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The SFB 732 brings together scientists from the areas of linguistics, computational linguistics and signal processing at the University of Stuttgart. Their common scientific goals are to achieve a better understanding of the mechanisms that lead to ambiguity control/disambiguation as well as the enrichment of missing/incomplete information and to develop methods that are able to fully describe these mechanisms.

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Preface

The 13th installment of the annual meeting of the *Gesellschaft für Semantik*, *Sinn und Bedeutung 13*, took place September 30—October 2, 2008 at the University of Stuttgart. Our invited speakers were Gerhard Jäger, Lauri Karttunen, Alex Lascarides, and Claudia Maienborn. In addition, 42 submitted abstracts were selected for presentation. We are deligthed to be able to include 38 of these in the proceedings.

On behalf of the organizers – Ljudmila Geist, Klaus von Heusinger, Hans Kamp, Udo Klein, Fabienne Martin, Edgar Onea, Arndt Riester, and Torgrim Solstad – we would like to thank the speakers, reviewers and student helpers for making SuB13 such an inspiring and enjoyable event. We are also much obliged to Nina Seemann for assisting us with the typesetting of this document.

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Stuttgart, May 20, 2009
Arndt Riester
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PART 1

Counting Configurations

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Abstract

The sentence *With these three shirts and four pairs of pants, one can make twelve different outfits* does not entail that one can dress twelve persons. The article proposes an analysis of "configurational" entities like outfits as individual concepts. It investigates the interaction of noun phrases based on such nouns with temporal and modal operators and in collective and cumulative interpretations. It also discusses a generalization from tokens to types, as in *with the seven pieces of a tangram set, one can lay dozens of figures*, suggesting an analysis of outfits and tangram figures in terms of properties.

1 What are Configurations?

"Configurations" is a term that I will use for what the italicized terms in sentences like the following refer to:

(1) a. You have 3 shirts and 4 pairs of pants. *How many different outfits* can you make? [...] You get *twelve outfits*. Not counting if a dude makes an outfit without a shirt, or a crazy person without pants.[1]

b. [Description of a tangram set.] With just seven simple pieces, you can make *dozens of amazing shapes*.[2]

c. [Description of fischertechnik crane construction kit:] 100 Bauteile ermöglichen den Bau *dreier unterschiedlicher, einfacher Kräne*.
'With 100 construction parts one can build *three different, simple cranes*.'[3]

[1] answers.yahoo.com/question/index?qid=20080723031442AAYcny3. The text continues: *Now let's say you throw in three different pairs of socks...then you'd have 3 shirts times 4 pairs of pants times 3 pairs of socks for 36. It can get crazy the more options you throw in there.*

[2] www.amazon.com/Think-Fun-4985-Tangram/dp/B000BXHP04

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d. [Description of Scrabble Word Builder:] We typed in the letters C, D, P, N, Y, E, A, and U and the Word Builder provided *dozens and dozens of words* that could be created with those letters.[4]

Our main concern here is in the fact that even though the sentences in (1) talk about twelve outfits, dozens of tangram shapes, three cranes, and dozens and dozens of words, they do not imply that at any one possible world or point in time, dozens of shapes, twelve outfits, three cranes exist, or dozens of words constructed with a set of eight scrabble pieces coexist. For example, we can combine three shirts and four pairs of pants only to three outfits at a time. Nevertheless, the sentences in (1) are true. The number words appear to count things that exist across the different possible worlds or times referred to be the modal and temporal operators of the sentences. This might not appear so remarkable for examples (1.b,c,d) if *tangram figure*, *crane*, or *word* refer to types (or kinds), which presumably have a more abstract way of existence anyway. However, (1.a) does not lend itself to a type reading; the shirts and pants that are mixed and matched may well be unique.

Our main goal is to develop a semantic representation for configurational entity expressions that captures their semantic behavior in numeral constructions. I will start with sentences like (1.a), and look at singular, cumulative and collective interpretations. Then I will generalize the solution to account for the type-related readings that are more likely for (1.a).

2 The Problem with Configurations

The natural readings of the examples in (1) cannot be rendered if nouns like *outfit* refer to regular individuals, type e. Consider the following simplified example:

(2) It is possible to make four outfits with these two shirts and two pants.

We assume an interpretation format with explicit quantification over indices that stand for worlds or times (including time intervals), and with entities that can be combined to form sum entities. I use i, i′ etc. as variables over indices (type s), and u, u′ etc. as variables over entities (type e). The count noun *outfit* applies to single outfits that consist of combining pieces of clothing in culturally acceptable ways, cf. (3).

(3) $[\![\textit{outfit}]\!] = \lambda i \lambda u$[u consists of parts arranged in i so that they form an outfit in i]

The number word *four* can be represented in various ways. Let us assume the standard Generalized Quantifier analysis (where P is a variable over properties, type set).

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[3] spielwaren.1index.de/Fischertechnik@Cranes@Fischertechnik@Basic.19673.WOB00000001.137

[4] www.education-world.com/a_lesson/dailylp/dailylp/dailylp099.shtml

(4) $[\![\textit{four outfits}]\!] = \lambda i \lambda P[\#(\lambda u[[\![\textit{outfit}]\!](i)(u) \wedge P(i)(u)]) \geq 4]$

The verb *make* means 'arrange the parts of u in a particular way'. It is true at an index i iff the agent arranges the parts of u at an index i′ that immediately precedes i, for which I will write $i' \angle i$ (cf. von Stechow 2001 for verbs of creation).

(5) $[\![\textit{make}]\!] = \lambda i \lambda u \lambda u' \exists i'[i' \angle i \wedge u'$ arranges the parts of u in $i']$

The PP headed by *with* is analyzed as an internal adverbial modifier. Let us assume that *this* refers to a sum individual consisting of two shirts s_1, s_2 and two pairs of pants p_1, p_2, where $\oplus$ denotes the sum operation, and $\sqsubseteq$ the part relation.

(6) $[\![\textit{make with this}]\!]$
$= \lambda i \lambda u \lambda u' \exists i'[i' \angle i \wedge u \sqsubseteq s_1 \oplus s_2 \oplus p_1 \oplus p_2 \wedge u'$ arranges the parts of u in $i']$

Combining the meaning of an indefinite object *an outfit*, a subject DP *John*, and tense information (with $<$ as the temporal precedence relation), and applying the resulting proposition to an index of evaluation i_0, we get the following interpretation:

(7) $[\![\textit{John made an outfit with this}]\!](i_0)$
$= \exists i < i_0 \, \exists u \exists i'[i' \angle i \wedge u \sqsubseteq s_1 \oplus s_2 \oplus p_1 \oplus p_2$
$\wedge$ John arranges the parts of u in i'
$\wedge$ u consists of parts arranged in i so that they form an outfit in i]

This says that there is a time i before i_0 that immediately follows a time i′ during which John arranges parts of the two shirts and two pairs of pants, and that they form an outfit at the culminating time, i.[5] According to the intended understanding of *outfit*, there are four possible sum individuals that would qualify as outfits when properly arranged, namely $s_1 \oplus p_1$, $s_1 \oplus p_2$, $s_2 \oplus p_1$, and $s_2 \oplus p_2$. But at each index i, only two of these can be arranged to an outfit simultaneously, namely $s_1 \oplus p_1$ and $s_2 \oplus p_2$, and $s_1 \oplus p_2$ and $s_2 \oplus p_1$.

Let us now look at our example, (2). The non-governed infinitival form existentially quantifies over the subject position:

(8) $[\![\textit{to make with this}]\!]$
$= \lambda i \lambda u \exists u' \exists i'[i' \angle i \wedge u \sqsubseteq s_1 \oplus s_2 \oplus p_1 \oplus p_2 \wedge u'$ arranges the parts of u in $i']$

For the modal *possible* we assume the standard analysis as existential quantifier over indices that are elements of a set of indices R(i), the indices that are accessible from i. In our case, accessibility means that the parts of the shirts and pairs of pants are combined such that they qualify as outfits relative to the standards of i.

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[5] This does not capture a possible intentional component that John wanted to create an outfit, which is irrelevant for our purposes.

(9) $[\![\textit{it is possible}]\!] = \lambda i' \lambda p \exists i \in R(i')[p(i)]$

We are now in a position to test whether we can generate the correct interpretation of (1.a), the reading that does not require that at any particular index, four outfits exist.

First, the modal might have wide scope with respect to the DP, resulting in the following interpretation at an index i_0.

(10) $[\![[\textit{it is possible}]\ [[\textit{four outfits}]\ [\textit{to make with this}]]]\!](i_0)$
$= \lambda i[[\![\textit{it is possible}]\!](i)(\lambda i'[[\![\textit{four outfits}]\!](i')([\![\textit{to make with this}]\!](i'))])](i_0)$
$= \exists i \in R(i_0)[\#(\lambda u[[\![\textit{outfit}]\!](i)(u) \wedge u \sqsubseteq s_1 \oplus s_2 \oplus p_1 \oplus p_2 \wedge [\![\textit{to make}]\!](i)(u)]) \geq 4]$

This states that from i_0 there is an index i' accessible from i_0 such that the cardinality of outfits made with the two shirts and two pairs of pants at i' is at least four. Clearly, this is not the intended reading: it requires that four outfits are made at the same index.

Second, the DP might have wide scope with respect to the modal. This results in the following interpretation:

(11) $[\![[\textit{four outfits}]\ \lambda t[\textit{it is possible}\ [\textit{to make}\ t\ \textit{with this}]]]\!](i_0)$
$= \lambda i[[\![\textit{four outfits}]\!](i)(\lambda u[[\![\textit{it is possible}]\!](i)(\lambda i'[[\![\textit{to make with this}]\!](i')(u)]))]\!](i_0)$
$= \#(\lambda u[[\![\textit{outfit}]\!](i_0)(u) \wedge \exists i \in R(i_0)[[\![\textit{to make}]\!](i)(u) \wedge u \sqsubseteq s_1 \oplus s_2 \oplus p_1 \oplus p_2]) = 4$

This result is even worse because it states that there are four outfits made with the two shirts and two pairs of pants at the index of interpretation i_0 itself.

3 An Individual Concept Analysis

What went wrong? The fault, I would like to argue, is with the analysis of outfits as simple entities, type e, as suggested by (3). There cannot be four outfit **entities** at the same time. The solution I would like to propose is that outfits and their ilk are rather **individual concepts**, that is, possibly partial functions from indices to entities, type se. Individual concepts were used by Gupta (1980) to model the meaning of sentences like *National Airlines served two million passengers in 1975*. Gupta pointed out that this does not entail that National Airlines served two million persons, as one and the same person can perform the role of a passenger multiple times. Gupta's solution – which analyzes passengers as individual concepts defined only for the time of a person's flight – is problematic for passenger sentences, as we have the same interpretation for sentences like *National Airlines served two million persons in 1975* (cf. Krifka 1990). But individual concets appear to be well-suited for configurations.

To illustrate the individual concept analysis, take the four outfits one can make with the two shirts s_1, s_2 and the two pairs of pants p_1, p_2. I make use of the notation introduced in Heim & Kratzer (1998) according to which an expression of the form λv.Restriction[v]. [Value[v]] denotes the (possibly partial) function from entities of the

type of v that is only defined for arguments for which Restriction[v] holds; if defined, the function gives as value whatever is specified in Value[v].

(12) o_1 = λi. s_1 and p_1 are arranged as an outfit in i. [$s_1 \oplus p_1$]
o_2 = λi. s_1 and p_2 are arranged as an outfit in i. [$s_1 \oplus p_2$]
o_3 = λi. s_2 and p_1 are arranged as an outfit in i. [$s_2 \oplus p_1$]
o_4 = λi. s_2 and p_2 are arranged as an outfit in i. [$s_2 \oplus p_2$]

For example, o_1 is an individual concept that is only defined for indices i if s_1 and p_1 are arranged as an outfit in i; if defined, o_1 maps to the sum individual consisting of s_1 and p_1. As one piece of clothing cannot be part of two outfits at a given index, the outfit concepts o_1, o_2 and o_3 have non-overlapping domains; only the outfits o_1 and o_4 and the outfits o_2 and o_3 can co-exist, as they consist of non-overlapping parts.

The individual concept analysis should not be restricted to configurations, of course. Take a regular entity, like Wolfgang Amadeus Mozart; he can be represented as individual concept that maps all indices i at which Mozart exists to Mozart – in our world, these are all indices from January 27, 1756 to December 5, 1791. In contrast to configurations, this is a convex set of indices: If i and i′ are indices of the same possible world that are in this set, and if i″ is an index of the same possible world that is temporally in between i and i′, then i″ is in this set as well. – Second, take role concepts like *the tallest man*, or *the Pope*. In contrast to configurations, they may refer to different entities for different indices. – Third, take individual concepts like the denotation of *the gifted mathematician that John claims to be* (cf. Grosu & Krifka 2008). Like configurations, they denote individual concepts referring to the same entity, but are restricted to those indices that are compatible with John's claims.

Gupta analyzed common nouns as properties of individual concepts, type s(se)t, and we will follow him here. The common noun *outfit* applies to individual concepts like o_1 in (12), and not to simple entities. I first give the extension of this common noun meaning at an index i_0 in the set notation; it is of type (se)t.

(13) $[\![outfit]\!](i_0)$
= {λi. the parts of u are arranged in i to qualify as outfit in i_0 . [u] | $u \in D_e$}

This is the set of all functions from indices i to entities u in the universe D_e whose parts are arranged in such a way in i that they qualify as an outfit at the index of interpretation, i_0. This accounts for the fact that there might be indices at which we do not consider the arrangement of a striped shirt and a checkered pairs of pants a suitable outfit. We get the intension of this set by lambda-abstraction over i_0, as usual.

Notice that it might be that at a given index i_0, all the individual concepts in $[\![outfit]\!](i_0)$ are such that they are not defined for i_0, because their parts are not arranged in i_0 in the proper way. Nevertheless, $[\![outfit]\!](i_0)$ is not empty in this case. To give a concrete example, assume a set of seven indices i_0,...i_6, and assume that the four outfits mentioned in (12) are as follows:

(14) $o_1 = [i_1 \rightarrow s_1 \oplus p_1, i_2 \rightarrow s_1 \oplus p_1]$ $\quad o_3 = [i_5 \rightarrow s_2 \oplus p_1, i_6 \rightarrow s_2 \oplus p_1]$
$o_2 = [i_4 \rightarrow s_1 \oplus p_2, i_5 \rightarrow s_1 \oplus p_2]$ $\quad o_4 = [i_2 \rightarrow s_2 \oplus p_2, i_3 \rightarrow s_2 \oplus p_2]$

Notice that o_1 and o_4 both exist for i_2, and o_2 and o_3 both exist for i_5, but that o_1 and o_4 as well as o_2 and o_3 do not co-exist. At i_0 no outfit exists at all. But the noun *outfit* denotes for all indices, including i_0, the set of all these individual concepts, if what qualifies as outfit is the same for all indices:

(15) $[\![\textit{outfit}]\!] = \lambda i \in \{i_0, \ldots i_6\} \; [\{o_1, o_2, o_3, o_4\}]$

It simplifies the grammatical description if we assume that common nouns and verbal predicates in general are properties of individual concepts, following the methodological principle of Montague grammar of generalizing types to the most complex case. With extensional predicates like *be on the table*, they can be reduced to entities (in the following, I use x, x′ etc. as variables over individual concepts).

(16) $[\![\textit{be in the laundry machine}]\!] = \lambda i \lambda x$[x(i) is in the laundry machine at i]

That is, the property is ascribed to x(i), the value of the individual concept x at the index i. Non-extensional predicates like *rise* or *change* are not reducible in this way (cf. Montague 1973). Verbs of creation like *make* state that an agent causes an individual concept to be realized at an index. For example, if John makes outfit o_1 at an index i then John caused during an interval preceding i that at i, o_1 is defined. This presupposes that during the making of i, o_1 was not defined (one cannot be making something that exists already) and entails that the agent acted upon the parts that o_1 refers to, $s_1 \oplus h_1$, in the time before i. The essential parts of this is captured in the following interpretation.

(17) $[\![\textit{to make}]\!]$
$= \lambda i \lambda x \exists x' \exists i'.\ i' \angle i \wedge \neg i' \in \mathrm{DOM}(x)$ [$i \in \mathrm{DOM}(x) \wedge x'$ acts on x(i) in i']
$= \lambda i \lambda x$[someone realizes x at i] (in short)

The DP *four outfits* will get the following interpretation, with P is a variable for properties of individual concepts, type s(se)t.

(18) $[\![[_{\mathrm{DP}}\, \textit{four outfits}]]\!] = \lambda i \; \lambda P \; [\#(\lambda x [[\![\textit{outfit}]\!](i)(x) \wedge P(i)(x)]) \geq 4]$

We now can give an appropriate interpretation to our example. It states that there are four outfit concepts such that there are accessible indices at which these outfits are made. Notice that the predication is understood as distributive: For each of these individual concepts, there is an accessible index at which it can be made.

(19) $[\![$[*four outfits*] λt[*it is possible* [*to make* t *with this*]]$]\!](i_0)$
$= \lambda i[[\![\textit{four outfits}]\!](i)(\lambda x[[\![\textit{it is possible}]\!](i)(\lambda i'[[\![\textit{to make with this}]\!](i')(x)]))]\!](i_0)$
$= [\![\textit{four outfits}]\!](i_0)(\lambda x[[\![\textit{it is possible}]\!](i_0)(\lambda i'[[\![\textit{to make with this}]\!](i')(x)])$
$= \#(\lambda x[[\![\textit{outfit}]\!](i_0)(x) \wedge [\![\textit{it is possible}]\!](i_0)(\lambda i'[[\![\textit{to make with this}]\!](i')(x)]) \geq 4$
$= \#(\lambda x[x \in [\![\textit{outfit}]\!](i_0)(x) \wedge \exists i' \in R(i_0)[[\![\textit{to make}]\!](i')(x) \wedge x \in \{o_1,o_2,o_3,o_4\}]) \geq 4$
$= \#(\lambda x[x \in \{o_1, o_2, o_3, o_4\} \wedge \exists i' \in R(i_0)[$someone realizes x at i′$]) \geq 4$

This is true iff for each of the four individual concepts there is an index i′ accessible from i_0 such that x is realized by someone at i′. Notice that this does not entail that there is an index at which all four individual concepts are realized. In particular, (19) is compatible with a situation in which only two outfits can be realized at a time.

4 Sum Formation for Individual Concepts

4.1 Collective Interpretations

Our proposed treatment of sentences with reference to configurations allows only for a distributive interpretation, as distributivity is built in into the very nature of DPs like *four outfits*. However, we also find collective readings:

(20) Two outfits are rather similar to each other.

Equivalent readings of sentences with noun phrases that refer to regular individuals have been analyzed with the help of the notion of sum individuals (cf. e.g. Link 1983), and we can employ this idea in the present case as well.

One natural way in which the notion of sum formation can be extended to individual concepts is to lift the join operation ⊕ for entities to a join operation for individual concepts, as follows:

(21) $x \oplus y = \lambda i[x(i) \oplus y(i)]$

The join of two individual concepts, x⊕y, is an individual concept that maps every index i to the join of the individuals x(i) and y(i). But notice that this join is only defined in case x(i) and y(i) are defined. This may be useful for certain kinds of complex individual concepts, but not for the one we are after. In our example, the four outfits o_1,... o_4 do not all exist at the same index, hence $o_1 \oplus o_2 \oplus o_3 \oplus o_4$ will not be defined for any index. Hence we need a different join operation of individual concepts. One option is to use set formation; the join of the four outfits then is $\{o_1, o_2, o_3, o_4\}$. This is not an individual concept in its own right: It is not a function from indices to entities, but a set of such functions. Let us consider the construction of DPs with number words, like *two outfits*, in this framework.

(22) $[\![\textit{two}]\!] = \lambda i \lambda P \lambda X[\#(X) = 2 \wedge X \subseteq P(i)]$
$[\![[_{NP}\ \textit{two outfits}]]\!] = \lambda i\ [[\![\textit{two}]\!](i)([\![\textit{outfit}]\!](i)] = \lambda i \lambda X[\#(X) = 2 \wedge X \subseteq [\![\textit{outfit}]\!](i)]$

This is a property of sets of individual concepts, type s((se)t)t. From it we can derive an indefinite DP which is interpreted as an existential quantifier that combines with a verbal predicate $\underline{P}$, a property of sets of individual concepts.

(23) $[\![[_{DP}\ [\textit{two outfits}]]]\!] = \lambda i \lambda \underline{P} \exists X[[\![[_{NP}\ \textit{two outfits}]]\!](i)(X) \wedge \underline{P}(i)(X)]$

The predicate *are similar* is a property of sets of individual concepts; it is true of such a set iff its elements are pairwise similar to each other.

(24) $[\![[_{DP}\ [\textit{two outfits}]]\ [\textit{are similar}]]\!](i_0)$
$= [\![[_{DP}\ [\textit{two outfits}]]]\!](i_0)([\![\textit{are similar}]\!](i_0))$
$= \lambda \underline{P} \exists X[[\![[_{NP}\ \textit{two outfits}]]\!](i)(X) \wedge \underline{P}(i)(X)](\lambda X \forall x,y \in X[x \text{ is similar to y at } i_0])$
$= \exists X[\#(X) = 2 \wedge X \subseteq [\![\textit{outfit}]\!](i) \wedge \forall x,y \in X[x \text{ is similar to y at } i_0]]$

Where similarity of two individual concepts x and y at i_0 means that according to the similarity standards of i_0, the realizations of x and the realizations of y are deemed similar. Notice again that this does not entail that x and y have realizations at i_0; *be similar* must be understood as an intensional predicate. We find this type of comparison with other cases of individual concepts, as in *two popes were similar to each other*, which may be true even if the two popes were not contemporaries.

The interpretation of expressions like *two outfits* proposed here is also possible for the non-collective examples we started out with, provided that we assume that verbal predicates, when applied to sets of individual concepts, distribute over their elements. This can be implemented by a type lifting of verbal predicates to accommodate sets of individual concepts as arguments. The type lifting is indicated with *, a symbol that is sometimes used for the cumulative closure of a predicate, as we have cumulativity here as well, insofar as $*\underline{P}(i)(X) \wedge *\underline{P}(i)(Y)$ entails $*\underline{P}(i)(X \cup Y)$.

(25) $*P = \lambda i \lambda X \forall x \in X[P(i)(x)]$

(26) $*[\![\lambda t[\textit{it is possible}\ [\textit{to make}\ t]]]\!] = \lambda i \lambda X \forall x \in X \exists i' \in R(i)[\text{s.o. realizes x at } i']$

The derivation of the reading of our original sentence is straightforward:

(27) $[\![[[_{DP}\textit{four outfits}]\ \lambda t[\textit{it is possible}\ [\textit{to make}\ t]]]\!](i_0)$
$= [\![[_{DP}\textit{four outfits}]]\!](i_0)(*[\![\lambda t[\textit{it is possible}\ [\textit{to make}\ t]]]\!](i_0))$
$= \lambda \underline{P} \exists X[\#(X) = 4 \wedge X \subseteq [\![\textit{outfit}]\!](i_0) \wedge \underline{P}(i_0)(X)]$
$(\lambda X \forall x \in X \exists i' \in R(i_0)[\text{someone realizes x at } i'])$
$= \exists X[\#(X) = 4 \wedge X \subseteq [\![\textit{outfit}]\!](i_0) \wedge \forall x \in X \exists i' \in R(i_0)[\text{someone realizes x at } i']]$

Notice that we do not assume a distributive operator here; distributivity is rather a consequence of type lifting expressed by the * operator.

4.2 Configurations and Temporal Operators

Examples like (28) involve a temporal operator, the perfect. Just as with modal operators, the sentence does not entail that the three outfits existed at the same time.

(28) John has made three outfits with these shirts and pants.

The proper representation of perfect tense is beyond the scope of this paper. What is important is that perfect clauses like *John has arrived* entail that there was a time prior to the time of utterance at which John arrives. Then we can give the interpretation (29), where the part in parentheses will be neglected, for the perfect. This enables derivations like in (30), which allows for each element x of the four outfit concepts X that they were made at different times i′.

(29) $[\![\textit{PERFECT}]\!] = \lambda i \lambda p \exists i' < i[p(i') (\wedge \text{ afterstate of } p(i') \text{ still holds at } i)]$

(30) $[\![[_{DP}\ \textit{three outfits}]\ [\textit{have been made}]]\!](i_0)$
$= [\![[_{DP}\ \textit{three outfits}]]\!](i_0)(*[\![\textit{PERFECT}\ [\textit{be made}]]\!](i_0))$
$= \lambda \underline{P} \exists X[\#(X) = 3 \wedge X \subseteq [\![\textit{outfit}]\!](i_0) \wedge \underline{P}(i_0)(X)]$
$(\lambda X \forall x \in X \exists i' < i_0[\text{someone realizes x at } i'])$
$= \exists X[\#(X) = 3 \wedge X \subseteq [\![\textit{outfit}]\!](i_0) \wedge \forall x \in X \exists i' < i_0[\text{someone realizes x at } i']]$

Notice that a simple past tense as in *John made three outfits* tends to have the reading for which the three outfits coexist. This is because past tense typically refers to a particular time given by the context. When we say that the three outfit concepts x of the set X were made at that particular time, then they must coexist at that time (or at the end of that time).

4.3 Cumulative Interpretations

Sets of individual concepts can also accommodate cumulative interpretations. Imagine that a kindergarten owns a construction set with which all kinds of vehicles can be constructed, but only one at a time (there are only four wheels).

(31) Dozens of children have built hundreds of vehicles with this construction set.

Such interpretations have been explained as a consequence of the cumulativity of verbal predicates (cf. Krifka 1989, Sternefeld 1998). That is, transitive predicates like *build* are interpreted such that if u builds v and u′ builds v′, then u⊕u′ builds v⊕v′. This interpretation is triggered by Sternefeld's operator **, here adapted as in (32). Let Q be a variable for relations between sets of individual concepts, type s(se)(se)t.

(32) $**Q = \lambda i \lambda X \lambda Y[\forall x \in X \exists y \in Y[R(i)(x)(y)] \wedge \forall y \in Y \exists x \in X[Q(i)(x)(y)]]$

This operator enables derivations as in (33), where ">> 24" and ">> 200" state that a number is in the range of dozens and hundreds, respectively.

(33) $[\![[\textit{dozens of children}]\ [[\textit{have built}]\ [\textit{hundreds of vehicles}]]]\!](i_0)$
$= [\![\textit{dozens of children}]\!](i_0)([\![\textit{hundreds of vehicles}]\!](i_0)(**[\![\textit{have built}]\!](i_0)))$
$= \lambda P \exists X[\#(X) >> 24 \wedge X \subseteq [\![\textit{child}]\!](i_0) \wedge \underline{P}(i_0)(X)]$
$(\lambda \underline{R} \lambda X \exists Y[\#(Y) >> 200 \wedge Y \subseteq [\![\textit{vehicle}]\!](i_0) \wedge \underline{R}(i_0)(Y)(X)]$
$(**[\![\textit{PERFECT}]\!](i_0)([\![\textit{build}]\!])(Y)(X)))$
$= \exists X \exists Y[\#(X) >> 24 \wedge X \subseteq [\![\textit{child}]\!](i_0) \wedge \#(Y) >> 200 \wedge Y \subseteq [\![\textit{vehicle}]\!](i_0)$
$\wedge \forall x \in X \exists y \in Y \exists i' < i_0[x \text{ realizes } y \text{ at } i'] \wedge$
$\forall y \in Y \exists x \in X[\exists i' < i_0[x \text{ realizes } y \text{ at } i']]$

Here, X is a set of individual concepts that have the property of being children with respect to i_0. This set X contains dozens of elements. Similarly, Y is a set of individual concepts that are vehicle concepts with respect to i_0; the way things are set up, no two vehicle concepts exist at the same temporal index. Y contains hundreds of elements. For every element x of X there is an element y of Y and a time before t_0 such that x builds y at that time, and for every element y of Y there is an element x of X such that y was built by x at that time. Notice that this does not require that at any one time there exists more than one vehicle. It does require, though, that the builders of the vehicle are children at the time of the building, as the condition "x realizes y at i′" entails that the realization x(i′) did the building at i′, and if x is only defined for persons during their childhood years, then x must be a child during the time of the building of y. Notice, also, that this interpretation allows that children cooperate in the building of one vehicle, as the individual concept x may well refer to two or more children; cf. (21).

5 The Property Analysis, and Identity Criteria for Concepts

Condoravdi, Crouch & van den Berg (2001) have analyzed examples like (34) in a way that looks similar to what we have proposed for configurations.

(34) The mayor prevented three strikes.

Prevent is analyzed as an intensional predicate, like *seek*, which Condoravdi e.a. interpret, following Zimmermann (1993), as having a property argument:

(35) $[\![$*The mayor prevented a strike*$]\!](i_0)$
$= \exists i<i_0\ [[\![$*prevent*$]\!](i)([\![$*strike*$]\!])([\![$*the mayor*$]\!])]$
$= \exists i<i_0\ [[\![$*prevent*$]\!](i)(\lambda i'\lambda u[u \text{ is a strike in } i'])(\mathbf{m})]$

This captures the reading in which no reference to a specific strike is intended. But there is also a specific reading: There was a threat for a strike, and the mayor prevented that strike from happening. The normal solution for specific reading, giving the noun phrase wide scope (cf. (36)), does not work. It entails the existence of a strike u – but this is exactly what the next conjunct says was prevented.

(36) $\exists i<i_0\ \exists u[[\![$*strike*$]\!](i)(u) \wedge [\![$*prevent*$]\!](i)(\lambda i'\lambda v[u=v])(\mathbf{m})]$

Condoravdi et. al. propose a solution for the specific interpretation using "sub-concepts" (that is, subproperties). No strict definition is given, but we certainly should assume that a superconcept applies to all indices and individuals a subconcept applies to. The specific reading can be given as follows, where $\subseteq_{sc}$ is the subset relation.

(37) $\exists P \subseteq_{sc} [\![$*strike*$]\!]\exists i<i_0\ [\![$*prevent*$]\!](i)(X)(\mathbf{m})$

For the interpretation of *three strikes*, Condoravdi et al. (2001) discuss various options, settling on a generalized quantifier analysis:

(38) $[\![$*the mayor prevented three strikes*$]\!](i_0)$
$= \#(\lambda P[P \subseteq_{sc} [\![$*strikes*$]\!]] \wedge \exists i<i_0\ [\![$*prevent*$]\!](i)(P)(\mathbf{m})]) = 3$

But for this to work, the notion of subconcept must be properly restricted. One entity may fall under different subconcepts of *strike*, e.g. it might be a strike of the railroad workers and at the same time (as railroad workers are public workers) a strike of the public workers. Obviously, the subconcepts that we count should not be such that one is included in the other. Hence Condoravdi e.a. propose to restrict counting to minimal subconcepts, that is, to "maximally specific instantiated concepts".

Using individual concepts instead of properties, we get minimality for free, as individual concepts can apply to maximally one individual. Hence it seems natural to apply the individual concepts analysis to examples of the type of Condoravdi e.a. (2001). The natural reading of (34) is that what the mayor prevented was that three specific strike threats led to a full-blown strike. In each world at which these strikes would have been realized, there would have been exactly one realization.

(39) $[\![$*The mayor prevented three strikes*$]\!](i_0)$
$= \exists X[\#(X) = 3 \wedge X \subseteq [\![$*strike*$]\!](i_0) \wedge \forall x \in X \exists i'<i_0[\mathbf{m} \text{ prevented x at } i']]$

This says that X consists of three individual concepts that are strikes, and that the mayor prevented them (possibly at three different times). To prevent an individual concept at an index i′ means to act in such a way that the individual concept is not realized in the possible future continuations of the index i′. That is, without the intervention, the individual concept x would have been realized at a normal continuation of i′.

But there is still an issue of minimality to be considered: While individual concepts necessarily refer to one entity, they may be defined for a greater of smaller set of indices. For example, if $[i_1 \rightarrow e_1, i_2 \rightarrow e_2]$ is a strike (which is realized in i_1 by the event e_1, and in i_2 by the event e_2), and if $[i_3 \rightarrow e_3, i_4 \rightarrow e_4]$ is a strike, what prevents us from saying that $[i_1 \rightarrow e_1, i_2 \rightarrow e_2, i_3 \rightarrow e_3, i_4 \rightarrow e_4]$ is a strike? Alternatively, what prevents us from saying that $[i_1 \rightarrow e_1]$ is a strike? Put differently, what would make us say that $[i_1 \rightarrow e_1]$ is the same strike as $[i_2 \rightarrow e_2]$, but that $[i_1 \rightarrow e_1, i_2 \rightarrow e_2]$ and $[i_3 \rightarrow e_3, i_4 \rightarrow e_4]$ are different strikes?

Like identity criteria in general, this depends on lexical semantics and cannot be determined by abstract principles. In the case at hand, there are complex issues involved, e.g. when an announced strike is declared illegal, and the workers announce another strike with similar goals and methods to circumvene the court ruling. Formal semantics can only provide the general format of the objects of lexical semantics.

With sentences referring to configurations, the adjective *different* occurs quite naturally, cf. the examples in (1). This points to the greater relevance of identity criteria in such sentences. There are two competing strategies: First, we might count as one outfit, tangram figure or crane the maximally temporally convex individual concept that is a particular outfit, tangram figure, or crane. There is no contradiction in (40):

(40) John has made many figures with this tangram set, but he nearly always makes the same one – the ice-skater.

Different excludes such readings, hence indicates that a criterion of identity is used beyond temporal convexity. A similar effect was noticed by Barker (1999), who observed that the reading of *National Airlines served two million persons* that is similar to (11) vanishes if the object is replaced by *two million different persons*.

6 Tokens and Types

The preceding section argued that there are advantages of the individual concept analysis of strikes (and outfits) over the property analysis. However, the property analysis has its advantages when we consider the availability of type readings, in addition to the token readings of *outfit* and *strike* considered so far.

The type reading is quite natural for examples (1.b,c,d), We can distinguish between the type of tangram sets, or the type of a particular tangram shape like the ice skater, and the tokens that realize this type. The crucial difference is that tokens exist only once at a particular world and time, whereas types can be realized multiple times. But notice that, even under the type interpretation, it is still true to say: *With a tangram set, one make dozens of figures, but only one at a time.*

There are different ways to model the type/token distinction. Types can be treated as kinds and tokens as exemplars that are related to kinds via a realization relation (cf. Carlson 1978). Or they may refer to the sum individuals of all tokens (cf. Chierchia 1998 for definite generics). But there is one way that hasn't been explored so far, according to which types and tokens are properties, where types may apply to multiple entities at an index, whereas tokens may apply to maximally one entity. In this light, it is worthwhile to reconsider the property analysis of Condoravdi e.a. (2001). The type of a particular tangram figure, say the ice-skater, is realized by many tokens – all the tangram pieces that are in the configuration of the shape called the ice-skater.

(41) $[\![$*the ice-skater*$]\!](i_0)$
λi {u | u is a tangram set in $i_0 \wedge$ the parts of u are put together in i such that they form a shape that looks like an ice-skater, according to i_0}

If we concentrate on a single tangram set **t**, then we can model tangram shape tokens in a similar way – as properties that map indices to singleton sets, or to the empty set.

(42) $[\![$*the ice-skater made of the tangram set* ***t***$]\!](i_0)$
$= \lambda i$ {u | u = **t** $\wedge$ **t** is a tangram set in $i_0 \wedge$ the parts of u are put together in i such that they form a shape that looks like an ice-skater, according to i_0}

This token belongs to the type of (41), as the following holds:

(43) $\forall i \forall i' \forall u[[\![$*the ice-skater made of* ***t***$]\!](i)(i')(u) \rightarrow [\![$*the ice-skater*$]\!](i)(i')(u)]$

The predicate *tangram figure* applies to such properties, regardless whether they tokens or types; hence it is of type s(set)t. We can define the set of tangram figure types and the set of tangram figure tokens as follows:

(44) $[\![$*tangram figure (types)*$]\!](i_0)$
$= \{\lambda i$ {u | u is a tangram set in $i_0 \wedge$ the parts of u are put together in i such that they form a shape that looks like α } | α is a tangram shape in $i_0\}$
$[\![$*tangram figure (tokens)*$]\!](i_0)$
$= \{\lambda i$ {u | u = v $\wedge$ the parts of u are put together in i such that they form a shape that looks like α } | v is a tangram set in i_0 and α is a tangram shape in $i_0\}$

A noun like *tangram figures* can be seen as ambiguous between the type reading and the token reading, or alternatively as vague – then it would refer to the union of the two readings indicated in (44). The use of *different* selects the type reading, or restricts the vague reading to it.

With this analysis of common nouns, we can treat sentences like *it is possible to make dozens of different tangram figures* with reference to tangram figure types

rather than tokens. Following an analysis along the lines of (22) and (23) we have the following meaning of the DP; here $\underline{X}$ is a variable of type (set)t, and $\underline{P}$ is a variable of type s(set)t.

(45) $[\![[_{DP}$ *dozens of* [*tangram figures (types)*]]$]\!]$
$= \lambda i \lambda \underline{P} \exists \underline{X}[\#(\underline{X}) >> 24 \wedge \underline{X} \subseteq [\![$*tangram figure (types)*$]\!](i) \wedge \underline{P}(i)(\underline{X})]$

The meaning of verbal predicates has to be adjusted to the property analysis. For example, to *make* a particular tangram figure (type) means to cause that an entity u that was not in the extension of this tangram figure to become part of it. The definition of *to make* in (17) has to be replaced by the following, where $\underline{x}$ now stands for properties.

(46) $[\![$*to make*$]\!]$
$= \lambda i \lambda x \exists \underline{x}' \exists i' \exists u.\ i' \angle i \wedge \neg\ \underline{x}(i')(u)$ [$\underline{x}(i)(u) \wedge \underline{x}'$ acts on u in i′]
$= \lambda i \lambda \underline{x}$[someone realizes an $\underline{x}$ at i] (for short)

We now can analyze our example as follows:

(47) $[\![[_{DP}$ *dozens of t. figures (types)*$]$ λt[*it is possible* [*to make* t]]$]\!](i_0)$
$= [\![[_{DP}$ *dozens of t. figures (types)*$]]\!](i_0)(^*[\![\lambda$t[*it is possible* [*to make* t]]$]\!](i_0))$
$= \lambda \underline{P} \exists X \lceil \#(X) >> 24 \wedge \underline{X} \subseteq [\![$*tangram figure*$]\!](i_0) \wedge \underline{P}(i_0)(\underline{X})]$
$(\lambda \underline{X} \forall \underline{x} \in \underline{X} \exists i' \in R(i_0)$[someone realizes an $\underline{x}$ at i′])
$= \exists \underline{X} \lceil \#(X) >> 24 \wedge \underline{X} \subseteq [\![$*tangram figure*$]\!](i_0) \wedge$
$\forall \underline{x} \in \underline{X} \exists i' \in R(i_0)$[someone realizes an $\underline{x}$ at i′])

This says that there is a set $\underline{X}$ containing dozens of properties that are all different tangram figure types, and that for each property $\underline{x}$ of this set there is an accessible index i′ at which $\underline{x}$ is realized. This in turn means that some agent acts on a sum individual u (the elements of a tangram set) such that it falls under the property $\underline{x}$. This renders the intended interpretation correctly. In particular, it does not imply that at any accessible index dozens of tangram figure types are realized simultaneously.

7 Conclusion

In this paper I have outlined two different ways how to deal with what I called "configurational" entities denoted by such terms as *outfit* or *tangram figure*. First, they can be analyzed as partial individual concepts that are realized at some indices but not at others. This predicts their behavior in modal and temporal clauses, and the analysis can explain the behavior of such sentences in distributive, collective and cumulative interpretations. The individual concept analysis is well-suited for the token readings of these terms. For the type readings I suggested an alternative representation, as properties that could be generalized to token readings as well.

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On the Cross-Linguistic Interpretation of Embedded Tenses

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Abstract

We propose a semantic analysis of cross-linguistic variation in the distribution and interpretation of tenses embedded in propositional attitude complements and temporal adjunct clauses in English, Japanese and Russian. We compare our analysis to previous ones proposed by Ogihara (1994, 1996) and Arregui and Kusumoto (1998), which attribute the variation to syntactic differences between the languages, and argue that the semantic analysis is preferable on both empirical and conceptual grounds.

1 Introduction

This paper develops a semantic analysis of the distribution and interpretation of tenses embedded in propositional attitude complements (PACs) and temporal adjunct clauses (TACs) in English, Japanese and Russian. English examples illustrating the two types of clauses are given in (1):

(1) a. Ken said that Anna was sick. (PAC)
b. Anna left before Ken arrived. (TAC)

The variation observed is that tenses in English and Russian TACs exhibit the same distribution (in contrast to Japanese tenses) whereas the interpretations of tenses are parallel in Russian and Japanese PACs (but different for English). Despite tense interpretation being a semantic phenomenon, previous analyses of (parts of) this cross-linguistic variation attribute the variation primarily to syntactic differences between the languages (cf. Ogihara 1994, 1996; Arregui and Kusumoto 1998). The current paper considers a broader set of languages and constructions than any single previous work, and demonstrates that a purely semantic analysis of the variation is possible once the fact that PACs and TACs impose distinct constraints on the interpretation of embedded tenses is taken

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into consideration. A comparison of the semantic analysis to the previous ones reveals empirical and conceptual advantages of the semantic analysis.

2 Tenses in embedded clauses

We assume that each of the three languages has a past and a non-past tense. The data in (2) show the (bold-faced) past tenses of the three languages: in matrix clauses, they result in interpretations where the eventuality denoted by the verb is temporally located prior to the speech time.[1]

(2) a. Ken arriv**ed** yesterday/#now/#tomorrow.
b. Japanese
Ken-ga kinoo/#ima/#asita ki-**ta**.
Ken-NOM yesterday/now/tomorrow arrive-PAST
'Ken arrived yesterday/#now/#tomorrow.'
c. Russian
Ken pri-exa-**l** včera/#sejčas#zavtra.
Ken PERF-arrive-PAST.MASC yesterday/now/tomorrow
'Ken arrived yesterday/#now/#tomorrow.'

Each language also has a tense form which (in matrix clauses) is compatible with non-past time reference, cf. (3). (These non-past tenses receive slightly different interpretations in the three languages depending on the Aktionsart of the proposition; we ignore these differences here since tenses are our primary concern.)

(3) a. Anna **is** in her office #yesterday/now/tomorrow.
b. Japanese
Anna-wa #kinoo/ima/asita Tookyoo-ni i-**ru**.
Anna-TOP yesterday/now/tomorrow Tokyo-at be-NPST
'Anna is/will be in Tokyo now/tomorrow.'
c. Russian
Anna #včera/sejčas/zavtra poj-**ot**.
Anna yesterday/now/tomorrow sing-NPST
'Anna is singing now/Anna will sing tomorrow.'

English, Japanese and Russian differ in the distribution of tenses in TACs. We restrict our discussion here to 'before'-clauses with past tense matrix clauses; comparable points can be made for 'after'-clauses (cf. e.g. Ogihara 1994; Arregui and Kusumoto 1998). In (4), the TACs are enclosed in brackets:

[1] We use the following glosses in this paper: COMPL = complementizer, FEM = feminine gender, INSTR = instrumental case, MASC = masculine gender, NOM = nominative case, NPST = non-past tense, PAST = past tense, PERF = perfective aspect, TOP = topic.

(4) a. Anna left [before Ken arriv**ed**/#arriv**es**].

b. Japanese

[Ken-ga #ki-**ta**/ku-**ru** mae-ni] Anna-ga kaet-ta.
Ken-NOM arrive-PAST/arrive-NPST before-at Anna-NOM leave-PAST
'Anna left before Ken arrived.'

c. Russian

Anna u-exa-l-a [pered tem, kak Ken
Anna PERF-leave-PAST-FEM before that.INSTR as Ken
pri-exa-**l**/#pri-ed-**et**].
PERF-arrive-PAST.MASC/PERF-arrive-NPST
'Anna left before Ken arrived.'

The matrix clauses in (4) are interpreted in the past of the speech time. In English (4-a) and Russian (4-c), past tenses are obligatory in the 'before'-TACs whereas in Japanese the non-past tense is required (4-b). If the temporal connectives of all three languages locate the time at which the matrix clause is interpreted prior to the time at which the TAC is interpreted, the distribution of tenses in (4) points to differences in the interpretation of tenses in English/Russian versus Japanese TACs. In particular, the English and Russian TACs seem to be interpreted at the speech time since the interpretation of the embedded past tense is compatible with the meaning of the temporal connective: if the TACs were interpreted at the matrix event time,[2] the embedded past tenses would locate the TACs prior to the matrix event time, thereby contradicting the meaning of the temporal connectives. The Japanese TAC, on the other hand, seems to be interpreted at the matrix event time since the interpretation of the non-past tense is compatible with the meaning of the temporal connective.[3]

Traditionally, a tense that is interpreted at the speech time is called an ABSOLUTE tense whereas one that is interpreted at a time supplied by the linguistic context (and which may differ from the speech time) is called a RELATIVE tense (Comrie 1985). Thus, the data in (4) suggest that English and Russian tenses are absolute while those of Japanese are relative. We return to this below.

In PACs, both past and non-past tenses are permitted in the three languages but the languages differ in the interpretations the tenses realize. In (5), past tenses occur in the PACs and the matrix clauses. The English PAC in (5-a) is ambiguous between an interpretation where the time of Anna's being sick precedes the time of Ken's saying (the 'back-shifted' interpretation) and an interpretation where the time of Anna's being sick overlaps with the time of Ken's saying (the 'overlapping' interpretation). The Japanese

[2]The term 'matrix event time' refers to the situation time of the eventuality denoted by the matrix clause.

[3]If English and Russian TACs are interpreted at the speech time, the non-past tenses should also be acceptable in 'before'-TACs (contrary to fact), resulting in an interpretation of e.g. (4-a) according to which Anna's past leaving is followed by Ken's arrival at or after the speech time. We argue in Kubota et al. (2009) that the unavailability of such interpretations is due to a pragmatic constraint on temporal interpretation.

and Russian examples in (5-b) and (5-c), respectively, only receive the back-shifted interpretation.[4]

(5) a. Ken said [that Anna **was** sick].
b. Japanese
Ken-wa [Anna-ga byooki dat-**ta** to] it-ta.
Ken-TOP Anna-NOM sick be-PAST COMPL say-PAST
'Ken said that Anna had been sick.'
c. Russian
Ken skaza-l [čto Anna bole-**l**-a].
Ken say-PAST.MASC that Anna be.sick-PAST-FEM
'Ken said that Anna had been sick.'

In (6), we find non-past tenses in the PACs. The Japanese and Russian PACs in (6-b) and (6-c), respectively, receive an overlapping interpretation while the English PAC in (6-a) has the 'double-access' reading (Abusch 1997a).

(6) a. Ken said that Anna **is** sick.
b. Japanese
Ken-wa [Anna-ga byooki da to] it-ta.
Ken-TOP Anna-NOM sick be.NPST COMPL say-PAST
'Ken said that Anna was sick (at the time of saying).'
c. Russian
Ken skaza-l [čto Anna bole-**et**].
Ken say-PAST.MASC that Anna be.sick-NPST
'Ken said that Anna was sick (at the time of saying).'

The English PAC in (6-a) differs from the Japanese and Russian PACs in that for (6-a) to be true it is not sufficient for Ken to have said at a time in the past that Anna was sick at that past time (the overlapping interpretation); the interpretation of the PAC in (6-a) seems to additionally involve the speech time (hence the name 'double-access' reading). This additional meaning of (6-a) is not just the assertion that Ken said at some time in the past that Anna would be sick at the speech time. For speakers who accept (6-a), the sentence means something along the lines that, according to Ken's belief, Anna was sick at the time he make his remark, and that his belief was such that the speaker could attribute to him an additional, consequential belief that, if everything took the normal course of events, then Anna would still be sick at the speech time.

