. It seems, however, that the border should be fuzzy, which might result from difficulty determining a precise σ from context. Alternatively, an applicable use of fuzzy sets is discussed in Lasersohn (1999).

[2] As described here, this results in a linear probability curve, not the Gaussian one described above, a problem which will not be addressed here.

twenty dollars with $\mu = 20$ and $\sigma = 2$. Here $p_\sigma = \lambda w.y(w) \in \{[\![20-2]\!], ..., [\![20+2]\!]\}$ (i.e. picks out set of worlds where the value y intended by the speaker in that world is between 18 and 22) and $p_x = \lambda w.y(w) \in \{[\![20-x]\!], ..., [\![20+x]\!]\}, 0 < x < 2$.

As for *maybe*, I will treat it as involving an epistemic modal possibility operator. For uncertain numerals (e.g. *maybe twenty*), the modal base will contain the sets of worlds consistent with p_σ (i.e. worlds within σ of μ) and the ordering source will contain the worlds consistent with the propositions in p_x for $0 < x < \sigma$ (i.e. will order more closely worlds where the value is closer to μ).

We now have an explanation for the approximation that arises from uncertain numerals: only worlds where values close to the uttered numeral are true will be epistemically accessible, so only these values will be plausible alternatives. We also have an explanation for why approximation does not always occur with uncertain numerals: this effect only happens with *scalar* numerals, like in (2), not with numerals acting in a non-scalar labeling capacity, as in (3), which do not represent ranges and are therefore not associated with p_σ and p_x like scalars are.

And finally, if we consider Krifka's pragmatic preference for simple expressions, we have an explanation for why the range of alternatives depends on the numeral, as we see when *maybe twenty* in (2) leads to a wider range of alternatives than *maybe twenty-seven* in (4). A pragmatic preference for simple expressions leads more complex numerals like *twenty-seven* to represent smaller ranges (i.e. induce smaller σs) than simpler numerals like *twenty*. Since *twenty-seven* has a smaller σ, its p_σ allows a smaller range of possible worlds, leading to its narrower interpretation as an uncertain numeral (see Krifka (2009) for details).

To summarize the explanations offered here, first, uncertain numerals give rise to approximative readings because they involve p_σ and p_x in their modal base and ordering source respectively, so possible worlds are those in which the numeral is close to the uncertain numeral. Some uncertain numerals fail to give rise to approximative readings because they are not scalar and therefore are not associated with p_σ and p_x. Some uncertain numerals give rise to more approximate readings than others because they are associated with larger σs, so p_σ allows a wider range of possible worlds.

2.3 Uncertain Scalars

Numerals are not unique in expressing ranges, so this approximation effect should not be unique to numerals either. Specifically, we expect that whenever some appropriately range-representing expression is marked as uncertain, it

gives rise to approximation. And this is indeed the case.

We can see this, for example, with uncertain colors, as in (7) and (8). Here, if *blue* is interpreted as a scalar representing a range of colors within the blue spectrum (i.e. as not necessarily representing one specific hue), a range of colors (here with wavelengths from purple to green) might be entertained as alternatives.

(7) a. A: You say you got a good look at John's car. What color is it?
B: Maybe blue.
b. {425nm, ..., 525nm}

We even see an effect of complexity, much like we did with *twenty* vs. *twenty-seven*. Here, the more complex color term *cyan* gives rise to a smaller range of alternatives (here with wavelengths within the light blues) than the simpler color term *blue*, since the more complex *cyan* will be pragmatically associated with a smaller σ.

(8) a. A: You say you got a good look at John's car. What color is it?
B: Maybe cyan.
b. {450nm, ..., 500nm}

This approximation effect can be seen with any item that is used scalarly, including such an unlikely term as *beef stroganoff*. To see this, consider a scalar interpretation of *beef stroganoff*, like the one required in the sentence *It was only approximately beef stroganoff*. Using this scalar interpretation, consider the sentence *What John cooked was maybe beef stroganoff*. This gives the reading that what John cooked was somewhere near the ideal of beef stroganoff, or approximately beef stroganoff.[3]

So, the same phenomena we saw with uncertain numerals happen with other scalars, and the same explanation applies: the scalar represents some range, and when combined with the modal *maybe* this range information represented in p_σ and p_x enters into the modal base and ordering source such that

[3] Sauerland & Stateva (2007) provide a different take on this kind of construction. They consider *approximately beef stroganoff* infelicitous in (i) because scalar approximators (*exactly/approximately*) can only combine with scalar items.

(i) Judgments from Sauerland & Stateva (2007)
a. What John cooked was definitely/maybe beef stroganoff.
b. # What John cooked was exactly/approximately beef stroganoff.

Here, I suggest that *beef stroganoff* can in fact be scalar, and when it is, *maybe beef stroganoff* and *approximation beef stroganoff* give rise to a similar type of scalar approximation. This is much like the similarity between *maybe twenty* and *approximately twenty* discussed above.

scalarly-close items are more likely alternatives.

2.4 Other Uses of *maybe*

At the beginning of section 2.3 it was remarked that any *appropriately* range-representing expression gives rise to approximation when marked as uncertain. The qualifier *appropriately* is present to exclude certain readings, especially those involving *epistemic vagueness* and *uncertain labels*, described below.

The non-numeral scalars discussed above (e.g. *cyan*) are subject to another kind of approximation, termed *epistemic* by Sauerland & Stateva (2007). This concerns uncertainty regarding the precise meaning of the word in question, as can be seen with the word *heap*. Saying *This pile of rice is maybe a heap* may mean that the speaker knows exactly how many grains of rice there are, but is unsure if together they constitute a heap. Similarly, *The color is maybe cyan* may mean that the speaker knows exactly which hue they have in mind, but is unsure if it can be called *cyan*. This is not the kind of vagueness I am concerned with here. Rather, I am interested in the case where the speaker does not know the hue, but believes it to be close to cyan.

Another case of uncertainty is the *uncertain label* discussed in the context of (3), where the word modified by *maybe* is acting as a label, not a scalar. It should be kept in mind that this type of label reading is available for all the examples above and can cause them to lose their approximate reading, which again is only available when they are interpreted as scalars.

An interesting case related to this labeling reading can be seen in (9) and (10), as pointed out by Stephanie Solt (p.c.).

(9) Context: Ann organized, but did not attend, a party last night and hopes that at least 75 people attended. Bill attended the party and does not know exactly how many people were there, but believes the number to be 40, give or take 10.
Ann: How many people were at the party?
Bill: Maybe fifty.

Here, it seems that Bill chose his response to best fit Ann's expectations, rather than to reflect the number he really thought was most likely, 40. He chose the highest likely value, 50, to minimize Ann's disappointment. This seems to be an instance of labeling. Bill had several answers he could have given, and for pragmatic reasons he chose the one called *fifty*.

Note that this 'exaggeration' can go down as well as up, so long as is in the direction of the hearer's goals. Compare (10a), where Ann is hoping for a low temperature, with (10b), where Charlie is hoping for a high temperature.

(10) Context: Bill thinks that the temperature is around freezing (32°F).
   a. Ann: I hope it's cold enough to go ice skating. How cold is it?
      Bill: Maybe 30.
   b. Charlie: I hope it's too warm to go ice skating. How cold is it?
      Bill: Maybe 35.

This exaggerative use of *maybe* does not seem to impede communication, since it is intonationally distinguished from the non-exaggerative use. In particular, this *maybe* is typically stressed and drawn out, and is often accompanied by a grimace. Therefore, it is unlikely that Ann or Charlie would interpret Bill's response as a scalar (i.e. as representing a range of values centered around the expressed numeral, as in (11c)) such that the actual value could be even closer to their goal value. Instead, they should recognize this as an exaggerative used and entertain alternatives along the lines of (11b).