Assuming that the matrix clause verbs in the three languages make the same contributions to the temporal interpretation of the embedded clauses, the variation observed in (5) and (6) again suggests differences in the interpretations of embedded tenses in the three languages. In particular, the Japanese and Russian PACs seem to be interpreted with respect to the matrix event time, which, on the traditional classification, means that

[4] Altshuler (2008) points out that Russian past-under-past PACs can receive an overlapping interpretation in certain discourse contexts. We leave open the question of how such examples could be accounted for in the analysis we propose here.

they are relative tenses. But now Russian presents a problem for the traditional classification: TACs motivate that Russian tenses are absolute while PACs motivate that they are relative. English likewise poses a problem since the non-past tense in PACs needs to be interpreted at the speech time and the matrix event time—simply saying that it is relative (or absolute, or both) is not satisfying. Thus, the traditional classification of tenses into relative and absolute tenses is inadequate. We return to this in §3.3.

3 A semantic analysis of the variation

This section develops a semantic analysis of the variation in temporal interpretation observed above. The notion of LOCAL EVALUATION TIME, which is the time at which a tense is interpreted, plays a key role in our analysis. For matrix clause tenses, the local evaluation time is always the speech time. For embedded tenses, our proposal, in short, is that there is variation both among languages and among constructions as to which time is identified as the local evaluation time.[5] For PACs, we argue that, due to the fact that PACs denote mental attitudes ascribed to some attitude holder who does not have access to the speech time, the local evaluation time of tenses embedded in PACs cannot be the speech time. This semantic constraint limits possible cross-linguistic variation in the interpretation of tenses embedded in PACs. By contrast, TACs are just adverbial clauses that restrict the denotation of the matrix clause. Unlike PACs, TACs do not impose semantic restrictions on how to determine the local evaluation time of the embedded clause, and there is cross-linguistic variation in this respect.

3.1 Variation in temporal adjunct clauses (TACs)

Recall from §2 that the past tense occurs in English and Russian 'before'-TACs (with a past tense matrix clause) whereas the non-past tense occurs in the Japanese counterparts. This variation can be accounted for semantically by allowing for variation in what time a temporal connective of a particular language specifies as the local evaluation time of the embedded tense. This is illustrated in detail in Kubota et al. (2009). For Japanese, we follow Ogihara (1994, 1996), who derives the distribution of tenses in TACs from the meanings of tenses and temporal connectives. Consider (7-a) and its translation in (7-b), where **past** is the contribution of the matrix clause past tense and **npst** that of the embedded non-past tense.[6]

(7) a. [Ken-ga ku-ru mae-ni] Anna-ga kaet-ta. (Japanese)
Ken-NOM arrive-NPST before-at Anna-NOM leave-PAST
'Anna left before Ken arrived.'

b. $\exists t[\mathbf{past}(t) \wedge \mathbf{AT}(t, leave'(a)) \wedge \mathbf{AT}(t, \exists t_1[\mathbf{npst}(t_1) \wedge \mathbf{AT}(t_1, arrive'(k)) \wedge t < t_1])]$

[5] The idea that a time (potentially) distinct from the speech time is useful for the interpretation of embedded tenses is also present in e.g. Gennari (2003) on English, Ogihara (1996) on Japanese (and English), Yoon (1996) on Korean and Smirnova (2009) on Bulgarian.

[6] $[\![\mathbf{past}(\zeta)]\!]^{M,i,g} = 1$ iff $[\![\zeta]\!]^{M,i,g} < i$; $[\![\mathbf{npst}(\zeta)]\!]^{M,i,g} = 1$ iff $i \leq [\![\zeta]\!]^{M,i,g}$.

According to (7-b), (7-a) is true if and only if there is a time t prior to the speech time s^* at which Anna leaves (contribution of the matrix past tense) and there is a time t_1 that is non-past with respect to t and at which Ken arrives (contribution of the embedded non-past tense), and t precedes t_1 (contribution of the connective *mae* 'before'). The time t is located prior to the speech time since the local evaluation time of the matrix clause past tense is the speech time s*. The local evaluation time for the embedded tense, however, is the matrix event time t as specified by the AT predicate.[7] Therefore, the embedded non-past tense locates the time t_1 of Ken's arrival at or in the future of the time t of Anna's leaving. Since the temporal connective requires t to precede t_1, it is correctly predicted that (7-a) means that Anna left before Ken arrived. The key to this analysis is the lexical entry of the temporal connective *mae* 'before': it specifies (using the AT predicate) that the local evaluation time of the embedded clause P is the event time t of the matrix clause Q:[8]

(8) *mae* 'before' $\Rightarrow \lambda P \lambda Q \lambda t[Q(t) \wedge \mathbf{AT}(t, \exists t_1[P(t_1) \wedge t < t_1])]$

This analysis (originally due to Ogihara) also predicts that the past tense is unacceptable in Japanese *mae* 'before' clauses since a contradiction arises between the interpretation of the embedded past tense (which locates t_1 prior to t) and the interpretation of the temporal connective (which requires that t precede t_1):

(9) a. #[Ken-ga ki-ta mae-ni] Anna-ga kaet-ta. (Japanese)
Ken-NOM arrive-PAST before-at Anna-NOM leave-PAST
Intended: 'Anna left before Ken arrived.'

b. $\exists t[\mathbf{past}(t) \wedge \mathbf{AT}(t, leave'(a)) \wedge \mathbf{AT}(t, \exists t_1[\mathbf{past}(t_1) \wedge \mathbf{AT}(t_1, arrive'(k)) \wedge t < t_1])]$

We do not follow Ogihara in his analysis of English TACs, which, as discussed in §4, relies on syntactic differences between English and Japanese. Instead, we account for the distribution of tenses in English and Russian TACs by specifying that the local evaluation time of the embedded clause is the speech time rather than the matrix event time (cf. Stump (1985) for English). (10) gives the relevant lexical entries for the temporal connectives:

(10) English *before*/Russian *pered* 'before' $\Rightarrow \lambda P \lambda Q \lambda t[\exists t_1(Q(t) \wedge P(t_1) \wedge t < t_1)]$

In contrast to the lexical entry of Japanese 'before' in (8), the denotation of the embedded clause (again, represented by the variable P) is not embedded under an AT predicate in (10). Thus, the local evaluation time of the embedded clause is the speech time. This correctly predicts that the past tense is acceptable in English and Russian 'before'-TACs, as illustrated in (11) for English:

[7] The AT predicate is defined as: $[\![\mathbf{AT}(\zeta, P)]\!]^{M,i,g} = 1$ iff $[\![P]\!]^{M,i',s} = 1$ where $i' = [\![\zeta]\!]^{M,i,g}$

[8] As it stands, the analysis incorrectly predicts there is a time at which the eventuality denoted by a 'before'-clause is true, i.e. that the 'before'-clause is veridical. We assume that our analysis can be adapted along the lines of Beaver and Condoravdi (2003) to account for the non-veridical readings of 'before'-TACs.

(11) a. Anna left before Ken arrived.
b. $\exists t \exists t_1 [\mathbf{past}(t) \wedge \mathbf{AT}(t, leave'(a)) \wedge \mathbf{past}(t_1) \wedge \mathbf{AT}(t_1, arrive'(k)) \wedge t < t_1]$

According to (11-b), (11-a) is true if and only if there is a time t in the past of the speech time at which Anna leaves and a time t_1 in the past of the speech time at which Ken arrives, and t precedes t_1.

In sum, we account for cross-linguistic variation in English, Japanese and Russian TACs semantically. Our analysis is a synthesis (and modest extension) of Ogihara's (1994, 1996) relative tense analysis of Japanese TACs and Stump's (1985) absolute tense analysis of English TACs. (Cf. Kubota et al. (2009) for a rebuttal of Ogihara's criticism of a Stump-style analysis of English TACs.) Crucially, TACs themselves do not impose any constraint on how the local evaluation time of the embedded clause should be identified, thus allowing for variation such as that observed with English and Russian versus Japanese.

3.2 Variation in propositional attitude complements (PACs)

In contrast to TACs, the semantics of PACs imposes a constraint on the interpretation of embedded tense. More specifically, due to the fact that PACs express a mental attitude held by an individual who does not necessarily have access to the utterance event in which his/her mental attitude is reported, PACs cannot in principle contain indexical expressions that refer to the speech time (cf. e.g. von Stechow 1995; Ogihara 1996). What this means with respect to tenses occurring inside PACs is that they can't have interpretations that make reference to the speech time; in other words, setting the local evaluation time to the speech time is not an option for tenses inside PACs. Instead, tenses in PACs are interpreted with respect to the time that the attitude holder takes to be the current time. We call this time the 'attitude holder's now', adapting Abusch's (1997b) term 'believer's now'. Since this property of PACs is a consequence of what it means to ascribe a mental attitude to some individual, this is a constraint that any language observes:

(12) The 'attitude holder's now' is identified with the local evaluation time of the PAC (von Stechow 1995; Abusch 1997b; Gennari 2003).

It follows from (12) that, cross-linguistically, the local evaluation time of a PAC invariably is the matrix event time (in the belief worlds of the attitude holder). Thus, an embedded past tense locates the eventuality denoted by the embedded clause at a time prior to the time of the matrix event whereas an embedded non-past tense locates it at (or after) the matrix event time. This is the pattern observed in §2 for Japanese and Russian PACs. Consider the Japanese examples in (13-a) and (14-a), together with their translations:[9]

[9]We assume that PACs denote propositions (sets of world-time pairs), such that e.g. for an individual to believe the proposition p in w at i is to say that for all of the pairs of w' and t' that could be the actual world and the current time according to this individual's belief in w at i, p is true in w' at t'.

(13) a. Ken-wa [Anna-ga byooki dat-**ta** to] sinzi-ta.
Ken-TOP Anna-NOM sick be-PAST COMPL believe-PAST
'Ken believed that Anna had been sick.'
b. $\exists t[\mathbf{AT}(t, believe'(k, \hat{}\exists t'[\mathbf{AT}(t', sick'(a)) \wedge \mathbf{past}(t')])) \wedge \mathbf{past}(t)]$

(14) a. Ken-wa [Anna-ga byooki da to] sinzi-ta.
Ken-TOP Anna-NOM sick be.NPST COMPL believe-PAST
'Ken believed that Anna was sick (at the time of his belief).'
b. $\exists t[\mathbf{AT}(t, believe'(k, \hat{}\exists t'[\mathbf{AT}(t', sick'(a)) \wedge \mathbf{npst}(t')])) \wedge \mathbf{past}(t)]$

(13-a) is true if and only if there is some time t prior to the speech time at which Ken believes that there is some time t' prior to the time of his utterance at which Anna is sick. (14-a) is true if and only if there is some time t prior to the speech time at which Ken believes that there is some time t' not prior to the time of his utterance at which Anna is sick. This analysis of Japanese PACs is essentially that of Ogihara (1989, 1996). The same semantic analysis accounts for Russian PACs.

English seems to pose a problem for this analysis of PACs: If no cross-linguistic variation with respect to the identity of the local evaluation time is allowed in PACs, why is it that English does not pattern like Japanese and Russian? Recall that English PACs embedded under a past tense matrix clause differ from Japanese/Russian ones in two ways: First, English past tense stative PACs may receive both an overlapping and a back-shifted interpretation; second, non-past PACs receive a double-access interpretation. We follow Gennari (1999, 2001, 2003) in assuming that these two facts are not independent: in short, her insight is that English past tense stative PACs are compatible with a wider set of interpretations than their Japanese/Russian counterparts because of the fact that English non-past PACs receive a double-access rather than a simple overlapping interpretation. Gennari proposes that the English non-past tense in PACs is exceptional compared to other English tenses and tenses in other languages in that it is both indexical and anaphoric: it is indexical since it refers to the speech time and it is anaphoric since it also imposes a constraint on the relation between the event time and the evaluation time.

Adopting Gennari's (1999) analysis, the meaning of $\mathbf{npst}_E$, the English non-past tense in PACs, can be defined as follows:[10]

(15) $[\![\mathbf{npst}_E(\zeta)]\!]^{M,i,g} = 1$ iff $[\![\zeta]\!]^{M,i,g} \cap i \neq \emptyset$ and $\neg([\![\zeta]\!]^{M,i,g} < s^*)$

This definition contains a direct reference to the speech time by means of the distinguished free variable s^*. As a consequence, English examples with non-past tense PACs, like (16-a), should, strictly speaking, be semantically uninterpretable given the constraint in (12): the problem is that the translation in (16-b) would ascribe to the attitude holder a mental attitude about a time whose location is unknown to her/him. More specifically, when interpreting the semantic contribution of the embedded non-past tense in (15), one

(i) $[\![believe']\!]^{M,i,g}(\delta, p) = 1$ iff for all world-time pairs $\langle w', t' \rangle$ compatible with the belief held by δ in w at i, $p(\langle w', t' \rangle) = 1$.

[10]Thus, the meaning of the English non-past tense realized in PACs differs from the non-past tense in TACs, cf. footnote 6.

cannot make sense of the s^* designating the speech time as part of the belief attributed to the attitude holder.

(16) a. Ken believed that Anna is sick.
b. $\exists t[\mathbf{AT}(t, \mathbf{believe}(\mathbf{k}, {}^\wedge\exists t_1[\mathbf{AT}(t_1, \mathbf{sick}(\mathbf{a})) \wedge \mathbf{npst}_E(t_1)]) \wedge \mathbf{past}(t))]$

Gennari solves this problem by arguing that PACs (in English) do not directly denote mental attitudes held by the attitude holder, but rather that they denote 'implicit attitudes' — attitudes ascribed to attitude holders *from the perspective of the reporter of the attitude*. The idea is that when we talk about an attitude held by some individual, we are really talking about an augmented variant of the original attitude of the attitude holder with our own interpretation 'superimposed' on it, so to speak. We allow ourselves to talk as if the original attitude holder actually held that augmented variant of his/her own belief. Since the reporter of the attitude has access to the speech time, the 'interpretation' of the original attitude can of course make reference to the speech time. At the same time, since the non-past tense is interpreted with respect to the attitude holder's now, the anaphoric part of the meaning of the non-past tense in PACs requires temporal overlap of the event times of the embedded and the matrix clause. Thus, Gennari's analysis correctly captures native speakers' intuitions that a sentence like (16-a) is infelicitous if, for example, it was uttered a month after Ken had a belief that Anna was sick but he also believed that she would get better in a week. One of the only requirements that need to be satisfied for (16-a) to be uttered felicitously is that a reasonable interpretation of Ken's belief be such that he would have accepted as also believing that Anna would be sick at the speech time had he been demanded to explicate his belief more precisely at the time he held that belief. Thus, in Gennari's analysis, (16-a) is true if Ken at some past time held the belief that Anna was sick at that time and the reporter of Ken's attitude has reason to believe that Ken would also have believed that Anna would be sick at the speech time.

Gennari's (2003) key insight is that the fact that English non-past PACs receive an unexpected interpretation has repercussions for the interpretation of English past tense PACs. She argues that English past tense stative PACs can receive an overlapping interpretation (in contrast to those of Japanese and Russian) since English non-past PACs like (16-a) cannot express a purely overlapping interpretation, i.e. one where Anna is sick at the past time of Ken's belief but not necessarily at the speech time. Gennari's analysis makes use of the superinterval property,[11] a pragmatic inference available for states (but not events) according to which a stative proposition is implicated to be true at a proper super-interval of the interval for which it is asserted to be true (Dowty 1986). Gennari accounts for the overlapping interpretation of past under past English PACs as follows. In English (just as in Japanese and Russian), the truth-conditional meaning of a past tense embedded in a PAC gives rise to the back-shifted interpretation. The interval at which a past tense stative PAC is true may be implicated to be a larger interval, one that includes the attitude holder's now, such that past tense stative PACs may receive an

[11] A stative proposition, due to its homogeneity, has the entailment that it is true of all of the subintervals I' of an interval I at which it is true. Thus, for any of the subintervals I' there is a proper super-interval at which the proposition is true. But then, given any interval at which a stative proposition is true, it is implicated that there is a (proper) super-interval at which the proposition is also true.

overlapping interpretation. This implicature arises in English since the overlapping interpretation is unavailable in English with an embedded non-past tense; the overlapping reading is blocked for Japanese and Russian past under past PACs since a non-past PAC realizes this meaning. Gennari's analysis also predicts that the overlapping interpretation is not available for past tense eventive PACs since eventive predicates do not have the superinterval property (but see Kusumoto (1999), who argues that the overlapping interpretation is available with some eventive predicates).

In sum, Gennari (1999, 2003) shows that the seemingly anomalous interpretations of English past and non-past PACs can be systematically explained once the relevant factors (Aktionsart, tense) are teased apart carefully. This means that we can maintain our thesis that the local evaluation time of PACs is uniformly the attitude holder's now. Cross-linguistic variation in the interpretation of tense in PACs is not variation in how the local evaluation time of an embedded tense is set but rather results from the existence of an exceptional tense (such as the English non-past) whose meaning does not involve just the local evaluation time but also an indexical reference to the speech time.

3.3 Summary

We have provided a purely semantic analysis of cross-linguistic variation in the distribution and interpretation of tenses in PACs and TACs in English, Japanese and Russian. Crucial to the analysis is the observation that PACs but not TACs impose constraints on how the local evaluation time is determined. The cross-linguistic variation in the distribution of tenses in TACs can then be attributed to the fact that the local evaluation time can be either the speech time or the matrix event time. In PACs, on the other hand, the local evaluation time is always the matrix event time; variation nevertheless arises from differences in tense systems.

A consequence of our analysis is that all tenses are anaphoric, i.e. interpreted with respect to the local evaluation time (the English non-past tense in PACs additionally is indexical). Differences in how tenses are interpreted do not arise from the meaning of the tenses themselves but rather from the way in which the local evaluation time is set by constructions in which tenses occur. This stands in contrast to the traditional absolute/relative classification of tenses where differences in interpretation seem to be attributed to the tenses themselves (cf. §2). A conceptual advantage of the former way of characterizing cross-linguistic variation in tense systems is that e.g. the tenses of Russian are unproblematic. Recall that, under the traditional characterization, data from TACs motivated that Russian tenses are absolute while PACs motivated that Russian tenses are relative. In our approach, Russian tenses are uniformly anaphoric—what differs is that the local evaluation time is the speech time in TACs and the matrix event time in PACs. Thus, we argue that the traditional classification of tenses as absolute or relative is merely an epiphenomenon of differences in the identity of the local evaluation time across languages and constructions.

4 Comparison with previous proposals

In this section we compare our semantic analysis of the variation to that of Ogihara (1989, 1996, 1994) and Arregui and Kusumoto (1998).

4.1 Ogihara (1989, 1996, 1994)

Ogihara is concerned with variation in English and Japanese PACs and TACs. As discussed above, we adopt his analysis of Japanese TACs and PACs, according to which the local evaluation time of the embedded tense is the matrix event time. Our proposal differs from his in how English TACs and PACs are interpreted. For English TACs, Ogihara assumes that the local evaluation time of embedded tenses is the matrix event time, too, just like in Japanese. To account for the observed variation between English and Japanese, Ogihara relies on the Sequence-of-Tense (SOT) rule, which operates at Logical Form (LF) and deletes an embedded tense that is c-commanded by an identical matrix tense. He assumes that this rule does not apply in Japanese TACs or PACs (where embedded tenses are always interpreted at the matrix event time) but applies obligatorily in English TACs. Thus, past tense *before*-clauses are acceptable in English since the backward shifting contribution of the past tense is eliminated by the SOT rule.

Ogihara also relies on the SOT rule to account for the interpretations of past tense PACs with past matrix clauses. In contrast to TACs, the SOT rule applies optionally in PACs: a past tense PAC in English receives a back-shifted interpretation if the SOT rule does not apply and an overlapping interpretation if the SOT rule applies. Ogihara (1996) accounts for the double-access interpretation of non-past tense PACs (with past matrix clauses) by assuming that the embedded non-past tense is interpreted *de re*, i.e. outside the scope of the attitude verb in the matrix clause (cf. also Abusch 1997b for a closely related approach). The translation of the structure that results after the embedded non-past tense has moved is given in (17-a), cf. Ogihara (1996, 212). The sentence *Ken believed that Anna is sick* receives the translation in (17-b):

(17) a. $[_{CP}\text{PRES}_{\text{n}}\ \text{S}] \Rightarrow \lambda t_3 \lambda t_2 \exists s_n[\mathbf{pres}_n(t_2)(t_3) \wedge exist'(t_2)(s_n) \wedge \exists t_5(\mathbf{S}(s^*)(t_5))]$

b. $\exists s[exist'(s^*,s) \wedge \exists t[t < s^* \wedge believe'(t,k,s,^\wedge \lambda t_3 \lambda s_1[sick'(s_1,a)])]]$

According to (17-b) and the truth conditions Ogihara proposes for *de re* attitude verbs, *Ken believed that Anna is sick* is true if and only if there exists a state s that includes the speech time s^* and there is an acquaintance relation R that connects Ken to s in the actual world at the past time t, and, in all of Ken's doxastic alternatives $\langle w', t' \rangle$ in the actual world w and at t, the state to which Ken is acquainted via R in w' at t' has the property of Anna being sick. Hence, the acquaintance relation and the meaning of *believe* defined in terms of it account for the temporal overlap of s with the matrix event time t, whereas the overlap of s with the speech time is contributed by the $exist'$ predicate, which comes from the definition of the *de re* non-past tense in (17-a).

Ogihara's analysis of cross-linguistic variation in English and Japanese TACs and PACs faces both empirical and conceptual problems:

1. Since the SOT rule applies at the level of LF, Ogihara's analysis can only be couched in theories that have a syntactic level of representation at which c-command is definable and deletion operations are permissible.

2. Ogihara's analysis of PACs treats as separate and unrelated phenomena the fact that English past under past PACs may receive an overlapping interpretation and the fact that non-past under past PACs receive the double-access interpretation. Thus, in contrast to Gennari, Ogihara does not predict that only if a language induces double-access readings for the non-past tense can past under past PACs receive an overlapping interpretation.[12]
3. It is unclear whether Ogihara's analysis extends to languages such as Russian. Arregui and Kusumoto (1998) point out that Polish (which is like Russian in all relevant respects) behaves like English with respect to TACs but like Japanese with respect to PACs. Thus, if one assumes (as is the null hypothesis in an SOT-based account) that a language either has the SOT rule or does not have it, Ogihara's analysis cannot be extended to Polish and Russian. (See Kubota et al. (2009) for further discussion of this point.)
4. As pointed out by Gennari (1999, 2003) it remains unclear under Ogihara's account why the overlapping interpretation of past under past PACs and the double-access reading is only available for embedded stative predicates (whereas this falls out naturally from Gennari's analysis).
5. Gennari (1999, 2003) provides several arguments against *de re* analyses of the double-access interpretation. For example, as Gennari (1999) shows, for a sentence with a double-access reading to be felicitous, there does not necessarily have to be any state of affairs that obtains throughout an interval containing both the embedded event time and the speech time in the actual world. Ogihara's analysis, however, as well as that of Abusch (1997b), require the existence of such an interval.

4.2 Arregui and Kusumoto (1998)

Arregui and Kusumoto (1998) (henceforth A&K) analyze variation among English, Japanese and Polish TACs (where Polish behaves like Russian in the relevant respects). We refer the reader to Kubota et al. (2009) for detailed comparison of our analysis with A&K. The central assumption of A&K's analysis is that English and Polish TACs have a different syntactic structure than Japanese TACs; in particular, the temporal connectives of English and Polish TACs select for a CP while that of Japanese selects for a TP. Since the speech time is assumed to be realized in the head of CP, a consequence of the syntactic variation is that English and Polish tenses in TACs are interpreted with respect to the speech time while that of Japanese TACs are interpreted with respect to the matrix event time. This correctly predicts that, with past tense matrix clauses, the past tenses occur in English and Polish TACs (cf. (4-a) and (4-c)) while Japanese TACs require the non-past tense (4-b).

As discussed by A&K, these syntactic differences do not suffice to exclude the past tense from Japanese *mae* 'before' clauses. To remedy the situation, A&K propose that Japanese *mae* 'before' bears a binder index and, hence, can occur with a

[12]Recall that, in Gennari's analysis, the latter fact is a consequence of the former. To account for this fact in the context of an analysis of PACs along the lines of Ogihara (1996), one would need to introduce an additional mechanism such as Sharvit's (2003) Embeddability Principle.

present tense (a variable), but not with past tense (a temporal abstract modifier of type $\langle\langle i,t\rangle,\langle i,t\rangle\rangle$). Thus, in short, the analysis of the cross-linguistic variation in TACs proposed by A&K relies on a non-uniform syntax/semantics of the temporal connectives in Japanese, as well as a non-uniform syntax/semantics of the past and non-past tenses of the three languages.

5 Conclusion

Cross-linguistic analyses of the distribution and interpretation of tenses embedded in TACs and PACs sit squarely at the interface of the syntactic and semantic components of grammar. These analyses differ in the extent to which they attribute the variation to syntactic or semantic similarities and differences between languages. The comparison of previous analyses of (parts of) the variation to the semantic analysis developed in §3 has shown that, all other things being equal, the semantic analysis is more straightforward since it only relies on the semantic contributions of the expressions and constructions involved. By contrast, Ogihara's and A&K's analyses involve syntactic differences between the languages, e.g. with respect to the tenses, the structure of TACs or the interface with semantics. We maintain that a semantic analysis of a semantic phenomenon (tense interpretation) is generally preferable. Additionally, we conclude that the semantic analysis of the variation is not only a viable alternative to the previous, syntactic analyses but advantageous for empirical, conceptual and theoretical reasons.

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Spanish *Unos* and the Article Hypothesis

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Abstract

The main claim of this paper is that *unos* is the Spanish plural indefinite article. This claim will be motivated both from a diachronic and a synchronic perspective. I will furthermore motivate why indefinite articles are expected to lack partitive readings and bare nominal arguments needn't be blocked by the existence of an article (cf. Chierchia's Blocking Principle)

1 Introduction: the challenge

Spanish has a plural determiner that doesn't allow for proportional readings: *unos* 'some' (Villalta 1994, Gutiérrez-Rexach 2001, Martí 2008). The challenge resides in the fact that non-proportional determiners in general do have a proportional use that surfaces when they are stressed. As shown in (1) *unos* is a noteworthy exception to this generalization:[1]

(1) ? UNOS estudiantes son abogados.
some students are lawyers
"SOME students are lawyers."

(Gutiérrez-Rexach 2001)

Even though this behaviour of *unos* has often been described in the literature there has only been one attempt to explain why *unos* behaves this way: Martí (2008) opposes *unos* to *algunos* 'some' and hypothesizes that *alg-* adds a syntactic / semantic layer responsible for the availability of proportional readings. This however begs the question why only *unos* needs *alg-* for this.

[1] Note that I am aware of the fact that *unos* can take partitive readings when combined with *otros*. I however assume, with Gutiérrez-Rexach (2001) and Martí (2008) that *unos…otros* is a fixed expression.

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2 My proposal

I claim *unos* is the Spanish plural indefinite article. The initial motivation for this proposal comes from the fact that in the singular determiner paradigm indefinite articles are in general the only ones that do not allow for partitive readings:

(2) ? A student is a lawyer. (non-generic reading)

Before addressing two of the questions this claim raises I will take a look at corroborating evidence from diachrony. This is the topic of section 3.

3 Support from diachrony

In 2. I showed that *unos* patterns (at least partially) with indefinite singular articles in synchrony. In this section I will show that it also patterns with them in diachrony. To do so I will look at two properties that can be associated with the grammaticalization process that gives rise to indefinite articles. It is important to note that I will talk about those indefinite articles that originated in the numeral *one*.

3.1 Semantic bleaching

Even though it is never explicitly mentioned the evolution from a numeral to an indefinite article involves semantic bleaching: whereas the numeral does allow for partitive readings, the indefinite article does not. This means that somewhere along their grammaticalization path numerals lose their partitive potential.

If *unos* behaves like indefinite articles in diachrony we expect it to have allowed for partitive readings at the beginning of its grammaticalization process. Showing that this expectation is borne out is not straightforward though. Indeed, given that we have no access to native speaker judgements for Old Spanish it is hard to tell whether the occurrences of *unos* we find have a partitive reading or not. There is a way out though; it has been claimed that one of the ramifications of *unos*' incapacity to allow for partitive readings in synchrony is that it cannot appear in the upstairs D position of (standard) partitives (Gutiérrez-Rexach 2001):

(3) ??? He visto a unos de los familiares de Pedro
have seen to some of the relatives of Pedro
Intended: 'I saw some of Pedro's relatives.'

(Gutiérrez-Rexach 2001)

Under the assumption that the same should hold in diachrony this gives us a tool to probe the partitive potential of *unos* without having to worry too much about the intended interpretation.

On a first browse through the data of the CORDE corpus I came up with the following example:[2]

(4) E ellas yendo, se fueron unos de los guardadores
And they going themselves went some of the guards
a la ciudat
to the city
"And while they left, some of the guards went to the city."

It is taken from the Manuscrito Escurialense – an Old Spanish Bible manuscript (of around 1260) – and refers to the events that took place on the day Mary and the other women discovered that Jesus' grave was empty. The crucial thing to note is that *unos* appears as the upstairs determiner of a partitive; the interpretation of this example is that some but not all of the guards went to the city (to tell the High Priests what happened).

Convincing as this example might seem it of course does not warrant the conclusion that *unos* allowed for partitive readings at the beginning of its grammaticalization process. Indeed, two potential problems have to be discarded before this conclusion can be drawn. The first is one every corpus study faces: if you only have one example it might actually be an accident. This is further complicated by the fact that any text could contain an accident. What I should be looking for then is texts with multiple examples. The second problem is more subtle: the example in (4) is drawn from a translation and it is not unthinkable that the translator did not respect the grammar of his / her language in order to try to be faithful to the original text. To discard this problem I have to compare the translation to the original text.

The first problem can easily be solved. A more profound browse of the CORDE corpus shows that there are three texts with multiple occurrences of *unos* in the upstairs D position of partitives:

(5)

text	*author*	*number of partitives with unos*
Manuscrito Escurialense (1260)	Anonymous	8
General Estoria (1270)	Alfonso X	5
Biblia Reina-Valera (1570)	Casiodoro de Reina	6

This not only shows that the example in (4) is not isolated within Old Spanish but moreover that it is not isolated within one text.

I now turn to the second problem that has become more acute than before given that two of the texts listed in (5) are translations (the Manuscrito Escurialense and the Biblia Reina-Valera). In order to show that the original texts did not influence the translations I will show that identical constructions in the original text not only gave rise to translations involving *unos* but also to translations involving *algunos*. This shows the translator had an alternative and did not hesitate to use it. The hypothesis

[2] CORDE stands for COrpus Diacrónico del Español, is maintained by the Real Academia Española and is freely available online (http://corpus.rae.es/cordenet.html).

that he would have used *unos* to be faithful to the original text is thus effectively discarded.

In Table 1 I compare the Manuscrito Escurialense to its original which is assumed to be the Vulgate (the latin translation by Saint Jerome). The table is organized in the following way: in the third column I list the constructions of the original text giving rise to a partitive construction with *unos* or *algunos* in the translation. The fourth column indicates whether *unos* or *algunos* were used.[3]

	Reference	**Vulgata**	**Manuscrito Escurialense**
1	Romans 11:17	*aliqui* + *ex* + plural	algunos
2	John 9:40	*ex* + plural	algunos
3	Matthew 9:3	*quidam* + *de* + plural	algunos
4	Matthew 12:38	*quidam* + *de* + *plural*	unos
5	Matthew 28:11	*quidam* + *de* + *plural*	unos
6	Mark 2:6	*quidam* + *de* + *plural*	algunos
7	Mark 15:35	*quidam* + *de* + *plural*	algunos
8	Luke 24:24	*quidam* + *ex* + plural	unos
9	Acts 15:2	*quidam* + *ex* + plural	algunos
10	Acts 23:12	*quidam* + *ex* + plural	unos
11	Luke 6:2	*quidam* + genitive plural	algunos
12	Luke 13:31	*quidam* + genitive plural	unos
13	Luke 20:27	*quidam* + genitive plural	unos
14	Luke 20:39	*quidam* + genitive plural	unos
15	Acts 23:9	*quidam* + genitive plural	unos
16	Mark 12:13	*quosdam* + *ex* + plural	algunos

Table 1: Comparison between Manuscrito Escurialense and Vulgate

What Table 1 shows is that for none of the latin partitive constructions that are recurrent it is possible to predict how it will be translated; both *algunos* and *unos* appear in their translations. It furthermore shows that *unos* is as productive in the translation of partitives as *algunos*; both *unos* and *algunos* are chosen 50 percent of the time. This strongly suggests that the partitive potential of *unos* was comparable to that of *algunos*.

In Table 2 I compare the Biblia Reina-Valera to its original which is assumed to be the Textus Receptus (a Greek translation of the bible by Stephanus dating back to 1550).[4] The table is organized in the same way as Table 1.[5]

What Table 2 shows is that for the only recurrent Greek construction it is not possible to predict how it will be translated; both *algunos* and *unos* appear in its translations. It is interesting to note though that *unos* is far less frequent than *algunos* especially in comparison to what we saw for the Manuscrito Escurialense. This is in no

[3] I used the edition of the Vulgate that is freely available online via http://www.biblegateway.com.
[4] I used the edition of the Reina-Valera bible that is freely available online via http://www.biblegateway.com.
[5] Note that there is one partitive construction involving *unos* that is missing in the table. This is due to the fact that the original construction was not a partitive construction.

way surprising though; under the assumption that *unos* started to grammaticalize time should have an influence on its partitive potential. Given that the Biblia Reina-Valera is roughly three hundred years younger than the Manuscrito Escurialense it would even be weird if *unos* were to be chosen as frequently as *algunos*.

	Reference	Textus Receptus	Reina-Valera
1	Mark 12:13	*tinas* + genetive definite plural	algunos
2	Acts 21:16	genitive definite plural	algunos
3	Acts 19:13	*tines* + *apo* + definite plural	algunos
4	John 7:25	*tines* + *ek* + definite plural	unos
5	Matthew 9:3	*tines* + genitive definite plural	algunos
6	Matthew 12:38	*tines* + genitive definite plural	algunos
7	Mark 2:6	*tines* + genitive definite plural	algunos
8	Mark 7:1	*tines* + genitive definite plural	algunos
9	Mark 11:5	*tines* + genitive definite plural	unos
10	Mark 15:35	*tines* + genitive definite plural	unos
11	Luke 6:2	*tines* + genitive definite plural	algunos
12	Luke 9:27	*tines* + genitive definite plural	algunos
13	Luke 19:39	*tines* + genitive definite plural	algunos
14	Luke 20:27	*tines* + genitive definite plural	unos
15	Luke 20:39	*tines* + genitive definite plural	unos
16	Luke 24:24	*tines* + genitive definite plural	algunos
17	Acts 10:23	*tines* + genitive definite plural	algunos
18	Acts 19:31	*tines* + genitive definite plural	algunos
19	Acts 23:12	*tines* + genitive definite plural	algunos
20	Romans 11:17	*tines* + genitive definite plural	algunos

Table 2: Comparison between Textus Receptus und Reina-Valera

From the above I conclude that *unos* allowed for partitive readings at the beginning of its grammaticalization process. Given that it doesn't allow for them anymore and given that the same evolution holds for indefinite articles I furthermore conclude that *unos* patterns (in this respect) with indefinite articles in diachrony. This is the first piece of evidence I draw from diachrony that corroborates my claim about the nature of *unos*.

3.2 Frequency

A well-attested fact about items that grammaticalize is that their frequency increases. This is no different for the indefinite article as is shown in Table 3 for its variants *un* and *una*. The data are taken from the Corpus del Español.[6] Most noteworthy is the sudden increase in frequency around the 15th-16th century.

[6] The Corpus del Español was designed by Mark Davies, is maintained through the support of the National Endowment for the Humanities and Brigham Young University and is freely available online (http://www.corpusdelespanol.org/).

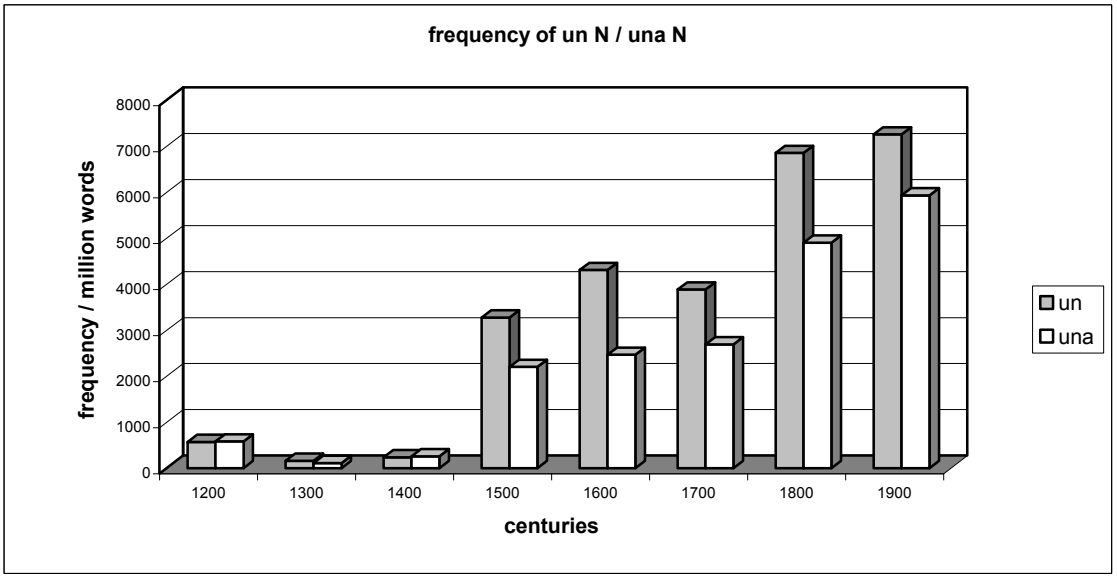

Table 3: Frequency of un / una

Under the assumption that *unos* behaves like indefinite articles in diachrony we expect it to have a similar increase in frequency around the same time. Table 4 shows that this expectation is borne out.

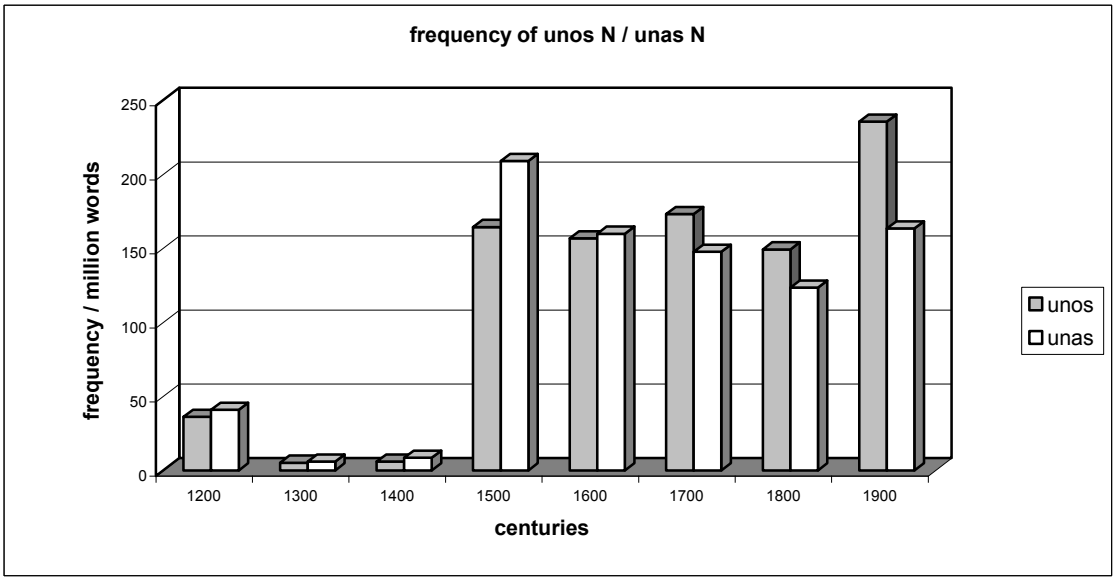

Table 4: Frequency of unos / unas

The frequency data show that *unos* patterns (in this respect) with indefinite articles in diachrony. This is the second piece of evidence I draw from diachrony that corroborates my claim about the nature of *unos*.

3.3 Taking stock

In this section I have shown that *unos* patterns with indefinite articles in diachrony in at least two respects: (i) it lost its ability to take on partitive readings, (ii) its frequency increased dramatically around the same time as that of the indefinite article.[7] The similarity is striking and I consider it to be strong support for my claim about the article status of *unos* especially when combined with the synchronic similarity noted in (1) and (2).

In the following section I will consider two of the questions my claim raises.

4 Two questions[8]

4.1 What is an article ?

In (1) and (2) I noted that *unos* patterns with singular indefinite articles in not allowing for partitive readings. This is a purely empirical observation and the real question that should be asked is the following: what is it that makes the lack of partitive readings of *unos* into an argument in favour of its articlehood? This question can be divided up into two subquestions: (i) what is an article? and (ii) why is it that articles do not allow for partitive readings?

The anwer I propose for (i) goes back to Partee (1987): the indefinite singular article is the least marked inverse of the BE type-shift as defined in (6) ("it applies to a generalized quantifier, finds all the singletons therein, and collects their elements into a set"):

(6) $\lambda \wp [\lambda x [\{x\} \in \wp]]$

The extension from a singular indefinite article to a plural one is straightforward: instead of having singular individuals we would be having plural individuals.

The answer I propose for (ii) finds its origin in the fact that the BE type-shift ignores any partitive structure: under the assumption that an indefinite article should be the inverse of BE one expects that it should not allow for structure that BE ignores.

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[7] I leave for future research the checking of a third possible similarity: it was noted by Blazer (1979) and Stark (2002) that articles – at the beginning of their grammaticalization process – marked highly persistent discourse referents. Under the assumption that *unos* behaves like indefinite articles in diachrony we would then expect it to have the same kind of use in the beginning of its grammaticalization process.

[8] A question I don't treat is why *unos* doesn't allow for event-splitting (see Martí 2008). I leave this for future research but do acknowledge that it is potentially problematic for my analysis.

4.2 Why does Spanish allow for bare plural arguments ?

Under the assumption that *unos* is the plural indefinite article we might expect the Blocking Principle in (8) to block the appearance of bare plurals in argument position. As shown in (9) this expectation is not borne out.

(8) Blocking Principle
For any type shifting operation τ and any X:
$*\tau(X)$
if there is a determiner D such that for any set X in its domain,
$D(X) = \tau(X)$

(Chierchia 1998)

(9) Juan comió bizcochos.
Juan ate biscuits
"Juan ate biscuits."

The question (9) raises is whether I can maintain that *unos* is the plural counterpart of the indefinite article if it doesn't pattern with it in blocking bare nominals. The answer I propose is that the facts in (9) are not a problem for my analysis of *unos* and that the Blocking Principle in (8) is too coarse-grained.

The gist of my argumentation
The strongest argument in favour of the Blocking Principle is the complementary distribution of bare singular arguments and indefinite / definite articles across languages. If we take this argument seriously and if it is possible to show that the bare plural and *unos* are in complementary distribution language-internally we can conclude that the Blocking Principle is not violated in (9) but that it needs to be qualified.

In what follows I will (i) identify the dimension along which I assume *unos* and the bare plural can be said to be in complementary distribution, (ii) show that they really are and (iii) give a revised version of the Blocking Principle.

The dimension
Laca & Tasmowski (1994) make an interesting observation: according to them the bare plural has to be replaced by *unos* if one wants to pick up its referent in subsequent discourse. This suggestion can be formally rendered in at least two ways. The first is that bare plurals cannot introduce discourse referents (see Laca 1996, 1999), the second that bare plurals introduce discourse referents that are not salient (i.e. that are not likely to be picked up in subsequent discourse). The choice between these ways can be settled empirically; if it is possible to refer back to a referent that could only have been introduced by a bare plural it is the salience card that has to be drawn. (10) shows that this is indeed the case.

(10) Encontró **ladrones**; pero no ladrones de buen tono, no ladrones fashionables como José María […]. Eran ladrones de poco más o menos […]. (La gaviota, Caballero Fernán)
He met **thieves**; but not thieves that are *bon ton*, not fashionable thieves like José María […]. **They** were thieves and nothing more […].

The dimension along which *unos* and the bare plural can be said to be in complementary distribution is that of salience: bare plurals introduce non-salient discourse referents whereas *unos* introduces salient discourse referents.

Complementary distribution
Showing a complementary distribution between two items on the basis of salience is not easy. Indeed, as Dayal (2004) notes for similar facts in Hindi, judgements "are affected by potentially different expectations people can have about the relevance of the entity referred to in the discourse". There is a way to circumvent this problem though: if we can identify a context that prohibits the subsequent picking up of discourse referents and a context that forces the subsequent picking up of discourse referents we would make the predictions listed in (11).[9]

(11) a. in a context that prohibits the picking up of discourse referents we expect the bare plural to be the only option
b. in a context that forces the picking up of discourse referents we expect *unos* to be the only option

One context we know prohibits the picking up of discourse referents is the scope of negation. (11a) then predicts that *unos* has to scope over negation and function as a PPI. (12) shows that this prediction is borne out :

(12) A la reunión no asistieron unos profesores. NEG< *unos* *NEG> *unos*
At the meeting not attended some professors
"Some professors didn't attend the meeting." (Laca 1996)

The identification of a context forcing the picking up of discourse referents is more subtle and depends on a specific analysis of preverbal subjects in Spanish. Zagona (2002) (following work by Contreras (1991) and Olarrea (1996)) claims that Spanish preverbal subjects are adjuncts of a silent left dislocated clitic. The main argument in favour of this analysis is that there needn't be grammatical agreement between a preverbal subject and its verb:

(13) Los estudiantes tenemos un alto concepto de nosotros mismos.
The students have-1st-pl. a high opinion of us- selves
"Students, (we) have a high opinion of ourselves."

[9] It would be more correct to talk about contexts that have an influence on the anaphoric potential of discourse referents that are introduced in them.

The disagreeement between *los estudiantes* and *tenemos* can be explained if we assume a silent first person plural clitic that picks up the referent introduced by *los estudiantes*. Under this assumption *los estudiantes* has to be picked up by the silent clitic in order to be interpreted as the subject of the sentence and – more generally – to be interpretable within the sentence at all. This means that the preverbal subject position is one forcing the picking-up of discourse referent. (11b) then predicts that the bare plural should not be allowed to occur in this position. (14) shows that this prediction is borne out:

(14) * Políticos han ocupado el palacio.
Politicians have occupied the palace
"Politicians have occupied the palace."

(Delfitto & Schroten 1991)

Conclusion
In what precedes I have shown that the bare plural and *unos* are in complementary distribution in Spanish w.r.t salience. If this language-internal observation is taken as seriously as the cross-linguistic observations that led to the formulation of the Blocking Principle this means that the Blocking Principle should be reformulated as follows:

(15) Blocking Principle (revised)
For any type shifting operation τ and any X:
*τ(X)
if there is a determiner D such that for any set X in its domain,
D(X) = τ(X)
and the salience of D(X) is equal to that of τ(X)

Under this revised version of the Blocking Principle the existence of bare plural arguments is no longer a problem for an analysis that assumes *unos* is the Spanish plural indefinite article.