(11) Context: Bill thinks that the temperature is around freezing (32°F).
   a. Ann: I hope it's cold enough to go ice skating. How cold is it?
      Bill: Maybe 30.
   b. {30, 31, 32, 33, 34}
   c. #{28, 29, 30, 31, 32}

2.5 Alternatives as Approximation

Considering the similarity in interpretation between *maybe twenty* and *approximately twenty*, we might wonder if the interpretation of *maybe John* in (1) could be thought of as approximation too. This seems quite possible, provided that we are able to determine the appropriate scales to range over. To see this, we can think of John as representing a point on some set of scales. Alternatives to John then are like John in certain relevant respects (e.g. speed, predisposition to race, and susceptibility to performance anxiety) and represent points on these relevant scales that fall close enough to John to be considered likely. There is a marked difference between *maybe/approximately twenty* and *maybe/approximately John*, which will be discussed in section 3.2.

3 Other Approximators

While we have seen that uncertain numerals can give rise to approximation, many other modifiers give rise to approximation as well, and the analysis of uncertain numerals here can inform the way we think of these other approximators.

3.1 *Approximately*

Approximately gives rise to approximate readings (e.g. *approximately twenty people*), but not the way *maybe* does. Instead, *approximately* expresses that something falls within a range (e.g. that the number of people falls within some range around twenty), with a denotation like (12).[4]

(12) $[\![\textbf{approximately}]\!] = [\lambda n.\lambda y.\exists z \in \{[\![\mu_n - \sigma_n]\!], ..., [\![\mu_n + \sigma_n]\!]\} | \#y = z]$

Here again μ corresponds to the uttered numeral, and *approximately* takes a scalar n and some y and returns true if the location of y is within the contextually-determined σ of n on the relevant scale.

For example, in *approximately twenty people*,

$[\![\textbf{approximately twenty people}]\!]$

$= [\lambda n.\lambda y.\exists z \in \{[\![\mu_n - \sigma_n]\!], ..., [\![\mu_n + \sigma_n]\!]\} | \#y = z]([\![\textbf{twenty}]\!])([\![\textbf{people}]\!])$

$= [\exists z \in \{[\![\mu_{20} - \sigma_{20}]\!], ..., [\![\mu_{20} + \sigma_{20}]\!]\} | \#people = z]$

and if we again assume $\mu_{20} = 20$ and $\sigma_{20} = 2$, this yields

$= [\exists z \in \{18, ..., 22\} | \#people = z]$

(i.e. there is some number in the range $[18 - 22]$ which is equal to the number of people, i.e. the actual number of people is in the range $[18 - 22]$).

Approximately shows the same range effects as *maybe*, as can be seen by replacing *maybe* with *approximately* in (2) and (4) (note that *approximately* cannot replace *maybe* in (3) to give rise to a reading like (2b), since *twenty* here is not scalar). These approximative effects are captured in the denotation in (12), which incorporates σ to determine its range.

This denotation also captures an important difference, shown in (13).

(13) a. It's Susan's birthday today, and she's maybe thirty.
b. # It's Susan's birthday today, and she's approximately thirty.

Here *approximately* in (13b) is unable to accommodate the fact that it is Susan's birthday (i.e. that ages like 28 and three months are impossible).[5] With *maybe* in (13a), on the other hand, this information can easily be accommodated in the modal base, excluding incompatible ages from consideration. This difference is reflected in the denotation above in (12), where z is drawn from a continuous range. Note that *approximately* is still technically consistent with it being Su-

[4] For *approximately*'s counterpart, consider: $[\![\textbf{exactly}]\!] = [\lambda n.\lambda y.\exists z \in \{[\![\mu_n - \sigma_n]\!], ..., [\![\mu_n + \sigma_n]\!]\} | \#y = z$, defined if $\sigma_n < \sigma_{c,n}]$ (takes a scalar n and some y and returns true if the location of y is within the contextually-determined σ of n on the relevant scale, where σ is less than some small contextually-determined value)

[5] Note that *approximately* is acceptable in a very precise context (e.g. *Actually, she's 30 years 14 hours and 22 minutes*), but this is not the reading that I am considering.

san's birthday, but it suggests that intermediate values are possible. This results in strangeness, requiring a certain amount of work on hearer's behalf in order to fit the utterance to the context.

So, through associating scalars with the kind of information described by Krifka, the similarities between *maybe* and *approximately*, as well as their differences, can be captured. These are summarized briefly in (14).