5 General conclusion

The main claim of this paper is that *unos* is the Spanish plural indefinite article. This claim was motivated both from a diachronic and a synchronic perspective. I furthermore motivated why articles are expected to lack partitive readings and bare nominal arguments needn't be blocked by the existence of an article.

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Speaker-Oriented Adverbs of the German *-weise* Sort

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Abstract

Speaker-oriented adverbs (SpOAs) such as *glücklicherweise* 'fortunately' in German constitute a secondary proposition by predicating over the main proposition and a syntactically often silent argument 'Beneficient'. Since SpOAs take wide scope, quantifying adverbs, whether negative or positive, may not precede them syntactically as otherwise they would compete for scope-taking over the rest of the sentence and this would cause a clash with the semantics of SpOAs. By uttering a sentence with a SpOA, the speaker performs two illocutionary acts, one assertive and the other expressive about the same propositional content *p*. The expressive speech act presupposes the assertive one, which is why any use of SpOAs presupposes the truth of *p*.

1 Introduction

Speaker-oriented adverbs (SpOAs), a term first used in Jackendoff (1972), are usually used to express the speaker's emotion or evaluation towards the propositional content *p* that the speaker asserts by the rest of the sentence or part of the sentence where SpOAs occur. In this paper, I will discuss the lexical semantics/pragmatics of German SpOAs such as *glücklicherweise* 'fortunately' and *erfreulicherweise*[1] 'luckily' in line with their distributional facts. (1) provides examples from google for illustration.

(1) a. Erstaunlicherweise scheint aus meiner Erkältung keine Grippe zu werden.
'Astonishingly, it seems that my cold is not turning into the flu.'
b. 1858 wurde tragischerweise der letzte Kaplöwe getötet.
'1858, the last Cape Lion was tragically killed.'
c. Verkehrsunfall mit glücklicherweise nur Leichtverletzten.
'Road accident with fortunately, only mild injuries resulting in'

[1]German SpOAs of this type (ADJ-*er-weise*) can often be paraphrased as 'in an ADJ way'. As adverbs, they do not always have English equivalents. For example, *erfreulicherweise* means 'in a pleasant way' and 'luckily' is just a rough translation.

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d. Die gekürzte Studiofassung wurde unglaublicherweise OHNE(!) die Musik von Ennio Morricone in den USA veröffentlicht.
'The shortened studio version got published in the USA, unbelievably, without the music of Ennio Morricone.'

The paper is organized as follows. I will first provide an overview about the distribution of SpOAs. Section 3 addresses two previous analyses, one that treats SpOAs as positive polarity items (PPIs) (Nilsen 2004, Ernst 2005) and the other that takes the relation between the main proposition p and SpOAs as conditional (Bonami and Godard 2008): $p \rightarrow SpOA(p)$. I will argue that the PPI-labeling of SpOAs is misleading if not entirely wrong and the conditional semantics for SpOAs is not right, either. In Section 4, I will first discuss the semantics of SpOAs in the double-propositional approach following Bellert (1977) and Bach (1999) and then propose that by use of SpOAs the speaker performs two illocutionary acts, one assertive and the other expressive of the same propositional content p. Most crucially, the expressive speech act presupposes the assertive one, and this is why any use of SpOAs presupposes the truth of p. Section 5 concludes the paper.

2 Distribution of SpOAs

To my knowledge, although the study of positive polarity dates back as early as Bolinger (1960), PPIs only started to gain more attention recently. As counterparts of NPIs, PPIs tend not to occur in downward entailing (Ladusaw 1980), henceforth DE, contexts, illustrated below:

(2) a. Mary has *(**not**) got married yet$_{NPI}$.
b. Mary has (***not**) already$_{PPI}$ got married.

Nilsen (1999) claims that SpOAs are PPIs as they are excluded in DE contexts. The corpus search and speaker judgement experiments[2] (Liu and Soehn *in press*) confirmed their 'PPI-hood': 24 subjects all accepted (3a) and all rejected (3b), for example.

(3) a. Die Vorschule hat glücklicherweise einen tollen Spielplatz.
b. *Die Vorschule hat **nicht** glücklicherweise einen tollen Spielplatz.
'The pre-school has (*not) fortunately a great playground.'

According to Bellert (1977), besides negatives, SpOAs do not appear in hypotheticals, questions or performative sentences, either. Her observation holds true for the most part, as shown in the following examples. The reason why SpOAs can appear in the antecedent of conditionals or unreal (echo or tag) questions will be explicated later in the paper when we turn to their semantics.

[2]The experiments used anti-additive (AA) contexts as stimuli as according to Szabolcsi (2004), it is anti-additivity, a subset of DEness, that PPIs are sensitive to.

(4) Conditionals:

a. indicative: [*Wenn* . . . ?*SpOA* . . . , . . . ∗ *SpOA* . . .]
Wenn die Vorschule ?glücklicherweise einen tollen Spielplatz hat, können die Kinder *erfreulicherweise mehr Sport treiben.
'If the preschool fortunately has a great playground, the kids can luckily do more sports.'

b. counterfactual: [*Wenn* . . . ∗ *SpOAs* . . . , . . . ∗ *SpOAs* . . .]
Wenn die Schule *glücklicherweise einen tollen Spielplatz hätte, könnten die Kinder *erfreulicherweise mehr Sport treiben.
'If the preschool fortunately had a great playground, the kids could luckily do more sports.'

(5) Questions:

a. Hat die Vorschule *glücklicherweise einen tollen Spielplatz?
'Does the preschool fortunately has a great playground?'

b. Wer ist unglücklicherweise in einen Unfall verwickelt worden?
'Who (again) unfortunately got into an accident?'

c. Tom ist unglücklicherweise in der Prüfung durchgefallen, gell?
'Tom unfortunately failed in the exam, right?'

(6) Performatives:
Ich befehle *glücklicherweise dass Du sofort losfährst.
'I order fortunately that you set off immediately.'

As (3)-(6) show, SpOAs cannot be negated, questioned or hypothesized, which makes them different from manner adverbs and degree adverbs such as *ganz* 'entirely', *deutlich* 'clearly' that can.

Ernst (2005), also labeling SpOAs as PPIs, maintains that they are excluded in non-veridical (Zwarts 1995, Giannakidou 1998) contexts, which also include for instance imperatives or modals besides DE ones.

(7) Imperatives:
Stirb *unglücklicherweise!
'Die unfortunately!'

SpOAs, meeting modal adverbs or verbs, must outscope them.

(8) a. Unglücklicherweise ist Peter möglicherweise krank.
'Unfortunately, Peter is possibly sick.'

b. *Möglicherweise ist Peter unglücklicherweise krank.
Possibly, Peter is unfortunately sick.

c. Peter könnte unglücklicherweise krank sein. =
Es ist unglücklich dass . . . ≠
Es könnte unglücklich sein dass . . .
'Unfortunately, Peter could be sick.' = 'It is unfortunate that . . .' ≠ 'It could be unfortunate that . . .'

Finally, SpOAs can be embedded by veridical/factive predicates such as *wissen* 'know', *bedauern* 'regret' or reportives such as *sagen* 'say' but not by nonveridical predicates such as neg-raising[3] or volitional ones.

(9) a. Factives:
Maria weiß (nicht) dass Peter unglücklicherweise gestorben ist.
'Maria does (not) know that Peter unfortunately died.'
b. Assertives:
Maria sagte (nicht) dass Peter unglücklicherweise gestorben war.
'Maria did (not) say that Peter unfortunately died.'
c. Neg-raising predicates:
Maria glaubt (*nicht) dass Peter unglücklicherweise gestorben ist.
'Maria does (*not) believe that Peter had unfortunately died.'
d. Volitionals:
Maria hofft (nicht) dass Peter *tragischerweise gestorben ist.
'Maria does (not) hope that Peter tragically died.

I will come back to these data in the following discussion.

3 Two Misconceptions about SpOAs

This section discusses two previous analyses, namely, the conditional semantics for French evaluatives by Bonami and Godard (2008) and the PPI-labeling of SpOAs by Nilsen (1999) and Ernst (2005). I will first show that although Bonami and Godard's proposal correctly predicts some of SpOAs' behavior, it fails to do so for some others. This also leads to my argument for abandoning the PPI-labeling of SpOAs.

3.1 Conditional semantics for SpOAs

According to Bonami and Godard (2008), the oddness of French evaluatives (what we call SpOAs in the present paper) like *malheureusement* 'unfortunately' in the scope of negation (such as **Paul n'est pas malheureusement venu* 'Paul did not unfortunately come') is due to the clash between the "main assertion" $\neg p$ and the "ancillary commitment" $p \rightarrow SpOA(p)$. This analysis can elegantly explain the anti-collocaitonal relation between SpOAs and negative contexts. However, it fails to account for the fact that even when preceding adverbs are not negative, such as *immer* 'always', thus a clash should not arise as the 'main assertion' is positive, the sentences still remain bad. Compare:

(10) a. Peter ist unglaublicherweise **immer/niemals/oft/manchmal** krank.
'Peter is unbelievably always/never/often/sometimes sick.'
b. *Peter ist **immer/niemals/oft/manchmal** unglaublicherweise krank.
'Peter is always/never/often/sometimes unbelievably sick.'

[3]Frank Richter (p.c.) pointed out to me that (9c) is not quite good an example, mainly due to the fact that the neg-raising reading of *glauben* 'believe' is sometimes difficult to distinguish from the non-neg-raising reading. If it is not a neg-raising reading then (9c) would be just as fine as (9a-b), whether negation is present or not.

An explanatory analysis of SpOAs should be able to answer the question either why adverbs such as *immer* 'always', *nie* 'never', *selten* 'seldom' cannot outscope SpOAs, or why SpOAs cannot outscope these adverbs if they take a syntactically higher position, although they can outscope for example, *nichts* 'nothing', *niemand* 'nobody', *wenig* 'few', or modals.

(11) a. **Niemand** hat erfreulicherweise bei der Hochzeit gefehlt. =
Erfreulicherweise hat **niemand** bei der Hochzeit gefehlt.
'Happily, nobody was absent from the wedding.'
b. Peter **könnte** unglaublicherweise gut angezogen sein. =
Unglaublicherweise **könnte** Peter gut angezogen sein.
'Unbelievably, Peter could be well-dressed.'

Such adverbs that SpOAs tend only to outscope (both semantically and syntactically) are called quantifying adverbs (Lewis 2002/1975). More examples from English are *invariably*, *universally*, *without exception*, *occasionally*, *usually*, *mostly*, *generally*, *infrequently*, *rarely*. They quantify over cases (which might as well simply be events). For example, *always* in *A man who owns a donkey always beats it now and then* is a quantifier over the case: [if x is a man, if y is a donkey, and if x owns y, x beats y now and then]. To figure out the semantics of SpOAs, it is helpful to take quantifying adverbs as a test and see how they behave in relation to SpOAs in a sentence.

I have three points to make on why the quantification by these adverbs has to happen before the semantics of SpOAs comes into play. First, SpOAs are not quantifiable themselves as they are not cases: what they express is not for example an event but an (often emotional) evaluation. This blocks SpOAs from being bound alone in the scope of quantifying adverbs. Second, quantifying adverbs cannot quantify over the event or case expressed by the rest of the sentence, if the latter is already modified by a SpOA, because such a case is closed (by evaluation), that is, the truth value of the expressed proposition is already settled and thus allows no further quantification (that should be considered to yield the truth-value). Last, the possibility to have both the content expressed by SpOAs and that by the rest of the sentence be bound by quantifying adverbs is not available due to the very relation between these two contents, which I will discuss more in Section 4. (12) is my formulation of the semantic constraints concerning the co-occurence of quantifying adverbs and SpOAs (that are treated as predicates as I will show in Section 4): the combinations marked with $*$ are out and the good one is with $\surd$.

(12) Semantic constraint of SpOAs:
a. $*$ quantification $>$ predication$_{SpOA}$ $>$ case
(i) $*$ (quantification $>$ predication$_{SpOA}$) $>$ case
(ii) $*$ quantification $>$ (predication$_{SpOA}$ $>$ case)
b. $\surd$ predication$_{SpOA}$ $>$ quantification $>$ case

The semantic contraint in (12b) requires that SpOAs take a syntactically higher position than quantifying adverbs, as they are in a competing relation for scope-taking over the rest of the sentence and syntactically higher ones win. SpOAs have no problem with adverbs in a syntactically higher position if these adverbs cannot take wide scope, such as

yesterday. In (13), we get the reading that *it is unfortunate that Peter was sick yesterday*. Notably, the SpOA does not only outscope the temporal adverb but also the tense, that is, the entire temporal modification of the sentence.

(13) Peter war gestern unglücklicherweise krank.
'Peter was yesterday unfortunately sick.'

3.2 PPI-labeling of SpOAs

We have seen that although the distributional facts stated in Section 2 seem all to suggest that SpOAs be PPIs, this labeling is misleading. The example of quantifying adverbs show that it is not negative polar quantification that SpOAs are hostile to but adverbial quantification that slips away from the scope of SpOAs, no matter whether it is negative or positive. Quantifying adverbs must follow SpoAs syntactically, because semantically, SpOAs have to take wide scope and a clash would arise if syntax says otherwise.

To render a general remark, the PPIs recorded in the existing literature seem not to be homogeneous. The term of PPIs is to my mind more of a distributional commonness of different things. For instance, SpOAs and PIAs[4] are certainly not of the same kind, although distributionally speaking, both seem to crave for positive polar contexts. This distinguishes PPIs from NPIs in the way that NPIs (at least the set of minimizers) make up a natural class, whereas there is no such corresponding natural class of PPIs.

4 The Semantics and Pragmatics of SpOAs

Having discarded the PPI labeling and the conditional semantics for SpOAs, I will now discuss the semantics of SpOAs following the double-propositional view (Bellert 1977, Bach 1999) and the pragmatics of SpOAs in speech act theory. First, I will argue for treating SpOAs as two-place predicates, one argument being the main proposition[5] and the other one a Beneficient that does not necessarily co-incide with the speaker. In speech act theory, by uttering a sentence with SpOAs, the speaker performs two illocutionary acts about the same propositional content p, one assertive and the other expressive/evaluative by use of SpOAs. The assertive one is independent while the expressive presupposes the assertive one, and this is why any use of SpOAs presupposes the truth of p.

[4] Adverbs of this type are called positive intensifying adverbs (PIAs, Liu and Soehn *to appear*) such as *total* 'totally', *durchaus* 'absolutely' also tend not to occur in negative contexts, but for the reason that they contribute no propositional content to a sentence but are used as conventional tools to intensify an (mostly positive) utterance and therefore negating, questioning or hypothesizing of them would be vacuous.

[5] 'Proposition' has always been a confusing term to me and I guess, probably to many others as well. In the current analysis, I take propositions as something truth-evaluable, though, what I take as linguistic means to express propositions might differ from many existing proposals: to me, besides sentences, the speaker can use certain noun phrases such as 'the king of France', prepositional phrases such as 'with a pair of sunglasses' to express propositions, and the reason why we usually only interprete an atomic sentence as a single proposition is but a question of theoretic convenience and necessity.

4.1 Semantic Duality

The double-propositional insight for SpOAs is found at least in Jackendoff (1972), Bellert (1977) and Bach (1999). Jackendoff (1972) maintains that modal adverbs such as *certainly* are predicates over a sentence, while SpOAs such as *happily* predicate over a sentence and the argument SPEAKER, that is, $SpOA(SPEAKER, S)$. Thus modal adverbs should be handled differently from SpOAs. Modal adverbs are added to the rest of the sentence to constitute one proposition. SpOAs predicate over the main proposition expressed by the rest of the sentence, and this predication constitutes an extra proposition. Bellert echoes this view (1977: p.342) about SpOAs: "the adverb makes a second proposition by evaluation of the fact, event, or states of affairs denoted by S." Bach (1999) calls SpOAs assessives and claims that they "contribute to the content of the utterance" (p.359) by a second - evaluative/assessive - proposition.
However, paraphrasing modal ADVs and SpOAs such as *certainly* and *happily*, we can easily get the same structure *it is certain/happy that S*. Since both epistemic certainty and emotive evaluation are in the end speaker-oriented, to what extent do they really differ? The solution I suggest here is to treat SpOAs as two-place predicates taking Beneficient (or Recipient, Experiencer) as the second argument, that is, $SpOA(S, Beneficient)$. By contrast, modal adverbs are one-place predicates such that $ModalAdv(S)$[6].

4.1.1 Beneficient and Speaker

Bonami and Godard (2008) already express doubt concerning the notion of the speaker-orientation for French evaluatives: "the agent responsible for the evaluative may be different from the speaker. Accordingly, an adequate analysis must not presuppose that evaluatives are strictly speaker-oriented" (p.15). The assigning of Beneficient instead of SPEAKER as the second argument solves the problem. This means that the emotion or evaluation that the speaker expresses by use of SpOAs towards the main proposition could be attributed to the speaker himself, but also to the addressees, the subject of the sentence, etc. In other words, the Beneficient might co-incide with the speaker, but this does not have to. It can be made explicit linguistically, with *for*-phrases in English as in (14a), or contextually. In (14b), the fact that Paul screwed up in the final exam is unfortunate for him and maybe for the speaker as well.

(14) a. Unfortunately for most female PhD students, having babies can add unnecessary stress to their academic lives.
b. Paul unfortunately screwed up in the final exam.

Despite the context dependency of Beneficients, a felicitous use of SpOAs presupposes the existence of such a Beneficient. In a war situation where the speaker informs his own party about the serious casualties of the opposite party, the use of *unglücklicherweise* or *tragischerweise* will be outragous. This means that the existence of such Beneficients should be in the semantics of a sentence with SpOAs, therefore, I propose to render this

[6]Of course, we can introduce the argument SPEAKER into both cases, ending up with SpOAs as three-place predicates and modal adverbs as two-place ones, but this move will lead to redundancy, as we then need to assign every sentence a SPEAKER argument.

argument into the logical form of such a sentence: $(\lambda Q.\lambda P.Q(P, Beneficient))(spoa)$, although it is often syntactically silent.

4.1.2 Proposition and Sentence

One can argue whether the contribution by SpOAs is propositional, i.e. whether it has a truth value. However, by introducing the Beneficient as their argument, the meaning contribution of SpOAs is indeed truth-evaluable. If the speaker says that *Sadly for Paul, he screwed up in the final exam*, the meaning of SpOAs is truth-evaluable in terms of whether Paul truly or falsely has sad emotions due to the fact that he screwed up in the final exam. Emotions, despite the perceptive difficulty in comparison, are entities/Dasein, I believe. Therefore, by a sentence with SpOAs the speaker expresses (at least) two propositions. The rule of 'one sentence, one proposition', although practical in most cases, is but of theoretic convenience. Bach (1999) and Potts (2005) both challenged this view in their discussions of conventional implicatures including the cases of *but* and SpOAs. I do so as well but also for an extra reason, namely, the main proposition that SpOAs predicate over might be the rest of the sentence or just a fragment of it. SpOAs do not necessarily take the rest of the sentence as their (immediate) affective domain.

(15) Peter war unglücklicherweise gestern krank.
'Peter was unfortuntely sick yesterday.'
   a. Peter war unglücklicherweise GESTERN krank.
   'Peter was unfortunately yesterday sick.'
   b. Gestern war unglüklicherweise PETER krank.
   'Unfortunately, Peter was yesterday sick.'

(15) shows that SpOAs, despite their syntactical category as sentence adverbs, are subject to the focus effect of the rest of the sentence. Intonation and word order change can be used to clearly indicate their affective domain, which can be the entire sentence such as in (15) or a propositional fragment of it such as capitalized in (15a) and (15b). The latter two sentences can be best paraphrased with cleft constructions, roughly as *it is unfortunate that it is yesterday that Peter was sick* and *it is unfortunate that it is Peter who was sick yesterday*. In a similar way, we can paraphrase the sentences in (1) as (16): only in (1a) does the SpOA take the entire rest of the sentence as its argument.

(16) a. It is astonishing that it seems that my cold is not turning into the flu.
   b. 1858, the last Cape Lion was killed. It is tragical that the last Cape Lion was killed.
   c. (There was a) road accident. It is fortunate that people were only mildly injured.
   d. The shortened studio version got published in the USA. It is unbelievable that they published it without the music of Ennio Morricone.

This is to show that SpOAs also provide evidence for the multipropositionality of natural language sentences without SpOAs: for example, in (1c) the prepositional phrase expresses a proposition. Therefore, not only does 'one sentence' not necessarily express

only 'one proposition', but 'one proposition' does not have to be expressed by 'one sentence'.

4.2 Pragmatic Asymmetry

I have argued above that the meaning contribution by SpOAs can be analysed as propositional, that is, two things (propositions) are said in a sentence with SpOAs. However, these two things are not said equally. In this section, I will show that the truth/falsity of the proposition that the speaker expresses by SpOAs is dependent on that of the main proposition and has correspondingly a secondary status in discourse logic. In other words, there is a pragmatic asymmerty between them. In the following, I will briefly discuss Potts's (2005) analysis and then propose an alternative analysis in speech act theory.

4.2.1 SpOAs as conventional implicatures

Potts (2005) treats SpOAs as conventional implicatures (CIs), which he considers to be entailments, but different from what he calls "at-issue entailments". Informally, (17) entails both (17a) and (17b), but the former is the at-isse entailment and the latter the CI.

(17) Luckily, Willie won the pool tournament. (Potts 2005: p.187)
   a. p: Willie won the pool tournament.
   b. $\lambda p.\mathbf{lucky}(p)$

Although the term of CI is sometimes confusing as Potts admits himself, with his analysis, we are able to distinguish (17) from (18). In (18a), the at-issue content is $\lambda p.\mathbf{lucky}(p)$ and in (18b), both p and $\lambda p.\mathbf{lucky}(p)$ are at-issue contents due to the conjunction.

(18) a. It is lucky that Willie won the pool tournament.
   b. Willie won the pool tournament and this is lucky.

It is worth noting that SpOAs, or CIs in general, do convey new information, just as the definite NP in *The king of France is bald* could be new information for people who didn't know whether France is Republican or Monarchic. In this sense, both CIs and presuppositions differ from "at-issue entailments" essentially in terms of informative prominence.

4.2.2 SpOAs in speech act theory

SpOAs are illocutionary words (Bellert 1972, Bartsch 1976). First consider:

> If we adopt illocutionary point as the basic notion on which to classify uses of language, then there are a rather limited number of basic things we do with language: we tell people how things are, we try to get them to do things, we express our feelings and attitudes, and we bring about changes through our utterances. Often, we do more than one of these at once in the same utterance. (Searle 1979: p.155)

In one and the same utterance with SpOAs, the speaker does not only tell people how things are but at the same time also expresses his or someone else's feelings and attitudes towards the way things are. However, there is a question of (logical) order in doing the two things, as I formulate below:

(19) Pragmatics of $SpOA(p)$:
The speaker performs two speech acts, one (factually) assertive and the other expressive of the same propositional content p. The assertive speech act is performed independently. However, the expressive speech act presupposes the assertive one, therefore, any use of SpOAs presupposes the truth of p.

With (18a), the speaker only performs one assertive speech act of the propositional content that *It is lucky that Willie won the pool tournament*, while with (18b), the speaker performs two assertive speech acts of two different propositional contents by conjunction. In the case of SpOAs, the expressive content is parasitic on the asserted content, and secondary to the latter, as the expressive speech act cannot be successfully performed if the assertive speech act is not successfully performed, but not vice versa.

By uttering a sentence $(\lambda Q.\lambda P.Q(P, Beneficient))(spoa)$, the speaker commits himself to both the truth of P and the (evaluative/emotional) content Q towards P for the beneficient of the described state of affairs by P. P and Q can both be negated independently (Bellert 1977), but not at the same time due to their very relation: denying P makes the denying Q unnecessary and denying Q presupposes the agreeing on P. The truth/falsity of P is independent of that of Q, while Q becomes an issue only when P holds true (is asserted). This is illustrated below:

(20) A: Tom is unfortunately dead.
B: No, he is not dead.
B': He is dead, but it is not unfortunate for you!
B": He is dead, but it is not unfortunate to me.

4.3 (Non-)Veridicality

In Section 3, I have shown that SpOAs take wide scope and they should precede quantifying adverbs, whether they are negative or positive, because quantifying adverbs also take wide scope over the rest of the sentence and if they syntactically predece SpOAs, this will cause a clash. The pragmatics of an utterance $SpOA(p)$ as I formuated in (19) says that any content predicated over by SpOAs is asserted by the speaker and therefore does not allow any further quantification. This applies for the negative adverb *nicht* 'not' as well: informally speaking, you cannot tell people how things are and express the feelings or evaluations while simultaneously denying the way things are.

SpOAs also tend not to occur in contexts such as conditionals, yes-no questions, performative sentences, imperatives, neg-raising predicates, volitionals, modals, as by these things the speaker does not assert the embedded proposition, i.e. the speaker does not state how he believes the world is, thus it would be odd to use SpOAs, which predicate over a proposition that is asserted. In brief, if we do not know "how things are" in the

first place, it is impossible to "express our feelings and attitudes" towards the way they are.

Concerning modals, it is observed by Regine Eckardt (p.c.) that if we change *möglicherweise* 'possibly' in (8b) into *vielleicht* 'maybe', the sentence turns good. I think the meaning contribution of *vielleicht* here is similar to that of *ich glaube* 'I believe': in both cases, the speaker expresses his uncertainty about what he asserts, which makes the assertion sound weaker, but it is definitely different from *möglicherweise* where the content by the rest of the sentence is simply not asserted[7].

(21) a. Vielleicht ist Peter unglücklicherweise krank.
'Maybe, Peter is unfortunately sick.'
b. Ich glaube, Peter ist unglücklicherweise krank.
'I believe, Peter is unfortunately sick.'

The reason why SpOAs are possible in the antecedent of indicative conditionals is, as Ernst (2005) points out, because there "the truth of the proposition is still somehow implicated", while this possiblity is certainly unavailable with counterfactuals. As Daniel Hole (p.c.) pointed out, if we substitute *if* with *given that*, the occurrence of SpOAs follows even more naturally. It is to note that the speaker could fairly well use conditionals even when she does believe the truth of the antecedent but thinks that the antecedent is not common-grounded, in a similar fashion as the projection problem of presuppositions in conditionals. For the same reason, SpOAs can occur in echo questions and tag questions, as the expressed content is also maintained as true by the speaker, while they are bad in yes-no questions. Most of the contexts stated above seem to echo Ernst's (2005) observation that SpOAs may not occur in the scope of nonveridical contexts. Briefly, the concept of nonveridicality captures the state of uncertainty, where the truth value of the sentence is not yet known.

(22) Definitions (Zwarts 1995, Giannakidou 1998):
a. F is veridical if $Fp \Rightarrow p$.
b. F is nonveridical if $Fp \not\Rightarrow p$.

The notion of nonveridicality is useful for proposition embedding functions: SpOAs do not occur in nonveridial predicates because they would influence the truth of p and therefore lead to a clash with the meaning of SpOAs, while this problem does not arise with factives as they preserve the truth of the embedded proposition and therefore are harmonious with SpOAs. However, the crucial point is that SpOAs cannot occur in the scope of anything[8], veridical or non-veridical, that is, they semantically outscope everything including temporal/modal modification or quantification (see Section 3.1). The examples below demonstrate different behaviors of the same SpOA with regard to the adverbs *yesterday* and *always*, although both are veridical.

[7]This is the reason why *möglicherweise* should not receive the same analysis as SpOAs of the *-weise* sort.

[8]One exception are "pragmatic adverbs" (Bellert 1977) or "utterance modifiers"(Bach 1999) such as *frankly*, *sincerely*, *honestly*, *briefly*, *precisely*. However, they take scope over SpOAs not semantically but pragmatically, as with these words, the speaker comments on the act of his utterance rather than the content of it.

(23) a. Peter war gestern$_{veridical}$ unglücklicherweise krank.
'Unfortunately, Peter was sick yesterday.'
b. *Peter ist immer$_{veridical}$ unglücklicherweise krank.
'Peter is always unfortunately sick.'
c. Yesterday, Peter was unfortunately sick. $\neq$
It was yesterday unfortunate that Peter was sick.

However, SpOAs are themselves veridical, as $SpOA(p)$ entails p. Whether we take veridicality as a semantic or pragmatic concept, this is in line with the pragmatics of SpOAs as in (19).

5 Summary

In the foregoing, I have argued that the labeling of SpOAs as PPIs is misleading and a conditional semantics for their meaning is not quite right, either. SpOAs predicate over the main proposition where they occur, which yields a secondary proposition. I take both contents as propositional as both are truth-evaluable. However, there is a pragmatic asymmetry between these two propositions, which I showed in speech act theory: by uttering a sentence with SpOAs, the speaker performs two speech acts, one assertive and one expressive of the same propositional content p, but the expressive one presupposes the assertive one (therefore, any use of SpOAs presupposes the truth of p), while the assertive one is independent.

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Iterated *de re*: A New Puzzle for the Relational Report Semantics

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Abstract

I present and solve a puzzle involving iterated *de re* reports in a relational attitudes framework. The investigation shows that *de re* reporting is even more non-compositional than hypothesized earlier.

1 Introduction

De re belief reports are sentences that ascribe to someone a belief about some external entity or *res*. If the content of the ascribed belief is itself a *de re* belief we have an iterated *de re* report. For instance:

(1) John believes that Mary thinks I'm cool

I'll show that the doubly embedded *I* in (1) is problematic in a context where John *thinks* there is a *de re* belief between Mary and me, while *in fact* Mary's belief was about someone else. I reconcile the intuitive truth of (1) in such a scenario with the fact that *I* picks out the current speaker, me.

Outline: after fleshing out the scenario and intuitions in section 2, I introduce the framework of relational attitudes in section 3. In section 4 I examine the problematic predictions of this relational analysis with respect to mistaken iterated *de re*. In section 5 I propose a solution, and in 6 I discuss some implications of that solution.

2 Iterated *de re* and mistaken identity

Consider the following scenario:

(2) John and Mary are friends. Mary says: "That guy is cool". John thought she was pointing to me. In fact, she's pointing to Peter.

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From Mary's utterance it follows that she has a *de re* belief, not about me, but about Peter. I would be entitled to report her belief as (3a), but not (3b):

(3) a. Mary thinks Peter is cool
b. #Mary thinks I'm cool

John also has a *de re* belief, about Mary. Since he is confused about the object of her belief he would disagree with our judgments in (3). Because he thinks Mary's belief is about me, we intuitively judge (4b) true:

(4) John believes that Mary thinks I'm cool [=(1)]

The puzzling observation is that we use a first person pronoun in (4) even though neither John's nor Mary's belief appears to be *de re* about me. More precisely, I will show that the intuitive, relational paraphrase *John believes of Mary that she believes of me that I am cool* of (4) fails to capture the correct truth conditions.

3 Background: the relational analysis of *de re*

A traditional way to cash out the difference between modalities *de re* and *de dicto* is in terms of scope. Take the following attitude ascription:

(5) John hoped the new president would be pro-life

On the *de dicto* reading John merely hopes for a pro-life president. On a *de re* reading on the other hand John hoped of a certain individual, the actual new president, Obama, that he would be pro-life. Crucially, in the *de re* reading, John's hope is about Obama regardless of whom he believed or hoped would be president; the report would be true if John's thought were of the form 'I know he won't win the election, but I hope that Obama is pro-life'.

The scope analysis represents this truth-conditional difference between *de re* and *de dicto* as a difference between wide and narrow scope of the description with respect to the attitude operator:

(6) a. *de dicto*: $\text{HOPE}_{\text{j}}\texttt{prolife}(\iota\texttt{x}[\texttt{president}(\texttt{x})])$
b. *de re*: $\iota\texttt{x}[\texttt{president}(\texttt{x})]\lambda\texttt{y}\text{HOPE}_{\text{j}}[\texttt{prolife}(\texttt{y})]$

In a standard possible worlds framework (intensional first-order logic, with only extensional variables) this seems to make the right predictions. $[\![(6a)]\!]_w = 1$ iff in all of the worlds w' compatible with John's hopes in w, the new president of w' is pro-life in w', which indeed corresponds to the *de dicto* interpretation. $[\![(6b)]\!]_w = 1$ iff there is a unique individual that is the president in w, and that individual has the property of being pro-life in all worlds w' compatible with John's hopes.

Unfortunately, the wide scope representation of *de re* beliefs is too weak, as Quine (1956) demonstrated with his famous Ortcutt example (now often referred to as the double vision thought experiment):

> There is a certain man in a brown hat whom Ralph has glimpsed several times under questionable circumstances on which we need not enter here; suffice it to say that Ralph suspects he is a spy.

It follows that Ralph has a *de re* belief about this man in the brown hat, which we might report with (7a), which has wide scope representation (7b):

(7) a. Ralph believes *de re* of the man with the brown hat that he is a spy
b. $\iota x[\texttt{man\_brown\_hat}(x)]\lambda y[\textsc{bel}_{\texttt{r}}[\texttt{spy}(y)]]$

The story continues:

> Also there is a grey-haired man, vaguely known to Ralph as rather a pillar of the community, whom Ralph is not aware of having seen except once at the beach

We conclude:

(8) a. Ralph believes *de re* of the man at the beach that he is not a spy
b. $\iota x[\texttt{man\_beach}(x)]\lambda y[\textsc{bel}_{\texttt{r}}[\neg\texttt{spy}(y)]]$

"Now," Quine adds, "Ralph does not know it, but the men are one and the same", viz. the spy B.J. Ortcutt. It follows from this and (7) that Ralph believes *de re* of Ortcutt that he is a spy and from (8) that he believes *de re* of Ortcutt that he is not a spy. Given our possible worlds semantics and wide scope scope representations of *de re* belief we can deduce that Ralph believes *de re* of Ortcutt that he is both a spy and not a spy. In other words, not only is Ralph confused about Ortcutt's identity, he is also confused about logic, believing a true contradiction. The absurdity of the latter consequence is commonly regarded as proof of the inadequacy of the wide scope analysis of *de re*.

A popular solution to this problem is the so-called relational analysis of *de re*, based on Kaplan's (1969) 'vivid names' (more conveniently captured in Lewis' (1979) terminology, using acquaintance relations, below). The starting point is that *x* believes *de re* of *y* that it has property *P* iff there is an actual acquaintance relation between *x* and *y*, and *x* believes that the individual she herself is so acquainted with has *P*. The actual acquaintance relation connecting the subject and the *res* is taken into the logical form (henceforth, lf) to give the descriptive mode of presentation under which the belief is held. This analysis, summarized in (9), thus reduces a *de re* belief about *y* that it's *P* to a propositional, descriptive belief, viz. that whoever the subject is *R*-acquainted with is *P*.

(9) a. *x* believes *de re* of *y* that he is *P*
b. lf: $\exists\texttt{R}[\texttt{R}(x,y) \wedge \textsc{bel}_{x}[\texttt{P}(\iota z[\texttt{R}(x,z)])]]$ [to be refined]

Before showing how the relational analysis solves the Ortcutt paradox, let me introduce two refinements to Kaplan's original proposal as reconstructed in (9).

First, in (9b) we see that the acquaintance relation (R) and *res* (y) are represented outside the actual belief operator. This requires a separation of *res* from ascribed content, introducing an aspect of non-compositionality, or, in more syntactic terms, a '*res* movement'. Note that this separation can be made explicit on the surface by means of

the (not quite natural) reformulation of *believes that …* as *believes of … that …*. I'll return to this matter in sections 5 and 6 below. For now, we'll assume that syntax parses belief complements into structured representations of the form $\langle res, \text{predicate}\rangle$. We'll use the notation $\text{BEL}\langle \ldots, \ldots \rangle$ for *de re* lf's, i.e. as an abbreviation of the existentially quantified relational representation.

(10) a. *x* believes *de re* of *y* that he is *P*
b. lf: $\text{BEL}_{\mathtt{x}}\langle \mathtt{y}, \mathtt{P}\rangle$
c. $\text{BEL}_{\mathtt{x}}\langle \mathtt{y}, \mathtt{P}\rangle =_{\text{def}} \exists \mathtt{R}[\mathtt{R}(\mathtt{x},\mathtt{y}) \wedge \text{BEL}_{\mathtt{x}}[\mathtt{P}(\iota \mathtt{z}[\mathtt{R}(\mathtt{x},\mathtt{z})])]]$ [to be refined]

Second, the representation of the subject x as a variable inside the belief operator in (9b) (or (10c)) will lead to similar kinds of problems as the wide scope representation of Ortcutt. We will not go into this matter too deeply here, but note that the x there really denotes the attitude holder himself, from his own first person perspective. Rather than just *de re* beliefs of the subject about the subject, a subject's beliefs about himself are typically *de se*. For a full discussion about *de se*, and especially the relation between *de re* and *de se* belief in the relational framework, I refer the reader to Maier (2006). Suffice it to say that, to avoid problems with *de se*, the 'believes' in (10a) is further explicated as a property-self-ascription (SELFASCR), following Lewis (1979). That means that the *res*-separated lf (10b) can be taken to abbreviate the following property self-ascription:

(11) $\text{BEL}_{\mathtt{x}}\langle \mathtt{y}, \mathtt{P}\rangle =_{\text{def}} \exists \mathtt{R}[\mathtt{R}(\mathtt{x},\mathtt{y}) \wedge \text{SELFASCR}_{\mathtt{x}} \lambda \mathtt{u}[\mathtt{P}(\iota \mathtt{z}[\mathtt{R}(\mathtt{u},\mathtt{z})])]]$

In words, there is an acquaintance relation *R* between subject *x* and *res y*, and *x* self-ascribes the property of being uniquely *R*-acquainted with someone, who is also *P*.

By way of an illustration, let's see how this relational semantics solves the Ortcutt puzzle. From the first part of the Ortcutt story (p.348), and the 'punch line', we concluded that Ralph has a *de re* belief about Ortcutt, viz. (12a). We now represent this as (12b), rather than (7b):

(12) a. Ralph believes *de re* of Ortcutt that he is a spy
b. $\text{BEL}_{\mathtt{r}}\langle \mathtt{o}, \lambda \mathtt{z}[\mathtt{spy}(\mathtt{z})]\rangle$

From the second part we gather:

(13) a. Ralph believes *de re* of Ortcutt that he is not a spy
b. $\text{BEL}_{\mathtt{r}}\langle \mathtt{o}, \lambda \mathtt{z}[\neg \mathtt{spy}(\mathtt{z})]\rangle$

Crucially, we cannot combine these two to conclude that Ralph believes *de re* about Ortcutt that he is and is not a spy:

(14) $(12b) \wedge (13b) \not\models \text{BEL}_{\mathtt{r}}\langle \mathtt{o}, \lambda \mathtt{z}[\mathtt{spy}(\mathtt{z}) \wedge \neg \mathtt{spy}(\mathtt{z})]\rangle$

This lemma is easily checked by writing out the definitions of the formulas. What the left hand conjunction says is that there is an acquaintance relation between Ralph and Ortcutt under which Ralph believes himself to be acquainted with a spy, and there is another acquaintance relation under which he believes to be acquainted with a non-spy. These two existential statements are indeed non-paradoxically true in our scenario, The

first acquaintance relation would be seeing the guy in the brown hat, the second would be seeing the guy at the beach. The statement on the right hand side is much stronger, and indeed ascribes to Ralph a contradictory belief: Ralph bears an acquaintance relation to Ortcutt and believes the person he is so acquainted with is both a spy and not a spy.

The relational analysis thus avoids the unwanted inference to a contradictory belief. At the same time it preserves the *de re*/*de dicto* distinction, in that the former is characterized by the *res* being scoped out of the logical belief operator, and by the existence of an acquaintance relation that also serves as the mode of presentation of the *res* inside the belief.

4 The puzzle: embedded double vision

Given the relational system, the most natural parse and logical form of our iterated report (1) would be:

(15) a. John believes *de re* of Mary that she believes *de re* of me that I am cool
b. $\text{BEL}_{\mathtt{j}}\langle \mathtt{m}, \lambda \mathtt{x}[\text{BEL}_{\mathtt{x}}\langle \mathtt{i}, \lambda \mathtt{z}[\mathtt{cool}(\mathtt{z})]\rangle]\rangle$

Surprisingly, with the relational semantics specified above, (15) does not represent a sensible reading. This can be brought out by expanding the structured beliefs as specified by (11):

(16) $\exists \mathtt{R}[\mathtt{R}(\mathtt{j},\mathtt{m}) \wedge \text{SELFASCR}_{\mathtt{j}} \lambda \mathtt{u}[$
$\exists \mathtt{R}'[\mathtt{R}'(\iota \mathtt{v}[\mathtt{R}(\mathtt{u},\mathtt{v})],\mathtt{i}) \wedge \text{SELFASCR}_{\iota \mathtt{v}[\mathtt{R}(\mathtt{u},\mathtt{v})]} \lambda \mathtt{u}'[$
$\mathtt{cool}(\iota \mathtt{v}'[\mathtt{R}'(\mathtt{u}',\mathtt{v}')])]]]]$

The problem with (16) is that there is an indexical, i, occurring inside a semantic belief operator (SELFASCR). Because indexicals are rigid designators (Kaplan, 1989), i.e. they function like variables bound from outside, they create a singular proposition, similar to that created by the wide scope representation rejected in (6). In other words, we should be able to create an Ortcutt scenario to disqualify it. We achieve this by adding to our scenario (2) a second encounter between John, Mary and me:

(17) John and Mary meet me again. John doesn't recognize me from the first encounter. Mary to me: "You're a dork"

John might report this to me as (18a), which I in turn could report with (18b):

(18) a. John to me: "Mary thinks you're not cool"
b. John believes that Mary thinks I'm not cool

We find that in the extended scenario (2)+(17), both (1) and (18b) are true, the latter paraphrased and analyzed below:

(19) a. John believes *de re* of Mary that she believes *de re* of me that I am not cool
b. $\text{BEL}_{\mathtt{j}}\langle \mathtt{m}, \lambda \mathtt{x}[\text{BEL}_{\mathtt{x}}\langle \mathtt{i}, \lambda \mathtt{z}[\neg \mathtt{cool}(\mathtt{z})]\rangle]\rangle$

Combining the logical forms in (15b) and (19b) should yield an Ortcutt-like contradiction on account of the $\mathtt{i}$, which is replaced by a description in the innermost self-ascription, but which nonetheless creates a so-called singular proposition in the outermost one.

Because of the double embedding, however, we do not immediately get a contradiction. John might well think that Mary knows me under two distinct guises and thus has two distinct beliefs that he knows are *de re* about me. To bring out the inadequacy of (15) and (19) we have to control for this by adding to our story that John thinks Mary met me only once, which, with the same kind of representation as in (15) and (19) looks like this:

(20) a. John believes *de re* of Mary that she met me only once
b. $\textsc{bel}_{\mathtt{j}}\langle \mathtt{m}, \lambda \mathtt{x}[\exists !\mathtt{R}[\mathtt{R}(\mathtt{x},\mathtt{m})]]\rangle$

Note that this is assumption entirely compatible with the story thus far. Because John doesn't recognize me on the second encounter, the unique acquaintance he believes to exist between me and Mary is the one underlying the first scene (which, moreover, is *in fact* an acquaintance relation between Mary and Peter).

As expected, the extended scenario has as an unwanted consequence that John believes that Mary believes a contradiction:

(21) $(15b) \wedge (19b) \wedge (20b) \models \textsc{bel}_{\mathtt{j}}\langle \mathtt{m}, \lambda \mathtt{x}[\textsc{bel}_{\mathtt{x}}\langle \mathtt{i}, \lambda \mathtt{z}[\mathtt{cool}(\mathtt{z}) \wedge \neg \mathtt{cool}(\mathtt{z})]\rangle]\rangle$

As Quine showed with his Ortcutt example, one cannot believe two contradictory things about a single actual individual, me ($\mathtt{i}$), without taking the different 'guises', given by acquaintance relations, of that individual into account.

5 Solution: iterated *res* movement

Having pinpointed the problem thus, a solution within the relational framework presents itself. What we must do is 'move' the doubly embedded *res*, $\mathtt{i}$, one step further, leaving behind a descriptive guise in John's belief as well as in Mary's. In (22b-c) I use arrows to depict the *res* movements that have taken place to derive this new logical form for (1), repeated as (22a):

(22) a. John believes that Mary thinks I'm cool

b. John believes of Mary and of me that _ believes of _ that _ is cool

c. $\textsc{bel}_{\mathtt{j}}\langle \mathtt{m}, \mathtt{i}, \lambda \mathtt{x} \lambda \mathtt{y}[\textsc{bel}_{\mathtt{x}}\langle \mathtt{y}, \lambda \mathtt{z}[\mathtt{cool}(\mathtt{z})]\rangle]\rangle$

An attempt at an explicit semi-natural language paraphrase: John believes of Mary and of me that the former believes of the latter that he is cool. As is clear from (22b-c), the indexical first person pronoun is moved outside both belief embeddings, so the relational interpretation should be Ortcutt-proof.

To make sure, let's write out the full definition of the relational beliefs from (11). This requires first a trivial extension to cover beliefs about multiple *res*:

(23) If $\mathtt{t}_1 \ldots \mathtt{t}_n$ are terms, and $\mathtt{P}$ is an *n*-place predicate:

$$\begin{aligned}&\textsc{bel}_{\mathtt{x}}\langle \mathtt{t}_1, \ldots, \mathtt{t}_n, \mathtt{P}\rangle =_{\text{def}}\\ &\quad \exists \mathtt{R}_1 \ldots \mathtt{R}_n[\mathtt{R}_1(\mathtt{x}, \mathtt{t}_1) \wedge \ldots \wedge \mathtt{R}_n(\mathtt{x}, \mathtt{t}_n) \wedge\\ &\quad\quad \textsc{selfascr}_{\mathtt{x}} \lambda \mathtt{u}[\mathtt{P}(\iota \mathtt{z}_1[\mathtt{R}_1(\mathtt{u}, \mathtt{z}_1)], \ldots, \iota \mathtt{z}_n[\mathtt{R}_n(\mathtt{u}, \mathtt{z}_n)])]]\end{aligned}$$

In words: believing *de re* about a number of *res* that they're *P*, means that you're acquainted with all of them and believe that the representational guises of the *res* under their respective acquaintance relations, stand in the relation *P* to each other.

With (23), the fully specified, double movement relational lf of (22) looks like this:

(24) $$\begin{aligned}&\exists \mathtt{R}_1, \mathtt{R}_2[\mathtt{R}_1(\mathtt{j}, \mathtt{m}) \wedge \mathtt{R}_2(\mathtt{j}, \mathtt{i}) \wedge \textsc{selfascr}_{\mathtt{j}} \lambda \mathtt{u}[\\ &\quad \exists \mathtt{R}_3[\mathtt{R}_3(\iota \mathtt{v}[\mathtt{R}_1(\mathtt{u}, \mathtt{v})], \iota \mathtt{w}[\mathtt{R}_2(\mathtt{u}, \mathtt{w})]) \wedge \textsc{selfascr}_{\iota \mathtt{v}[\mathtt{R}_1(\mathtt{u}, \mathtt{v})]} \lambda \mathtt{u}'[\\ &\quad\quad \mathtt{cool}(\iota \mathtt{v}'[\mathtt{R}_3(\mathtt{u}', \mathtt{v}')])]]]]\end{aligned}$$

To see why (24) does not suffer from the Ortcutt problems of (16), note that in (24) John no longer has to believe his representation of Mary ($\iota \mathtt{v}[\mathtt{R}_1(\mathtt{u}, \mathtt{v})]$) to be acquainted with the *actual me* ($\mathtt{i}$), as was the case in (16), but rather with *his representation of* the actual me under $\mathtt{R}_2$ ($\iota \mathtt{w}[\mathtt{R}_2(\mathtt{u}, \mathtt{w})]$). John's mistaking me and Peter in the first scene, (2), exploits precisely this distinction between whom one is acquainted with and whom one believes to be acquainted with.

No singular propositions are ascribed in (24), every *res* is properly moved outside, leaving behind a descriptive, acquaintance-based guise. Consequently, no paradox arises if we continue the scenario as in (17) and (20), which verify the following formulas, respectively:

(25) a. $\textsc{bel}_{\mathtt{j}}\langle \mathtt{m}, \mathtt{i}, \lambda \mathtt{x} \lambda \mathtt{y}[\textsc{bel}_{\mathtt{x}}\langle \mathtt{y}, \lambda \mathtt{z}[\neg \mathtt{cool}(\mathtt{z})]\rangle]\rangle$

b. $\textsc{bel}_{\mathtt{j}}\langle \mathtt{m}, \mathtt{i}, \lambda \mathtt{x} \lambda \mathtt{y}[\exists! \mathtt{R}[\mathtt{R}(\mathtt{x}, \mathtt{y})]]\rangle$

To see that (22), (25a), and (25b) are indeed jointly verified by our story as a whole, without leading to contradictory beliefs, I will show what acquaintance relations play a role in the various *de re* beliefs.

First, consider (24), the detailed representation of (22), which shows the three existentially quantified acquaintance relations that play a role. For $\mathtt{R}_1$ we can take John's actual relation to Mary in the first scene, i.e. their being friends. For $\mathtt{R}_2$ we must take John's acquaintance with me, but the scenario doesn't explicitly specify any such acquaintance. It does say that John "thinks Mary is pointing to me", which presupposes that John does in fact know me. This way by which John is acquainted with me is our $\mathtt{R}_2$. Now, $\mathtt{R}_3$ is supposed to hold in John's mind between his representation of Mary under $\mathtt{R}_1$ (*my friend*) and his representation of me under $\mathtt{R}_2$ (*that guy Emar*). We can take $\mathtt{R}_3$ to be the salient seeing and pointing relation witnessed by John according to the story. The content of the belief he ascribes to Mary is then that she believes the person she's pointing at is a hero, which is in line with the story. Note that we can safely assume that

this $\mathtt{R}_3$ is, in John's mind, the only acquaintance relation between "my friend Mary", and "that guy Emar", which verifies (25b).

As for (25a), we can take the same representation of Mary, $\mathtt{R}_1$, but the acquaintance between me and John is different. The relevant relation here is the perceptual one that goes with the new pointing. John is acquainted with me as *that guy over there that Mary is pointing at*. The third acquaintance relation, between "my friend Mary" and "the person I see Mary pointing at", is, again, that very pointing/seeing relation. The content of the belief ascribed to Mary is that the person she is pointing at is not cool. This, too, fits the story precisely. And since the two beliefs John ascribes to Mary on the basis of our two encounters are really about different representations (of a single me) there is no contradiction.

I conclude from this and the previous section that the interpretation of iterated *de re* belief ascriptions of depth n, strictly require chains of *nres* movements, as demonstrated in (22) for $n = 2$. In the next section I'll look at the consequences of this discovery.

6 Discussion: acquaintance and compositionality

To conclude this paper, let me highlight a number of observations, mostly repeating some remarks already made in passing above.

In discussing (24), the proposed lf of (1), we noted an interesting novel prediction of the proposed method of iterated *res* movement, not shared by the straightforward but ultimately unsatisfactory lf discussed in section 4: (1) can only be true if John is vividly acquainted with me. As I pointed out, this is indeed implicitly assumed in the description of the first scenario: in order for John to think Mary is pointing to me, he must have some prior acquaintance with me. What would it mean to mistake someone for someone you have never been in contact with?

A second consequence of the proposed interpretation procedure, is that we now predict (26a), with lf (26b). to be true in the the first scene, (2), as well:

(26) a. John believes that Mary thinks Peter is cool
b. $\mathrm{BEL}_{\mathtt{j}}\langle \mathtt{m}, \mathtt{p}, \lambda \mathtt{x} \lambda \mathtt{y}[\mathrm{BEL}_{\mathtt{x}}\langle \mathtt{y}, \lambda \mathtt{z}[\mathtt{cool}(\mathtt{z})]\rangle]\rangle$

Let's see why (26) is true. The crucial acquaintance relation hidden in (26b), is the one between John and Peter. If we take that one to be the perceptual link from the story, it follows that John thinks Mary has a belief about the person they are currently seeing, viz. that he's cool.

At first sight, the truth of (26) is counterintuitive. But note that (26a) is ultimately *my* report of what happened. If I know Mary was pointing to Peter, and that John's report was in error, I might well reason that his report was not really *de re* about me but about Peter. In that case, I am certainly not expressing a falsehood if I say (26a), though without explicit further context it is a indeed misleading. To bring out the intended interpretation of (26) I could, for instance, preface it with something like, "John believes Mary thinks the guy she's pointing at is cool. Though he thinks she's pointing at me, she is really pointing at Peter. Therefore, actually, [(26)]"

A final observation concerns the non-compositionality of our solution. von Stechow and Zimmermann (2005) criticize the relational account for requiring what they termed *res* movement, the syntactic analogue of the essentially non-compositional separation between *res* and ascribed predicate that is inherent in any form of the relational approach. Note that the current proposal requires an extra *res* movement for any extra *de re* embedding. In this sense, the current paper shows that the relational analysis of *de re* is even more non-compositional than previously thought.[1] This may be taken as evidence in favor of the main rival of the relational approach, i.e. the approach with characterial (two-dimensional) modes of presentation, following Kaplan's (1989) "Adding 'Says'". In fact, the belief semantics based on Kaplan's analysis of indirect speech is truly compositional—no movements required—and covers *de dicto*, *de re* and *de se* uniformly. However, as von Stechow and Zimmermann show, this approach fails to predict adequate truth conditions for almost every belief ascription. For detailed proof of the inadequacy of a Kaplanian belief semantics, I refer to the proofs in their paper.

Given that Kaplan's compositional analysis is inadequate for beliefs, and that there's no real alternative to characters and acquaintance relations, I submit that the non-compositionality of *de re* is real, and even worse than hypothesized earlier. It remains to be seen though if we can't integrate the as yet purely syntactic movement into a more semantic or pragmatic mechanism.

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[1] Maier's (2006) version of the relational framework makes *de re* even more non-compositional, in a sense, because it holds that acquaintance relations are to be resolved in the context. On the other hand, the DRT framework employed there allows for different notions of compositionality: contextual resolution plays no role at the first stage of interpretation, the construction of a preliminary DRS, so compositionality at that level is no different from compositionality in the static relational account discussed here.

Constructing Concessive Conditionals: In Case of Japanese

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Abstract

This paper presents a compositional analysis of concessive conditionals in Japanese, which consists of a gerundive clause and the particle *mo*. Unlike the English *even if* sentences, there is no morpheme like *if* that apparently signals conditionality. On its surface, it looks as if the existence of *mo* serves as a combination of 'even' and 'if'. I propose that *mo* can have a quantificational force over possible worlds. By interacting with the meaning of gerundive clause, it derives the conditionality '*if*' and the unlikeliness '*even*' meaning. In addition to a general understanding of concessive conditionals in a cross-linguistic view, this study also leads to further questions about *mo* which has a wide range of properties from additivity to quantification.

1 Introduction

This paper is concerned with the Japanese concessive conditionals in contrast with the *even if* sentences in English. Consider a sample situation like (1) and the following concessive conditional sentence (2).[1]

(1) SITUATION: Mary has been hospitalized for a long time. Normally, despite her difficult physical condition, she looks very happy when her boyfriend John comes to see her. Exceptionally, though, this is not the case when she needs to get an injection. She hates it so much that ...

(2) John-ga kite-mo Mary-wa fukigen-da
John-NOM come.GER-*mo* Mary-TOP grumpy-is.NONPAST
'Even if John came, Mary would be in a bad mood.'

[1]Following abbreviations are used in this paper: TOP=Topic Marker, ACC=Accusative Marker, NOM=Nominative Marker, DAT=Dative Marker, CONT=Contrastive Marker, GER=Gerundive Form, COND=Conditional Form

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As the English translation shows, the sentence (2) not only expresses conditionality (under which condition Mary is in a bad mood), but also how unlikely it is, given the normal situation. Concessive conditionals in Japanese consist of an antecedent clause that contains a verb in the 'gerundive' form and the particle *mo*.[2]

An interesting puzzle arises when we compare (2) with (3), which is identical to (2) except for the absence of *mo*.

(3) John-ga kite Mary-wa fukigen-da
John-NOM come.GER Mary-TOP grumpy-is.NONPAST
'John came, and Mary is/will be in a bad mood.'
NOT: 'If John came, Mary would/will be in a bad mood.'

Without *mo*, not only does it lose the 'even' meaning, but it loses the 'even if' meaning altogether. The minimal pair (2)-(3) shows that the existence of *mo* on the gerundive clause expresses the *if*-meaning (conditionality) and the 'even' meaning (unlikeliness, unexpectedness) at once.[3] The main purpose of this paper is to derive the concessive conditional meaning compositionally and show how *mo* on the gerundive clause turns 'p and q' (3) into 'even if p, q' (2). As it will be shown in section 4, this leads us to further questions of understanding the property of this particle *mo* and the gerundive construction in Japanese. Before I present my solution to the puzzle, let us review the two basic notions crucial for the meaning and structure of concessive conditionals, i.e. conditionality (section 2.1) and unlikeliness (section 2.2).

2 Backgrounds

2.1 Conditionality

Being accompanied by the conditional meaning, sentence (2) does not show a prototypical conditional construction. Typically, the antecedent clause of conditional sentences has some sort of conditional morpheme such as the 'conditional' *(r)eba* clause, the 'perfective' *tara* clause, and the 'assertive' *nara(ba)* clause (Kuno, 1973).

(4) a. (Moshi) John-ga ku**reba** Mary-wa kigen-ga warui
(If) John-NOM come.COND Mary-TOP mood-NOM bad.NONPAST
'If John comes, Mary will be in a bad mood.'
b. (Moshi) John-ga kita**ra** Mary-wa kigen-ga warui
(If) John-NOM come.PAST.if Mary-TOP mood-NOM bad.NONPAST
'If John has come, Mary will be in a bad mood.'

[2]For this particular form of verbs (and adjectives), also typically named '*TE*-form' in Japanese textbooks, I call it 'gerundive form', following Kuno (1973) and Hasegawa (1996, p.765).

[3]One of the reviewers has asked if the conditionality can be removed from the unlikeliness meaning. That is, if the sentence (2) could mean 'Even John came, and Mary is unhappy.' This is not available, which suggests that the conditionality is not optional in this structure.

c. (Moshi) John-ga kuru-**nara** Mary-wa kigen-ga
(If) John-NOM come.NONPAST-if Mary-TOP mood-NOM
warui
bad.NONPAST
'If it is the case that John comes, Mary would be in a bad mood.'

Note that all types of conditional clauses optionally take an adverb *moshi*. Although the antecedent clause in (2) does not have any of these overt conditional morphemes, it can take the adverb '*moshi*'. This is not possible without *mo*.

(5) a. (Moshi) John-ga kite-mo Mary-wa kigen-ga warui
(If) John-NOM come.GER-*mo* Mary-TOP mood-NOM bad.NONPAST
'Even if John came, Mary would be in a bad mood.'
b. *Moshi John-ga kite Mary-wa kigen-ga warui
If John-NOM come.GER Mary-TOP mood-NOM bad.NONPAST
Intended: 'If John came, Mary would be in a bad mood.'

Thus, adding *mo* to the gerundive clause makes the clause conditional.

It is not uncommon to find conditionality without an overt conditional morpheme. In English, for example, the conditional meaning arises without a canonical conditional morpheme like *if*.

(6) a. *Pay within a week and you'll get a 10 percent discount.*
(If you pay within a week you get the discount.)
b. *We need to pay the bill today or we won't get the discount.*
(If we don't pay the bill today we won't get the discount.)

(Huddleston and Pullum, 2005)

(7) a. *Standing on a chair, John can touch the ceiling.*
(If he stands on a chair, John can touch the ceiling.)
b. *In first gear, the truck might reach the top of that hill.*
(If it were in first gear, the truck might reach the top of that hill.)

(Stump, 1985)

Stump (1985) adopts possible worlds semantics, namely Kratzer's theory of conditional modality, to account for the conditional meaning in various free adjunct constructions (Kratzer, 1981, 1986). The conditionality is represented by quantification over worlds. For example, a sentence with *must* (8) can be interpreted in different ways, i.e. epistemic (8-a) or deontic (8-b).

(8) *John must be in his office now.*
a. (In view of what is known,) John must be in his office now.
b. (In view of the school regulation,) John must be in his office now.

A context dependent modal like *must* is interpreted with respect to what kind of world we are talking about. The meanings of *must* in (8-a) and (8-b) are different in that respect.

(9) a. (8-a) is true in w iff,
$\forall w' \left[\begin{array}{l} \text{what is true in } w' \text{ is the} \\ \text{closest to what we know in } w \end{array} \rightarrow \textit{in-office}(J)(w') \right]$
(John is in his office in all those possible worlds which are closest to what is known in w.)

b. (8-b) is true in w iff,
$\forall w' \left[\begin{array}{l} \text{what is true in } w' \text{ is the} \\ \text{closest to what the rule says in } w \end{array} \rightarrow \textit{in-office}(J)(w') \right]$
(John is in his office in all those possible worlds which are closest to what the rule requires in w.)

In conditional sentences, the domain of possible worlds is now specified by the antecedent clause. Thus, in the following examples, the *if*-clauses serve as a domain of universal quantification of worlds for the consequent clause to be true.

(10) a. *If you saw his car parked on campus, John must be in his office now* is true in w iff,
$\forall w' \left[\begin{array}{l} \text{what is true in } w' \text{ is the closest to} \\ \text{what we know in } w \text{ and} \\ \text{John's car was parked on campus in } w' \end{array} \rightarrow \textit{in-office}(J)(w') \right]$

b. *If it is his office hour now, John must be in his office now* is true in w iff,
$\forall w' \left[\begin{array}{l} \text{what is true in } w' \text{ is the closest to} \\ \text{what the rule requires in } w \\ \text{and it is his office hour in } w' \end{array} \rightarrow \textit{in-office}(J)(w') \right]$

Following Stump (1985), we will extend this modal analysis to the conditional sentences without an overt conditional marking. Let us assume that the modal *would* essentially works the same as *must* as suggested by Stump.[4]

2.2 Unlikeliness and 'Even'

Even in English is generally considered as a focus sensitive morpheme (Karttunen and Peters, 1979; Giannakidou, 2007). According to Karttunen and Peters (1979), the meaning of (11), which has a focus on *Bill*, indicated by capitals, is a combination of (a-c) in (12).

(11) *Even BILL likes Mary.*

(12) a. Bill likes Mary. (Assersion)
b. Other people besides Bill like Mary. (Existential Presupposition)
c. Of the people under consideration, Bill is the least likely to like Mary. (Scalar Presupposition)

The following shows one way to formalize (12) (cf. Giannakidou (2007); Nakanishi (2006); Yoshimura (2007)).

[4] "**Would** and **might**, according to Kratzer, are interpreted just like **must** and **can**, respectively. [...] **Would** and **might**, furthermore, can be used with **if**-clauses whose propositions are incompatible with 'common knowledge', or the presuppositions of language users[...]" (Stump, 1985, 49-50)

(13) Where x is a variable for individuals, *like-mary*(*Bill*) corresponds to the proposition 'Bill likes Mary', C a set of individuals that is salient in the context,

a. *like-mary*(*Bill*)=1
b. $\exists x \in C[x \neq Bill \wedge like\text{-}mary(x)]$ (A set of alternatives)
c. $\forall x \in C[x \neq Bill \rightarrow like\text{-}mary(Bill) <_{likely} like\text{-}mary(x)]$ (Scalar Presupposition)

Here, the set of alternatives is a set of entities, i.e. the people other than Bill.

On the other hand, Guerzoni and Lim (2007) formalize (12) in another way.

(14) Where p is a variable for propositions, w a possible world, C a set of propositions that has derived from focus assignment, and *Bill-likes-Mary*(w) corresponds to 'Bill likes Mary in w'',

a. *Bill-likes-Mary*(w)=1
b. $\exists p \in C[p \neq Bill\text{-}likes\text{-}Mary(w) \wedge p(w) = 1]$
c. $\forall p \in C[p \neq Bill\text{-}likes\text{-}Mary \rightarrow Bill\text{-}likes\text{-}Mary <_{likely} p]$

Instead of the set of entities, (14) has a set of propositions. Among the set of propositions, 'Bill likes Mary' is the least likely case. By adopting alternative semantics for focus (Rooth, 1992, 1997), the set of propositions is generated basically by substituting the focused phrase with other relevant phrases. In the case of (11), the set C looks like (15).

(15) C={Bill likes Mary, John likes Mary, George likes Mary, ...}

According to them, a concessive conditional in (16), where *John* is focused, is analyzed in the following way.

(16) *Even if JOHN came, Mary would be in a bad mood.*

(17) a. *If John came Mary is in a bad mood*(w)=1
b. $\exists p \in C[p \neq$ *If John came Mary is in a bad mood*$(w) \wedge p(w) = 1]$
c. $\forall p \in C[p \neq$ *If John came Mary is in a bad mood* $\rightarrow$ *If John came Mary is in a bad mood* $<_{likely} p]$
d. C = {If Bill came Mary is in a bad mood, If Sue came Mary is in a bad mood, If Alex came Mary is in a bad mood, ...}

This shows that (16) means the same as 'if John came Mary is in a bad mood' with a scalar unlikeliness meaning such that 'if John came Mary is in a bad mood' is the least likely proposition among others in C.

Guerzoni and Lim (2007) also analyze a case in which an *even-if* sentence does not have an apparent focuse phrase like *JOHN* in the antecedent clause. They posit a phonologically null morpheme AFF, referring to Höhle's (1992) VERUM focus.

(18) Even if John AFF came, Mary would be in a bad mood.

According to them, the null AFF can be focused, in which case the alternative set looks like (19).

(19) $C = \left\{ \begin{array}{l} \text{if John came Mary would be in a bad mood,} \\ \text{if John did not come Mary would be in a bad mood} \end{array} \right\}$

My analysis is not concerned with the AFF morpheme. However, I share the idea that the unlikeliness meaning involves an alternative set of propositions. In the next section, I present my analysis of the Japanese concessive conditionals based on the two basic concepts reviewed in this section.

3 A Solution Proposal

3.1 The Gerundive Construction

Before presenting an analysis of *mo*, let us first turn to the gerundive construction so that we can add *mo* later and derive the meaning compositionally.

(20) John-ga kite Mary-wa gokigen-da
John-NOM come.GER Mary-TOP happy-is.NONPAST
'John came, and Mary is happy.'

The gerundive construction (20) looks like a coordination, or a conjunction of two propositions. It is true that John came and that Mary is happy. I will further add a notion of normality that derives likeliness. For the speaker who says (20), it is normal for the two events, John's coming and Mary's being in a good mood, to co-occur in a particular world.[5] I implement this normality using quantification over possible world w'.

(21) $[\![\text{GER}]\!]^w = \lambda p_{\langle s,t\rangle} \lambda q_{\langle s,t\rangle} \cdot \left[\begin{array}{c} p(w) \wedge q(w) \wedge \\ \forall w'[[\text{NORM}_w(w') \wedge \textit{john-came}(w')] \rightarrow q(w')] \end{array} \right]$
Where $\text{NORM}_w(w')$ stands for 'what is true in w' is the closest to what we think is normal in w'

In case of (20), by substituting p with 'John came in w' and q with 'Mary is happy in w', we get the meaning (22).

(22) $[\![(20)]\!]^w = \left[\begin{array}{c} \textit{john-came}(w) \wedge \textit{happy-mary}(w) \wedge \\ \forall w'[[\text{NORM}_w(w') \wedge \textit{john}-\textit{came}(w')] \rightarrow \textit{happy-mary}(w')] \end{array} \right]$

Thus, (20) means that John came and Mary is happy. Furthermore, there is a sense of normality, i.e. in all normal worlds, if John comes Mary is happy. With respect to the normal worlds in which Mary is happy if John came, the coordinated statement 'John came and Mary is happy' is nothing surprising or unlikely.[6]

[5] I set aside an issue of tense. The gerundive form lacks past/non-past morphology, therefore its interpretation of tense is not clear. I assume a free variable for the tense of gerundive clause to be given temporal information in some way.

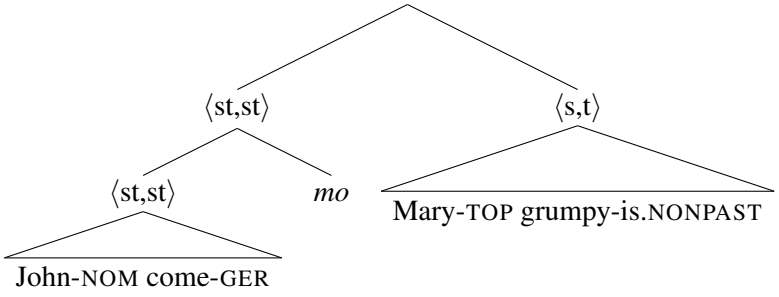
[6] If the two events, John's coming and Mary's being in a good mood, are not expected to be normal things to co-occur, then the conjunction 'but' may be more suitable.
John-ga kita-kedo Mary-wa gokigen-da.
John-NOM come.PAST-but Mary-*top* happy-is.NONPAST
'John came, but Mary is happy.'

3.2 Quantification by *MO*

What has been observed in section 1 is that the particle *mo*, being attached to the gerundive clause, introduces conditionality and unlikeliness. I adopt the modal analysis for conditionals (section 2.1), and propose the denotation of *mo* as in (23). It departs from the analyses of *even* in section 2.2, in that it does not have the scalar likeliness representation in a form of $<_{likely}$. It nevertheless derives the unlikeliness meaning of concessive conditionals, as I will explain below.

(23) $[\![mo]\!]^w = \lambda f_{\langle st,st\rangle}\lambda q_{\langle s,t\rangle}.\exists q'[q' \neq q \wedge f(q')(w)] \wedge \forall w'[f(q')(w) \rightarrow q(w')]$

(24)



First, *mo* takes the first argument, a set of propositions $f_{\langle st,st\rangle}$ (the gerundive clause [John-NOM come.GER]).

(25) $[\![mo]\!]^w([\![\textit{John}\text{-NOM } \textit{come}.\text{GER}]\!]^w) = \lambda q.\left[\begin{array}{l}\exists q'[[q' \neq q] \wedge \textit{John-came}(q')(w)] \wedge \\ \forall w'[\textit{John-came}(q')(w) \rightarrow q(w')]\end{array}\right]$

Then, it takes the second argument, a proposition $q_{\langle s,t\rangle}$ (the consequent clause [Mary-TOP grumpy-is.NONPAST]), which yields the concessive conditional (2).

(26) $[\![(2)]\!]^w = [\![\textit{John}\text{-NOM } \textit{come}.\text{GER-}\textit{mo}]\!]^w([\![\textit{Mary}\text{-TOP } \textit{grumpy-is}]\!]^w)$
$= \left[\begin{array}{ll}\exists q'[[q' \neq \textit{grumpy-Mary} \wedge \textit{John-came}(q')(w)] \wedge & \cdots(\text{i}) \\ \forall w'[\textit{John-came}(q')(w) \rightarrow \textit{grumpy}\text{-Mary}(w')] & \cdots(\text{ii})\end{array}\right]$

(27) (2) is true in w iff

a. There is an alternative proposition q' that is not 'Mary is in a bad mood', for instance 'Mary is happy', such that
$[\![\textit{John}\text{-NOM } \textit{come}.\text{GER}]\!]^w(q')$, and ……(i)

b. For all worlds w' such that $[\![\text{John-NOM come.GER}]\!]^w(q')$,
Mary is in a bad mood in w'. ……(ii)

It may not be clear where the unlikeliness meaning is in (27). Unlike previous proposals for *even*, my denotation of *mo* does not have a scalar likeliness meaning in a form of $<_{likely}$. For the present analysis, the crucial part which is responsible for the (un)likeliness meaning is the gerundive clause. Let me illustrate (27) in more detail referring to the proposed denotation of the gerundive morpheme.

(28) From (21),
$[\![\textit{John}\text{-NOM } \textit{come}.\text{GER}]\!]^{w}(q')$
$= \left[\begin{array}{c} \textit{john-came}(w) \wedge q'(w) \wedge \\ \forall w'[[\text{NORM}_{w}(w') \wedge \textit{john-came}(w')] \rightarrow q'(w')] \end{array} \right]$

Suppose q' a proposition such as 'Mary is happy'.[7] (28) is a gerundive sentence, meaning 'John came and Mary is happy'. It also presupposes that 'normally if John came Mary is happy'. In other word, the presupposition 'normally if John came Mary is happy' is what makes the conjunction 'John came and Mary is happy' likely and usual. (i) states an existence of such q'. (ii) involves a quantification over possible worlds. The domain of restriction is the presupposed normal worlds w' that has been introduced by the gerundive clause (28).

(29) The meaning of (ii):
$\forall w'[[\![\textit{John}\text{-NOM } \textit{come}.\text{GER}]\!]^{w}(q') \rightarrow [\![\textit{Mary}\text{-TOP } \textit{grumpy-is}]\!]^{w'}]$
$= \forall w' \left[\left[\begin{array}{c} \textit{john-came}(w) \wedge q'(w) \wedge \\ \forall w'[[\text{NORM}_{w}(w') \wedge \textit{john-came}(w')] \rightarrow q'(w')] \end{array} \right] \rightarrow \textit{grumpy-Mary}(w') \right]$

This shows that in all worlds w', Mary is in a bad mood. The domain of w' is the normal world that originates from the gerundive clause, in which 'Mary is happy if John came' is considered to be normal. 'Mary is in a bad mood in w'' is out of the normal situation that exist at this point. Therefore, it is unexpected with respect to the normality introduced by the gerundive construction.

In this section, I have shown how the combination of the gerundive construction and *mo* derives the concessive conditional meaning, conditionality and unlikeliness, in a compositional way. The key point is that it is not the particle *mo* itself, but is the gerundive clause that can presuppose the normality. In the remaining part of the paper, I consider some other peculiarities of the gerundive clause and *mo* and investigate further issues that still need to be accounted for.

4 Further Issues

4.1 On MO

One of the things I attempted is not to impose the unlikeliness meaning directly onto the denotation of *mo*. The intuition behind this is that *mo*, just by itself, probably does not inherently have such (un)likeliness meaning. The following examples show that *mo* appears to function as the additive particle 'too' or 'also' without the 'even' meaning.

(30) a. John-**mo** san-ji-ni keeki-o tabeta.
John-*mo* three-o'clock-at cake-ACC eat.PAST
'John ate cake at 3 too.' (Someone besides John ate cake at 3.)
b. John-ga san-ji-ni keeki-**mo** tabeta.
John-NOM three-o'clock-at cake-*mo* eat.PAST
'John ate cake too at 3.' (John ate something besides cake at 3.)

[7] I am simplifying the possible worlds: Mary is either in a bad mood (grumpy) or happy.

c. John-ga san-ji-ni-**mo** keeki-o tabeta.
John-NOM three-o'clock-at-*mo* cake-ACC eat.PAST
'John ate cake at 3 too.' (John ate cake at some other time.)
d. Mary-wa [John-ga keeki-o tabeta]-to-**mo** itteita.
Mary-TOP [John-NOM cake-ACC eat.PAST]-COMP-*mo* say.PAST
'Mary also said John ate cake.' (Mary said something else.)

One might assume that *mo* in (30) and *mo* in concessive conditionals are lexically ambiguous: one for the additive particle that is attached to a noun phrase, and the other for 'even' when it occurs with a gerundive clause.[8]

There are other cases, where *mo* occurs with some specific amount expressions such as 'three pieces' and '18 hours', which results in neither the additive meaning nor the 'even' meaning.

(31) a. John-ga keeki-o san-kire-**mo** tabeta.
John-NOM cake-ACC three-pieces-*mo* eat.PAST
'John ate three pieces of cake.' (Three pieces of cake is a lot!)
b. John-ga juuhachi-jikan-**mo** neta.
John-NOM eighteen-hours-*mo* sleep.PAST
'John slept for 18 hours.' (18 hours of sleep is a lot!)

The sentences in (31) express the speaker's surprise with respect to the amount.[9] If this surprise meaning should also originate from the notion of normality, my attempt to excluding the likeliness meaning from the denotation of *mo* may not be plausible. However, the analysis of (31) requires an investigation of how the numeral/amount expressions work, which goes beyond the topic of this paper.

Another major issue of *mo*, besides the additive meaning and the 'even' meaning, is its property of quantification over variables introduces by *wh*-phrases (Nishigauchi, 1991; Kratzer and Shimoyama, 2002; Shimoyama, 2006).

(32) Dono-gakusee-mo odotta.
Which-student-*mo* danced
'Every student danced.' (Shimoyama, 2006)

According to their view, the *wh*-phrase in (32) provides a set of entities that are students, which will be quantified by *mo*.

(33) a. For $[\![\alpha]\!]^g \subset D_e$, $[\![\alpha \text{ mo}]\!]^g = \{\lambda P \forall x[x \in [\![\alpha]\!]^g \rightarrow P(x) = 1]\}$
b. $\{\forall x[x \in \{y : \text{student}(y)\} \rightarrow \text{dance}(x)]\}$ (Shimoyama, 2006)

The denotation of *mo* in (23) proposed in this paper cannot directly account for this fact. The denotation (23) so far only works for the case where *mo* takes a function from proposition to proposition, a set of propositions, and not an entity or a set of entities.

[8]However, as noted by Giannakidou (2007) and also pointed out by Henk Zeevat (p.c.), the cross-linguistic evidence seems to suggest that it is not an accident for the additive particle and the 'even'-like morpheme to be expressed by the same morpheme.

[9]It can**not** mean 'surprisingly **less**' for unknown reasons.

Again, at this point, we can posit a lexical ambiguity view to this fact too, leaving a comprehensive understanding of the multi-functionality of *mo* for future research.

4.2 On the Gerundive Form

At the beginning of the paper, we observed that the meaning of a simple gerundive construction in Japanese looks like a coordination of two clauses.

(3) John-ga kite Mary-wa fukigen-da
John-NOM come.GER Mary-TOP grumpy-is.NONPAST
'John came, and Mary is/will be in a bad mood.'

Unlike the logical conjunction, the proposed denotation of the gerundive clause has a part where the two clauses are in an antecedent-consequent relationship ($\forall w'[\text{NORM}_w(w') \wedge$ *john-came*$(w') \rightarrow q(w')]$) in addition to the conjunctive meaning ($p(w) \wedge q(w)$).

(21) $[\![\text{GER}]\!]^w = \lambda p_{\langle s,t\rangle} \lambda q_{\langle s,t\rangle} \cdot \left[\begin{array}{c} p(w) \wedge q(w) \wedge \\ \forall w'[\text{NORM}_w(w') \wedge \textit{john-came}(w') \rightarrow q(w')] \end{array} \right]$

This predicts that for any gerundive clause this antecedent-consequent relationship holds in terms of the normal world w'. That is, whenever we see a gerundive morpheme, it is presupposed that 'if p then q' is normal.

The following shows that the gerundive form appears in various kinds of coordinate constructions.

(34) a. Mary-wa [yasashiku**te**] [kawaii]
Mary-TOP kind.GER cute.NONPAST
'Mary is kind and cute.'
b. John-wa [hon-o yon**de**] [terebi-o mita]
John-TOP book-ACC read.GER TV-ACC watch.PAST
'John read a book and watched TV.'
c. John-wa keeki-o [tsukut**te**] [tabeta]
John-TOP cake-ACC make.GER eat.PAST
'John made and ate the cake.'

Since the proposed gerundive meaning has a property of coordinating two propositions, which can be extended to account for these facts by assuming that they are syntactically derived from a clausal source.

(35) [John-wa keeki-o tsukut**te**] [~~John-wa keeki-o~~ tabeta]
John-TOP cake-ACC make.GER John-TOPcake-ACC eat.PAST
'John made and ate the cake.'

However, the proposed denotation is not extendable to the case where the clausal coordinate structure is less apparent.

(36) a. John-ga nete-iru.
John-NOM sleep.GER-is.NONPAST
'John is sleeping.'

b. John-ga Mary-ni hon-o yonde-ageta.
John-NOM Mary-DAT book-ACC read.GER-give.PAST
'John read a book to Mary.'

Although there is a gerundive form in (36), these do not seem to be derived from coordination of two propositions, as the recovered structures below show.

(37) a. [John-ga nete] [~~John-ga~~ iru].
John-NOM sleep.GER John-NOM is.NONPAST
'John sleeps and John is there.'
b. [John-ga Mary-ni hon-o yonde]
John-NOM Mary-DAT book-ACC read.GER
[~~John-ga Mary-ni hon-o~~ ageta].
John-NOM Mary-DAT book-ACC give.PAST
'John read Mary a book and John gave Mary a book.'

Intuitively, *nete-iru* and *yonde-ageta* form a complex verb rather than having a clausal source. Once again, one option is to assume lexical ambiguity for the gerundive morpheme.

4.3 The Notion of 'Normality'

My analysis derived the 'even if' meaning from the gerundive construction and *mo* referring to the notion normality. However, there are some cases in which the same combination of the gerundive clause and *mo* is interpreted not as 'even if' but as part of deontic expression.

(38) a. John-ga kite-mo iidesu-yo.
John-NOM come.GER-*mo* good.NONPAST(POLITE)-*yo*
Lit. 'It is ok for John to come.'/'John may come.' (Permission)
b. John-ga kite-wa ikemasen.
John-NOM come.GER-TOP/CONT disallowed.NONPAST(POLITE)
Lit. 'It is not ok for John to come.'/'John may not come.'(Prohibition)

At a glance, the notion of normality may not be suitable to account for this kind of modal meaning. Nevertheless, since my account for concessive conditionals is based on the conditional modal analysis, the present approach may account for (38-a) having some way to analyze the meaning of permission.[10]

[10]The next further question is why *mo* cannot appear in (38-b) with the prohibition meaning. Stefan Kaufmann asked me if I would like to analogously extend the analysis of *mo* to *wa* in (38-b). At this point, I have no clue, but it will be interesting to investigate the possibility of quantification over possible worlds by the topic/contrastive marker *wa*.

5 Conclusion

I presented a puzzle in Japanese where the particle *mo* expresses conditionality and unlikeliness. Based on Karttunen and Peter's (1979) view on 'even', the analysis has incorporated Kratzer-Stump style conditional modality to it in order to derive the conditional meaning and the unlikeliness meaning. By doing this in a compositional way, I show how the conjunctive meaning turns into concessive conditionals. The unlikeliness meaning is explained not by the existence of a morpheme that inherently has the 'unlikeliness' scalar meaning, but as the interaction between the particle *mo* that has a quantificational force and the gerundive clause that provides the notion of normality.

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Asserted and Implicated Meanings in Catalan *Déu n'hi do*

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Abstract

In this paper, we present an analysis of the semantics and pragmatics of the lexicalized Catalan expression *Déu n'hi do*, which embeds *wh*-clauses, including exclamatives. Interestingly, though, *Déu n'hi do* sentences do not convey extreme degree, they have have different distributional properties than matrix exclamatives, and they usually – but not always – co-occur with an exclamative intonation. We argue that the peculiar properties of *Déu n'hi do* derive from the combination of the assertion and the scalar implicature it conveys, plus the conventional implicature generated by this intonation.

1 Introduction

The goal of this paper is to provide an analysis of the semantics and pragmatics of the Catalan particle *Déu n'hi do* (DND henceforth), as illustrated in (1). As a first intuitive approximation, this particle may be roughly translated in English by the meaning of the adverb *quite* when uttered with an exclamative intonation. As we spell out our analysis, it should become clear why we have chosen this paraphrase.

(1) Déu n'hi do quin fred que fa!
DND what cold that makes
'It's quite cold!'

DND is a linguistically interesting particle for the following three reasons: (1) it is a *wh*-embedding predicate that differs semantically and pragmatically from other *wh*-embedding predicates such as *know* or *it's amazing*, (2) it selects for *wh*-exclamatives, but it does not indicate extreme degree – which is in principle counter-intuitive – and (3) it shows a complex semantic behavior, conveying meaning at different semantic levels.

Our main claims in this paper are the following: (*i*) DND does not select for exclamatives or interrogatives, but for *wh*-clauses in general, (*ii*) DND generates a conversational implicature such that the proposition that is true in the actual world is compatible with the worlds that the speaker considers unusual (but not weird), and (*iii*) DND

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contributes to discourse at both at-issue and conventional implicature (CI) domains of meaning. Furthermore, apart from analyzing the properties of DND, we also argue that there is a complex relationship between different domains of meaning: i.e., only assertions are able to cancel conversational implicatures.

This paper is structured as follows: Section 2 presents some background and previous work on this particle, Section 3 gives an overview of the main properties of DND, Section 4 presents a previous analysis, which we call *an exclamative account*, and Section 5 presents our current proposal, a non-exclamative account. Finally, Section 6 concludes.

2 Background

DND comes from the lexicalization of the sentence "God gave to you" (see the gloss in (2-a)), which in Old Catalan could be used literally, as shown in (2-b), and in modern Catalan has acquired a figurative meaning. Specifically, it has become an emotive predicate, as illustrated in (2-c) and (2-d).

(2) a. Déu n'hi do
God DO.IO give
b. Doni'm un pa que Déu n'hi do.
Give me a bread that DND
'Give me some bread that God gave to you.'
c. Tinc una feina que Déu n'hi do!
I have a work that DND
'I have quite a lot of work!'
d. Déu n'hi do quina feina que tinc!
DND what work that I have
'I have quite a lot of work!'

As far as its distribution is concerned, DND can appear on its own or it can also take single or multiple *wh*-questions (cf. (3-a) and (3-b)), *wh*-exclamatives (cf. (3-c))[1] and DPs (see (3-d)).

(3) a. Déu n'hi do qui va venir a la festa!
'DND who came to the party!'
b. Déu n'hi do qui va ballar amb qui!
'DND who danced with who!'
c. Déu n'hi do que bé que sona!
'DND how good it sounds!'
d. Déu n'hi do la gent que va venir!
'DND the people who came!'

[1]This embedded clause can only be a *wh*-exclamative since the *wh*-word *que* in Catalan can only introduce *wh*-exclamatives and, crucially, not *wh*-interrogatives. Also, note that there is a second *que*, which is an optional complementizer that also occurs exclusively with exclamatives.

Sancho (2003) has argued that the basic function of DND "is that of emphasis or intensification" (p.157). He has also noted that DND can be followed by an exclamative and he claims that, in such cases, DND "only reinforces constructions which are emphatic by themselves" (p.159). The idea that DND's basic function is that of intensification is recurrent in the dictionaries that attempt to define it. For example, the classical Catalan dictionary Alcover and Moll (1968-1969) defines DND in the following way: "It is used as an emphatic exclamation, to express the greatness or importance of something or the admiration it produces". Also, in her study of interjections, Cuenca (2002) classifies DND as an expressive interjection which expresses admiration or surprise. In this paper, we will argue against both claims (1) that DND is an intensifier and (2) that DND is semantically redundant when it appears followed by a *wh*-clause. In the next Section, we present some evidence that claims (1) and (2) do not hold.

3 Properties

DND has three interesting properties, which our analysis needs to explain.

Not-extreme degree. The first interesting property of DND is that it conveys that an extreme degree has not been reached. Therefore, the discourse in (4-a), in which this lack of extreme degree is explicitly conveyed, is perfectly coherent. This contrasts with the behavior of other emotive predicates and of matrix exclamatives, which are not compatible with an explicit denial of extreme degree, as (4-b) and (4-c) show. The proposals mentioned in the previous Section mistakenly attribute to DND a purely exclamative meaning and, thus, cannot account for cases like (4-a).

(4) a. Déu n'hi do que alt que és. Tanmateix, no és extremament alt.
'DND how tall he is. However, he's not extremely tall.'
b. # It's amazing how tall he is. However, he's not extremely tall.
c. # How tall he is! However, he's not extremely tall.

Interestingly, the lack of extreme degree can be canceled and, therefore, the discourse in (5-a) is also felicitous. However, there are some restrictions on this cancelation. In particular, it cannot take place within the DND sentence itself (see (5-b)):

(5) a. Déu n'hi do que alt que és! De fet, és extremament alt.
'DND how tall he is! In fact, he's extremely tall.'
b. # Déu n'hi do que extremament alt que és!
'DND how extremely tall he is!'

Discourse possibilities. DND can appear in some contexts were matrix *wh*-clauses are not acceptable. For example, DND can answer questions ((6-b)), while *wh*-exclamatives and other emotive predicates cannot ((6-c) and (6-d)).

(6) a. Have you published many papers?
b. Déu n'hi do.
c. # It's amazing.
d. # How many papers I've published!

Additionally, DND can be embedded syntactically in some contexts that do not allow for matrix *wh*-clauses, such as verbs of belief (see (7)):

(7) Crec que *(Déu n'hi do) que guapo que és el seu nòvio!
'I believe that DND how cute her boyfriend is!'

Intonation. The third interesting property of DND is that it usually appears with an exclamative intonation (ExInt, henceforth), but can also appear without it and, in that case, it is pronounced with a plain declarative intonation (see (8)).

(8) a. La Júlia creu que [Déu n'hi do que guapo que és el seu nòvio!]$_{ExInt}$.
b. La Júlia creu que Déu n'hi do que guapo que és el seu nòvio.
'Júlia believes that DND how cute her boyfriend is.'

We will show in Section 5 how this variation has interesting semantic effects.

4 An exclamative account of DND

This section briefly reviews a previous analysis of DND (Mayol, 2007), which captured the lack of extreme degree that DND conveys by using the semantics of exclamatives proposed by Zanuttini and Portner (2003). We first present this analysis, then, we see its application to DND, and we close the section by justifying the need of an alternative.

4.1 Zanuttini and Porter's (2003) semantics of exclamatives

Zanuttini and Portner's (2003) proposal may be summarized as follows. They posit three elements in order to derive the semantics of exclamatives. Syntactically, exclamatives contain a *wh* operator-variable structure and an abstract factive morpheme FACT. Moreover, there is a process of widening of the domain of quantification of the *wh*-operator. Let us examine each element in turn:

(1) The *wh*-component of the sentence is responsible for creating the denotation of a set of alternative propositions, as in questions (following Hamblin 1973 and Karttunen 1977). Thus, in a context in which we are discussing what chili peppers our friend John likes to eat, the sentence in (9-a) denotes a set of propositions of the form 'he eats *x*', with a contextual restriction on the domain of quantification. The current domain of quantification is the set of peppers D1, as specified in (9-b).

(9) a. $[\![\text{what things he eats!}]\!]_w = \{p\text{: } p \text{ is true in } w \text{ and } \exists x(p = \text{'he eats } x\text{'})\}$ = {he eats poblanos, he eats serranos, he eats jalapeños}
b. D1 = {poblano, serrano, jalapeño}

(2) Let us turn now to the second ingredient: widening. At an intuitive level, widening makes the domain of quantification bigger so that it includes things we would otherwise not have considered, with more extreme values. More formally, for any clause S containing widening, the initial domain of quantification, D1, is widened to a new

domain of quantification, D3.[2] In each domain of quantification D, there is an ordering represented by $[\![\text{S}]\!]_{w,D,<}$. The widening process is such that the conditions in (10-a) and (10-b) hold:

(10) a. $[\![\text{S}]\!]_{w,D3,<}$ - $[\![\text{S}]\!]_{w,D1,<} \neq \emptyset$
b. $\forall x \forall y[(x \in D1 \ \& \ y \in (D3 - D1) \rightarrow x < y]$
c. D3= {poblano, serrano, jalapeño, güero, habanero}

That is, the difference between the widened domain D3 and the regular domain D1 is not empty; D3 adds something which was not in the previous domain D1. Besides, there is a particular ordering in the domains, such that the widened domain, D3, contains more extreme values. Continuing with (9-a), the widened domain D3 is a superset of D1, containing types of peppers with more extreme degrees of spiciness, such as the set in (10-c).

(3) The factive morpheme FACT will introduce the presupposition in (11-a): all the propositions added to the denotation of the clause through evaluation in relation to the widened domain are true. Thus, the sentence in (9-a) has the presupposition in (11-b): John eats the hottest peppers, that is, the ones contained in the widened domain, but not in the regular domain.

(11) a. $\forall p \in [\![\text{S}]\!]_{w,D3,<}$ - $[\![\text{S}]\!]_{w,D1,<}$: p is true
b. $[\![\text{what things he eats!}]\!]_w$ = {he eats güeros, he eats habaneros}

4.2 DND exclamative semantics

Mayol (2007) used the semantics of exclamatives that we just presented to capture the lack of extreme value conveyed by DND. This was achieved by introducing a further domain of quantification, D2. The proposal is that DND presupposes that there is another domain of quantification, D2,which is a proper subset of D3 and a proper superset of D1, as defined in (12).

(12) $[\![\text{DND-CP}]\!]_w$ is defined iff:
a. $[\![\text{CP}]\!]_{w,D2,<}$ - $[\![\text{CP}]\!]_{w,D1,<} \neq \emptyset$
b. $[\![\text{CP}]\!]_{w,D3,<}$ - $[\![\text{CP}]\!]_{w,D2,<} \neq \emptyset$
c. $\forall x \forall y \forall z[(x \in D1 \ \& \ y \in (D2 - D1) \& z \in (D3 - D2)) \rightarrow x < y < z]$

The domain D2 needs to be bigger than D1 (condition (12-a)) and smaller than D3 (condition (12-b)). Also, there remains the ordering in the domains (condition (12-c)), so that D1 contains the least extreme values, D3 contains all values, including the more extreme values, and D2 falls in the middle between the other two domains. For the example in (9-a), this middle domain D2 may look like the set specified in (13-a). The assertion of a DND-clause is given in (13-b). All the propositions added to the denotation when the assignment function is evaluated with respect to D2 (the middle domain) are true.

[2]Zanuttini and Portner (2003) call this widened domain *D2*. It is called *D3* here for expository purposes, as it will become clear once Mayol's (2007) analysis of DND is introduced.

(13) a. D2 = {poblano, serrano, jalapeño, güero}
b. $\forall p \in [\![\text{CP}]\!]_{w,D2,<}$ - $[\![\text{CP}]\!]_{w,D1,<}$: p is true
c. $[\![\text{DND what things he eats!}]\!]_w$ = {he eats güeros}

Thus, modifying the example in (9-a) and turning it into a DND-exclamative would yield the assertion in (13-c). That is, the assertion is that John eats mildly spicy peppers, but it says nothing about the habanero, the very spicy pepper which is a member of D3, but not of D2.

Mayol (2007) proposes that there is a further component of meaning, a scalar conversational implicature, given in (14-a): all the propositions added to the denotation when the assignment function is evaluated with respect to D3 are false. That is, there is no extreme widening. Being a conversational implicature, it can be canceled, as was shown in (5-a).

(14) a. (i) $\forall p \in [\![\text{CP}]\!]_{w,D3,<}$ - $[\![\text{CP}]\!]_{w,D2,<}$: p is false
(ii) $[\![\text{DND what things he eats!}]\!]_w$ = 'he eats habaneros' is implicated to be false.

Thus, the scalar conversational implicature of the DND-exclamative in (13-c) is that it is false that John eats the habanero, the extremely spicy pepper which is contained in D3, but not in D2.