(14)

approximately	*maybe*
– non-modal	– modal
– does not accommodate contextual information	– accommodates contextual information
– uses σ for range	– uses σ for modal base

Since *approximately* is not modal, it is unable to accommodate contextual information, but since it draws on σ in determining range, it gives rise to the same roundness effects as *maybe*.

3.2 Atomicity in Approximation

This discussion of *approximately* brings up a new question: why is *approximately twenty people* as a response in (2) is less offensive than *approximately thirty* in (13b)? More specifically, why does *approximately twenty people* not mean that there may have been, say, 21.7 people? The solution here is atomicity. In particular, people are considered atomic, and so only integer-increments of people are considered in (2). Years, on the other hand, are readily divisible, so non-integer increments are considered in (13b).

Similarly, we can see that the alternatives arising from *maybe John* do not tend to be the same as the items that fall within the denotation of *approximately John*. *Approximately John* seems to point to some (possibly hypothetical) person who differs from John only slightly. *Maybe John* gives a more macroscopic reading, allowing for alternatives that differ more sharply from John. This difference may be due to contextual information accommodation: you are presumably searching for actual people, not hypothetical John-like people, so for *maybe John* the range (σ) needs to be wider if it is to include any alternatives not already ruled out by world knowledge. For *approximately John*, on the other hand, the range will contain hypothetical entities even without widening.

4 Halos

The analysis presented above is reminiscent of Lasersohn's (1999) pragmatic halos. According to Lasersohn, some element α is surrounded by a halo of

elements which differ from α in pragmatically ignorable ways.[6]

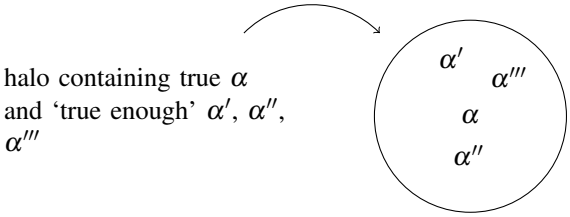


Figure 3: α with its halos, containing α', α'', and α''', which differ from α only in pragmatically ignorable ways.

It would seem that the propositions in the modal base and ordering source above are the same as the information structuring these pragmatic halos (i.e. the information used to determine what is pragmatically ignorable and how to order based on similarity). However, one difference soon becomes apparent, which is seen most clearly through slack regulators.

Slack regulators like the hedges *roughly*, *loosely speaking* manipulate pragmatic halos, functioning to more-or-less expand $[\![\alpha]\!]$ to include its halo.[7] For example, while $[\![$**twenty**$]\!]$ is only true for 20 exactly, $[\![$**roughly twenty**$]\!]$ is true for values that differ from twenty in pragmatically ignorable ways.

To see how the information used in the possible worlds account differs from one using pragmatic halos, compare the use of *maybe* with the hedge *roughly* in (15).

(15) a. It's Susan's birthday today, and she's maybe thirty.
b. # It's Susan's birthday today, and she's roughly thirty.

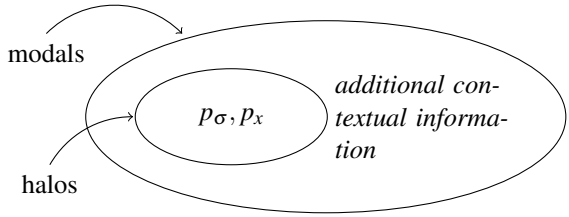
Again, *maybe* can readily accommodate the fact that it is Susan's birthday, but with *roughly*, this does not have the same effect on the halo, leading to infelicity.[8] And this behavior is not specific to the term *roughly*. Even round numbers (e.g. *twenty* when it represents $[18-22]$) do not accommodate this kind of outside information. So, while there is overlap in the information structuring

[6] Lasersohn writes: "Given an expression α denoting some object x, I like to think of the set the context associates with x as arrayed around x in a sort of circular cluster, so I will call this set, together with its ordering relation, the PRAGMATIC HALO of x, or, extending the terminology, as the pragmatic halo of α", (Lasersohn 1999: 527) and "$H_C(\alpha)$ is understood to be a set of objects which differ from $[\![\alpha]\!]^{M,C}$ only in ways which are pragmatically ignorable in C; $\leq_{\alpha,C}$ is an ordering of $H_C(\alpha)$ according to similarity to $[\![\alpha]\!]^{M,C}$", (Lasersohn 1999: 548).