4.3 Why an alternative?

We present an alternative approach to DND both for theoretical and empirical reasons. From the theoretical side, the notion of widening is not an uncontroversial one. It may be useful to explain the behavior of matrix exclamatives, but it also involves stipulations; for instance, it is be triggered by a null factive morpheme with an ad-hoc interpretation. Along with others (cf. D'Avis 2002; Abels 2005; Castroviejo 2006; Rett t.a.), we would like to explore whether we can do without it and still account for the data. From the empirical side, this proposal does not explain the contribution of intonation and also has nothing to say about the impossible cancelation in (5-b).

5 A non-exclamative account

The proposal we make in order to account for the properties presented in Section 3 aims to be maximally simple. This is why we are not considering *wh*-interrogatives and *wh*-exclamatives as being semantically different. Crucially, none of the aforementioned properties hinge on the fact that the *wh*-clause introduced by DND is a *wh*-interrogative or a *wh*-exclamative. For our purposes here, we leave aside their syntactical or morphological differences and we focus on the core semantic features they have in common. In particular, we consider three kinds of meaning that are involved in the utterence of a DND sentence, which will be developed in the following subsections. We first look at DND as a *wh*-embedding predicate with an at-issue meaning, then we deal with the scalar implicature it generates, and finally we elaborate on the expressive meaning that derives from the usual pairing between DND and exclamative intonation.

5.1 DND as a *wh*-embedding predicate

In order to understand the meaning that DND contributes to the at-issue dimension (that is, its descriptive or ordinary meaning, cf. Potts 2005), we take as a model Sharvit (2002)'s denotation for the verb *surprise* in (15).

(15) $[\![\text{surprise}]\!]^{H/K}(w)(Q)(a) = 1$ iff $\text{NONEXP}(a)(w) \supseteq \cap\{p : p \in Q(w) \;\&\; w \in p\}$

NONEXP(a) is the complementary set of the set compatible with a's expectations in w. (15) says that *surprise* takes as argument a world w, a Hamblin/Karttunen question denotation Q (i.e., a set of propositions) and an individual a and it yields true only if the true answer to the question Q in w is included in the set of unexpected worlds according to individual a. To illustrate it with an example, the paraphrase of (16-a) is in (16-b).

(16) a. It surprises John who came.
b. For all worlds w, the proposition that truthfully answers the question *Who came in w?* is not compatible with John's set of expected worlds.

DND resembles *surprise* in that the former also takes Q as argument, but rather than expressing unexpectedness, DND indicates that the true answer to the question is unusual.[3] That is why, instead of making use of NONEXP(a), we propose to include in its denotation another predicate, namely UNUSUAL(a).[4] We assume the following: (*i*) UNUSUAL(a) is the complement set of the set of worlds compatible with what a considers to be standard, and (*ii*) UNUSUAL(a) is a subset of the set of weird worlds (let us call it WEIRD(a)), such that the material implication in (17) holds, but it does not hold that an unusual world must be a weird one. The denotation for DND we propose, which is adapted from (15), can be seen in (18).

(17) $\forall w\, [w \in \text{WEIRD}(a) \rightarrow w \in \text{UNUSUAL}(a)]$

(18) $[\![\text{DND}]\!](w)(Q)(a) = 1$ iff $\text{UNUSUAL}(a)(w) \supseteq \cap\{p : p \in Q(w) \;\&\; w \in p\}$

The restriction imposed on the set of propositions in the formula above is not related to a's complementary set of expected worlds (i.e., NONEXP(a)), but rather to the complementary set of the set of worlds a considers to be standard (i.e., UNUSUAL(a)). The example in (19-a) can be paraphrased as in (19-b). We should also point out that, since DND is not a verb that can be inflected (unlike *surprise*), a will refer to the speaker by default. But if DND is embedded in a belief predicate, then a can identify its subject.

(19) a. Déu n'hi do quines coses que menja!
'DND what things he eats!'
b. For all worlds w, the proposition that truthfully answers the question *What things does he eat in w?* is not compatible with the speaker's set of standard worlds.

[3] We assume that when DND appears on its own – for instance when answering a question (see (6-b)) – Q is recovered from context.

[4] It is not the aim of this paper to go any deeper in the formalization of this predicate. This could be possibly done by appealing to Kratzer (1981)'s notion of *ordering source*. We thank Cécile Meier (p.c.) for this suggestion, and leave this issue for future research.

The meaning just described is asserted content, which belongs to the at-issue dimension of meaning. Assertions are characterized by (1) their ability to anwer questions, and (2) the ability of its content to embed under a predicate like *believe*, which takes propositions that may be either true or false. Since DND can answer a question ((6-b))[5] and embed under *believe* ((7)), its descriptive content (as presented in (18)) counts as at-issue meaning and, thus, can be used to make an assertion.

5.2 A scalar implicature

In this subsection we show that DND generates a scalar implicature, which conveys that the worlds we are taking into account are those which are compatible with what the speaker considers to be unusual, but not weird. In order to do so, we first take a quick look at a prototypical case of scalar implicature, namely the example of *some*.

Some is part of a scale which contains other quantificational items such as, for instance, *all*, which we represent as <some, all> (cf. Horn 1972). In these scales, every item logically entails the item on its left and implicates the negation of the item on its right. In other words, if we choose to use *some* and we are cooperative speakers, we implicate *not all*. This explains why the follow-up in (20) is pefectly natural, because we understand the first part of the sentence as meaning, by default, that the speaker did not meet all of his/her friends at the party.

(20) I met some of my friends at the party. However, I didn't meet all of them.

Still, since a scalar implicature is a particular kind of a conversational implicature and a conversational implicature can be canceled, the first part of the sentence in (21) can be followed by another sentence that denies the implicature according to which the speaker did not meet all of his friends at the party, as shown in (21).

(21) I met some of my friends at the party. In fact, I met all of them.

Now, we can draw a parallelism between *some* and DND. We propose that DND generates a scalar implicature by virtue of it including UNUSUAL. In particular, we understand that UNUSUAL(a) is part of a scale of the following form: <UNUSUAL(a), WEIRD(a)>. Again, if a world is weird according to a, it must also be unusual, but an unusual world may (but must not) be a weird world. Moreover, the use of a lexical item that incorporates UNUSUAL(a) implicates that WEIRD(a) does not hold. This explains why we can both reinforce this meaning ((22)) and cancel it ((23)).

(22) Déu n'hi do que alt que és! Tanmateix, no és extremament alt.
'DND how tall he is! However, he's not extremely tall.'

(23) Déu n'hi do que alt que és! De fet, és extremament alt.
'DND how tall he is! In fact, he's extremely tall.'

In giving a first approximation to the meaning of DND ((1)), we have proposed to use the English adverb *quite*. In what remains of this subsection we will see that *quite* resembles

[5]The difference of acceptability between a answer with DND and an answer with *it's surprising* is due to the fact that the latter is factive, while the former is not.

DND in also generating a scalar implicature. In fact, *quite* – which takes as argument a gradable predicate, as in (24-b) – and DND convey similar meanings when the latter takes as argument a degree *wh*-clause, as in (24-a).

(24) a. DND how tall Pau is!
b. Pau is quite tall!

Certainly, the compositional semantics of (24-a) and (24-b) is different: whereas (24-a) involves a question denotation, we could paraphrase (24-b) as *Pau is tall to a high degree*. The similarity between DND and *quite* emerges because asserting that a proposition with a gradable property is unusual amounts to asserting that this property has a high degree. Moreover, *quite* also generates an implicature, since it is part of the following scale: <quite, very>. Hence, when we say that Pau is tall to a high degree, we implicate that this degree is not extreme. That is, *quite* implicates *not very*. Consequently, just like what happens with DND, we can both reinforce ((25-a)) and cancel ((25-b)) this implicature.

(25) a. Pau is quite tall. However, he's not very tall.
b. Pau is quite tall! In fact, he is very tall.

To sum up, we argue that DND asserts that the proposition that is true in the actual world is compatible with the worlds that the speaker considers unusual and conversationally implicates that this proposition is not compatible with the worlds that the speaker considers weird. This is how we capture the lack of extreme degree that DND conveys.

5.3 Expressive meaning

Last but not least, DND can convey a third kind of meaning, namely a conventional implicature (CI), in the sense of Potts (2005) and Potts (2007). We propose to derive this effect from the usual co-occurrence of the exclamative intonation (ExInt) and DND (cf. (8)). In particular, we see ExInt as an instance of an expressive item with similar properties as those that characterize *damn* in *The damn machine doesn't work*. Likewise, intonation takes as input at-issue meaning and returns expressive meaning, even though *damn* combines with a noun and ExInt, with an entire proposition. The meaning contributed at the expressive dimension is expressed in (26).

(26) $\text{NONEXP}_s(w) \supseteq p$

In prose, we claim that there is a proposition p which, crucially, corresponds to the true answer to the question Q at the at-issue meaning (cf. (18)) and which is incompatible with the set of the speaker's expected worlds (we are adopting here Sharvit (2002)'s NONEXP predicate to represent the complement set of the set compatible with the speaker's expected worlds).

In order to show that the information conveyed by intonation is comparable with that of a regular expressive item (i.e., an epithet, a non-restrictive relative clause or a parenthetical), we will go over the properties that Potts (2007) attributes to expressives,

starting from perspective dependence.

Expressive meaning cannot be embedded; that is, it is strictly speaker-oriented. In (27) we see that a DND sentence can embed in a belief predicate (as previously shown in (7)). If we abstract away from ExInt, UNUSUAL(a) is applied to *Júlia*, so the speaker may felicitously contribute that s/he finds this fact unsurprising. However, if the sentence includes ExInt, which involves the speaker's surprise at the true answer to the question *How late did Peter come?*, the sentence introduced by *but* is necessarily contradictory.

(27) La Júlia creu que [Déu n'hi do que tard que ha arribat en Pere (#!$_{ExInt}$)], però a mi no m'ho sembla.
'Julia believes that DND how late Peter was!, but I don't feel this way.'

Also, expressive meaning is nondisplaceable; that is, it expresses something about the utterance situation. We can show that this holds for ExInt, too, by means of the following example:

(28) Déu n'hi do que tard que va arribar en Pere ahir (#!$_{ExInt}$) Ahir em va sorprendre, però avui ja no.
'DND how late Peter was yesterday! This surprised me yesterday, but not today.'

In (28), we see that, if the DND sentence includes ExInt, then the follow-up is infelicitous, since the speaker is stating that the meaning conveyed by ExInt belongs to the past and it is not valid at the moment of utterance.

On the other hand, ExInt, like regular expressive items, shows immediacy; that is, it behaves like a performative, which achieves its intended act simply by being uttered. In other words, in using ExInt, the speaker introduces this meaning directly to the addressee's commitment set (cf. Gunlogson 2003, Bonami and Godard 2008). Crucially, unlike asserted meaning, the content conveyed by ExInt cannot be judged true or false by the rest of the discourse participants. Consider the dialogue below:

(29) a. A: Déu n'hi do que tard que va arribar en Pere ahir!$_{ExInt}$
'DND how late Peter was yesterday!'
b. B1: That's not true. He arrived as usual.
c. B2: # That's not true. I don't think this is unexpected at all.
d. B3: # That's true. I also think this is unexpected.

The reply in (29-b) is felicitous, because it is denying assertion conveyed by the DND sentence. Since it concerns the at-issue dimension, the addressee is allowed to judge it before incorporating it to his/her commitment set. In contrast, both the replies in (29-c) and (29-d), which are attempts to judge the meaning conveyed by ExInt true or false, are ruled out.

Finally, expressive meaning exhibits the property that Potts calls *independence*. This amounts to saying that it can be removed, but the descriptive meaning is still conveyed. Below, we see an example of a DND sentence without intonation, which is still able to make its contribution to the discourse felicitously.

(30) a. A: Has publicat gaire?
'Have you published much?'
b. B: Déu n'hi do.
'Quite a lot.'

The previous example shows that the at-issue and expressive meanings that DND involves are independent. Why do they co-occur so often, then? This has to do with the fact that DND asserts that something is unusual, on the one hand, and, on the other hand, unusual things are generally (but not necessarily) unexpected. Hence, the utterance of DND and ExInt allows the speaker to convey both things at a time: unusualness and unexpectedness.[6]

At this point it seems that the division of labor in at-issue, conversationally implicated and conventionally implicated meaning offers a neat picture of the behavior of DND sentences. However, we cannot still account for the contrast in (5) repeated below:

(31) a. Déu n'hi do que alt que és! De fet, és extremament alt.
'DND how tell he is! In fact, he is extremely tall.'
b. # Déu n'hi do que extremament alt que és!
'DND how extremely tall he is!'

To be able to explain the contrast above, we need to make an additional claim; we must pay attention to the kind of meaning that is being used to cancel the scalar implicature in each case. Crucially, in (31-a), the follow-up is a declarative that functions as an assertion. Thus, assertions are able to cancel implicatures. However, following Castroviejo (2008), we take *extremely* in the particular configuration exemplified by (31-b) to be a non-restrictive modifier. As such, it is a function that takes at-issue meaning as input and returns expressive meaning. In other words, it is a CI item. Our claim is, in fact, that CIs – contrary to assertions – cannot cancel scalar implicatures.[7]

In order to justify this claim, let us provide additional evidence. For starters, we can show that regular CIs, like non-restrictive relative clauses (aka *supplements* in Potts 2005), cannot cancel a scalar implicature, either. Consider the examples below:

(32) a. I met a pretty tall boy. In fact, he was extremely tall.
b. #I met a pretty tall boy, who, in fact, was extremely tall/a giant.

[6]It is an interesting issue why intonation can be embedded in those cases and not others. We leave the study of this phenomenon for further research and thank Ede Zimmermann (p.c.) for this valuable comment.

[7]There is another difference between the two cancellations in (31): the latter one does not include the discourse marker *in fact*, which is syntactically impossible in this configuration (we thank Galit Sassoon for this observation). However, we can reject the possibility that the absence of *in fact* is responsible for the ungrammaticality of (31-b) on two grounds: first, sentences which do allow for *in fact* are also unacceptable when a CI is trying to cancel an implicature (cf. (32-b)) and, second, some implicatures can be felicitously canceled even without *in fact*, cf. (i).

(i) a. John has two or more brothers.
b. John has two brothers or more.

The contrast between *a.* and *b.* shows that only at-issue meaning is able to cancel the implicature generated by *pretty* according to which the boy is tall, but not extremely tall. This holds even if the two sentences have the same amount of information, but this information is computed at different dimensions of meaning.

Not only this, it appears to be the case that presupposed meaning is also unable to cancel scalar implicatures. See for example (33):

(33) a. Some of my students came to the party. In fact, I believe that all of them came.
b. # Some of my students came to the party. In fact, I regret that all of them came.

In the examples above, we have the prototypical case of *some* (cf. Section 5.2 above), which conversationally implicates *not all*. In the *a.* sentence, the implicature is canceled by using a follow-up which functions as an assertion. On the other hand, in the follow-up of the *b.* sentence, the information according to which all of the students came to the party is presupposed and not asserted (the *that*-clause is embedded under a factive predicate). Note that this presupposed content cannot cancel the implicature. Therefore, this points to a complex relationship between different dimensions of meanings; it is not the case that the weakest meaning (here, the conversational implicature) always disappears; rather, only assertions seem to be able to cancel it.

6 Conclusions

To wrap up, we have shown that *Déu n'hi do* conveys at the at-issue dimension a meaning similar to *quite*, which can be canceled, but only by means of another assertion (and not by means of a CI or a presupposition). Also, in combination with an exclamative intonation, *Déu n'hi do* contributes to the expressive dimension a conventional implicated meaning, roughly, that the proposition about which *Déu n'hi do* asserts that is unusual is also unexpected.

This being a language-specific phenomenon, we may wonder whether this research is relevant beyond Catalan *Déu n'hi do*. We strongly believe the answer is yes. First, we have shown that we can account for the properties of embedded *wh*-clauses with a single semantic denotation: i.e., we can subsume the semantics of interrogatives and exclamatives under a common semantics. We have thus offered additional evidence in favor of an analysis of embedded *wh*-exclamatives viewed as having the same at-issue content as *wh*-interrogatives. Second, we have highlighted the semantic role of intonation and have proposed an interpretation for it. And third, we have identified another parameter that characterizes assertions (w.r.t. CIs and presuppositions), namely the ability to cancel conversational implicatures.

Of course, many questions regarding the topics touched upon in this paper remain unanswered. The first one we consider concerns anyone working on expressives: we should formalize and restrict the interactions between the at-issue and the CI dimension. Moreover, it would be interesting to test to what extent *Déu n'hi do* and other emotive predicates like *it's amazing* or *you wouldn't believe* differ. And finally, we would like to

find out whether DPs introduced by *Déu n'hi do* provide any arguments for or against so-called *concealed exclamations*.

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Two Kinds of Modified Numerals

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Abstract

In this paper I argue that there are two kinds of numeral modifiers: (Class-A) those that express the comparison of a certain cardinality with the value expressed by the numeral and (Class-B) those that express a bound on a degree property.

1 Introduction

The landscape of modified numerals is strikingly diverse. Apart from what I will call *comparative quantifiers*, like "more than 100", "fewer than 100", "less than 100", "no more than 100", "no fewer than 100", etc., there are *superlative quantifiers* like "at least 100" and "at most 100"; *disjunctive quantifiers* like "100 or more", "100 or fewer", etc.; *prepositional quantifiers* like the locative "under 100", "over 100" and "between 100 and 200" and the directional "from 100" and "up to 100"; and a whole range of other quantifiers based on operators expressing a bound, such as "minimally 100", "maximally 100" or "100 tops".

Recently, a number of studies have tried to explain this variation. Such investigations usually concern the specific quirks of certain modified numerals.[1] While I believe that it is important to have a semantic analysis of modified numerals on a case by case basis, I also believe that what is lacking from the literature so far is a view of to what extent the various modified numerals involve similar semantic structures. In this paper, I will attempt to reach a generalisation along these lines by claiming that there are two kinds of modified numerals: (A) those that relate the numeral to some (specific) cardinality and (B) those that place a bound on the cardinality of some property. The difference will be made clear below. The most obvious examples of (A) are comparative modified numerals like "more/fewer than". Most other kinds of modified numerals fall in the second class.

[1] See, e.g., Geurts and Nouwen (2007); Umbach (2006); Corblin (2007); Krifka (2007) on *at least/most*, Corver and Zwarts (2006) on locative quantifiers, Nouwen (2008a) on directional quantifiers, Nouwen (2008b) on negative comparative quantifiers. See also Nouwen (2008c) for an overview.

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I will start by making clear what distinguishes the two classes of modified numerals by presenting a body of data that sets them apart. Then, in section 3, I introduce a well-founded decompositional treatment of comparative quantifiers (Hackl, 2000), which I take to represent the proper treatment of class A modifiers. In section 4, I propose that class B modifiers are operators that indicate maxima/minima. Section 5 concludes by discussing a remaining problem as well as some speculations about which modifiers belong to which class.

2 Class A and class B modified numerals

It is a striking feature of comparative quantifiers that they can be used to assert extremely weak propositions. For instance, (1) is acceptable, even though it expresses a rather under-informative truth.

(1) A hexagon has fewer than 10 sides. A

This example contrasts strongly with the examples in (2), which are all unacceptable. (Or, alternatively, one might have the intuition that they are *false*).

(2) a. #A hexagon has at most 10 sides. B
b. #A hexagon has maximally 10 sides. B
c. #A hexagon has up to 10 sides. B

Why is this so? A naive theory might have it that (1) states that the number of sides in a hexagon is strictly smaller than 10 (i.e. $<$10), and that the only difference with (2) is that, there, it is stated that this number is smaller *or equal* to 10 (i.e.$\leq$ 10). Clearly, 6 is both $<$ 10 and $\leq$ 10. So why are not both kinds of examples under-informative but true?

Let's call quantifiers that are acceptable in such examples *class A* quantifiers and those that are like (2) *class B* quantifiers. As the contrast between (3) and (4) shows, the distinction is also visible with lower bound quantifiers. That is, (3) is under-informative, yet true and acceptable, while the examples in (4) are unacceptable/false.

(3) A hexagon has more than 3 sides. A

(4) #A hexagon has { at least / minimally } 3 sides. B

What I think is the underlying problem of examples involving class B expressions is that such quantifiers are incapable of relating to definite amounts. Imagine, for instance, that we are talking about my new laptop and that we are concerned with how much internal memory it has. Say, it has 1GB of memory and that I know that it has so much memory. In case, for instance, you just told me that your laptop has 2GB of memory, then I can assert (5).

(5) I know exactly how much memory my laptop has and it is less than 2GB.

Or, if your computer has a mere 512MB of memory, I can boast that:

(6) My laptop has more than 512MB of memory.

In these examples, I am comparing the definite amount of 1GB to some given contrasting amount 2GB (512MB) by means of "less than" ("more than"). This is something class A quantifiers can do very well, but something that is unavailable for class B modified numerals:

(7) I know exactly how much memory my laptop has...
  a. ...and it is { #at most / #maximally / #up to } 2GB.
  b. ...and it is { #at least / #minimally } 512MB.

In contrast to (7), class B quantifiers are acceptable when what is 'under discussion' is not a definite amount, but rather a range of amounts, as in (8).

(8) a. Computers of this kind have { at most / maximally / up to } 2GB of memory.
  b. Computers of this kind have { at least / minimally } 512MB of memory.

In other words, it appear that class B quantifiers relate to ranges of values, rather than to a single specific cardinality. This intuition is supported (9).

(9) Jasper invited maximally 50 people to his party.

We normally interpret (9) to indicate that the speaker does not know how many people Jasper invited. That is, it is unacceptable for a speaker to utter (9) if s/he has a definite amount in mind, which is why the rider in (10) is infelicitous. (Cf. Geurts and Nouwen (2007), Corblin (2007)).

(10) Jasper invited maximally 50 people to his party, #namely 43.

By assuming that the speaker does not know the exact amount, (9) is interpreted as being about the range of values possible from the speaker's perspective. The speaker thus states that there is a bound on that range. The same intuition occurs if we substitute "maximally 50" by any other class B quantifier.

3 Hackl's semantics for comparative modifiers

In this section, I discuss the semantics for comparative modified numerals as developed in Hackl (2000). I will assume that this represents the proper treatment of class A numeral modifiers. I also extend the framework slightly by adding a way to account for the ambiguity of non-modified numerals.

3.1 Class A modifiers as degree quantifiers

What is the semantics of a class A quantifier? It is tempting to think that class A quantifiers correspond to the well-known generalised quantifier-style determiner denotations such as the one in (11).

(11) $[\![\text{fewer than } 10]\!] = \lambda PQ.|P \cap Q| < 10$

In the past decade it has become clear that it is important to have a closer look at these modified numerals (Krifka, 1999; Hackl, 2000). In what follows, I will assume the following semantics of "fewer than", which is based on the arguments in Hackl (2000).

(12) $[\![\text{fewer than } 10]\!] = \lambda M.\ \max_n(M(n)) < 10$

The workings of this definition will become clear below, but one of the main motivations for an analysis along this line can be pointed out immediately. The semantics in (12) is simply that of a comparative construction, where cardinalities are seen as a special kind of degrees. That is, like the comparative, it involves a degree predicate M and a maximality operator that applies to this predicate (Heim, 2000). In other words, (12) is completely parallel to *other* comparatives, like (13).

(13) $[\![\text{shorter than } d]\!] = \lambda M.\max_{d'}(M(d')) < d$

Hackl assumes that argument DPs containing a (modified) numeral always contain a silent counting quantifier "many":

(14) $[\![\text{many}]\!] = \lambda n \lambda P \lambda Q.\exists x[\#x = n \ \&\ P(x) \ \&\ Q(x)]$

(15) 10 sushis $\rightsquigarrow$ [$_{\text{DP}}$ [10 many] sushis]

In this framework, the numeral is an argument of the quantifier "many". By applying [10 many] to the noun (phrase), the standard generalised quantifier denotation of "10 sushis" is derived: $\lambda Q.\exists x[\#x = 10 \ \&\ \text{sushi}(x) \ \&\ Q(x)]$. The structure of a DP containing a modified numeral does not differ essentially. Modified numerals are also the argument of a counting quantifier, as illustrated in (16).

(16) fewer than 10 sushis $\rightsquigarrow$ [$_{\text{DP}}$ [[fewer than 10] many] sushis]

"Fewer than 10", however, is a (degree) quantifier, not a number constant. Thus, for type purposes, the modified numeral in (16) has to move, leaving a degree trace and creating a degree property.

(17) Jasper ate fewer than 10 sushis.
$\rightsquigarrow$ [[fewer than 10] [λn [Jasper ate n many sushis]]]

This leads to the following interpretation, which results in the desired simple truth-conditions.

(18) $[\lambda M.\max_n(M(n)) < 10]$ ($\lambda n.\exists x[\#x = n \ \&\ \text{sushi}(x) \ \&\ \text{ate}(j,x)]$)
$= \max_n(\exists x[\#x = n \ \&\ \text{sushi}(x) \ \&\ \text{ate}(j,x)]) < 10$

If, like degree operators, modified numeral operators can take scope, we expect to find scope alternations that resemble those found with degree operators (Heim, 2000). As Hackl observed, this is borne out by examples like the following.[2] The two readings of (19) are an upper bound reading, and one which is very weak, stating simply that

[2] I show here the scope interaction with weak modality. There is a similar interaction with strong modals. The example in (i), for instance is ambiguous with (i-a) and (i-b) as its two readings. See Hackl (2000) for details.

values below the numeral are within what is permitted, without stating anything about the permissions for higher values.

(19) John is allowed to bring fewer than 10 friends.
   a. 'John shouldn't bring more than 9 friends'
   b. 'It's OK if John brings 9 or fewer friends (and it might also be OK if he brings more)'

Following Heim (2000), Hackl analyses this ambiguity as resulting from alternative scope orderings of the modal and the comparative quantifier.

(20) $\max_n(\Diamond\exists x[\#x = n \;\&\; \text{friend}(x) \;\&\; \text{bring}(j,x)]) < 6$
[[fewer than 6] [λn [allow [John invite n-many friends]]]]

(21) $\Diamond[\max_n(\exists x[\#x = n \;\&\; \text{friend}(x) \;\&\; \text{bring}(j,x)]) < 6]$
[allow [[fewer than 6] [λn [John invite n-many friends]]]]

The reader may check that Hackl's predicted readings in (20) and (21) are indeed the attested ones.

3.2 Class B modifiers are different

These analyses are strongly supportive of an approach which treats comparative quantifiers as comparative constructions. The question now is whether class B quantifiers should be given a similar treatment. In other words, will the semantics in (22) do?

(22) $[\text{up to / maximally / at most / etc... } 10] =^{?} \lambda M.\ \max_n(M(n)) \leq 10$

Choosing a semantics that is parallel to that of "fewer than" is partly unintuitive since the class B quantifiers are not comparative constructions. Yet, cases like "maximally 10" suggest that the crucial ingredient of the semantics is the same, namely a maximality operator. The unsuitability of the analysis in (22) becomes immediately apparent, however, if we investigate examples with class B modified numerals embedded under a weak modal: these turn out not to be ambiguous. Class B modifiers like *maximally*, *up to* and *at most* always yield an upper bound on what is allowed and resist the weaker reading that was found with comparative modifiers.

(23) John is allowed to bring { up to / at most / maximally } 10 friends.
#But more is fine too.

A further interesting property of the interaction of class B modified numeral quantifiers and modals is that weak modals intervene with the inferences about speaker knowledge that we found for simple sentences. Above, I observed that (24) licenses the inference

(i) (Bill has to read 6 books.) John is required to read fewer than 6 books.
   a. 'John shouldn't read more than 5 books'
   b. 'The minimal number of books John should read is fewer than 6'

For reasons explained in Heim (2000), structural ambiguity arising from degree quantifiers and intensional operators like modals is only visible with non-upward entailing quantifiers.

that the speaker does not know how many friends Jasper invited. In contrast, (25) does not license any such inference; it is compatible with the speaker knowing exactly what is and what is not allowed.

(24) Jasper invited maximally 50 friends.

(25) Jasper is allowed to invite maximally 50 friends.

These observations add to the data separating class A from class B quantifiers. Summarising, the distinctions are then as follows. First of all, class B quantifiers, but not class A quantifiers, resist definite amounts, except when embedded under a weak modal. Second, class B quantifiers, but not class A quantifiers, resist weak readings when embedded under a weak modal.

In the next section I will argue that the peculiarities of class B quantifiers can be explained if we assume that they are quite simply maxima and minima indicators. Basically, what I propose is that the semantics of "maximally" ("minimally") is simply the operator $\max_d$ ($\min_d$). This might be perceived as stating the obvious. What is not obvious, however, is how such a proposal accounts for the difference between class A and class B quantifiers. I will argue that the limited distribution of class B modifiers is due to the fact that they give rise to readings that are in competition with readings available for non-modified structures. I will show that, in many circumstances, the application of a class B modifier to a numeral yields an interpretation which is equivalent to one that was already available for the bare numeral. Before I can explain the proposal in detail, I therefore need to include an account of bare numerals in the framework.

3.3 The semantics of numerals

Above, I adopted the semantics of Hackl (2000) for comparative modified numerals. An important part in that framework is played by the counting quantifier *many*. I will rename this operator $many_1$, for, in what follows, I assume that for any (modified) numeral there are two counting quantifiers available. These two options are to account for the two meanings of numerals that may be observed: the existential weak lower-bounded meaning and the doubly bound strong meaning. An example like (26), for instance, is ambiguous between (26-a) and (26-b).

(26) Jasper read 10 books.

a. the number of books read by Jasper ≥ 10

b. the number of books read by Jasper = 10

I assume that the meaning in (26-b) is semantic and not the result of a scalar implicature that results from (26-a). See e.g. Geurts (2006) for a detailed ambiguity account, and for some compelling arguments in favour of it.

In the current framework, that of Hackl (2000), the weak reading in (26-a) is due to a weak semantics for the counting quantifier: i.e. $many_1$. I propose that the strong reading, (26-b), is accounted for by an alternative quantifier $many_2$ (taking inspiration from Geurts (2006).)

(27) $[\text{many}_1] = \lambda n \lambda P \lambda Q.\exists x[\#x = n \;\&\; P(x) \;\&\; Q(x)]$
$[\text{many}_2] = \lambda n \lambda P \lambda Q.\exists !x[\#x = n \;\&\; P(x) \;\&\; Q(x)]$

Not only does this option suffice to account for the ambiguity of bare numerals, it is moreover harmless with respect to the semantics of comparative quantifiers. That is, it is important to note that the account of the ambiguity of bare numerals does not predict further ambiguities to arise for modified numerals, since such ambiguities do not appear to exists. It is instructive to see in somewhat more detail why the availability of two counting quantifiers changes nothing for our account of comparative quantifiers. The structure in (28) is exemplary of any simple sentence with a modified numeral. As explained earlier, the modified numeral applies to the degree predicate that is created by moving the quantifier out of the DP.

(28) [MOD n [λd [Jasper read d $\text{many}_{1/2}$ books]]]

Of course, the denotation of the degree predicate depends on which of the two counting quantifiers is chosen. The predicate in (29) is the result of a structure containing *many*$_1$; the predicate in (30) is based on *many*$_2$. If, in the actual world, Jasper read 10 books, then (29) denotes $\{1,2,3,4,5,6,7,8,9,10\}$. When, however, the predicate contains the *many*$_2$ quantifier, the denotation is a singleton set: $\{10\}$ if Jasper reads 10 books. This is because only the maximal group of books read by Jasper is such that it is the unique group of that kind of a certain cardinality. In general, the *many*$_2$-based degree predicate extension is a singleton set containing the maximum of the values in the denotation of the *many*$_1$-based degree predicate.

(29) $\lambda d.\exists x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

(30) $\lambda d.\exists !x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

As discussed above, comparative quantifiers involve maximality operators. However, the maximal values for degree predicates like (29) and (30) are always equivalent. In simple sentences based on a structure like (28), the option of having two distinct counting quantifiers does therefore not result in any ambiguity.

When we turn to cases where the degree predicate is formed by moving the modified numerals over a strong modal operator, something similar can be observed. If Jasper is required to read (exactly) 10 books, then the structure in (31) yields, again, the set $\{1,2,3,4,5,6,7,8,9,10\}$. Once more, the structure which contains the bilateral counting quantifier, the one in (32), yields the set containing the maximum of its weaker counterpart.

(31) [λd [require [Jasper read d many_1 books]]]
$\rightsquigarrow \lambda d.\Box\exists x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

(32) [λd [require [Jasper read d many_2 books]]]
$\rightsquigarrow \lambda d.\Box\exists !x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

Given that the relation between (32) and (31) is once again one of a set and its maximal value, no ambiguities can be expected to arise when comparative quantifiers are applied to these two predicates. This is as is desired.

Of course, it could be that the actual situation is not one containing a specific requirement, but one with for instance a minimality requirement. Say, for instance, Jasper has to read at least 4 books. In that case, (32-a) denotes the set $\{1,2,3,4\}$. The extension of (32-b), however, is the empty set. (In such a context, there is no specific n such that Jasper has to read exactly n books.) Clearly, the maximal value for the predicate is undefined in such a case. This means the LF based on many_2 will not lead to a sensible interpretation and, so, we again do not expect to find ambiguity.

The case of predicates that are formed by abstracting over a weak modal operator is illustrated in (33) and (34). If Jasper is allowed to read a maximum of 10 books, then the two predicates are equivalent, both denoting the set $\{1,2,3,4,5,6,7,8,9,10\}$.[3]

(33) $\lambda d.\Diamond\exists x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

(34) $\lambda d.\Diamond\exists!x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]$

In sum, the option of two counting quantifiers $many_1$ and $many_2$ is irrelevant when combined with a comparative quantifier. This is because the comparative quantifier is based on maximality and the degree predicates containing the different counting quantifiers do not differ in their maximum value.

4 The semantics of class B quantifiers

I now turn to the main proposal: class B quantifiers are maxima/minima indicators. I start with the upper-bounded modifiers.

4.1 Upper bound class B modifiers

In the formula in (35) MOD generalises over any of the class B modifiers "at most", "maximally", "up to", etc.

(35) $[\![\text{MOD}]\!] \;=\; \lambda d.\lambda M.\; \max_n(M(n)) = d$

If the semantics of upper bound class B quantifiers is as in (35), then why is their distribution so limited? What I think is the reason for the awkwardness of a lot of examples with class B quantifiers is the fact that in many cases (35) is a vacuous operator. I think it will be important to find out for which degree predicates M, stating that $\max_d(M(d)) = n$ is equivalent to simply stating $M(n)$. The easy answer is that this equivalence holds when M denotes a singleton set. This observation has profound consequences for when it actually makes sense to state that the maximum of a degree predicate equals a certain value. To see this let us carefully go through the following examples.

We know from the discussion above that one of the interpretations available for (36) is (37).

(36) Jasper invited 10 people.

[3] If there is in addition a lower bound, the two predicates are no longer equivalent, but their maximum will be.

(37) $\exists!x[\#x = 10 \;\&\; \text{people}(x) \;\&\; \text{invite}(x)]$

Now consider (38), which is interpreted either as (39) or as (40).

(38) Jasper invited maximally 10 people.

(39) [maximally 10 [λd [Jasper invited d many$_1$ people]]]
$\rightsquigarrow \max_n(\exists x[\#x = n \;\&\; \text{people}(x) \;\&\; \text{invite}(j,x)]) = 10$

(40) [maximally 10 [λd [Jasper invited d many$_2$ people]]]
$\rightsquigarrow \max_n(\exists!x[\#x = n \;\&\; \text{people}(x) \;\&\; \text{invite}(j,x)]) = 10$

The interpretations in (39) and (40) are equivalent. In fact, just like we do not expect ambiguities to arise with comparative quantifiers on the basis of the *many*$_1$/*many*$_2$ choice, we do not expect any ambiguities to arise with upper-bound class B quantifiers, for the simple reason that both such operators involve a maximality operator and that the maximal values of predicates based on *many*$_1$ are always those of predicates based on *many*$_2$. In what follows, we will therefore gloss over the two equivalent options by representing the semantics following the general scheme in (41).

(41) [maximally 10 [λd [Jasper invited d many$_{1/2}$ people]]]
$\rightsquigarrow \max_n(\exists(!)x[\#x = n \;\&\; \text{people}(x) \;\&\; \text{invite}(j,x)]) = 10$

Importantly, the single reading of (38) is equivalent to (37), the strong reading of (36). The example in (36), however, reaches this interpretation by means of a much simpler linguistic form; one which does not involve a numeral modifier. I propose that this is why the reading in (41) of (38) does not surface: it is blocked by (36).

As observed above, we can nevertheless make sense of (38) once we interpret the sentence to be about what the speaker holds possible. So, a further possible reading for (38) is that in (42).

(42) $\max_n(\Diamond\exists(!)x[\#x = n \;\&\; \text{people}(x) \;\&\; \text{invite}(j,x)]) = 10$

Crucially, this interpretation is not equivalent to (43), which is the result of interpreting (36) from the perspective of speaker possibility.

(43) $\Diamond\exists!x[\#x = 10 \;\&\; \text{people}(x) \;\&\; \text{invite}(j,x)]$

In other words, the meaning in (42) for (38) is not blocked by the bare numeral form in (36) since (36) lacks this reading.

What is crucial is that degree predicates based on weak modals denote non-singleton sets even when the counting quantifier associated with the numeral is *many*$_2$. This entails that saying that the maximum value for such a predicate is n is not equivalent to saying that the predicate holds for n. As a result, whenever an upper bound class B modifier scopes over a weak modal, no blocking from the simpler bare numeral form will be able to take place. In other words, the application of an upper bound class B quantifier to a degree predicate is only felicitous if the resulting readings are not readings that can be expressed just as well by omitting the class B modifier. This is the case when a weak modal has scope inside the degree predicate.

Treating upper bound class B quantifiers as maxima indicators also explains why in the interaction with weak modality, no weak meanings occur. Consider (44).

(44) Jasper is allowed to invite maximally 10 people.

If "maximally 10" is taken to have wide scope over the modal, then we arrive at the reading that says that the maximum number of people Jasper is allowed to invite equals 10. This is not a semantic interpretation that is available for (45). Its many$_2$ reading, for instance, says that inviting exactly 10 people is something that Jasper is allowed to do. This is much weaker than our interpretation for (44). The only way we can arrive at an equally strong reading for (45) is by means of implicature.

(45) Jasper is allowed to invite 10 people

Given the fact that (45) yields weak semantic meanings, (44) lacks such weak meanings. If we take the modal in (44) to have widest scope, the resulting interpretation is one in which inviting exactly 10 people is allowed for Jasper. This is the reading for (45) discussed above, and so it is blocked.

An interesting side to the account presented here is that the upper bound class B quantifiers do not encode the $\leq$ relation. As maxima indicators, their application only makes sense if what they apply to denotes a range of values. Otherwise, using the strong reading of the bare numeral form will do just as well.[4]

4.2 Lower-bound class B modifiers

Lower-bound class B modifiers correspond to minimality operators. Let MOD correspond to any of the class B expressions *at least*, *from*, *minimally*, etc.

(46) $[\![\text{MOD}]\!] = \lambda d.\lambda M.\ \min_n(M(n)) = d$

Note first that minimality operators are sensitive to the many$_1$ / many$_2$ distinction. Say, we once more consider the degree predicate [λd. John read d many$_{1/2}$ books] and, say,

[4]Interestingly, the approach also predicts that some of the examples I discussed above do not only result in a blocking effect, but could moreover be predicted to be false. For instance, according to the approach set out above, the meaning of (i-a) is that in (i-b).

(i) a. #A triangle has maximally 10 sides.
b. '*the maximum number of sides in a triangle is 10*'

The reading in (i-b) is not only blocked by "A triangle has 10 sides", but it is moreover plainly false. I believe that this predicts that (i-a) should be expected to have a somewhat different status from (ii), which strictly speaking has a true interpretation, but one that can be expressed by simpler means.

(ii) #A triangle has maximally 3 sides.

It is difficult to establish whether this difference in status is borne out, or even how this difference can be recognised. However, my own intuition tells me that while (i) is never acceptable, (ii) could be used in a jokingly fashion. Native speakers inform me that (iii) is marginally acceptable:

(iii) "?A triangle has minimally and maximally 3 sides".

that John read 10 books. In the many$_1$ version of the LF, the minimal degree equals 1. In fact, independent of how many books John read, as long as he read books, the minimal degree will *always* be 1. In the many$_2$ version of the LF, the predicate denotes a singleton set, $\{10\}$ if John read 10 books. The minimal degree in that case is, of course, 10.

These observations already straightforwardly account for our intuitions for an example like (47).

(47) John read minimally 10 books.

The many$_1$ LF of (47) will be rejected, for it will always be false. The minimal value for any simple many$_1$-based degree predicate is always 1. The many$_2$ LF of (47) will be rejected too, for it will correspond to an interpretation saying that John read (exactly) 10 books. This reading is blocked by the bare numeral. (In fact, (47) in the many$_2$ variant is equivalent to *John read maximally 10 books*, which is equally blocked.)

We can save (47) by sticking in a weak modal. This yields two readings:

(48) a. $\min_d(\Diamond\exists x[\#x = d \;\&\; \text{read}(j,x) \;\&\; \text{book}(x)]) = 10$
b. $\min_d(\Diamond\exists!x[\#x = d \;\&\; \text{read}(j,x) \;\&\; \text{book}(x)]) = 10$

The form in (48-a) is once more a contradiction: the minimal degree for which it is deemed possible that John read d-many$_1$ books is always 1. The reading in (48-b) is much more informative. It says that that the minimal number for which it is thought possible that John read exactly so many books is 10. In other words, this says that it is regarded as impossible that John read fewer than 10 books. This is exactly the reading that is available.[5]

5 Outlook and conclusion

The analysis presented in the last section is just the tip of the iceberg. In fact, beyond what I have shown so far loom some problems which are hugely problematic. As Hackl (2000) observed, there is an interesting interaction between modified numerals and modals. I have extended these observations by showing how weak modals have a tight connection to class B modifiers in that they license their (otherwise blocked) existence. What I have not discussed at all is how class B modifiers interact with strong

[5]Some words are in order on the interaction of numeral modifiers with non-modal operators. Given the current proposal, any property that involves existential quantification would license the use of a class B modifier. However, it is known that degree operators (which we take modified numerals to be) cannot take scope over nominal quantifiers (see for instance Heim (2000)). This explains why (i) does not have the reading in (ii).

(i) Someone is allowed to invite maximally 50 friends.

(ii) the person who is allowed to invite most friends is allowed to invite 50 friends

As observed above, however, bare plurals do interact with class B quantifiers, as in for instance example (8). This would suggest that some intensional/modal analysis of the readings involved in such examples is in order. (Thanks to Maribel Romero for pointing this out to me.) At this point, however, I have no worked out theory of how to deal with such examples in detail.

modals. It turns out that this part of the story is not straightforward at all.[6] To sketch the problem, consider (49).

(49) To please his mother, John should read minimally 10 books.

According to my proposal, (49) means the following: 10 is the minimal number of books such that in every world in which John pleases his mother, John reads that number of books. This makes no sense. Say that we are in a situation in which John's mother is pleased in case John reads 5 or more books. In such a situation, every world in which John pleases his mother is a world in which John reads (at least) 5 books. Yet, every such world is also a world in which John reads a book. This means that the minimal number of books read in every *pleased-mother* world is 1 and not 5. In fact, in any situation, this minimal number will be 1.

The proposal, then, makes the wrong prediction: (49) is predicted to be non-sensical, when in reality it has a clear and intuitive meaning.

Nevertheless, I think that this problem does not undermine the proposal above. The reason is that the same problem occurs with different examples, that are completely independent of modified numerals. According to my theory, (49) means exactly the same as (50).

(50) The minimal number of books John must read to please his mother is 10.

This example wears its semantic analysis on its sleeve: (50) corresponds to (51).

(51) $\min_d(\Box_{\text{please John's mother}}\exists x[\#x = d \;\&\; \text{book}(x) \;\&\; \text{read}(j,x)]) = 10$

The example in (50) does not have a modified numeral in it. Still, its analysis, that of (51), runs in exactly the same trouble as did my proposal for (49): the form in (51) is non-sensical, for the minimal d alluded to will always be 1. I conclude from this that the problem is evidence for a puzzle which is independent of modified numerals, one which involves the interaction of modality and degree generally. Until we solve this bigger puzzle, there is no point in passing judgement on the current proposal.

$\star$

The main point of this paper is that there are two kinds of modified numerals. I leave it an open question exactly which quantifiers belong to which class. Nevertheless, I can already offer some speculations on this. Class A, for instance, could very well contain non-comparative quantifiers. Possible candidates are certain locative prepositional modifiers. Compare (52-a) and (52-b).

(52) a. You can get a car for under 1000 euros.
b. You can get a car for maximally 1000 euros.

The example in (52) is somewhat strange, since it claims that the most expensive car you can buy is 1000 euros. The example in (51), in contrast, makes no such claim. It clearly

[6] There is a precedent. In an earlier theory of "at least", Geurts and Nouwen (2007), the correct predictions regarding its relation to strong modals are arrived at by an essentially non-compositional mechanism. Krifka (2007) deals with this issue in a similarly non-standard way.

has a weak reading: there are cars that are cheaper than 1000 euros and there might be more expensive ones too. Such weak readings occur with class A and not with class B quantifiers. Furthermore, "under" seems perfectly compatible with definite amounts, such as in (53).

(53) The total number of guests is under 100. (To be precise, it's 87.)

Class A is then not restricted to comparative constructions only. In fact, other locative prepositions seem to behave similarly to "under".

(54) The total number of guests is between 100 and 150. (It's 122.)

The locative complex preposition "between ... and ..." contrasts with its directional counterpart "from ... (up) to ...", which behaves like a class B modifier: it is incompatible with definite amounts, as in (55), but felicitous if it relates to a range of values.

(55) #The ticket to the Stevie Wonder concert that I bought yesterday cost from €100 to €800.

(56) Tickets to the Stevie Wonder concert cost from €100 to €800.

"Over" parallels "under". In (57), "over 100" is clearly relating the precise weight 104kg with 100kg. Note in (58) how this contrasts with the directional "100 ... and up", which is made felicitous by embedding it under a weak modal.

(57) He weighs over 100 kg. To be precise, he weighs 104 kg.

(58) a. #He weighs 100 kg and up.
b. He is allowed to weigh 100 kg and up.

Data like these suggest that even more generalisations about the two kinds of modified numerals are still to be discovered. (It seems, for instance, that locative prepositions end up as class A modifiers, whereas directional ones are members of class B). Just like the precise formulation of how to account for the interaction of modifiers and strong modality, however, a detailed investigation of the generalisations governing the class A/B divide is left to further research.

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Topics and Corrections

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Abstract

In corrections a focus in the first conjunct is corrected by an alternative in the second conjunct. In German, the focus in the first conjunct is usually c-commanded by the negative marker. However, if the focus is a VP focus containing a definite object (DO), that DO can also occur before the negation. The paper argues that in in these cases the DO is situated above the negation because (a) it is a sentence topic and is forced to move out of the focus domain (= the c-command domain of the negation), (b) as a topic, it serves as a salient antecedent for an implicit topic in the second conjunct, which that conjunct is still about, (c) the implicit topic is interpreted on the basis of a variable in the syntax, which is resolved by the context. In cases where the DO occurs below the negation, in contrast, the DO is not a topic and the second conjunct is not about the referent of that DO anymore.

1 Introduction

In corrections, the corrected element and the substitute offered for it are usually considered foci (Drubig 1994; Krifka 2006). (1a) is an example with direct object (DO) foci, (1b) has VP foci. The foci are marked prosodically. Pitch accents are indicated by small caps.

(1) a. John didn't drink [$_{DP}$ CIder $_{Foc}$] but [$_{DP}$ VODka $_{Foc}$].
b. John didn't [$_{VP}$ drink CIder $_{Foc}$] but [$_{VP}$ ate CHOWder $_{Foc}$].

The second conjunct is elliptic, and corresponds to the size of the focus (Lang 1984).

The negation in corrections can take positions different from normal clausal negation, cf. McCawley (1991) for English, see (2) for a variant of (1a).

(2) John drank not vodka but cider.

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In German, the negative marker usually[1] c-commands the corrected element in the first clause (cf. Jacobs 1982, 1991; Drubig 1994; Repp 2006, 2009), see (3a). The normal order in non-corrections, where the DO precedes the negation, see (4), is ungrammatical in corrections, see (3b).

(3) a. Hans hat nicht [den PiNOT] getrunken sondern [den Rioja].
Hans has not the Pinot drunk but the Rioja
b. *Hans hat [den PiNOT] nicht getrunken sondern [den RIOja].
'Hans did not drink the Pinot but the Rioja.'

(4) Hans hat den Pinot nicht getrunken.
'Hans did not drink the Pinot.'

Ordering restrictions in corrections so far have only been investigated for narrow DP focus (Jacobs 1982, 1991; Drubig 1994), and, to some extent, for wide focus on the clause, as well as multiple narrow foci (Repp 2006, 2009). This paper concentrates on VP focus in German, where the generalization that the negation must c-command the focus no longer seems valid: (5) and (6) are minimal variants where the second conjunct indicates that they are instances of VP focus but where the position of the negation w.r.t. the DO varies: in (5) the negation c-commands the DO, in (6) it does not.

(5) *A few years ago Paul wanted to go on a trip around the world but didn't have enough money. Paul thought about selling his old Buick to a collector but didn't really want to part with his favourite.*
Am Ende hat er nicht das AUto verkauft,
at.the end has he not the car sold
sondern sich bei seiner BANK erkundigt.
but REFL at his bank enquired
'In the end he didn't sell the car but enquired at his bank.'
They gave him a loan with fair conditions and he could go on his trip.

(6) *A few years ago, Paul had an accident with his old Buick, which got damaged pretty badly. Paul thought about selling it to a collector but didn't really want to part with his favourite.*
Am Ende hat er das Auto nicht verKAUFT,
at.the end has he the car not sold
sondern sich bei seiner WERKstatt erkundigt.
but REFL at his garage enquired
'In the end he didn't sell the car but enquired at his garage.'
They made him a fair price and he got the car repaired.

[1] An element in Spec,CP or C can be contained within the scope of a negation below C, see (i), which is a case of clausal focus (cf. Jacobs 1991, Repp 2009).
(i) Peter ist nicht dumm, sondern Maria ist unfähig.
Peter is not stupid but Maria is incompetent
'Peter is not stupid – Maria is incompetent.'

Obviously, the two examples occur in different contexts, and, importantly, (5) cannot occur in the context of (6), and vice versa.

In this paper, I will argue that despite first appearances, the second conjunct in cases like (5) and (6) is a reliable indicator for the size of the focus, i.e. these examples are clear instances of corrections with VP focus. I will follow assumptions made inter alia in Hinterhölzl (2006) and Repp (2009), according to which the negative marker marks the border of νP and that diverging surface orders are derived by movement of the subject to Spec,IP (and possibly further), and for objects, by scrambling. I assume that this is also valid in corrections. I will argue that the difference between (5) and (6) is one of information structure: in (6), which is the surprising case from the point of view of focus marking in corrections, the DO has left the c-command domain of the negation because it is a topic (in the aboutness sense Reinhart, 1981), and therefore has to leave the focus domain, which corresponds to νP. As a topic, it serves as a salient antecedent for an implicit topic in the second conjunct, so the second conjunct is still about the same topic. In (5), in contrast, the DO does not to leave the c-command of the negation because it is not topical, and is not picked up in the second conjunct.

2 The topic in the first conjunct

There are two types of evidence that feed the assumption that a DO which has scrambled out of the c-command domain of the negation in a correction with VP focus is topical. One type is the context – left and right – of the sentence the DO occurs in, and the other type is the syntactic and semantic characteristics the DO has if it occurs outside the c-command domain of the negation, which I will show are those of a sentential aboutness topic. I will discuss these characteristics in subsection 2.1 and then move on to questions of context in subsection 2.2

2.1 Topic characteristics of the direct object in the first conjunct

The claim I will argue for in this subsection is that the DO in the first conjunct of a correction with VP focus must be a sentence topic in the aboutness sense (Reinhart 1981), if it is to move out of the c-command domain of the negation. There is syntactic and semantic evidence supporting this claim. As for the syntax of sentence topics in German, Frey (2004) argues that in the middle field, they are situated above sentential adverbs. This is illustrated in (7) (from Frey 2004: 158). The context makes *Maria* topical: the speaker will say something about her. The DP *Maria* must occur above the sentential adverb *wahrscheinlich* ('probably').

(7) *I tell you something about Mary:*

a.	Nächstes	Jahr	wird	Maria	wahrscheinlich	nach	London	gehen.
	next	year	will	Mary	probably	to	London	go
b.	#Nächstes	Jahr	wird	wahrscheinlich	Maria	nach	London	gehen.

'Next year Mary will probably go to London.'In a correction with VP focus where the DO occurs before the negation, we find that the DO has to appear before the sentential adverb, which suggests that we are dealing with an aboutness topic:

(8) a. Am Ende hat er das Auto glücklicherweise nicht verkauft,...
at.the end has he the car luckily not sold
b. #Am Ende hat er glücklicherweise das Auto nicht verkauft,...
...sondern sich bei seiner Werkstatt erkundigt.
'In the end he luckily didn't sell the car …but inquired at his garage.'

For the order where the negation precedes the DO, this test is not informative because sentential adverbs precede the negative marker in German.

As for the semantics of aboutness topics, it was suggested by Ebert & Endriss (2004), and Endriss (2006) that certain quantifiers can, but others cannot occur in topic positions: singular indefinites, bare numeral quantifiers and the quantifier *einige N* ('some N') can be topical; modified numeral quantifiers and negative quantifiers cannot. How do these quantifiers fare in corrections with VP focus? The results seem to be mixed. We find that increasing quantifiers can occur in the purported topic position (see (9)) whereas decreasing quantifiers cannot (see (10) - to appreciate the grammaticality status of (10) make sure you interpret the whole coordination. On its own, the first conjunct is fine).

(9) *Paul ist Töpfer mit eigenem Brennofen. Sein Nachbar, der auch die Töpferei betreibt, hat sich eine neue Brennanlage gekauft. Paul ist ein neugieriger Mensch. ('Paul is a potter with his own kiln. His neighbour, who is also a potter, just got a very modern burning system. Paul is a very curious guy.')*
Gestern hat er EIne/einige/ mehr als 10 Vase (n) nicht im EIgenen Ofen gebrannt
yester-day has he one/some/ more than 10 vase (s) not in. the own kiln burned
...sondern die Anlage des Nachbarn ausprobiert.
but the system of.the neighbour tried.out
'Yesterday he burnt {one/some/more than ten} vase(s) not in his own kiln but tried out the neighbour's system.'

(10) *Paul is a potter with his own kiln. His neighbour, who is also a potter, just got a very modern burning system. Paul is a very curious guy. But he is also very cautious.*
*Gestern hat er höchstens drei Vasen nicht im EIgenen Ofen gebrannt,
yesterday has he at.most 3 vases not in.the own kiln burned
...sondern die Anlage des Nachbarn ausprobiert.
'Yesterday he burnt at most 3 vase(s) not in his own kiln but tried out the neighbour's system.'

Now, Endriss (2006) makes the following subtle difference between monotone increasing quantifiers and non-monotonic (e.g. *exactly three students*) quantifiers on the one hand, and monotone decreasing quantifiers on the other. Whereas she judges the former to sound 'extremely odd' in the position above Frey's sentence adverbial, the latter result in entirely ungrammatical sentences. Example (11a) shows that closer scrutiny of increasing quantifiers in non-corrections – i.e. careful control of the discourse context – reveals that they can occur in Frey's topic position here as well, i.e. they do not necessarily sound 'extremely odd' in non-corrections. Importantly, decreasing quantifiers cannot be ameliorated in the same way, as is shown in (11b).

(11) *Paul deals in vases. He is always out at pottery fairs and tries to secure the best deals.*

a. *Last week something strange happened.*
Paul hat mehr als 20 Meissner Vasen überraschenderweise
Paul has more than 20 Meissen vases surprisingly
einem verhassten Konkurrenten überlassen.
a.DAT hated competitor left
'Paul surprisingly left more than 20 Meissen vases to a hated competitor.'

b. *Last week we thought that he would lose several deals. But luckily he didn't.*
b' *Paul hat höchstens 3 Meissner Vasen zum Glück...
Paul has at.most 3 Meissen vases to luck
b" Paul hat zum Glück höchstens 3 Meissner Vasen...
...einem verhassten Konkurrenten überlassen.
'Paul luckily left at most 3 Meissen vases to a hated competitor.'

Ebert & Endriss (2004) exclude decreasing quantifiers as topics because they cannot form 'sensible representatives' for a discourse referent: their minimal witness set (Barwise & Cooper, 1982) is the empty set, which is not a sensible representative. For the other quantifiers, the minimal witness set provides a sensible representative (in the case of *more than ten vases*, a sum individual of ten vases). Their often-observed infelicity in topic positions is put down by Ebert & Endriss (2004) to a condition on anaphoric reference: the anaphoric potential (*ten vases* vs. *more than ten vases*) must not change when the topic referent is created on the basis of the minimal witness set.

The above observation that in some environments increasing quantifiers are perfectly grammatical indicates that the condition on the minimal witness set is appropriate whereas the other condition needs some more thought. The examples need to be better controlled pragmatically. In the right context, with the right sentence adverbial, the results are different from what Ebert & Endriss (2004) suggest. I cannot go into the details of this here[2]. For the purposes of the present paper I conclude that the scram-

[2] Ebert & Endriss (2004) and Endriss (2006) generally uses examples with low numerals, e.g.
(i) ?? Während des Vortrags haben mehr als drei Studenten interessanterweise geschlafen.
'During the talk more than three students were asleep, interestingly. (cf. Endriss 2006: 42)
I agree with the judgements they give. It seems however, that the sentence pragmatically is odd – it seems that *3 students* must be some relevant threshold in order to make it plausible to say that it is

bled DO in corrections, which I claim to be a topic, behaves like other topics in 'ordinary' topic test environments. Thus, the syntactic and semantic characteristics of the scrambled DO in the first conjunct suggest that it is a sentence topic. Let us now move on to the question of context.

2.2 The left and right context

Returning to the examples in (5) and (6) in the introductory section – which for ease of exposition I repeat here – we find that the left context on its own does not help us much to distinguish between them. Both contexts introduce the car – which warrants the use of the definite DP here – so in both contexts the car could be topical, in the sense of an active discourse referent (see fn. 5 p. 399 for more on this):

(5) *A few years ago Paul wanted to go on a trip around the world but didn't have enough money. Paul thought about selling his old Buick to a collector but didn't really want to part with his favourite.*
Am Ende hat er nicht das AUto verkauft,
at.the end has he not the car sold
sondern sich bei seiner BANK erkundigt.
but REFL at his bank enquired
'In the end he didn't sell the car but enquired at his bank.'
They gave him a loan with fair conditions and he could go on his trip.

(6) *A few years ago, Paul had an accident with his old Buick, which got damaged pretty badly. Paul thought about selling it to a collector but didn't really want to part with his favourite..*
Am Ende hat er das Auto nicht verKAUFT,
at.the end has he the car not sold
sondern sich bei seiner WERKstatt erkundigt.
but REFL at his garage enquired
'In the end he didn't sell the car but enquired at his garage.'
They made him a fair price and he got the car repaired.

Obviously, the *discourse* topic in the two examples is different. Whereas the discourse in (5) is about Paul's trying to find enough money to go on a world trip, (6) is about Paul's deciding what to do with his damaged car. These discourse topics are carried through in the subsequent discourse, which in (5) is about finding money, and in (6) about the damaged car: enquiries at banks usually, and also in this case, are about money; enquiries at garages are usually about cars, and in this case can be inferred to have been about the car in question, say about prices, or about the availability of spare parts.

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interesting that more than 3 students were asleep. With higher numbers such thresholds are easier to motivate, see (ii), although I suspect that an appropriate context could also license a 'low' threshold.
(ii) Während des Vortrags haben mehr als 700 Studenten interessanterweise geschlafen.

Thus, in (6) it is the car that remains topical throughout – the second conjunct of the correction is still about the car – whereas in (5) this is not the case. Now, the difference in structure between the two examples is that the DO *das Auto* ('the car') in (5) is in the c-command domain of the negation and in (6) it is not. So what we find is that if the referent of the DO *the car* remains topical in the second conjunct the DO must leave the c-command domain of the negation.

The following naturally occurring example illustrates the same point. It is from an online blog of pet lovers, where a cat owner relates her experiences with a vet.

(12) *In the evening, after the x-ray was done, the vet called me into the surgery and showed me the x-ray photograph. She said that it didn't look good and that it was FIP (feline infectious peritonitis) or something else. To find out, she would have to get liquid from my cat's belly. She gave her an anasthetic and after 5 minuntes called me back into the surgery. She had a syringe with a yellow liquid in her hand and said that it definitely was FIP. That there was no cure. I read the report on catgirl.de. It says that there is a 50% chance for it being something else. I would like to know if I should go to a different vet or if I should do more tests like a blood test or a scan. [I am also convinced, that ...]*

[Ich bin auch überzeugt davon, dass…]

meine	Tierärztin	die	Flüssigkeit		nicht	untersucht	hat.
my	vet	the	liquid		not	examined	has
sondern	anhand	der	Farbe	die	Diagnose	gestellt	hat.
but	from	the	colour	the	diagnosis	made	has

'… my vet didn't examine the liquid but gave the diagnosis on the basis of the colour.'

She wanted to put my cat down immediately.

In this example, *die Farbe* ('the colour') referred to in the second conjunct is an inalienable property of something contextually present, which in the present context is to be inferred the liquid – the referent of the DO of the first conjunct. Thus, the second conjunct in this correction is still about that liquid. Note that the DO in the first conjunct is not in the c-command domain of the negation and what is more, the sentence would be deviant, if it were: I suggest that this is because there is no salient entity in the wider context whose colour could serve as the basis for the diagnosis in question, which means that the use of the relational definite DP *the colour* cannot be accommodated.

To conclude so far, in corrections with VP focus containing a definite DO that DO must leave the c-command domain of the negation in the first conjunct if the second conjunct is still about the referent of that DO. There need not be an overt expression corresponding to that referent, i.e. it can remain implicit.[3] In the next section I shall investigate the nature of the implicit referent in the second conjunct.

[3] As the wording suggests the implicit topic in the second conjunct can be made explicit. This holds for all the examples discussed in this paper. If explicit, the chosen form is usually a pronoun, which, interestingly, need not occur outside the vP of the second conjunct. Fanselow (2006) suggests that topics do not obligatorily move to the topic position suggested by Frey (2004) but that there is an interaction

3 The implicit referent in the second conjunct

The implicit referent in the second conjunct is interesting from (at least) two points of view. On the one hand, we need to ask what grammatical status that referent might have. This is discussed in section 3.1 and will be specified in more detail in section 4. I shall argue that the implicit referent is an *implicit argument* or, an *unarticulated constituent*, which is anaphoric to an antecedent in the context. In section 3.2 I shall demonstrate that topics – such as the one in the first conjunct – are very good antecedents to be picked up by anaphora.

3.1 Implicit arguments and unarticulated constituents

The examples we have seen all look like they involve what has been called an *implicit argument*. An implicit argument is a non-overt element that is part of the interpretation of a predicate and is usually thought to occur in positions which are licensed for a thematic argument, which, however, are not overtly realized (cf. Williams 1985, Roeper 1987, Engelberg 2002). For the examples discussed above, this reads as given in very rough form in (13), where the implicit argument occurs between brackets:

(13) a. to enquire at the garage (about x)
b. the colour (of x)

Implicit arguments can receive different interpretations (see e.g. Bhatt & Pancheva 2006). They can be interpreted as existential as in *Paul is eating (something)*, generic as in *(PRO) to dance is fun,* or definite and contextually determined as in *John finally accepted (x)*. The definite, contextually determined cases are the ones that resemble the correction data most closely. (Some) implicit arguments can pick up previously introduced antecedents (cf. Härtl 2008) as in *John got the boxes and stuck the labels on*, where the labels in all likelihood are stuck on the boxes, or as in *Paul bought the best-seller and read all night*, where Paul in all likelihood read the best-seller (but also see Martí 2006 on this). I shall not dwell here on the question of how particular types of implicit arguments are analyzed.[4] The reason is that the argument structure in the second conjunct upon closer scrutiny turns out to be not that important, as example (14a) from an online lexicon on media law illustrates: there is no implicit argument of the sort described above involved but still the second conjunct contains an implicit referent picking up the topic (=DO) of the first conjunct: the authorities use other sources of the journalist's than his/her 'voice', i.e. the second conjunct still is about the journalist. (14) is also different from the previous examples in that the order of the negation and the DO is flexible. In (14b), the negation precedes the DO of the focused VP. The example

with foci occurring below the sentential adverb. I think that Fanselow's observations are correct but I cannot investigate this matter here for reasons of space.

[4] The various sorts differ substantially, see Bhatt & Pancheva (2006), Härtl (2008).

also is fine. Importantly, there is a difference in interpretation between (a) and (b). In (b), the authorities use other sources than the interrogation of the journalist, i.e. the journalist is not topical in the second conjunct.

(14) *Confiscation of means of evidence. § 97 Abs. 5 StPO prohibits the confiscation of journalistic documents as means of evidence. This holds only, however, to the same extent that the media person has the right to refuse to give evidence. The prohibition of the confiscation of means of evidence is a necessary addition to the media's right to refuse to give evidence. [If it didn't exist the investigating authorities could very easily circumvent the right to refuse to give evidence,...]* [Existierte es nicht, könnten die Ermittlungsbehörden es leicht aushebeln, …]

a. indem sie den Journalisten nicht befragen,…
by they the journalist not interrogate

b. indem sie nicht den Journalisten befragen,...
...sondern gleich die Durchsuchung der Redaktionsräume und die Beschlagnahme des Recherchematerials anordnen.
'...by not interrogating the journalist, but ordering the search of the editorial offices and the confiscation of research material straightaway.'

I would like to argue that the second conjunct in (14a) contains what in truth-conditional pragmatics has been called an *unarticulated constituent (UC)* (Perry 1986, 1998; Recanati 2002, 2004; and for an opposing view Stanley 2000, Martí 2006). As summarized by Stanley (2000: 410), unarticulated constituents are elements "supplied by the context to the truth conditions of utterances" without being the "semantic values of any constituents in the actual structure of natural language sentences". To illustrate, consider Perry's (1986) example in (15):

(15) It is raining.

(15) is incomplete if no place is supplied, and cannot be evaluated for truth or falsitiy, i.e. failure to provide the UC results in vacuity. No proposition is expressed. The idea in truth-conditional pragmatics is that there is free pragmatic enrichment (top-down), which is necessary to interpret such sentences. Next to UCs supplied by the context, there are also 'metaphysical' UCs, as in *Mary is dancing*, where the place where Mary is dancing, is not required to express a proposition and assess its truth. The fact that Mary is dancing somewhere is a metaphysical fact, i.e. one of the real world: every action takes place somewhere (or at some time …). The views on metaphysical UCs differ but the assumption that they are 'truly' unarticulated is common – i.e. they are not part of the interpretation. If interpreted at all, they are a matter of pragmatics. Their interpretation is existential.

Going back to (14a), we find that the second conjunct contains an implicit referent that could be classified as a metaphysical UC if it were not provided contextually: that there is a relation between the journalist and his various potential sources of evi

dence, which might be interesting to the authorities, is a metaphysical fact. That we infer this information to be present in (14a) – it is the *journalist's* editorial offices whose search is ordered and *his/her* research material that is to be confiscated – shows that UCs which are not required to express a proposition can be present in the interpretation of a sentence if they are provided contextually. Importantly, their presence has an effect on grammar – the DO in the first conjunct of the correction takes a different position if the UC is present: it occurs above the negation because it is a topic and serves as the contextual antecedent of the UC. This supports opponents of the free enrichment view (e.g. Stanley 2000, Martí 2006)), who claim that there are no unarticulated constituents of the contextual sort. The referents in question are articulated (at LF): as variables that need to be contextually resolved. Also note in this connection the felicity of the order negation > DO in (14b): in this order, there is no contextual UC, it stays metaphysical, as it were.

In the present analysis, I shall lump implicit arguments and unarticulated arguments together, see section 4 for the specific proposal. Nevertheless, I suspect that there might be a difference between the two types of implicit referents because the case with the unarticulated constituent allows both orders of DO and negation, whereas the cases with implicit arguments do not.

3.2 An antecedent for the implicit referent

In the previous subsection I suggested that the value for the implicit referent in the second conjunct is provided by the context and that it is the topical DO in the first conjunct that serves as the antecedent. Frey (2007) discusses the relation between topichood and anaphoric reference and points out that it is standardly assumed that anaphoric expressions like pronouns refer to previously introduced referents that are salient (e.g. Ariel 1990; Gundel et al. 1993). Being a topic is one way to be salient (e.g. Gundel et al 1993; Erteschik-Shir 1997). Frey (2007: 12) disputes this traditional assumption on the basis of the following minimal pair – the judgement is Frey's:

(16) a. Gestern hat überraschenderweise [den Paul]$_1$ [der Direktor]$_2$ getroffen.
yesterday has surprisingly the.ACC Paul the.NOM director met
b. Gestern hat [den Paul]$_1$ überraschenderweise [der Direktor]$_2$ getroffen.
a&b. Er$_{*1/2}$ hat sich sehr darüber gefreut.
he has REFL very about.it happy
'Yesterday the director$_2$ surprisingly met Paul$_1$. He$_{*1/2}$ was very happy about it.'

In (16a), the DO in the first sentence is non-topical, whereas in (16b) it is topical. Frey says that the anaphoric possibilities in (a) and (b) are the same, i.e. there is a subject preference. My intuitions and those of a fair number of informants I consulted about (16) are different: Whereas in (16a), the indexation is as indicated, in (16b), the pronoun *he* refers to Paul, and not the director. I suggest that the judgements are subtle because the topic 'competes' with the subject as a potential antecedent: there is a strong

subject reference for pronoun resolution in general, as has been shown in experimental studies by e.g. Crawley & Stevenson (1990), Stevenson & Urbanowicz (1995). Kaiser (2006) found that subject preference is influenced by, but still overrules factors like preference for focus and topicality (which is implemented as givenness in her, and many other psycholinguistic studies[5]). Kaiser (2006) concludes that topicality does have an effect on pronoun resolution (also Arnold 1998) but interacts with other factors.

Apart from the sentence medial topics, Frey (2007) discusses data with left dislocation in German, where, in his view, a dislocated topical direct object does not serve as an antecedent for a pronoun in the next clause if a subject is present that can serve as an antecedent for that pronoun. I think that this does not hold generally. In the following example it is completely unclear whether the DO or the subject is the antecedent for the pronoun in the follow-up clause, as is illustrated by the two options, (a) and (b), to continue the discourse.

(17) *Max cannot see his friends tonight.*
[Den Paul]$_1$, den hat [der Hausmeister]$_2$ eingespannt.
the.ACC Paul him has the.NOM janitor monopolized
Er$_{1/2}$ baut das Schuhregal für die ersten Klassen.
he builds the shoe.shelves for the first grades
'As for Paul$_1$, the janitor$_2$ is monopolizing him$_1$. He$_{1/2}$ is building the shoe shelves for the first graders.'

a. Paul hilft ihm$_2$ dabei.
Paul helps him with.this
'Paul is helping him$_2$.'

b. Das hat er$_1$ dem Hausmeister vorigen Monat versprochen.
that has he the janitor last month promised
'That's what he$_1$ promised the janitor last month.'

Thus, topics can and do compete with subjects for the role of most salient antecedent. In harmony with much of previous psycholinguistic literature I assume topics to be good antecedents. In the corrections, the scrambled DO in the first conjunct is a topic, which serves as the antecedent for the implicit referent in the second conjunct.

4 The (information) structure of corrections with VP focus

In the previous sections I argued that in corrections with VP focus containing a definite DO in the first conjunct, that object must precede the negation if it is topical itself and if the second conjunct still is about that topic, even though the topic in the second conjunct is implicit. I suggest that this implicit topic is represented syntactically by a topic-marked *pro*, where the topic feature has the following denotation:

[5] Many psycholinguistic studies work with the notion of 'active discourse referents', where givenness is one indicator for being active.

(18) $[\![\text{TOP}]\!] = \lambda x \lambda P\ [\exists i.g(i) = x : P(x)]$

Thus, it is presupposed that x is a salient individual in the context,[6] and it is asserted that the predicate P applies to that individual. The [TOP] feature occurs on an entity-denoting constituent, which in the present case is the implicit argument in the second conjunct. The denoation of a topic-marked constituent $\alpha_{[\text{TOP}]}$ is given in (19)[7]:

(19) $[\![\ \alpha_{[\text{TOP}]}]\!] = [\![\text{TOP}]\!]\ ([\![\alpha]\!])$
$\lambda P\ [\exists i.g(i) = [\![\alpha]\!] : P([\![\alpha]\!])]$

In (6), which is repeated below without its context, the individual in question is the topic of the corrected clause (see (20) for the precise structure).

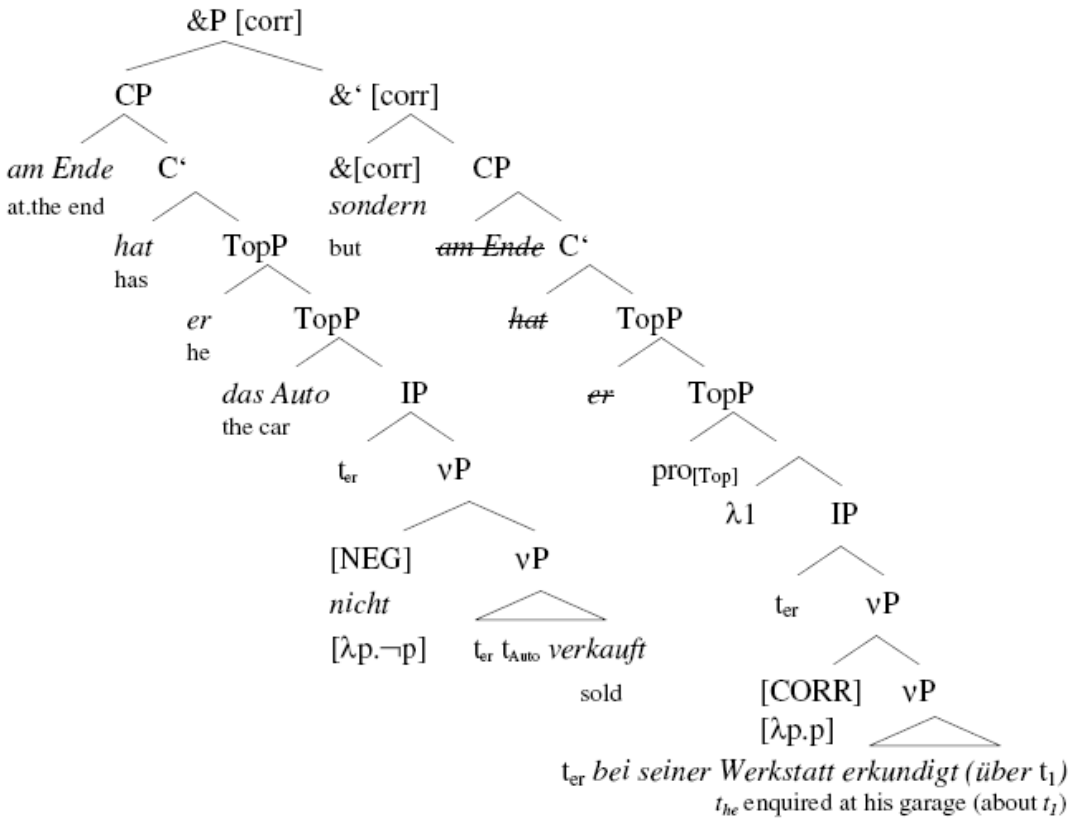
(6') Am Ende hat er [das AUto $_{\text{Top}}$] nicht [$_{\text{vP}}$ verkauft $_{\text{Foc}}$]
at.the end has he the car not sold
sondern sich pro$_{[\text{TOP}]}$ [$_{\text{vP}}$ bei seiner Werkstatt erkundigt $_{\text{Foc}}$]
but REFL at his garage enquired
'In the end he didn't sell the car but enquired at his garage.'

In the order where the negation c-commands the direct object, viz. (5), the context does not provide such an individual. If *pro$_{[TOP]}$* occurs in the structure, presupposition failure ensues.

It is worth pointing out that the structure of (6) corresponds to Vallduvi's (1993) tripartite information structure setup: in addition to the topic (= Vallduvi's link) and focus, there is material that can be classified as the ground: *am Ende hat er* ('in the end he has'). I assume that whereas the implicit topic in the second conjunct is retrieved on the basis of *pro$_{[TOP]}$* introduced above, the ground is retrieved on the basis of ellipsis processes. The ellipsis process in question is left peripheral deletion, which happens under phonological identity with material in the first conjunct (cf. Wesche 1995; Repp 2009). The analysis for (6) is given in (20). The ellipsis site in the second conjunct is indicated by strikethrough. The position of *pro$_{[TOP]}$* is above IP, which corresponds to Frey's (2004) topic position. As for the structure of the correction itself, I follow the assumption in McCawley (1991) and Lang (1991) that *not-but* is a complex operator. I propose that its parts NEG and CORR are licensed by Agree with a coordination head that is marked as corrective, and which hosts *sondern*. [8]

[6] I am borrowing here from Sauerland (2004) who suggests that an individual is given if it is the value of some index of the assignment *g*, where only individuals that are salient are stored in *g*.
[7] I am abstracting away from indefinite topics (Endriss 2006) here as they are not relevant in the present discussion.
[8] For reasons of space I could not discuss pronouns here, which behave different from definite DOs in corrections: they are never c-commanded by the negation even if they are not picked up by a topical referent in the second conjunct. The behaviour of pronouns in corrections parallels that of pronouns in other environments, e.g. DP scrambling has an information-structural effect on the next lower DP (provided the scrambled DP is not contrastive), pronoun movement does not. Thus, the high position of

(20) Analysis for (6):



5 Conclusion

I have argued that despite first appearances in corrections with VP focus, the negation in the first conjunct c-commands the focus just as in corrections with narrow(er DP) focus. If, however, the DO in such a VP is topical and is picked up by a(n implicit) topic in the second conjunct, the DO leaves the c-command domain of the negation. The implicit topic in the second conjunct structurally is represented as a pro element with a topic feature.

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pronouns in the middle field is licensed by givenness alone and does not necessarily interact with other information-structural categories.

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Free Variable Economy

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Abstract

Several authors have recently argued that semantic interpretation is subject to *economy constraints*. In particular, Fox (1999) argued that the interpretation of pronouns is subject to BINDING ECONOMY, which favors local binding over non-local binding. The present paper points out a problem for BINDING ECONOMY. The aim, then, is to see if this problem can be resolved in a conservative way, that is, preserving the general idea that interpretation is subject to economy constraints. The suggested solution is to consider a different economy criterion. The proposed constraint, FREE VARIABLE ECONOMY, disfavors free variables rather than non-local binding. It avoids the problem that BINDING ECONOMY runs into, and preserves the general idea that semantic interpretation is subject to economy constraints.

1 Economy and Semantic Interpretation

Several authors have recently argued that semantic interpretation is subject to *economy constraints* (cf. Fox, 1999; Reinhart, 2006). The general idea is that one logical form is ungrammatical if there is an alternative logical form which is:

1. semantically equivalent
2. syntactically simpler / more economical

To make this general idea more precise, we have to answer two questions:

1. When are two logical forms semantically equivalent?
2. When is one logical form simpler / more economical than another?

In this paper, I will focus on the second question. More particularly, I will be concerned with a measure of economy, proposed by Fox (1999), which says that logical forms in which pronouns are bound *locally* are more economical than logical forms in which pronouns are bound non-locally. Fox has shown that the associated economy constraint, which I will refer to as BINDING ECONOMY, accounts for a range of interesting data. Most strikingly, it deals with a long-standing problem in the theory of VP-ellipsis, known as Dahl's puzzle (Dahl, 1973).

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However, I will point out below that a variant of Dahl's puzzle is problematic for BINDING ECONOMY. My aim, then, is to resolve this problem in a conservative way. That is, I will try to preserve the general idea that semantic interpretation is subject to economy constraints, as well as the basic assumptions about the syntax-semantics interface and the nature of pronominal anaphora that proponents of this idea generally presuppose. My strategy will be to reconsider the question when a certain logical form should count as more economical than another. Fox's measure of economy is concerned with *locality* of pronominal binding. The measure of economy that I will propose is concerned with *free variables*. The associated economy constraint, FREE VARIABLE ECONOMY, disfavors free variables rather than non-local binding. This will be shown to resolve the problem that BINDING ECONOMY runs into.

The paper is organized as follows. First, some theoretical assumptions, terminology, and notation will be fixed in section 2. BINDING ECONOMY will be presented in section 3, followed by the new problematic data in section 4. Finally, FREE VARIABLE ECONOMY will be presented in section 5, and section 6 concludes.

2 Preliminaries

Let me start by fixing some theoretical assumptions, terminology and notation.

Syntax-semantics interface. I will assume that syntax generates logical forms (LFs), and that these logical forms are associated with a certain semantic meaning (or with an expression in the typed lambda-calculus representing such a meaning) in a compositional fashion, along the lines of Heim and Kratzer (1998).

Bound and referential pronouns. I will assume a basic distinction between bound and referential pronouns (cf. Reinhart, 1983). Pronouns may or may not be indexed at LF. A pronoun with an index n is interpreted as a variable x_n (the index is called a *binding* index in this case). If a pronoun is not indexed, it is taken to refer to some contextually salient individual.

Movement and abstraction. I will assume that wh-movement and quantifier raising work as follows. If a wh-element moves it receives a binder index n, which is adjoined to it in superscript (e.g., $[\text{who}]^3$). It also leaves behind a trace which has that same index n as its binding index (e.g., the trace of $[\text{who}]^3$ would be t_3).

(1) $[_{\text{TP}}\ \text{X}\ [_{\text{DP}}\ \text{wh}]\ \text{Y}] \ \Rightarrow\ [_{\text{TP}}\ [_{\text{DP}}\ \text{wh}]^n\ [_{\text{TP}}\ \text{X}\ \text{t}_n\ \text{Y}]]$ (wh-movement)

The same goes for quantifier raising: if a determiner phrase undergoes QR it receives a binder index n and leaves behind a trace which has that same index n as its binding index.

(2) $[_{\text{TP}}\ \text{X}\ [_{\text{DP}}\ \text{Q}]\ \text{Y}] \ \Rightarrow\ [_{\text{TP}}\ [_{\text{DP}}\ \text{Q}]^n\ [_{\text{TP}}\ \text{X}\ \text{t}_n\ \text{Y}]]$ (quantifier raising)

I will assume that determiner phrases always undergo QR. This assumption will make some of the formulations below run smoother, but nothing hinges on it.

A trace with a binding index n is interpreted as a variable x_n, and a constituent of the form X^nY is interpreted as:

(3) $X'(\lambda x_n.Y')$

where X' is the interpretation of X and Y' is the interpretation of Y. This composition rule embodies what Heim and Kratzer (1998) call *predicate abstraction*. As a result, the logical form in (4) is interpreted as (5):

(4) $[\text{John}]^1[t_1 \text{ called his}_1 \text{ mother}]$

(5) $\text{JOHN}(\lambda x_1.\ x_1 \text{ CALLED } x_1\text{'S MOTHER})$

Binding and reference. To define binding we first have to specify one auxiliary notion, namely that of *c-command* (cf. Reinhart, 1983). One constituent A c-commands another constituent B iff (i) A does not dominate B and (ii) all branching nodes that dominate A also dominate B.

Now let A be a determiner phrase with a binder index, and let B be a pronoun with a binding index. Then we say that A binds B iff:

(i) A's binder index matches B's binding index,

(ii) A c-commands B, and

(iii) A does not c-command any other DP which satisfies (i) and (ii).

This notion of binding is what Heim and Kratzer (1998) and Büring (2005b) call *semantic binding* and what Reinhart (2006) calls *A-binding*. To see what it amounts to consider example (4) above: according to the definition, [John] binds [his] in this logical form. To enhance readability, I will often use the following graphical notation:

(6) John called his mother.

Think of (6) as shorthand for (4): the arrow indicates that [his] is bound by [John].

For referential pronouns I will also use a graphical notation. For instance, if [his] is taken to refer to John, I will write:

(7) John called his mother.

John

VP ellipsis. The literature is very much divided on the nature of VP ellipsis (cf. Johnson 2008 for discussion). I will assume that the meaning of an elided VP is contextually retrieved, typically from an overt VP in the surrounding discourse (cf. Hardt, 1993; Kehler, 2002; Roelofsen, 2008), but I should emphasize that, as far as I can see, the discussion below does not hinge on this assumption.

The graphical notation introduced above will be useful in depicting the possible interpretations of elided VPs. Consider example (8):

(8) Max called his mother and Bob did too.

This sentence is ambiguous. It could be taken to mean that Max and Bob both called *Max's* mother. This is called the *strict* reading. But it could also be taken to mean that Max and Bob both called *their own* mother. This is called the *sloppy* reading. I assume that the strict reading arises if the pronoun in the source clause (the clause containing the antecedent VP) is taken to refer to Max. In this case, the pronoun in the target clause (the clause containing the elided VP) will also be taken to refer to Max (the "reconstructed" VP is printed in gray):

(9) Max called his mother and Bob called his mother too.
↓ ↓
Max Max

The sloppy reading arises when the pronoun in the source clause is *bound*. In this case, the pronoun in the target clause will also be bound. Only, in the source clause it is bound by [Max], while in the target clause it is bound by [Bob]:

(10) Max called his mother and Bob called his mother too.

I think it will be helpful to think of sloppy readings graphically: they arise when pronouns are, as it were, "bound in parallel" (cf. Fox, 1999; Büring, 2005a).

3 Binding Economy

We are now ready to have a closer look at BINDING ECONOMY. The idea is perhaps best illustrated by means of an example. Consider the following two logical forms:

(11) Max said that he called his mother.

(12) Max said that he called his mother.

These logical forms are semantically equivalent: they are associated with exactly the same semantic meaning. The difference is that in (11), the second pronoun, [his], is bound *locally*, by [he], while in (12) it is bound non-locally by [Max]. The idea behind BINDING ECONOMY is that logical forms like (12) are ungrammatical because of the existence of more economical logical forms like (11). To give a general and precise formulation of BINDING ECONOMY, we first have to specify which kind of structures it considers to be *alternatives*.

Alternatives. Two LF constituents are alternatives iff they are (i) semantically equivalent, and (ii) formally identical modulo binding indices on pronouns.

Next, we must specify what it means for one alternative to be more economical than another.

Economy Measure. Suppose that Σ and Π are alternatives. Then we say that Π is more economical than Σ if and only if there is a pronoun P and determiner phrases A and B in Σ and Π such that:

1. A binds P in Σ;
2. B binds P in Π;
3. A c-commands B in Σ and Π.

Now we are ready to state BINDING ECONOMY.

Binding Economy.
An LF constituent is ruled out if it has a more economical alternative.

Empirical evidence for this constraint mainly comes from a notorious puzzle concerning VP ellipsis, dating back to (Dahl, 1973). Consider the following sentence:

(13) Max said that he called his mother and Bob did too.

Notice that the second conjunct contains an elided VP, and that the overt VP in the first conjunct contains two pronouns. We may expect, then, that this sentence has at least four readings: one in which both pronouns are interpreted strictly, one in which they are both interpreted sloppily, and two "mixed" readings where one of the pronouns is interpreted strictly and the other sloppily. Surprisingly, one of these mixed readings is not available (in neutral contexts):

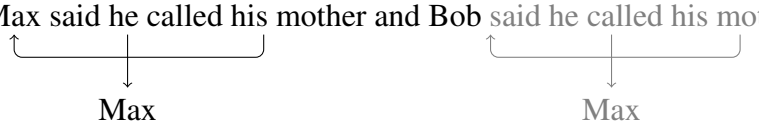
(13) Max said that he called his mother and Bob did too.

a.	...Bob too said that Max called Max's mother.	[strict-strict]
b.	...Bob too said that Bob called Bob's mother.	[sloppy-sloppy]
c.	...Bob too said that Bob called Max's mother.	[sloppy-strict]
d.	#...Bob too said that Max called Bob's mother.	[strict-sloppy]

Thus, the challenge is to account for the fact that (13-a), (13-b), and (13-c) are possible readings of the target clause in (13), while (13-d) is not.

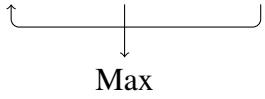
BINDING ECONOMY accounts for this fact. To see this, first consider the strict-sloppy reading in (13-d). This reading corresponds to the following LF:

(14) Max said he called his mother and Bob said he called his mother too.



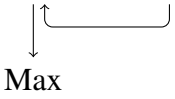
Consider the first conjunct of this logical form:

(15) Max said he called his mother.



This constituent has a more economical alternative:

(16) Max said he called his mother.



As a consequence, BINDING ECONOMY rules out (15), and therefore also (14). Thus, (13-d) cannot be derived as a reading for (13), as desired.

The other three readings, (13-a), (13-b), and (13-c), *can* be derived, through the following three logical forms. None of these involves non-local binding.

(17) Max said he called his mother and Bob said he called his mother too.

(18) Max said he called his mother and Bob said he called his mother too.

(19) Max said he called his mother and Bob said he called his mother too.

4 Problem for Binding Economy

Consider the following sentence:

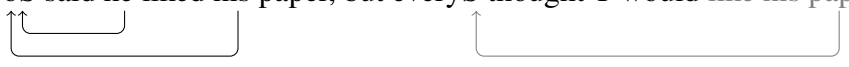
(20) No student said he liked his paper, but
every student thought the teacher would.

This sentence has the following *strict* reading (among others):

(21) . . . every student *x* thought the teacher would like *x*'s paper.

BINDING ECONOMY wrongly blocks this reading. To see this, consider the corresponding logical from:

(22) NoS said he liked his paper, but everyS thought T would like his paper.



The first conjunct has a more economical alternative:

(23) NoS said he liked his paper.

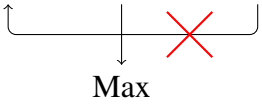
Thus, BINDING ECONOMY rules out (22). Notice that example (20) is very similar to Dahl's original example. If we strip off the second conjuncts, we are left with:

(24) Max said he called his mother.

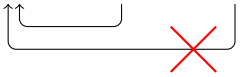
(25) NoS said he liked his paper.

The only relevant difference is that the subject of (24) is a referential determiner phrase, whereas the subject of (25) is a quantifying determiner phrase. In both cases, BINDING ECONOMY predicts that non-local binding of [his] is ungrammatical. Graphically:

(24) Max said he called his mother.



(25) NoS said he liked his paper.



In the case of (24) this is a welcome prediction, as it accounts for Dahl's puzzle. But in the case of (25) it is not, because it blocks the strict reading of (20).

It is worth noting that this problem carries over to alternative accounts of Dahl's puzzle such as those of Kehler (1993), Fiengo and May (1994), and Schlenker (2005).

5 Free Variable Economy

I will try to overcome this impasse in a way that preserves the general idea that semantic interpretation is subject to economy constraints. BINDING ECONOMY was derived from this general idea by assuming that one logical form is more economical than another if the pronominal binding relations it encodes are more local. This particular assumption seems to be problematic, but that does not mean that the general idea must be given up. There may be other measures of economy. Below, I will formulate such a measure. It is concerned with *free variables*, which are defined as follows:

Free Variables. Let Σ be an LF constituent, and let P be an indexed pronoun in Σ that is not bound within Σ. Then the index on P is called a free variable in Σ.

Let me give some examples (I must return here to using indices instead of arrows):

(26) a. [[Max]^2 [t_2 called his$_2$ mother]]
b. [[Max]^2 [t_2 called his$_1$ mother]]
c. [[he$_1$]^2 [t_2 called his$_1$ mother]]
d. [[he$_1$]^2 [t_2 called his$_2$ mother]]

(26-a) does not contain any free variables, because the pronoun it contains is bound within the given constituent. (26-b) does contain a free variable, because the pronoun [his] has a binding index, and is not bound within the given constituent. (26-c) also contains one free variable. Notice that we are not counting *occurrences* of free variables. The constituent contains two unbound pronouns, but both have the same index, so there is only one free variable. If one of the pronouns is bound, as in (26-d), the number of free variables does not change, it is still one.

In terms of free variables, we can define the following economy measure:

Economy Measure. Suppose that Σ and Π are alternatives. Then we say that Π is more economical that Σ if and only if some sub-constituent Π' of Π contains fewer free variables than the corresponding sub-constituent Σ' of Σ.

Now we are ready to state FREE VARIABLE ECONOMY.

Free Variable Economy.
An LF constituent is ruled out if it has a more economical alternative.

Notice that the formulation of FREE VARIABLE ECONOMY is identical to that of BINDING ECONOMY. The only thing that has changed is the measure of economy.

Free Variable Economy accounts for Dahl's puzzle, and it does *not* rule out the strict reading of (20). In other words, it prohibits non-local binding in (24) but not in (25). To see this, first consider (24), repeated in (27) using index-notation:

(27) [[Max]^1 [t_1 said that [[he]^2 [t_2 called his$_1$ mother]]]]
$\downarrow$
Max

This logical form has the following alternative:

(28) [Max]^1 [t_1 said that [[he]^2 [t_2 called his$_2$ mother]]]
$\downarrow$
Max

The only difference between (27) and (28) is that in (27), [his] is bound by [Max], while in (28), it is bound by [he]. The two logical forms are semantically equivalent, and, crucially, (28) is more economical than (27). To see this, consider the embedded clause. In (27), the embedded clause contains a free variable; in (28) it does not. This is enough for (28) to be considered more economical than (27), and thus for FREE VARIABLE ECONOMY to account for Dahl's puzzle.

Now consider (25), repeated in (29) using index-notation. Recall that this logical form should *not* be ruled out (otherwise the strict reading of (20) cannot be derived).

(29) [[No student]^1 [t_1 said that [[he$_1$]^2 [t_2 liked his$_1$ paper]]]]

This logical form has the following alternative:

(30) [[No student]^1 [t_1 said that [[he$_1$]^2 [t_2 liked his$_2$ paper]]]]

But this alternative is *not* more economical. Consider, in particular, the embedded clause. In (29), neither [he] nor [his] is bound within the embedded clause, but both carry the same index, so the embedded clause contains *one* free variable. In (30), [his] is bound within the embedded clause, but [he] is not, so the clause still contains one free variable. Thus, the embedded clause in (30) does not contain fewer free variables than the embedded clause in (29). It can be shown that no other constituent in (30) contains fewer free variables than the corresponding constituent in (29), and that the same holds for other alternatives of (29). Thus, FREE VARIABLE ECONOMY does not rule out (29) and correctly derives the strict reading of (20).

6 Conclusion

We have considered the idea that semantic interpretation is subject to economy constraints. We focused on one particular measure of economy, proposed by Fox (1999). This measure favors local pronominal binding over non-local binding. The resulting economy constraint, BINDING ECONOMY, accounts for a long-standing puzzle concerning VP ellipsis, dating back to Dahl (1973).