[7] $[\![$**loosely speaking** $\Phi]\!]^{M,C} = \bigcup H_C(\Phi) - [\![\Phi]\!]^{M,C}$ (Lasersohn 1999: 545)

[8] Note that *roughly* (like *approximately*) is acceptable in a very precise context.

pragmatic halos and the information structuring possible worlds, the overlap is not complete. Halos deal with precision (p_x, p_σ) only, while modals accommodate precision as well as additional contextual information.



4.1 The Hedge *like*

Now that this distinction between modal (e.g. *maybe*) and non-modal (e.g. *approximately*) approximators has been noted, we may expect to find modal items like *maybe* which have been mis-classified as slack regulators. And indeed this seems to be the case for Siegel's (2002) *like*. In her analysis, *like* α denotes a variable corresponding either to α or an element within α's halo. As can be seen in (16), however, *like* can accommodate outside information, just like *maybe*.

(16) It's Susan's birthday today, and she's, like, thirty.

In other words, *like*, like *maybe* and unlike *approximately*, is felicitous in contexts which require discontinuous sets of alternatives. This cannot be explained by halos and suggests that there is some modal semantic component to *like* such that outside information can be accommodated in its modal base, explaining the felicity of (16).

In summary, halos are similar to the present analysis in the way they determine the range of alternatives/approximation, but halos involve pragmatic precision only. An additional dimention, modality, is required to capture the differences highlighted in (13), (15), and (16). The means of approximation discussed here are divided as shown in (17).

(17) a. Modal: *maybe*, *like*
b. Non-modal: *approximately*, *roughly*, pragmatic slack/halos/roundness

5 Summary

By examining constructions like *maybe twenty* I show that information associated with numerals can be incorporated into a possible worlds semantics. This analysis describes their approximating behavior as well as their divergence from constructions like *approximately twenty*. Scalars represent ranges, with closer values being more probable. In modal contexts (e.g. *maybe twenty*), this information is incorporated into the modal base and ordering source such that plausible alternatives are those scalarly close, resembling approximation. It can also be seen that, while this same information may be used in pragmatic halos, use of contextual information sets these types of approximation apart and suggests that certain hedges contain modal components. The approximators with a modal component can then accommodate contextual information, while non-modal approximators cannot.

References

Kratzer, Angelika. 1991. Modality. In Arnim von Stechow & Dieter Wunderlich (eds.), *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, 639–650. Berlin: Walter de Gruyter.

Krifka, Manfred. 2009. *Approximate interpretations of number words: A case for strategic communication* 109–132. Stanford: CSLI Publications.

Lakoff, George. 1973. Hedges: a study in meaning criteria and the logic of fuzzy concepts. *Journal of Philosophical Logic* 2. 458–508.

Lasersohn, Peter. 1999. Pragmatic halos. *Language* 75. 522–551.

Sauerland, Uli & Penka Stateva. 2007. Scalar vs. epistemic vagueness: Evidence from approximators. In *Proceedings of SALT 17*, Ithaca, NY: CLC Publications, Cornell University.

Siegel, Muffy E. A. 2002. Like: The discourse particle and semantics. *Journal of Semantics* 19. 35–71.

Syrett, Kristen, Christopher Kennedy & Jeffrey Lidz. 2010. Meaning and context in children's understanding of gradable adjectives. *Journal of Semantics* 27. 1–35.

Sinn & Bedeutung – the annual conference of the *Gesellschaft für Semantik* – aims to bring together both established researchers and new blood working on current issues in natural language semantics, pragmatics, the syntax-semantics interface, the philosophy of language or carrying out psycholinguistic studies related to meaning.

Every year, the conference moves to a different location in Europe.

The 2010 conference – *Sinn & Bedeutung 15* – took place on September 9 - 11 at Saarland University, Saarbrücken, organized by the *Department for German Studies*.