We have seen, however, that a variant of Dahl's original puzzle is problematic for BINDING ECONOMY. In response to this, we have considered an alternative measure of economy. This measure disfavors *free variables*. The resulting economy constraint, FREE VARIABLE ECONOMY, accounts for Dahl's original puzzle, and also for the variant that was shown to be problematic for BINDING ECONOMY.

The general strategy in this paper was to try and resolve the encountered problem in such a way that as much of the general theoretical assumptions that were taken as a starting point would be preserved (the idea that semantic interpretation is subject to economy constraints, but also even more basic assumptions about the syntax-semantics interface, the nature of pronominal anaphora and VP ellipsis, etcetera). Whether these assumptions are ultimately justifiable, is a different issue. In (Roelofsen, 2008), I argue against some of them and eventually present a different outlook, especially on the nature of pronominal anaphora and VP ellipsis. Of course, this also leads to a different account of the data discussed here. The outlines of such an account are sketched in (Roelofsen, 2008). Economy continues to play a role there, but not in the process of generating grammatical logical forms. Rather, it affects the process of anaphora resolution. I believe that this may ultimately be more realistic, but in order to uphold such a claim, many details still have to worked out. That's for the future.

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De Re/De Dicto Ambiguity and Presupposition Projection

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Abstract

The purpose of this paper is to compare three existing theories of *de re/de dicto* ambiguity: (i) the scope theory, (ii) the intensional variable theory and (iii) the presupposition projection theory. We will conclude that the presupposition projection theory is the conceptually most desirable among these, although all three are expressive enough to describe the data. In particular, we will present novel data suggesting that the intensional variable theory is too expressive and hence lacks explanatory power.

1 Introduction

De re/de dicto ambiguity refers typically to the ambiguities in the interpretations of determiner phrases (DPs) in relation to modal operators. A representative example with a definite DP is given in (1).

(1) John thinks that **the president of United States** is smart.

Consider the situation as of today, in which Barack Obama is the president of United States and suppose that John wrongly thinks that Al Gore is. In this context, the sentence has two interpretations. It can be read as reporting John's belief about Barack Obama or about Al Gore. The former is called the *de re* reading and the latter the *de dicto* reading.

Similarly, indefinites show the same kind of ambiguity as illustrated in (2).

(2) Sue wants to marry **a plumber**.

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In the *de re* reading, the sentence is about an actual plumber who Sue wants to marry, and crucially, she does not have to know that he is a plumber. The *de dicto* reading, on the other hand, means that Sue wants to marry someone she thinks is a plumber.

In this paper, we only deal with one side of this phenomenon. That is, we are concerned with how the *de re* and *de dicto* readings are disambiguated at the relevant grammatical representation, and not with how they —especially *de re* readings— are adequately represented in a formal metalanguage (for this topic, see Cresswell and von Stechow 1982; Kaplan 1969; Lewis 1979; Maier 2006; Quine 1956 among others). The objective of this paper is to compare three theories of *de re/de dicto* ambiguity found in the literature, namely (i) the scope theory, (ii) the intensional variable theory and (iii) the presupposition projection theory. We will conclude that the presupposition projection theory is conceptually the best among these. In the following three sections, we will examine them in detail in this order. Section 5 briefly discusses the consequences of our conclusion with regards to the theory of presupposition projection.

2 The Scope Theory

The classic way to capture *de re/de dicto* ambiguity is to analyze it as a scope phenomenon between DPs and modal operators (Cresswell and von Stechow 1982; Fodor 1970; Keshet 2008; Montague 1973; Partee 1974; Russell 1905 among others). Under this theory, the readings of (1) and (2) are paraphrased as follows.

(3) John thinks that the president is smart.
   a. The president x is such that John believes x is smart.
   b. John believes that the president x is such that x is smart.

(4) Mary wants to marry a plumber.
   a. There is a plumber x and Mary wants to marry x.
   b. Mary believes there is a plumber x and wants to marry x.[1]

However, Bäuerle (1983), Fodor (1970, §4.3) and Percus (2000) point out that the naive scope theory is too weak and runs into the problem of scope puzzle.

To state the conclusion first, the scope puzzle suggests the need for differentiating the mechanisms of scope taking and the interpretation of the restrictor of the DP in question, which is impossible in a naive scope theory. Thus, more fine-grained terminologies than the simple dichotomy of *de re* an *de dicto* are needed, and we will henceforth use the following (cf. Bonomi, 1995; Quine, 1956).

(5) a. **Wide/Narrow Scope**:
   The quantifier scope with respect to the intensional operator
   b. **Transparent/Opaque**:
   Whether the extension of a predicate is actual or not

[1] The fact that the operator that the existential quantifier gets caught in is an epistemic operator rather than a bouletic one needs an explanation in any theory. See Heim (1992) and Geurts (1998) for discussions.

The *de re* readings of the previous examples as described above are wide scope transparent, while the *de dicto* readings are narrow scope opaque. The gist of the scope puzzle is that narrow scope transparent readings also exist.[2]

2.1 Scope Puzzle

Now let us look at concrete examples. Fodor (1970) uses the following example.

(6) Charley wants to buy a coat like Bill's. (Fodor, 1970, 226)

The wide scope transparent and narrow scope opaque readings are not surprising and, in the scope theory, they can be informally paraphrased as follows.

(7) a. There is a coat like Bill's x such that Charley wants to buy x.
b. Charley believes that there is a coat like Bill's x and wants to buy x.

Fodor points out that there is yet another reading, which is true in the following kind of context: suppose that a store sells some coats that all look like Bill's, and that Charley does not know anything about Bill. Assume further that Charley wants one of those coats and any of them is an option. The sentence in (6) is true in this context, but neither of (7) represents this reading. In fact, there is no other scope possibility for the DP in question.

The scope puzzle is not confined to indefinites, and applies to strong quantifiers, as the following example illustrates (cf. Percus, 2000).

(8) If every man was a woman, John would be happy.

The most salient reading of this sentence is that if every actual man was a woman, John would be happy. The logic of the problem is exactly the same as above. In a naive scope approach, if *every man* is read transparent, it has to take wide scope, and if it is read opaque, it has to take narrow scope, but neither of them is the desired reading. Rather, what we want here is to interprete the restriction as being outside of the antecedent of the conditional, while the scope as being inside.

2.2 Semantic Reconstruction as a Solution

Before leaving this section, we present one possible way of saving the scope theory from the scope puzzle (see Keshet, 2008 for a different proposal). Specifically, assuming quantifying-in as the mechanism of scope taking, higher order abstraction (or semantic reconstruction) can be used to solve the puzzle (von Fintel and Heim 2007; for semantic reconstruction in general, see Cresti 1995; Heim and Kratzer 1998; Sternefeld 2001). In this way, scope taking and transparency can be treated in some sense separately: quantifying-in dealing with the former and semantic reconstruction dealing with the latter. The problematic readings of the sentences above can be represented as follows, for example.

[2]Wide scope and opaque readings are logically possible, but whether they exist as semantically distinct readings in natural language is controversial (Fodor, 1970; Bonomi, 1995; Keshet, 2008). To simplify the discussion, we will put them aside in this paper.

(9) a. [a coat like Bill's] $\lambda Q_{\langle et,t\rangle}$ Charley wants to buy Q
b. [every man] $\lambda Q_{\langle et,t\rangle}$ if Q was a woman, John would be happy

Here, the DPs are interpreted above the intensional operators and thus they are transparent, but the scope is reconstructed below the operators. This solution requires a treatment for non-subject quantifiers, but such methods have been explored in the literature, for example, type-shifting (Sternefeld, 2001) and intermediate semantic reconstruction (Cresti, 1995).

However, there is a conceptual criticism that one can raise against this solution. It is known that quantificational DPs generally cannot take scope out of a tensed clause, but sentences like (8) require exactly this. It is of course possible to modify the locality constraint so that it is not a restriction on quantifying-in in general, but only on first-order quantifying-in. However, such an ad hoc formulation is conceptually undesirable.

3 The Intensional Variable Theory

The intensional variable theory separates the scope and the transparency mechanisms more directly by positing intensional variables in the object language so that transparency is treated by logical binding of intensional variables, while the scope is dealt with by an indenpendent scope taking mechanism (von Fintel and Heim, 2007; Keshet, 2008; Musan, 1995; Percus, 2000). For example, the ambiguity in our initial example is described as follows, where s and s' are variables ranging over situations.

(10) John thinks that the president is smart.
a. John thinks [$\lambda s'$ the president-s is smart] *(transparent)*
b. John thinks [$\lambda s'$ the president-s' is smart] *(opaque)*

By employing a completely distinct mechanism for dealing with transparency, this theory is free from the scope puzzle and does not involve any extra assumption about the locality of scope. In fact, the narrow scope transparent readings of the problematic sentences above are easily described as follows:

(11) a. Charley wants [$\lambda s'$ to buy a coat-like-Bill's-s]
b. If [$\lambda s'$ every man-s was a woman], John would be happy.

However, as Percus (2000) and Keshet (2008) point out, this theory is too strong in its expressive power and generates impossible readings. They propose four constraints to prohibit such impossible readings, which we now review. We also show the need for an additional, novel constraint.

3.1 Overgeneration and the Four Constraints

3.1.1 Main Predicate and Adverb Constraints

As Percus (2000) points out, main predicates and adverbs cannot have transparent readings. Thus, the following (a) examples do not have the readings paraphrased by the (b) sentences.[3]

(12) a. Mary thinks that my brother is Canadian.
b. The set of Canadian X is such that Mary thinks that whoever she thinks is my brother is a member of X.

(13) a. Mary thinks that my brother always won the game.
b. All the relevant rounds R of the game is such that Mary thinks that whoever she thinks is my brother is the winner in R.

These readings are readily generated in the intensional variable theory by indexing the intensional variable on the main predicate and the adverb with the respective evaluation index. Percus (2000) proposes the following constraints to block them.[4]

(14) a. *Main Predicate Constraint*
Main predicates cannot be interpreted transparent.
b. *Adverb Constraint*
Adverbs cannot be interpreted transparent.

3.1.2 Intersective Predicate Constraint

Keshet (2008) further points out that intersective modifiers of a DP restrictor have to agree in transparency with the head NP. For example, the following example does not have a corehent reading, which would be possible if *married* and *bachelor* could have different intensional variables on them.

(15) #Mary thinks that the married bachelor is confused. (Keshet, 2008, 53)

This is not blocked by the Main Predicate or Adverb Constraints, and Keshet posits a third constraint:

(16) *Intersective Predicate Constraint*
All intersective modifiers of a DP must agree in transparency with the NP.

3.1.3 Presuppositional DP Constraint

Thirdly, Keshet (2008) observes that non-presuppositional/cardinal DPs cannot be interpreted transparent (also Musan, 1995). The following example illustrates this.

[3]Percus' original paraphrases for the (b) examples are not the readings we are after, and they are changed appropriately here.

[4]Percus calls them Generalizations X and Y, but we will use more transparent labels here. Similarly for the Intersective Predicate Constraint immediately below, which Keshet (2008) calls Generalization Z.

(17) [Context: There are two horses, but Charley thinks that they are donkeys.]
#Charley thinks that there are two horses.

This is not subsumed by the above constraints, and a new constraint is needed:

(18) *Presuppositional DP Constraint*
Only presuppositional DPs can receive transparent readings.

3.2 Nested DP Constraint

Lastly, we add one more constraint on the distribution of intensional variables, in order to account for the range of interpretations in a configuration where one DP is nested inside another DP.

(19) *Nested DP Constraint* (to be revised)
When a DP is embedded inside a DP, the embedding DP must be opaque if the embedded DP is opaque.

In such a nested context, there are four logically possible combinations of transparent/opaque, but one is systematically excluded. Specifically, if the embedded DP is opaque, the entire DP cannot be transparent.

Here is a concrete example. Putting aside the two uncontroversial interpretations where the two DPs agree in transparency, let us first consider the actually avaialble mixed interpretation of (20-a) represented as (20-b).

(20) a. Mary thinks the wife of the president is nice.
b. Mary thinks [$\lambda s'$ the wife-s' of the president-s is nice]

This is true in the following context: Mary is watching television and sees Barack Obama, the actual president, and his sister besides him. Also, she doesn't know who he is and she thinks that the woman besides him must be is his wife. That (20-a) is true in this scenario means that (20-b) is a legitimate representation. The following is a more perspicuous example, where only the opaque-transparent reading is pragmatically felicitous.

(21) a. Mary wants to find every solution to the unsolvable problem.
b. Mary wants [$\lambda s'$ to find [every solution-s'] to [the unsolvable prob-s]]

On the other hand, as our generalization states, the reading in which *the president* is opaque and *the wife* is transparent is not available for (20-a). This should be true in the following context. Mary sees Bono Vox on TV with his wife Alison Hewson. Mary wrongly believes that he is the president, and furthermore, that the nice woman next to him is his sister. Thus, the wife-relation is actually true, but the characterization of Bono Vox as the president is not. Under the intensional variable theory, this reading can be represented as follows.

(22) Mary thinks [$\lambda s'$ the wife-s of the president-s' is nice]

However, the sentence is not judged true in this context. Thus, our constraint is independenly necessary to prohibit the representation in (22).

Incidentally, the constraint is general enough to capture cases involving relative clauses such as the following example, where only the transparent-opaque reading is pragmatically felicitous on the assumption that unicorns do not exist in reality. The infelicity of the example suggests this reading is again unavailable.

(23) a. #Mary thinks that [the man who likes the unicorn] is a woman.
b. Mary thinks [$\lambda s'$ the man-s who likes the unicorn-s' is a woman-s']

We have so far seen cases with two definites. The situation is the same for strong quantifiers, and we will not provide examples here for the sake of space. However, indefinites are a bit more complicated, because they can take exceptional wide scope and each indefinite is therefore three-way ambiguous: wide scope transparent, narrow scope opaque and narrow scope transparent.[5]

Thus if the whole DP is definite and there is an indefinite inside, the number of possible readings is six, rather than four. Of these, two are not attested. This is summarized below.

(24)

	Embedding DP	Embedded DP
a.	Transparent	Wide/Transparent
b.	*Transparent	Narrow/Opaque
c.	*Transparent	Narrow/Transparent
d.	Opaque	Wide/Transparent
e.	Opaque	Narrow/Opaque
f.	Opaque	Narrow/Transparent

For the sake of exposition, we do not go into the details of the uncontentious cases where the two DPs agree in transparency. Let us begin with the actually available cases of disagreeing transparency. Firstly, if the embedding DP is opaque, both mixed readings are possible. To see this, consider the following example.

(25) Mary thinks that the unicorn that a famous linguist hides from her is beautiful.

Suppose that unicorns do not exist, but Mary believes that they do and in addition that her father John hides a beautiful one from her. Assume further that he is a famous linguist, unbeknowest to Mary. In this context, the sentence is judged true and the reading is such that the indefinite phrase is read wide scope transparent.

Also, the narrow scope transparent reading of the embedded indefinite is available for the same sentence. Here is a context: assume that there are group of people in front of Mary and she is convinced that one of them hides a beautiful unicorn from her, but has no idea which. Those people are famous linguists, but Mary does not know this fact. The sentence is again true in this context.

On the other hand, if the embedded DP is read opaque, the mixed readings are both impossible. Consider the following example.

[5] We again ignore the wide scope opaque reading.

(26) Mary thinks that the semantics paper about a tone language is a phonology paper.

Suppose that there is a semantics paper about French, which Mary thinks is a phonology paper about some tone language that she does not know. In this context, the sentence is judged false, but it would not if the indefinite *a tone language* could be read narrow scope opaque with the whole DP being read transparent.

Similarly, the indefinite cannot be read narrow scope transparent. Suppose now that there is a semantics paper about Vietnamese. Mary knows that it is about either Vietnamese, Cantonese or Thai, but she is unaware of the fact that these languages are tone languages, and she thinks that the paper is a phonology paper. In this context, the sentence is again judged false, but it would not if the indefinite could be read opaque narrow transparent.

Notice that although the former case is subsumed by the Nested DP Constraint in (19), the latter reading is not. Thus we add an additional conjuct to it:

(27) *Nested DP Constraint*

a. When a DP is embedded inside a DP, the embedding DP must be opaque if the embedded DP is opaque;

b. When an indefinites is embedded inside a DP, the indefinite must be wide scope transparent, if the embedding DP is transparent.

3.3 Interim Summary

That the intensional variable theory needs the five constraints introduced above suggests that this theory is too expressive, and lacks explanatory power. Although the data can be correctly described with these constraints, they seem rather ad hoc and thus the theory lacks an insight into the nature of the present phenomenon.

Before closing this section, let us examine the scope theory with semantic reconstruction with respect to the same constraints. The scope theory is better than the intensional variable theory in that it does not require the Main Predicate, Adverb and Intersective Predicate Constraints, since they can be attributed to syntactic locality constraints on quantifying-in. That is, it is not inadequate to posit a constraint that forbids quantifying-in of predicates in general. Furthemore, such a locality constraint makes the nested DP constraint unnecessary as well. In the scope theory, the whole DP cannot be transparent with the embedded DP opaque, since such a configuration necessarily involves an unbound trace/variable.

Nonetheless, however, the Presuppositional DP Constraint is independently necessary, as nothing prohibits quantifying-in of a non-presuppositional/cardinal DP. Also, recall that this theory suffers from the conceptual complexity regarding the scope islands. The presupposition projection theory presented in the next section is free from all these conceptual problems.

4 The Presupposition Projection Theory

The presupposition projection theory uses presupposition projection to derive the two readings (Geurts, 1998; Maier, 2006). While Geurts uses the Discourse Representation Theory (DRT) augmented with the Binding Theory of Presupposition, we try to be neutral with respect to the detailed mechanism of presupposition projection in this section. Importantly, however, the flexibility of presupposition resolution is crucial as we will discuss in Section 5.

Specifically, this theory differentiates the two readings by resolving the presupposition of the relevant DP in two different places. Transparent readings obtain when the presupposition is resolved globally, while opaque readings obtain when it is resolved locally. For instance, our initial example is analyzed as follows. The presuppositional parts of the paraphrases are underscored.

(28) John thinks that the president is smart.
   a. $\underline{\exists!x\text{: president}(x)}$ and John thinks that $\iota x[\text{president}(x)]$ is smart
   b. John thinks that $\underline{\exists!x\text{: president}(x)}$ and $\iota x[\text{president}(x)]$ is smart

Definite descriptions are typical presuppositional DPs, and their transparency ambiguities are innocuously captured as above. Similarly, strong quantifiers have presuppositions, and exhibit transparency ambiguity. Here we make an assume that they presuppose the unique existence of their domains and are semantically partitives (Geurts and van der Sandt, 1999; Geurts, 2007).[6] This enables us to describe the transparency ambiguities with strong quantifiers in the following way.

(29) John thinks every Canadian is smart.
   a. $\underline{\exists!X\text{: Canadian}(X)}$ and John thinks that all of X are smart.
   b. John thinks that $\underline{\exists!X\text{: Canadian}(X)}$ and all of X are smart.

Note that just as in the intensional variable theory, the quantificational scope is reckoned independently from the transparency, and hence the scope puzzle does not arise in this theory. For example, the conditional case repeated below is treated as (30-b).

(30) a. If every man was a woman, John would be happy.
   b. $\underline{\exists!X\text{: men}(X)}$ and if all of X were women, John would be happy.

4.1 No Need for the Constraints

A good thing about this theory is that it requires none of the independent constraints introduced in Section 3.

The Main Predicate and Adverb Constraints follow from the fact that the nature of presuppositions associated with presuppositional predicates and adverbs is different from the nature of presuppositions of presuppositional DPs (Zeevat, 2002). Simply put,

[6] As Gennaro Chierchia (p.c.) pointed out to us, there might be some differences between true partitives such as *most of the linguists* and mere strong quantifiers such as *most linguists*. However, we believe the differences, if any, are differences in the nature of presuppositions and not fatal for our assumption here.

while presuppositional DPs mention the same individuals or sets thereof in the presupposition and the assertion, the presuppositions of main predicates and adverbs are always about different sets of individuals, properties, events, situations etc. This lack of direct anaphoric dependency between the presupposition and the assertion straightforwardly explains why transparency ambiguity does not arise with main predicates and adverbs.

The Intersective Predicate Constraint does not have to be stated independently either. Specifically, the presupposition of a DP is triggered by D, and the NP meaning becomes part of the presupposition as a whole. Consequently, its subconstituents just cannot be separated. Similarly, the Presuppositional DP Constraint is just what this theory predicts.

Furthermore, the nested DP constraint straightforwardly follows from interepretability (cf. *trapping* of van der Sandt, 1992). Let us look at the non-indefinite case first. The assumption here is that presuppositions cannot contain free variables. For instance, in the following example, the only felicitous reading necessarily contains a free variable y.

(31) #Mary thinks that the man who likes the unicorn is a woman.

a. *$\underline{\exists!x : \text{man}(x) \text{ and like}(x,y)}$ and Mary thinks that [$\exists!y : \text{unicorn}(y)$] and x is a woman. (T-O)

b. #$\underline{\exists!y : \text{unicorn}(y)}$ and Mary thinks that $\underline{\exists!x : \text{man}(x) \text{ and like}(x,y)}$ and x is a woman. (O-T)

c. #$\underline{\exists!x,y : \text{unicorn}(y) \text{ and man}(x) \text{ and like}(x,y)}$ and Mary thinks that x is a woman. (T-T)

d. #Mary thinks that $\underline{\exists!x,y : \text{unicorn}(y) \text{ and man}(x) \text{ and like}(x,y)}$ and x is a woman. (O-O)

4.2 Wide Scope Indefinites and Presuppositions

As we have already seen, indefinites can be interpreted transparent as well, but a problem here is that indefinites are generally considered non-presuppositional. It has been well known, however, that indefinites are different from other quantifiers in that they can take exceptional wide scope, and we maintain that whatever is responsible for the exceptional wide scope is also responsible for the wide scope transparent reading. For example, the wide scope transparent reading of the following example is captured as in (32-b).

(32) a. Mary thinks that a plumber is cool.

b. $\exists x : \text{plumber}(x)$ and Mary thinks that x is cool.

Nothing so far subsumes the narrow scope transparent reading of indefinites, but this also can be given a natural explanation. Namely, we assume that indefinites can be interpreted as partitives too. It is widely acknowledged that weak/non-presuppositional quantificational determiners can also be interpreted as strong/presuppositional, which we assume to be a partitive reading (Geurts and van der Sandt, 1999; Milsark, 1977), and there seems to be no reason to exclude indefinites from this generalization. Thus, Fodor's example of the scope puzzle with an indefinite is captured as follows.

(33) a. Charley wants to buy a coat like Bill's.
b. $\underline{\exists!X : \text{coats-like-Bill's}(X)}$ and Charley wants to buy one of X.

Furthermore, this account nicely predicts the interaction of wide scope indefinites and transparency stated in the second conjunct of the Nested DP Constraint. That is, when an indefinite is embedded inside a DP, the indefinite must be wide scope transparent if the embedding DP is transparent. This pattern straightforwardly follows from the interpretability. The relevant cases of the example in (26) would look as follows where y is free in the impossible readings.

(34) Mary thinks that the semantics paper about a tone language is a phonology paper.
a. $*\underline{\exists!Y, x : \text{tone-langs}(Y) \text{ and sem-paper}(x) \text{ and about}(x, y)}$ and Mary thinks $\exists y \in Y$ and x is a phonology paper. *(T-N/T)
b. $*\underline{\exists!x : \text{sem-paper}(x) \text{ and about}(x, y)}$ and Mary thinks $\exists y : \text{tone-lang}(y)$ and x is a phonology paper. *(T-N/O)
c. $\exists y : \text{tone-lang}(y)$ and $\underline{\exists!x : \text{sem-paper}(x) \text{ and about}(x, y)}$ and Mary thinks John is reading x. (T-W/T)

Thus, if the embedding DP is read transparent, the only choice for the embedded indefinite is also wide scope transparent, which is exactly what we want. Although we do not show them here, the other readings are also correctly accounted for.

From the above discussions, we conclude that the presupposition projection theory is conceptually better than the previous two theories and that transpancy ambiguity should be treated as a presuppositional phenomenon.

5 Theories of Presupposition Projection

The idea of treating transparency ambiguity as a presuppositional phenomenon is basically independent of the theory of presupposition projection. However, one thing it demands is that presupposition resolution be flexible enough so that there is a choice as to where the presupposition can be resolved. In other words, a theory that treats presupposition projection as a kind of scoping mechanism is necessary. The Binding Theory of Presupposition due to van der Sandt (1992) has this crucial feature, and the theories due to Geurts (1998) and Maier (2006) are couched in this framework. We simply refer the reader to those studies for the details of this account, and in this final section, we examine other representative theories of presupposition projection with regards to the flexibility of presupposition resolution.

The Satisfaction Theory (Heim, 1992; Karttunen, 1973) is one of the most espoused theories of presupposition projection. It attributes the projection behavior of a presupposition to the lexical nature of the operator that embeds the presupposition. In this framework such operators are divided in three different classes: *holes*, *plugs* and *filters*. Holes always let the presuppositions embedded in them project up, plugs always block them, and filters sometimes let them and sometimes do not. For what concerns us

here, attitude predicates are assumed to be plugs. Thus, while (35-a) presupposes (35-b), (35-c) does not.[7]

(35) a. The king of Buganda is bald.
b. Buganda is a monarchy
c. Fred thinks that the king of Buganda is bald.

However, if transparency ambiguity is to be treated as a presuppositional phenomenon, as suggested above, this theory will only yield the opaque reading of the definite DP in (35-c)[8].

Besides the Satisfaction Theory and the Binding Theory, a series of new theories have been recently proposed. Among these, we discuss the Transparency Theory (Schlenker, 2008) here. This theory treats the phenomenon of presupposition projection with the combination of a static semantics plus two violable pragmatic priciples, *Be Articulate* and *Be Brief*. The former requires that a sentence $\underline{p}p'$, where p is the presupposition of p', be expressed as *p and* $\underline{p}p'$, whereas the latter requires that p be not pronounced whenever it is pragmatically useless. For example (36-a) would be in accordance with *Be Articulate*, but not with *Be Brief*. As the latter is more highly ranked than the former by assumption, the less expressive form in (36-b) is the one usually chosen.

(36) a. Buganda is a monarchy and the king of Buganda is bald.
b. The king of Buganda is bald

In the case of attitude predicates the same reasoning can be applied and normally (37-b) would be chosen over (37-a) and this would give the opaque reading of the DP.

(37) a. John thinks that Buganda is a monarchy and the king of Buganda is bald.
b. John thinks that the king of Buganda is bald.

However, *Be Articulate* as defined in Schlenker (2008) cannot derive the transparent reading as it requires the conjunction *p and* to appear immediately before the sentence $\underline{p}p'$, i.e. as *p and* $\underline{p}p'$. In order to derive the transparent reading, one has to modify the definition of *Be Articulate* so that it also demands (37-a) to be expressed as (38).

(38) Buganda is a monarchy and John thinks that the king of Buganda is bald.

To sum up, what is needed for a presupposition theory is some level at which the transparent and opaque readings can be represented as different ways of solving the presupposition. In the case of the Binding Theory, this is encoded at the level of discourse representation, but as we have seen in this section, other options are possible in other theories, for example, in the lexical semantics and in pragmatic principles. A further examination of these alternatives, however, is deferred to future work.

[7]For Heim (1992) and Karttunen (1973), a sentence of the form *x believes* $p_{\{q\}}$, where q is the presupposition of p, presupposes that x believes q.

[8]One solution would be to assume that attitudes are filters, specifying the conditions under which the presupposition would not project.

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German *her*, *hin*, *hin- und her*, and *herum*: Meaning and Justification of Direction and Change of Direction in Perceptual Space

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Abstract

The paper presents a case study in the compositionality of particle-motion-verbs. Part of the investigation is the interaction between indexical elements contributed by *hin-* (there, thither) vs. *her-* (here, hither) and the deictic motion verbs *kommen* (come) vs. *gehen* (go). The investigation will lead to a distinction between the notion indexical in the sense of 'direct reference to the utterance situation' on the one hand and 'perspectival' as an attitudinal notion on the other. Both dimensions of context dependency are formalised in DRT-based lexical entries applied in a construction algorithm for multiple presupposition construction along syntactically driven principles. These principles are also shown operative in *hin- und her*-α and *herum*-α–descriptions of motion, both lacking reference to the utterance situation. The latter phenomenon is due to a general principle of self-location.

1 Introduction

German has a pair of particles *hin* and *her* specifying direction of motion which are interpreted w.r.t. the utterance location. They come close to English 'thither' and 'hither', respectively, which, however, seem oldfashioned or out of use. A German speaker naturally marks a motion of someone approaching him adding the particle *her-* to the motion verb, as in *Warum rennt der Hund her?* (Why does the dog run here?). He will also mark motion in the opposite direction adding *hin-*. If he is in the rear of the motion rather than in its front, we will ask e.g. *Wo rennt der Hund hin?* (Where does the does run (to)?). The first important question in this paper is whether *hinrennen* and *herrennen* can be reconstructed as compositional from the contribution of *hin-* or *her-* on the one hand and *rennen* (run) on the other. I will tackle the problem by making the idea of self-location in the front or rear of the directed motion operative. The puzzle seems harder with the double-particle construction *hin- und herrennen* as in *Warum rennt der Hund hin- und her?*, which translates as 'running back and forth'. In this complex verb *her-* does not

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refer to the utterance location and *hin-* does not indicate either where the speaker is. In one prominent use *hin- und her-* indicates iteration of changing direction which pragmatically implies running without a goal. German has another double particle construction with the latter meaning, i.e. *herumrennen*, with the particle *um* next to *her*. For *um* we can assume that it contributes change of direction as well in some way or other.

Concerning the issue of compositionlity a first glance already reveals that we need at last a semantics for the particles contributing direction, i.e. *hin-* and *her-*, as well as for *um-*, and for the contribution of the motion verbs.[1] But given that we can make the semantics of the particles precise as they occur in, say, *hinrennen* and *herrennen*, is their semantic contribution the same in the case of *hin- und herrennen*? — Hardly so, it seems, because *herrennen* is interpreted with respect to the speaker's self-location whereas the coordinated *hin- und herrennen* is not. *Hin und her-* are interpreted as direction and counter-direction in the motion sequence independent of the speaker's self-location. So the indexical particles come in different colours, and the question arises what makes them change their colour. This will be the leading question in section 2. *Hin-* and *her-* are sensitive to the utterance situation. There are verbs also known as context sensitive in this way, i.e. *come* and *go*, German *kommen* and *gehen*. Is the meaning of a combination of a context sensitive verb and a context sensitive particle predictable from their parts? This will be discussed in section 3. Section 4 will be devoted to *herum-* double particle constructions.

1.1 Background assumptions

The particles, we said, specify direction or change of direction. What is it, then, that the direction or change of direction is specified of? Per hypothesis this is the rectilinear path described with the help of manner-of-motion-verbs like *rennen* and *fahren* or deictic motion verbs like *kommen* and *gehen*. This hypothesis is a background assumption from more general research on space in Natural Language, see Kamp and Roßdeutscher (2005).

1.1.1 motion verbs

We believe that space as seen through the eyes of natural language has a simple geometry. Spatial directions are as much as possible conceived in such a way that all directions expressed in natural languages are conceptualised as following one of the three axes of *Primary Perceptual Space* (PPS), a notion adopted by Lang (1989). The principal determinants of PPS are the vertical axis VERT(ICAL) and the horizontal plane HOR(RIZONTAL), which is perpendicular to VERT. Events as they are described by motion verbs are rectilinear motions which follow one of the three axes of PPS. This assumption of the *Primacy of Orthogonality* relies on two empirical hypotheses on lexicalisation patterns in languages like German or English. First, there are no simple change-

[1] I do not claim, that the occurrences of the verbs as a whole or their complex parts are always composed 'online' according to some rules. But even if they are listed in the lexicon an answer to my question to which extent the interpretation of the constructions is rule based will help us to understand the lexicon better.

of-location-verbs that describe only motions that are neither along the VERT(ICAL) nor in the HOR(IZONTAL). Second, there are no simple change-of-location-verbs that describe only motions that are not rectilinear. *Walk, run* and *drive* describe motion in the horizontal, whereas *fall, sink, rise* along the vertical axis. But there are no verbs that lexicalise angular motion alone. You cannot but express the angular rising of a plane into the sky by using the verb *steigen* (to ascend, to rise), i.e. the same verb you use describing the straight vertical motion of, say, a balloon. We assume that the path w(eg) of a movement e (which is reminiscent to a path-concept of Kurt Eberle) is conceived of as a continuous 1-dimensional rectilinear region, and that the target y which moves along it is conceived as a point. This simple geometry sufficiently models what motion verbs express as the modificandum for the particle's contribution of direction and change of direction. The semantic analysis of the particle verbs will provide further evidence for the primacy of orthogonality because changes of direction in 90 degrees in the horizontal will be decisive to qualify for such changes expressed by means of the particles.

A lexical entry for the German motion verb *fahren* (drive) has the following form:

$$\text{fahr(en)}: \left\langle \text{e}, \left[\begin{array}{c} \underline{\text{y}}\ \text{w} \\ \text{weg(e)=w MOVE(e,}\underline{\text{y}}\text{)} \\ \text{DRIVE(e,}\underline{\text{y}}\text{) w} \perp \text{VERT} \end{array}\right] \right\rangle$$

There is a binding condition for the referential argument e and and for an argument slot y for the theme, such that *fahren* specifies a two-place relation DRIVE of a motion type between the theme y and the event e. The path of the (rectilinear) motion w is specified as perpendicular to the vertical of PPS. (As we look exclusively at motion in the horizontal we will skip the latter condition in the semantic representations.)

1.1.2 FRONT and REAR of a motion, *her-* and *hin-*

While traversing its path the moving target y determines for each time t two half-planes of the HORizontal; namely the FRONT of the motion e and the REAR of the motion. So the following axiom is part of the geometry that serves as the model for space as expressed in motion descriptions.

$$\left[\begin{array}{c} \text{e y t} \\ \text{MOVE(e,y,t)} \end{array}\right] \Rightarrow \left[\begin{array}{c} \\ \text{HOR} = \text{FRONT(e,y,t)} \cup \text{REAR(e,y,t)} \end{array}\right]$$

Let us assume that there is an observer of the motion. For each time t the observer can estimate whether the target y is approaching or whether it is disappearing. In other words: the observer either locates himself in the front of the motion, justifying the choice of *her* or else she localises herself in the rear of the motion. This justifies *hin*. That characterisation leaves open whether or not the observer locates herself at some point on the (estimated) path. It is only when endpoints of the motion come into play that the question whether the observer locates herself in the FRONT (or in the REAR) on the path becomes decisive for the lexical contribution of *hin-* and *her-*, see section 2. The direction as required by *hin-* and *her-* is sufficiently determined by the self-location of

the observer in the respective half-planes, FRONT(e,t) or REAR(e,t) defined for some particular t during the motion e.

Think of someone walking in the fields seeing at some time t a dog running towards him. As said in the introduction he will speak to himself or to someone walking by his side in terms (1).a. If the dog is running away from him he may utter (1).b.

(1) a. Warum rennt der Hund her?
why run the dog [hither]
'why is the dog running here?'

b. Wo rennt der Hund hin?
where run the dog [thither]
'where(to) is the dog running?'

If the man localises himself in the front of the movement it is unnatural for him to say *der Hund rennt irgendwo hin* (lit. the dog is running somewhere thither). He will also definitely not use *her-* if he is in the rear of the movement. Or think of the man having his dog close ordering him to stay put. He will say *Du rennst nirgendwohin!* (You are running nowhere!). But if the dog is somewhere distant and should not join the man he will shout *Du rennst nicht her!* (You are not running here!). In the former case the speaker localises himself in the rear of the motion whereas in the latter in the front of the motion.

With the notion of the REAR(e_α) and the FRONT(e_α) of the motion we have the conceptual and formal clue for presenting the contribution of *hin-* and *her-*, see (2): If some observer is present, his self-location is a spatial reference point r_0. We make the element of self-location of the observer explicit in the subscript 'i(ndex)', and a temporal index n(ow): $r_{0,i,n}$.[2] I present the contribution as a pair of presupposition and assertion. The event variable is free in (2).

(2) a. *her*: $\left\langle \left\{ \boxed{r_{0,i,n}} \right\}, \boxed{r_{0,i,n} \subseteq \text{FRONT}(e_\alpha)} \right\rangle$

b. *hin*: $\left\langle \left\{ \boxed{r_{0,i,n}}, \boxed{r_{1,n}} \right\}, \boxed{\begin{array}{c} r_{1,n} \neq r_{0,i,n} \\ r_{1,n} \subseteq \text{FRONT}(e_\alpha) \\ r_{0,i,n} \subseteq \text{REAR}(e_\alpha) \end{array}} \right\rangle$

her- is indexical. It requires that a reference point is resolved or accommodated in the front of the motion the description of which it is a part. *hin* is anti-indexical and requires a reference point r_1 in the front of the described motion, where r_1 is different from its indexical counterpart which is in the rear of the motion.[3] Both the indexical $r_{0,i,n}$ in the rear and the anti-indexial $r_{1,n}$ in the front must be justified in context.

In (3) the presupposed anti-indexical reference point r_1 is provided by the linguistic context. The man sees the dog running now and again to some particular spot in the field. He speaks to himself or to someone in his company, thereby introducing a description for the particular spot in the first sentence. The presupposed anti-indexical

[2] We have already alluded to the fact that the reference point need not be the self-location of the speaker $r_{0,i,n}$ but might actually also be some arbitrary reference point r_0, see next section.

[3] In the context of motion verbs we could strengthen the entry of *hin* adding a further condition: $r_{1,n} \subseteq$ w, weg(w,e_α). But this would not generalise to other verbal contexts that specify direction but no path, say, *vor sich hinreden* (to maunder) or *hin- und herwackeln* (to wiggle to and fro). This is why I leave the entry as is.

reference point r_1 is then resolved as anaphoric with respect to the explicitly introduced reference point in context.

(3) Da muss ein Kaninchenloch sein. Warum rennt der Hund sonst hin?
'There must be a rabbit hole. Why else does the dog run [hin]'

2 *hin- und her-rennen*

Warum rennt der Hund hin- und her? is interpreted as a squence of motion in some direction and its counter-direction and the reference points are interpreted as arbitrary, independent of the utterance place. This is not in line with the assumptions made in section 1 but the case can be accounted for. Let us, paving the way towards a solution of the puzzle, look at a description of a sequence of events of the dog's running first to the rabbit hole and then towards the speaker again. Let's also assume that the sequence occurs before the utterance time. The description may have the form (4).

(4) Der Hund rannte hin und rannte her.
'The dog ran there (e_1) and ran here (e_2)'

The description of the sequence $e_1 \prec e_2$ is a sequence of descriptions of rectilinear motions. Its dynamic semantics is as follows. e_1 has r_{11} as its goal. Following entry (2) the *hin-* description presupposes some reference point $r_{11,n1} \neq r_{01,i,n1}$, such that $r_{11,n1} \subseteq \text{FRONT}(e_1)$ and $r_{01,i,n1} \subseteq \text{REAR}(e_1)$. $r_{11,n1}$ is the 'place reached within the story' made of e_1 and e_2; it is a specific place (and the context is more natural if there is an explicit antecedent in the context). The *her-* description of e_2 requires according to (2) a reference point $r_{02,i,n2}$, which is located in $\text{FRONT}(e_2)$.

We can assume now that the spatial perspective point is stable and we yield the condition that the self-location at the beginning of the event sequence does not change. So we have two self-locations, both at the same place, i.e. $r_{01,i,n1} = r_{02,i,n2}$.

So far we have reconstructed descriptions with *hin-* und *her-* as a sequence of a theme running to some (definite) place distant from the speaker's place and then approaching again, as a special case of a sequence of motions in some direction and it's counter-direction.

***Primacy of Orthogonality*.** What qualifies as a change to counter-direction? A full turn of 180 degrees of the moving target of course target will do, but less dramatic changes can also be felicitously described in terms of *hinrennen und herrennen* or *hin- und herrennen*. However, the change must be one in more than 90 degrees. It is only then, that $r_{01,i,n1} = r_{02,in2}$ is located both in some half-plane qualifying as $\text{REAR}(e_1)$ and some half-plane qualifying as $\text{FRONT}(e_2)$(compare Figure 1, where the arrows represent the motions e_1 and e_2 and the lines the border between FRONT and REAR of e_1 and e_2, respectively.)

That latter condition and the confirmed assumption that motion descriptions are descriptions of those motions as following one of the three axes of PPS support the outstanding role of orthogonality in motion descriptions, see sec. 1.1.

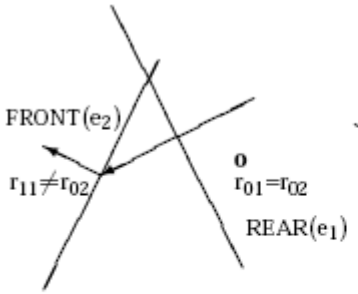


Figure 1.a No model for *hin- und her*(α).

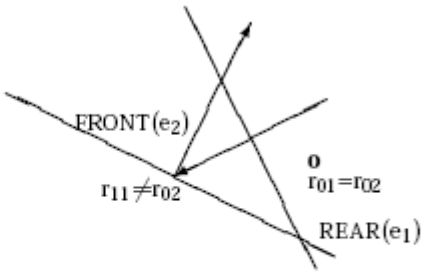


Figure 1.b Model for *hin- und her*(α).

What makes $r_{01,i,n1}$ and $r_{02,i,n2}$ loose their indexical colour in *hin-und her*-descriptions and makes them interpreted as arbitrary spatial reference points as given in $r_{01} = r_{02}$ (see Figure 1)? Crucial in this respect, I claim, is whether *hin- und her* serves as a complex modifier of *one* tensed verbal description α. If the sentence can be understood as a sequence of two descriptions, then the reference points can be interpreted as referring to the utterance place. For instance, *Der Hund rannte hin und wieder her* (He ran there and back here, again) must be reconstructed as elliptical, where the second occurrence of the verb is elided, but semantically present. But *hin- und herrennen* as in the simple *der Hund rannte hin- und her* (the dog ran back and forth) is understood as *one* event complex e such that e is a mereological sum of e_1 and e_2, displayed now and later as 'e = $e_1 \oplus e_2$'. We have *one* utterance time n, instead of two for the description of the complex e. Let's counterfactually assume that there would be one utterance time n of the description of e, but two self-locations $r_{01,i,n}$ and $r_{02,i,n}$. How would they be related to e? — $r_{01,i,n} \subseteq$ REAR(e), because $r_{01,i,n}$ is in REAR(e_1) and $r_{02,i,n} \subseteq$ FRONT(e), because it is in FRONT(e_2). So the speaker would have to split his self-location at utterance time n of the description e into two different perspectives on e, being in the front and in the rear of the complex motion e at the same time. But this is impossible. (N.B. Under this impossible assumption the anti-indexical $r_{11,i,n}$ is neither in the rear nor in the front of e, for it is in the front of e_1 and in the rear of e_2. Indeed r_{11}, the 'place where e_1 ends up', has no specific interpretation in simple *hin- und her*-descriptions, which it has in a sequence of descriptions like (4). In a single utterance description of an event complex it serves as an arbitrary point of return on the path of e.) Let us summarise what our counterfactual assumption shows: Self-location is bound to utterance time. One utterance, one self-location. Self-location can either be in the front or in the rear of the motion. If a single utterance describes a sequence of motion in some direction and counter-direction the indexicals cannot be interpreted with respect to the speaker's self-location. This prediction also covers *herum*-α double-particle constructions, which are also one utterance descriptions of event complexes, see section 4. *hin- und her*-constructions must be analysed as double particle constructions as well.

3 *her*-α vs. *hin*-α and *kommen* vs. *gehen*

On the face of it there is a correlation between indexical *her*-α descriptions and *kommen* (to come) on the one hand and anti-indexical *hin*-α -descriptions and *gehen* (to go) on the other. That correlation seems to gain substance by the fact that given our field scenario the utterance of (5) is as natural as (1).a, if not more natural.

(5) Warum kommt der Hund? / Warum kommt der Hund her?
'why does the dog come?' / 'Why does the dog come [here]'.

Is there any difference between *herrennen* and *kommen* or *herkommen* at all?[4] As far as the data presented there isn't and the entry of *her-* resembles the one for *kommen* in Roßdeutscher (2000). (The resemblance will be made precise in the following.) Given that resemblance we would not be surprised if *kommen* and *hin-* were incompatible. And indeed, if we substitute *rennen* with *kommen* in (6), we yield a weird context:

(6) # Da muss ein Kaninchenloch sein. Warum kommt der Hund sonst hin?
'There must be a rabbit hole. Why else does the dog come there'

But the matter is more complex: Neither have *kommen* and *herrennen* the same semantics nor are *kommen* and *hin-* incompatible. The data (7) illustrate the differences. The context is fixed as part of a conversation taking place in Stuttgart, speaking of tomorrow's party at Tübingen.

(7) Speaker in Stuttgart:"*Morgen ist in Tübingen eine Party...*
a. *... Kommst du auch?*"
b. *... # Kommst du auch her?*"
c. *... Kommst/fährst/gehst du auch hin?*"
d. *... Kommst/fährst/gehst du auch hin und kommst/fährst dann wieder her?*"
e. *... Kommst/fährst/gehst du auch hin und *gehst dann wieder her*?"

The surprising data are (7).b and (7).c as opposed to (7).a. Assuming that *kommen* is indexical (which is a natural assumption) (7).a. is known as counter-evidence against both seminal theories of indexicality, Fillmore's as well as Kaplan's. See Roßdeutscher (2000) for detailed discussion[5]. Recall that Fillmore (1983) in this analysis of *come* as an indexical predicts that *come* implies that the speaker or the addressee is at the goal of the motion, either at coding time (= utterance time) or at arrival time. But neither is guaranteed here: neither is the addressee's perspective chosen nor necessarily the speaker's, because it doesn't follow from (7).a that the speaker will be at the goal tomorrow. So Fillmore's theory must be qualified or rejected. And, again assuming that *kommen* (to come) is indexical, Kaplan's theory predicting direct reference at the goal of the motion must be rejected or qualified just as well.[6] For his theory on indexicals in Kaplan (1989) excludes any shifts of indices. Denying *kommen* indexical status right away does not present itself as promising taking the weird context (6) into account, where the anti-

[4]We ignore differences in manner specification.
[5]The example (7).a goes back to Cinque (1973).
[6]cf. Kamp and Roßdeutscher (2004)

indexical *hin-* and *kommen* apparently conflict. Why should they conflict if not with respect to indexicality? On the other hand (7).c with *hinkommen* is as felicitous as with the manner of motion describing *hinfahren* (drive thither)[7]. Thus the solution to the puzzle must be sensitive to the difference between contexts like (6) and (7).c in the first place. The puzzle has been solved already in the theory of *kommen* in Roßdeutscher (2000): *Kommen* requires an attitude bearer in the front of the motion, a person. That contextually provided attitude bearer is ascribed the attitude of localising himself in the front of the *kommen*-motion. This solves the puzzle of the felicitous (7).c on the one hand and the infelicitous (6) on the other: While there are naturally attitude bearers at the party venue the perspectives of whom justify *kommen*'s requirements,[8] there aren't any attitude bearers at rabbit holes, unless this is explicitly mentioned. Consequently the speaker who describes the motion cannot choose a perspectival description of motion in (6). The speaker in (7) has that option because an attitude bearer can be justified in the front of the motion at the party venue (at the goal) in (7).a, c, d, e for the first motion and he himself is an attitude bearer at the goal of the second motion in (7).d. This option to select *kommen* also obtains in (1).a, and (5). The speaker opts for a non-perspectival motion description in the former and for a perspectival one in the latter. Selecting *kommen* and thereby rejecting *fahren* or *rennen* means making a choice.

This, however, is not so in the selection of *her-* and non-selection of *hin* in *herrennen* in (1) or *herkommen* in (5) (as opposed to *hinrennen* in (1), nor in the selection of *herfahren* or *herkommen* in the description of the second motion in (7).d. The speaker has no choice. The selection is determined by what is actually the case in the utterance situation: The speaker is in the FRONT (at the goal) of the motion and he localises himself there. This actual self-location of the speaker at the indexical 'here' and 'now' of the utterance situation ($r_{0,i,n}$ in (2)) determines the use. And by the same token the region of self-location $r_{0,i,n}$ is the goal-denotation interpreting *her-* in *her-*α-descriptions. No other interpretation is possible.

Different from *come* or *kommen*, *her-* is an indexical in the sense of 'direct reference' claimed for indexicals in general by Kaplan (1989). This strict notion of indexicality as 'direct reference' can be observed in (7).b. In this context (as in any other) *her-* can only refer to the utterance place. *her-* can neither be justified as the self-location of some party-goer at arrival time nor as the prospective self-location of the speaker as it is possible with *kommen* (compare fn. 8). Counterfactual contexts as the following provide further evidence for the directly referential behaviour of *her-*α as opposed to the perspectival *kommen*.

(8) Speaker in Stuttgart:

a. "Wenn ich in Reutlingen wäre, würdest du auch kommen."
'If I were in Reutlingen, you would come, too.'
b. "Wenn ich in Reutlingen wäre, würdest du auch herkommen".
'If I were in Reutlingen, you would come here, too'.

[7] We leave aside *gehen* for the moment, coming back to it soon.

[8] It is possible that the speaker is ascribing himself an attitude towards the addressee's motion to obtain at the arrival time. But this is not necessarily so, as Cinque (1973) correctly observes.

In (8).a the speaker chooses the perspective of counter-factual self-location of himself in Reutlingen, i.e. at the goal of the counterfactual motion. (The speaker might allude to the fact that whereever he was the addressee would end up.) In (8).b the counterfactual motion ends at Stuttgart, the actual place of the speaker's self-location. (Here she might allude to the fact that it is not because of her that the addressee pays a visit to Stuttgart or that the addressee might even avoid Stuttgart, unless the speaker is absent.) It is compatible with what I claimed that justification of *her-* and of *kommen* may be different in one and the same complex predicate *herkommen*.[9] With *hinkommen* the justification of the anti-indexical *hin-*, which presupposes an indexical anchor in context and the perspectival *kommen* are necessarily independent. (7).c is an example. The indexical reference point $r_{0,i}$ is the utterance location in the rear (at the source) of tomorrow's motion and the attitudinal state which is required by *kommen* is ascribed to one of the party-goers in its front. For good measure I will represent how the requirements are constructed and justified in a syntax driven bottom up construction algorithm, see next subsection.

Before I do this I still have to discuss how *gehen* fits in. I have said that *her-* is indexical in the sense of 'direct reference', *hin-* is anti-indexical but presupposes some indexical reference point in the REAR and that *kommen* is perspectival. It goes without saying that there is no indexical nor attitudinal requirement with manner of motion verbs like *fahren*. A speaker selecting *fahren* as opposed to *kommen* in (7).c, d, or e refrains from taking perspective. What is the impact of selecting *gehen* as opposed to *kommen* in (7).c and (7).d and why is (7).e ungrammatical? Is *gehen* indexical or anti-indexical in some sense? And if so, is it a matter of self-location of the speaker in the rear of the motion or a matter of choice of someone's perspective in the rear of the motion? Is (7).e ungrammatical because *gehen* is (anti)-indexical? There is no semantic difference in *hingehen* as opposed to *hinfahren* in (7).c, d. But this doesn't say much, because of the anti-indexical *hin*.

My explanation of why (7).e is ungrammatical is unspectacular. It is grosso modo as follows. *Gehen* is initial-oriented, whereas *her-* is final-oriented (in the sense of Fillmore (1983))[10]. We can make the notion operative in assuming that *gehen* requires

[9] This theoretical possibility arises in (8).b. (in contrast to (8).a where no direct reference comes into play). Beyond doubt *her-* is justified because the speaker actually self-locates himself at the utterance place Stuttgart, in the front of the (counterfactual) motion. But *kommen* might be justified by taking the perspective of some other person in Stuttgart. In the more 'technical' sense made operative in the present paper this means that the speaker ascribes to some person in the counterfactual world in Stuttgart that this person believes himself in the front of the motion. It is more plausible, however, to assume that the speaker chooses his own perspective on the counter-factual motion: he self-ascribes the belief of (actually) being at some place that would be in the front of some motion which would occur in the counterfactual world.

[10] Note that Fillmore's exclusion implication (A) in Fillmore (1983) 'The speaker is not at the goal of the motion.' for *go* or *gehen* seems to indicate indexicality for *go*, too. As evidence he presents the ungrammatical **Go here!* or **Geh her!*, and the evidence for (A) seems overwhelming. Still it is the combination of *go* and the directly referential *here* that is ungrammatical and the implication (A) might not be provided by *go* on its own. Does, for instance, the utterance of *Go! Go! Go!* imply that the speaker is not at the goal? Consider a group of soccer fans sitting behind the opponent's goal shouting encouragement for their favourite team heading for the goal. Could this scenario challenge Fillmore's rule (A)? I want to leave this question unanswered. (For this would require an extended comparison of the accounts, which we must leave for another occasion). Nevertheless I would like to express my doubts in

some reference point r_0 in the rear of the motion, see (10) below. *her-* requires its indexical reference point in the front thereby being final-oriented. Thus the contextual requirements of *gehen* and *her-* would be contradictory. As a consequence *hergehen* is an impossible word. [11]

Is *hergehen* really an impossible word? What about *hin- und hergehen* in *Der Mann ging hin- und her* (The man went back and forth)? The latter is felicitous, but note that there is no indexical colour in *hin-* or *her-* in that one utterance description of $e = e_1 \bigoplus e_2$. *her-* does not refer to the utterance location of the speaker. The contextual requirement of *gehen* is fulfilled: $r_{01} \subseteq \text{REAR}(e)$ because r_{01} is is in the rear of the *hin-* motion e_1, which solves the *gehen*-requirement; and $r_{02} \subseteq \text{FRONT}(e)$, because r_{02} is in the front of the *her-* description e_2. So the condition $r_{01} = r_{02}$ obtains which is decisive for the interpretation of the sentence as describing a sequence of motions in some direction and counter-direction. It is not the impossible verb *hergehen* that we face in *Der Mann ging hin- und her*, but the verbal construction *hin- und hergehen* built according to the rules we are about to formulate as constraints to apply in a bottom-up semantics construction algorithm.

3.1 Semantics construction algorithm

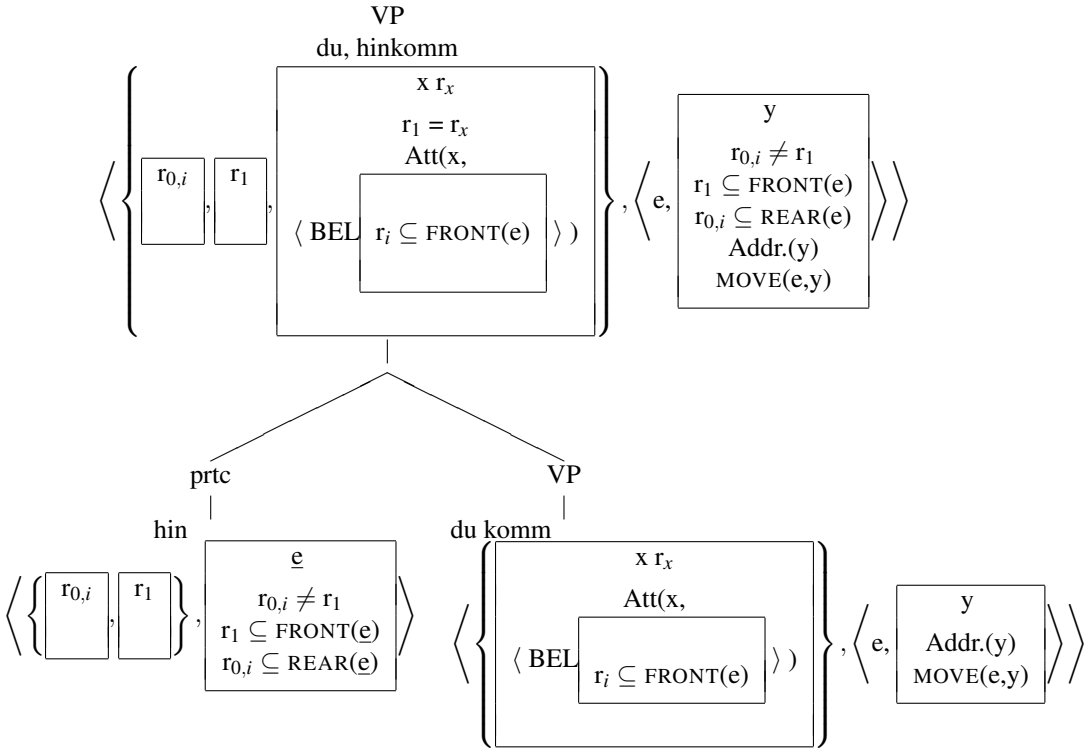
Semantics construction of the particle verbs in question is basically a matter of constructing and justifying the contextual requirements that stem from the particle and the verbal roots. It can be seen as a special case of constructing preliminary semantic representations which are justified in context in a second step, as familiar from Kamp (2001). What is novel is the fact that the construction is below word-level. Lack of space does not permit for going into the of word-syntactic principles which I assume underlying word-formation. I confine myself here to structures that separate the contribution of the verb and subject on the one hand and of the particle on the other. I will also simplify the semantic representation of attitude ascription to what is indispensable for the purpose of the paper. (See Genabith et al. (2006) for recent standard representations.) I also simplify the entry for the indexicals leaving out the temporal index of self-location.

I have chosen the semantics construction of *hinkommen* with the addressee as subject (occurring in (7).b) for a demonstration of how the composition can be modelled in a unification based framework on the basis of lexical entries, see (9), to be read bottom up.

(A) as follows: Had Fillmore taken an example like *Go! Go! Go!* as evidence for rule (A), the evidence of (A) would not have been overwhelming at all. N.B. According to the present account *Go! Go! Go!* just means *Move! Move! Move!* —, forward, though. The reference points r_0 in the rear required by *go* are in the respective backs of the players.

[11] In *hingehen* the requirement of *gehen* for some reference point r_0 in the rear of the motion is fulfilled in virtue of the requirements of *hin-*.

(9) *komm(st) (du) hin?*



Kommen is represented as a two-place relation between the referential argument and the subject of the sentence. The referential argument e is represented as a binding requirement that is due to be resolved at a Tense-projection, omitted here. *Kommen* does not specify any manner of motion but plain motion, represented as a prime in the representation language. Its presupposition component is presented in a DRS in curly brackets to the left of the assertion of the verbal head. As informally discussed *kommen* requires an attitude bearer x who is located at the region r_x and locates himself in the front of the motion, represented here as an attitude of belief (BEL). (The indexical r_i in the belief context, representing the attitude bearer's 'here', is bound to r_x in the main DRS, in accordance with general assumption of binding of indexical discourse referents in belief contexts). The node representation of the particle is a copy of (2).b, except that the variable $\underline{e}$ representing the event the direction of which *hin-* modifies is underlined indicating that the variable has to be bound in the course of the construction.

Interpreting the merge of the adjoined particle node and the VP obeys the following principle of justification of non-heads and heads in sublexical context. I dub it "Obey head requirements!" (OHR).

> **OHR** Justify the contextual requirements in the semantic representation of the non-head-node in the context of the representation of the head-node.

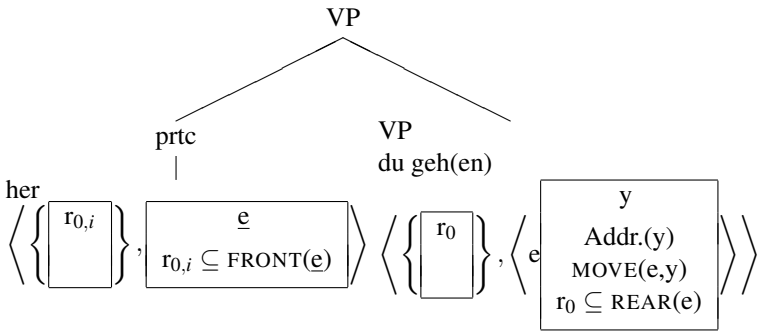
For *hinkommen* this means (i) substitute the binding requirement $\underline{e}$ by the referential argument e of the verb; (ii) justify the anti-indexical reference point r_1 as the region r_x of

the attitude bearer x presupposed by *komm(en)*. $r_1 = r_x$. The resulting VP representation contains already the relevant conditions of the preliminary sentence representation of (7).b. I only describe briefly how these context requirements are justified with respect to the linguistic and the situational context in (7): (i) $r_{0,i}$ is resolved as the speaker's (actual) self-location at speech time. (ii) $r_1 = r_x$ is resolved in context as the party venue in Tübingen, introduced in the previous sentence. (iii) The attitude bearer x must be accommodated and easily is so: party venues inhabit party-goers from the perspectives of whom the motion is described. So much for *hinkommen*.

In the construction of *herkommen*, $r_{0,i}$ in the representation of the particle node is resolved as r_x in the verbal node representation. We yield $r_{0,i} = r_x$. As $r_{0,i}$ must be justified indexically (directly referential) as the speaker's self-location the attitude bearer x will be resolved as the speaker, too (Compare fn. 9). This leads to incoherence of the context (7) with (7).b occurring therein.

I end this section by displaying the terminating construction of the impossible word **hergehen*.

(10)



The construction terminates because e in the particle representation must be bound by e in the verb's representation which would yield contradictory requirements $r_0 \subseteq$ FRONT(e) and $r_0 \subseteq$ REAR(e). But why can e undergoing failure of resolution not be accommodated to the effect that the modified VP describes a sequence e' $\prec$ e of motions towards the speaker and away from him again? — Because this would violate OHR. The sequence as a whole would not qualify as a *gehen*-event, for the first motion e' is final-oriented and disqualifies e as whole to be initial-oriented. This is why *her-* cannot obey the requirement of the *gehen*-head.

4 *herum-*α

In order to investigate whether *herum-* double particle constructions can be reconstructed as built according to the principles we have formulated, we must present the semantic contribution of *um*. The matter is not as straightforward as with the other particles, because there are two homonymous particles *um* in German. um_1 contributes a center and a sequence of paths around that center following tangents of the center; a second um_2 contributes opposites of some kind, in particular opposite directions. *Herum* is composed of *her-* and um_1. Think of a wheel with a center and spokes. *Um den Baum herumfahren* (to drive around the tree) describes a sequence of motions as follows: the

tree is the center; there are (fictive) spokes going into that center. A path specified by um_1 can be modeled as a sequence of rectilinear paths 'hopping from spike to spike', so to speak, (like on the rim of the wheel).[12] As mentioned in the introduction there is a reading where *herumfahren* means aimlessly driving, which is a pragmatic effect of iteration. But there is a more basic interpretation speaking of driving around a center z; the latter can be made explicit in an adjoined PP, where the internal argument of the preposition um_1 is the center z of the particle um_1, s. (11). I am concerned with the non-iterative event description which denotes a complex sequence of motions on the rim of the wheel around the center, contributed by the description of the tree in (11).

(11) Der Mann fuhr um den Baum herum.
'the man drove around the tree'.

It is important for our investigation to reconstruct the surplus which *herum-* adds to the description compared to *der Mann fuhr um den Baum* (the man drove around the tree) or *der Mann umfuhr den Baum* (the man avoided the tree). I have found that surplus of *herum* described in a Grammar in terms of 'coming back' in Heyse (1838), p. 843 and people I ask tend to speak in these terms of the differences. In the light of our hypothesis of the primacy of orthogonality in spatial descriptions I will have achieved my purpose if I can make sense of the idea that the complex verb involves change of direction to counter-direction as part of the predication; — not like with *hin- und her* (compare Figure 1.b), but with one more change in between. Please compare Figure 2 and Figure 3. (r_0 — r_2 display points 'on the spokes' of um_1 and the arrows motions 'from spoke to spoke'.)

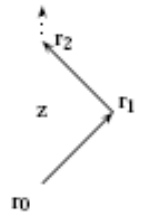


Figure 2

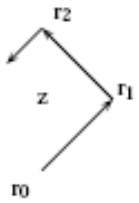


Figure 3

Figure 2 is a model for *um den Baum fahren* (also for *den Baum umfahren*) but not for *um den Baum herumfahren*. Figure 3 is a model for all three verbal descriptions. Please read the two non-dotted arrows in Figure 2 as contributed by um_1 in a double particle construction (where the double particle modifies a motion verb like *fahren*). According to standard morphological assumptions um_1 is the head of the double particle *herum* and *her-* is the non-head. According to ORH the requirements of *her-* must be justified with respect to the requirements of um_1, displayed here as the two motions e_1 and e_2, the first going from r_0 to r_1 and the second from r_1 to r_2. The reference point in the front of the motion required by *her* (which I refer to as r'_0) can be resolved as the source reference point r_0 contributed by um_1. But the motion e' in the front of which

[12] In constructions with um_2 as in *umherfahren* the different directions follow different spokes. There are differences in meaning between *umherfahren* and *herumfahren* which can be reconstructed in the present account. The decisive factors are (i) the difference of um_1 and um_2 in the 'wheel model', (ii) the differentiation of head vs. non-head in the double particle: *um* is the head in *herum*, *her* in *umher*.I leave the reconstruction for another occasion.

r'_0 is required to be located cannot be resolved in the context of um_1 as either e_1 or e_2 provided by um_1, because $r'_0 = r_0$ is neither in the front of e_1 nor in the front of e_2 and therefore doesn't qualify as being in the front of the sequence $e_1 \oplus e_2$. As a consequence $\underline{e'}$ has to be accommodated as a further motion e' with r_2 at its source and thereby in the rear of e'. As a result of this accommodation the requirement of *her-* is resolved, because $r'_0 = r_0$ is now in the front of e' and thereby in the front of the sequence $e_1 \oplus e_2 \oplus e'$ which specifies the complex *herumrennen*-event, as displayed in Figure 3.

5 Conclusion

The semantic analyses in this paper present partial but positive answers to the general research questions concerning context dependency and compositionality:

- Can the contextual requirements of complex predicates be reconstructed as built up from the contextual requirements of their sublexical parts in a rule based manner?
- Can we model motion descriptions and change-of-motion-descriptions on the basis of a simple geometry recurring to rectilinear motion and the primacy of orthogonality?
- Can we model the interaction of the situational and attitudinal dimensions of indexicals in a unique DRT-based semantics-construction algorithm?

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On Reading-Dependent Licensing of Strong Negative Polarity Items

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Abstract

I address two sets of data in which the acceptability of strong negative polarity items (*lift a finger*, *so much as*) is reading dependent: (i) Strong NPIs may occur in sentences with a law-like interpretation but not in sentences with an episodic interpretation. (ii) They improve in the restrictor of a proportional determiner even if ungrammatical in the restrictor of a corresponding cardinal determiner. These data are problematic for entailment-based and pragmatic approaches to NPI licensing. I propose an account based on *Discourse Representation Theory* (DRT). The differences are captured using DRT's representation of proportional determiners as duplex conditions and by the explicit integration of presuppositions into semantic representations.

1 Introduction

Negative Polarity Items (NPI) are expressions that cannot occur in affirmative, declarative sentences, but typically occur in negated sentences or in the complement clause to a matrix sentence of the form *I don't think*. This is illustrated in (1-a)/(2-a) and (1-b)/(2-b). NPIs are not a homogeneous class. As shown in (1-c) and (2-c), only some NPIs can be used in the scope of *not every N*. I use this as a diagnostic environment in the present paper to distinguish between *weak NPIs*, which can occur in the scope of *not every N*, (see (1-c)) and *strong NPIs*, as in (2-c), which have a more restricted occurrence pattern. This distinction was drawn for example in (Zwarts, 1997).

(1) Occurrence pattern of weak NPIs:

a. *Pat has ever heard of Hegel.
b. I **don't think** that Pat has ever heard of Hegel.
c. **Not every German** has ever heard of Hegel.

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(2) Occurrence pattern of strong NPIs:
   a. *Pat lifted a finger to help me.
   b. I **don't think** that Pat lifts a finger to help me.
   c. ***Not every students** lifts a finger to help his neighbor.

In the present paper I will consider another type of environments, the restrictor of a universal quantifier and the antecedent of a conditional. According to the classification of NPI-licensing contexts in (Zwarts, 1997), both strong and weak NPIs should be possible in the restrictor of *every*. Similarly, both types of NPIs have been observed in the antecedent of conditionals. This is illustrated with the data in (3) and (4).

(3) Weak NPIs:
   a. [**Every** restaurant that is ever mentioned in the Cosmopolitan] should be shut down.
   b. [**If** I a restaurant was ever mentioned in the Cosmopolitan], it should be shut down.

(4) Strong NPIs:
   a. [**Every** restaurant that charges so much as a dime for iceberg lettuce] should be shut down.
   b. [**If** a restaurant charges so much as a dime for iceberg lettuce], it should be shut down.

I will argue that strong NPIs are only possible in these contexts under a particular reading. I will, then, extend the observations made for *every* to the restrictor of other quantifiers. The data are presented in Section 2. This is followed by a brief discussion of previous approaches in Section 3. Sections 4 contains the basis of my representational account of NPI licensing. In Sections 5 and 6 this approach is generalized to account for the data of Section 2.

2 Data

2.1 Strong NPIs in Law-like Sentences

The status of NPIs in the contexts in (3) and (4) had been under discussion since Heim (1984). Addressing the data in (4), Heim suggests that a strong NPI is possible in the restrictor of *every* only in cases where there is an inherent connection between the restrictor and the scope of the quantifier — or the antecedent and the consequent in a conditional. I will call this type of sentences *law-like*.

The acceptable sentences in (4) are in contrast with the unacceptable occurrences of strong NPIs in (5). In (5) the relation between the two parts of the sentence is accidental, i.e. it is an observed co-occurrence of the events of the two parts of the sentence which is not based on an inherent link between the two. I will refer to this type of sentences as *episodic*.

(5) Strong NPIs in 'episodic' statements:
   a. *?[**Every** restaurant that charges so much as a dime for iceberg lettuce] happens to have four stars in the handbook.
   b. *?[**If** a restaurant charges so much as a dime for iceberg lettuce], it has four stars in the handbook.

Israel (1995) argues in detail that the difference between law-like and episodic statements has no parallel with weak NPIs. The data in (3) showed that weak NPIs are felicitous in law-like statements. The examples in (6) illustrate that they are equally fine in episodic statements.

(6) Weak NPIs in 'episodic' statements:
   a. [**Every** restaurant that was ever mentioned in the Cosmopolitan] happens to have four stars in the handbook.
   b. [**If** a restaurant was ever mentioned in the Cosmopolitan], it happens to have four stars in the handbook.

This brief review of Heim's and Israel's observations shows that even though the restrictor of universals and the antecedent of a conditional may host both weak and strong NPIs, strong NPIs are only possible in one reading. This can be captured in the following empirical generalization.

(7) Empirical generalization 1: Strong NPIs can occur in 'law-like' statements with *every* and *if*-clauses, but not in episodic statements.

2.2 NPIs in the Restrictor

In Section 2.1 we looked at the occurrence of strong NPIs in the restrictor of *every*. While the literature on NPIs concentrates on NPIs in the scope of various quantifiers, the restrictor has not received that much attention. The examples in (8) illustrate the occurrence pattern of NPIs in the restrictor of quantifiers as discussed for example in Zwarts (1997). There it is observed that the restrictor of *no*, *every*, and *few* allows for NPIs, whereas NPIs are excluded in the restrictor of *some*, *many*, and *most*.

(8) a. Determiners that allow for NPIs in their restrictor:
      (i) *no*/ *every*: [**No**/ **every** student who has ever studied syntax] will forget this example.
      (ii) *few*: [**Few** students who have ever studied syntax] will forget this example.
   b. Determiners that don't allow for NPIs in their restrictor:
      some/ *many*/ *most*: * [Some/ Many/ Most students who have ever studied syntax] analyzed this sentence correctly.

It was shown in Israel (1995) and Israel (2004) that the licensing pattern in (8) does not reflect the full picture. Israel observes a contrast between the NPI licensing in the restrictor of unstressed and stressed *some* and *many*, for which he writes *sm*/*mny* and *sóme*/*mány* respectively. While NPIs are excluded in the restrictor of the unstressed

versions, even strong NPIs considerably improve if the stressed version is used instead. This is shown with Israel's examples in (9).

(9) a. *[Sm/ mny of the guests who ate so much as a bite of trout] got sick.
b. ?[Sóme/ Mány of the guests who ate so much as a bite of trout] got sick.

This contrast can be related to observations from Partee (1988) where unstressed *sm* and *many* are classified as *weak determiners*, whereas stressed *sóme* and *mány* are considered *strong determiners*. The weak-strong distinction of determiners goes back to Milsark (1977). The existential *there* construction can be used as a diagnostics whether a determiner is weak or strong: Only weak determiners are allowed in this construction. This is illustrated in (10).

(10) Diagnostic environment: Existential *there*-sentences
a. Weak determiners:
There is a solution to this problem.
There are sm/ mny/ several/ a few books on this topic.
There are no ghosts/ few books on this topic.
b. Strong determiners:
* There is every book on this topic.
* There are sóme/ mány/ most books on this topic.

The classes of determiners identified by distributional criteria such as existential *there* sentences pattern with the semantic distinction between *cardinal* and *proportional* determiners (Barwise and Cooper, 1981). A determiner D is cardinal iff the interpretation of $D(A)(B)$ depends only on the size of the set $A \cap B$. A determiner D is proportional iff the interpretation of $D(A)(B)$ depends on the size of the set A in addition. For illustration, consider the definitions for the cardinal determiner *several* and the proportional determiner *most* in (11).

(11) a. for each sets A, B, $\mathbf{several}(A)(B)$ is true iff $|A \cap B| \geq 2$.
b. for each sets A, B, $\mathbf{most}(A)(B)$ is true iff $|A \cap B| \geq 0.5|A|$.

It is an important observation of Israel that the cardinal/proportional distinction plays a role in NPI licensing. This can be shown with the data in (12), which repeats the contrast between *sm* and *sóme* in (9), but uses unambiguously cardinal and proportional determiners.

(12) a. Cardinal determiners and NPI licensing:
* [Several guests who ate so much as a bite of trout] got sick.
b. Proportional determiners and NPI licensing:
? [Most (of the) guests who ate so much as a bite of trout] got sick.

The data from this subsection can be summarized in the empirical generalization in (13)

(13) Empirical generalization 2: Strong NPIs are (marginally) acceptable in the restrictor of proportional quantifiers.

3 Previous Approaches

In this section I will briefly sketch that prominent approaches to NPI licensing cannot capture the empirical generalizations from (7) and (13).

3.1 Entailment-based Approaches

The entailment-based approach to NPI licensing is formulated for example in Ladusaw (1980) and refined in Zwarts (1997). The key idea is that the entailment behavior of the context determines whether an NPI is possible or not. NPIs must occur in the scope of a *downward-entailing* operator, strong NPIs are furthermore required to be in the scope of an *anti-additive* operator. The relevant inference patterns are defined in (14).

(14) a. An operator O is *downward entailing* iff for each sets A and B, $O(A \cup B)$ implies $O(A) \cap O(B)$.
b. An operator O is *anti-additive* iff for each sets A and B, $O(A \cup B)$ is equivalent to $O(A) \cap O(B)$.

Applying these definitions to our examples, it can be shown that the restrictor of *every* is anti-additive.

(15) Every student who studies English or French knows Latin.
$\leftrightarrow$ Every student who studies English knows Latin and every student who studies French knows Latin.

The entailment-based approach also correctly predicts the licensing pattern in (8) as the determiners in (8-a) are all downward entailing in their restrictor, whereas those in (8-b) are not.

While the core data of NPI licensing are covered in this approach, the reading-dependent effects cannot be captured. The reason for this is that the entailment behavior does not seem to change according to the reading. For example, the entailment pattern in (15) is true independently of whether the sentences are interpreted in a law-like fashion or as an episodic observation about the current students. Similarly, the restrictor of *some* and *many* is not downward entailing, independent of whether they are used as a weak or strong determiner. The same is true for *most*, which is not downward-entailing in its restrictor either. This shows that the entailment-based approach cannot handle the observed reading-dependency of NPI licensing.[1]

[1] In a variant of the entailment-based approach, Giannakidou (1998) assumes that NPIs must be in the scope of a *nonveridical* operator. She defines nonveridicality for a determiner in such a way that $D(A)(B)$ is nonveridical in the restrictor iff the set A is not presupposed. Since strong determiners usually trigger an existential presupposition on their restrictor set (Geurts, 2007), it would be expected that NPIs are even worse in the restrictor of proportional determiners than they are in the restrictor of cardinals. In Section 6 I will assume that the existential presupposition of proportional determiners is suspended in law-like statements. Under this assumption, the restrictor of proportional determiners is a nonveridical context and, consequently, NPIs should be expected there. While this approach may account for the occurrence of NPIs in the restrictor of proportional determiners in law-like statements, there remains a problem. Since nonveridicality is the weakest occurrence condition for NPIs, this account would be forced to allow strong NPIs in nonveridical contexts in general, which may lead to a serious overgeneration.

3.2 Pragmatic Approaches

My main source of data in Section 2 were the publications by Michael Israel. Israel pursues a pragmatic account of NPI licensing, based on scalar implicatures, where the relevant scales may be provided by the context. According to Israel (2004) an NPI is possible in the restrictor of *most* just in case there is a contextually supported inference from sets to subsets, i.e. a pragmatic inference that behaves like downward entailment. Israel illustrates this with a scenario, in which everyone who can solve the hard puzzles can also solve the easy puzzles.

(16) Scenario: for each *x*: *x solves hard puzzles* → *x solves easy puzzles*
   a. inference from set to subset (similar to downward entailment):
      [Most students who could solve the easy puzzles] got a prize.
      → [Most students who could solve the hard puzzles] got a prize.
   b. inference from set to superset (similar to upward entailment):
      [Most students who could solve the hard puzzles] had trouble on the exam.
      → [Most students who could solve the easy puzzles] had trouble on the exam.

Using this scenario, Israel (2004) shows that the NPI *even* is only compatible with a context in which an inference from sets to subsets is intended, i.e. an inference as in (16-a).

(17) NPI-licensing pattern from Israel (2004):
   a. Most students who could solve even a single puzzle got a prize.
   b. *Most students who could solve even a single puzzle had trouble on the exam.

While Israel's observation is extremely interesting, the data in (17) seem to be due to the special scalar behavior of *even* rather than common to NPIs in general. The examples in (18) show that the NPI *ever* is equally fine in both contexts from (17).

(18) NPI-licensing pattern:
   a. Most students who could ever solve a single puzzle got a prize.
   b. Most students who could ever solve a single puzzle had trouble on the exam.

However, if we change the proportional determiner *most* into a cardinal determiner as in (19-a), an NPI may not occur in the sentence. Note that the sentence is such that in the given scenario, the contextual inference from sets to subsets is possible, as indicated in (19-b).

(19) a. *[Several students who could ever solve the easy puzzle] got a price.
   b. [Several students who could solve the easy p.] got a price.
      → [Several students who could solve the hard p.] got a price.

These examples illustrate that it is the cardinal-proportional distinction that is important for the NPI licensing in the restrictor of a determiner, not the direction of pragmatically available inferences.

4 A DRT-based Account of NPI Licensing

In this section I will present the basics of a DRT-based account of NPI licensing. The version of the account presented here is a minor simplification of the theory sketched in Sailer (2007a) and Sailer (2007b). Each sentence has a semantic representation that is a *Discourse Representation Structure* (DRS) as defined in Kamp and Reyle (1993). For NPIs I assume the general occurrence constraint in (20).

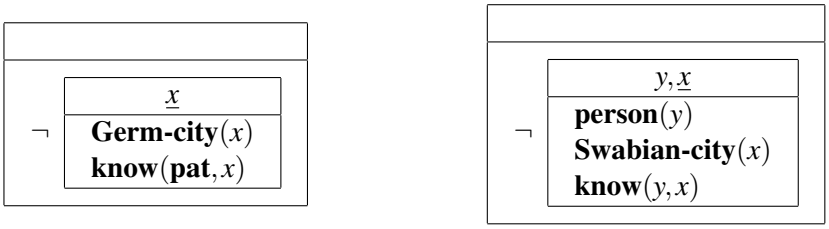
(20) In the semantic representation of a sentence, the contribution of every NPI must be part of an NPI-licensing DRS.

The constraint in (20) uses the notion of an *NPI-licensing DRS*, which needs to be defined. In the course of this and the next section, I will widen the definition of an NPI-licensing DRS step by step. In a first attempt, in (21), the scope of a negated DRS condition is an NPI-licensing DRS.

(21) NPI-Licensing DRS (first version): A DRS K is an *NPI-licensing DRS* iff K occurs in a DRS-condition of the form $\neg\ K$

This definition covers the occurrence of NPIs in sentences with a negated auxiliary and in the scope of negative indefinites such as *no one*. This is shown in the two examples in (22). The contribution of the NPI is underlined. In both cases it is the introduction of a discourse referent, written as $\underline{x}$. The contribution of the NPI occurs in the universe of the DRS that follows the negation symbol. Since this is a NPI-licensing DRS, the constraint in (20) is satisfied.

(22) Pat **doesn't** know any German city. **No one** knows any Swabian city.

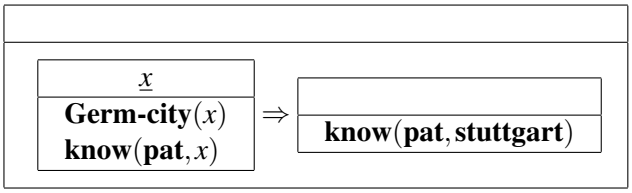


In DRT, a condition of the form $\neg\ K$ is equivalent to an implicational condition of the form $K \Rightarrow$ **false**, where **false** is any inconsistent DRS. To account for the occurrence of NPIs in the restrictor of a universal quantifier and in the antecedent of a conditional, it is sufficient to generalize the definition of an NPI-licensing DRS to the first DRS in an implicational condition. This leads to (23).

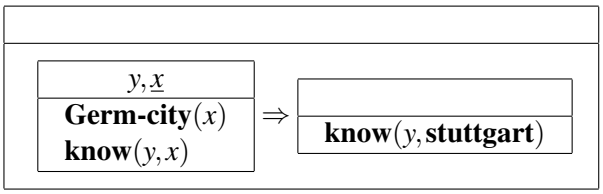
(23) NPI-Licensing DRS (second version): A DRS K is an *NPI-licensing DRS* iff K is the first DRS in a DRS-condition of the form $K \Rightarrow K'$.

The NPI licensing in *if*-clauses and in the restrictor of *every* follows immediately from (23). This is illustrated in (24) and (25). In both cases, the contribution of the NPI ($\underline{x}$) occurs in the first DRS of the duplex condition.

(24) [**If** Pat knows any German city], Pat knows Stuttgart.



(25) [**Everyone** who knows any German city], knows Stuttgart.



The representational theory of NPI licensing can be refined to account for the contrast between strong and weak NPIs. I assume that strong NPIs must be immediately contained in their licensing DRS, whereas weak NPIs allow for at most one intervening DRS. An intervening DRS is understood as a DRS that is contained in the same licensing DRS as the NPI and accessible from the NPI. These special constraints on strong and weak NPIs are stated in (26).

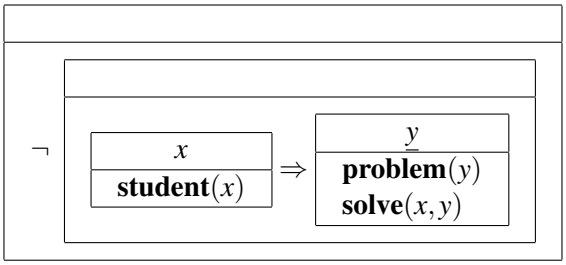
(26) a. A *strong NPI* must be an immediate part of an NPI-licensing DRS.
b. For a *weak NPI*, there may be at most one accessible DRS between the NPI and the NPI-licensing DRS.[2]

In all examples that we considered so far, the NPI was an immediate part of the licensing DRS. Consequently, both weak and strong NPIs are predicted to occur in these contexts.

The constraints in (26) can be illustrated with NPIs in the scope of *not every*, which I used as an empirical diagnostics in (1) and (2). In (27) a weak NPI, *any* with the semantic contribution $\underline{y}$, occurs in the scope of *not every*. The NPI-licensing DRS is the DRS immediately following the negation sign. Within this DRS, the restrictor of *every* is accessible from the DRS that contains the NPI. This shows that the constraint on weak NPIs in (26-b) is still met.

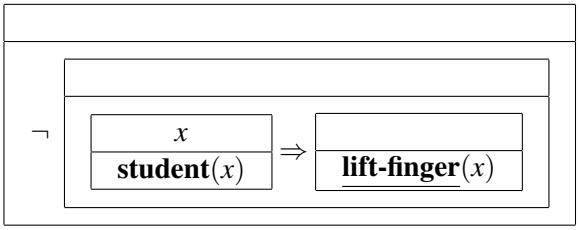
[2]In Sailer (2007a) I provide a more detailed characterization of the kinds of DRSs that may "intervene" between an NPI and its licensing DRS. For the present paper, the characterization in (26-b) is sufficient. Note also that the formulation "at most one ..." in (26-b) accounts for intervention effects, i.e. there may not be an additional quantifier occurring between the licensing DRS and the NPI. See Sailer (2007a,b) for details.

(27) **Not** *every* student solved any problem.



In the corresponding example with a strong NPI in (28) the NPI is not licensed. Since *lift a finger* is a strong NPI, its contribution, **lift-finger**, is required to be immediately contained in the NPI-licensing DRS, which is not the case.

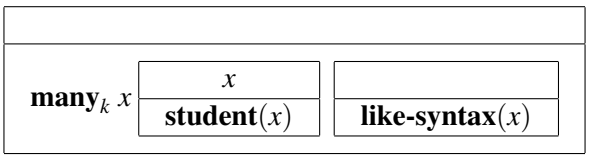
(28) ***Not** *every* student lifted a finger.



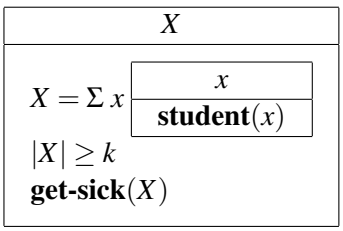
5 Generalization to Proportional Determiners

After these preliminaries, I will turn to the data from Section 2.2. Partee (1988) argues that DRT is ideally equipped to account for the difference between weak and strong determiners. She proposes that strong, i.e. proportional, determiners should be treated in terms of duplex conditions, which is parallel to the treatment of *every*. In contrast to this, weak, i.e. cardinal, determiners are to be analyzed parallel to indefinites. This is illustrated for the two readings of *many* in (29) and (30), where k is a contextually specified parameter for what should count as many.

(29) Many/ Mány students like syntax. (proportional reading)



(30) Many/ Mny students like syntax. (cardinal reading)

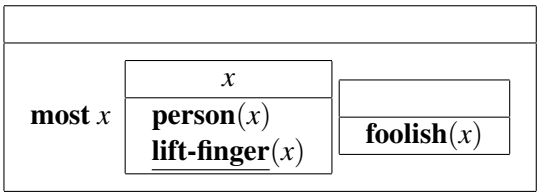


If we adopt Partee's suggestion of a representational difference between cardinal and proportional determiners, this can be exploited directly to generalize the definition of an NPI-licensing DRS even further.

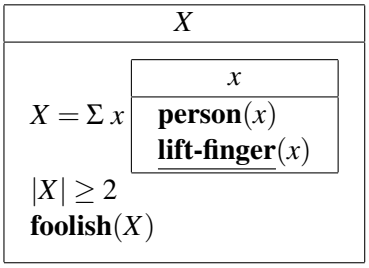
(31) NPI-licensing DRS (final version): A DRS K is an *NPI-licensing DRS* iff K is the first DRS in a duplex condition.

With the definition in (31) we immediately derive the prediction that NPIs, both weak and strong, should be possible in the restrictor of proportional determiners but not in that of cardinal determiners. Only in the first case are they included in an NPI-licensing DRS. This is illustrated for proportional *most* in (32) and for cardinal *several* in (33)

(32) ?[**Most** people who lift a finger to help Bill] are foolish.



(33) * [Several people who lift a finger to help Bill] are foolish.



The proposed widening of what counts as an NPI-licensing DRS immediately captures the contrast between cardinal and proportional determiners. The generalization in (13), follows naturally with standard assumptions on DRSs.

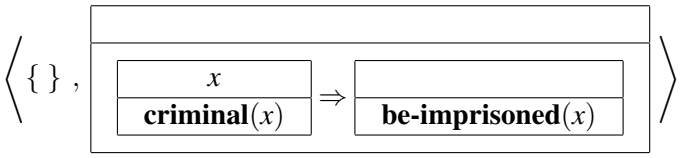
6 Presuppositions

In the preceeding section, I only focused on the cardinal/proportional distinction and ignored the law-like/episodic contrast from Section 2.1. As a consequence, my account would allow for NPIs in both law-like and episodic statements. In the present section, I will use DRT's integrated treatment of presupposition to prevent this overgeneration. Kamp (2001) presents an architecture of DRT that includes presuppositions. He assumes that a sentence has a *preliminary representation* and a *resolved representation*. The preliminary representation is a pair whose first element is a set of presupposed DRSs and whose second element is the DRS representing the asserted content of the sentence. In a resolved representation, the presuppositions are integrated into the asserted content.

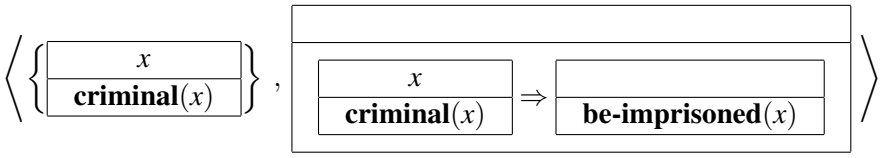
Horn (1997) argues that the difference between episodic (his *empirical*) and law-like statements can be related to a difference in presupposition. According to Horn, the

restrictor set is presupposed in an episodic universal statement. Such a presupposition is absent from a law-like statement. Adopting this plausible assumption, we arrive at distinct preliminary representations for law-like and episodic universal statements. In the law-like statement in (34) the set of presuppositions is empty. In the corresponding episodic statement in (35) it contains the restrictor DRS.

(34) Law-like statement: Every criminal will be imprisoned.



(35) Episodic statement: Every criminal was imprisoned.



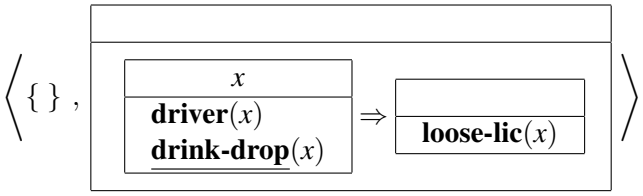
Given that there are distinct representations for law-like and episodic statements, it is possible to fine-tune the representational theory of NPI licensing accordingly. In the following, I assume that NPI licensing is checked at the level of the preliminary representation.

The inclusion of presupposition into the preliminary DRSs of a sentence has as its consequence that some parts of the contributed semantic material may occur more than once in the representation. In (35) the DRS that represents the restrictor of *every* occurs twice: Once in the asserted content, once in the set of presupposed DRSs. So far, my theory of NPI licensing does not specify whether both of these occurrences need to be licensed. I propose to distinguish two kinds of NPIs, which I will call *presupposition-sensitive NPIs* and *presupposition-neutral NPIs*. The relevant constraints on these types are given in (36).

(36) a. Every occurrence of a *presupposition-sensitive NPI* in the preliminary representation must be licensed.
b. Every occurrence of a *presupposition-neutral NPI* in the asserted part of the preliminary representation must be licensed.

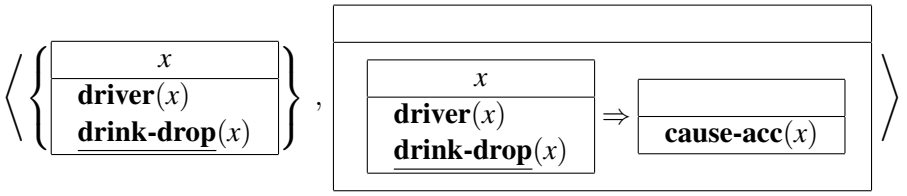
The data in Section 2.1 suggests that in English, weak NPIs are typically presupposition-neutral, whereas the listed strong NPIs are presupposition-sensitive. With this assumption, the ban of strong NPIs from episodic universal statements and conditionals can be captured. Consider first the grammatical, law-like statement in (37) and its DRS. Being a law-like statement, the restrictor of the universal is not presupposed. Therefore, there is only one occurrence of the strong NPI, **drink-drop**, in the DRS. This occurrence is in the first box of a duplex condition. Consequently, it is immediately contained in an NPI-licensing DRS, and the constraints in (26-a) and (36-a) are satisfied.

(37) [**Every** driver who drinks a drop] should loose his license.



The DRS of the corresponding episodic statement is given in (38). As far as the asserted content is concerned, the structure is as in (37) above. However, since the statement is episodic, the restrictor of the universal is included in the set of presupposed DRSs. As a consequence, the semantic contribution of the NPI occurs among the presuppositions as well. Since the NPI is presupposition sensitive, its occurrence in the presupposition set needs to be licensed. But in this set, the DRS that contains the NPI is not an NPI-licensing DRS. From this, it follows that the occurrence of the NPI violates (36-a) and, therefore, is not felicitous.

(38) *[**Every** driver who drank a drop last night] caused an accident.



Combining the insights from this and the previous section, we can see why the use of strong NPIs in the restrictor of proportional determiners is usually degraded. The existential impact of the restrictor set tends to be strong for proportional determiners. Only in limited occasions is it possible to arrive at a law-like, i.e. non-presuppositional, reading with a determiner such as *most*. This is exactly confirmed by the observations in Israel (1995) that the law-like/episodic dichotomy is not only relevant for NPIs in the restrictor of universals but extends to proportional determiners in general. I quote Israel's data that illustrate this contrast in (39).

(39) [**Most** students who've read the least bit of poetry], ...

a. will be familiar with Steven's "The Emperor of Ice Cream".

b. ?*seem to wear hats.

The present theory accounts for this contrast in the same way it accounted for the difference between (37) and (38). In both version of the sentence in (39) the strong and presupposition-sensitive NPI *the least bit* is licensed in the asserted part of the DRS. In the episodic reading in (39-b), however, the NPI fails to be licensed in the presupposed part.

As pointed out to me by Regine Eckardt (p.c.) the present proposal also correctly predicts that strong NPIs are usually excluded in the restrictor of *none of the N*, even though they are freely possible in the restrictor of *no N*. This is shown in (40). The important difference is that *none of the N* is presuppositional.

(40) a. *None of the [students who've read the least bit of poetry] seems to wear a hat.
b. No one [who was paying the least bit of attention] forgot this poem.

7 Conclusion

The paper is based on often-neglected data on the occurrence of strong NPIs in the restrictor of proportional determiners and in the antecedent of conditionals. I showed that an account of the facts is possible that uses standard DRT structures for the sentences. I made use of two important properties of DRT: First, proportional and cardinal determiners can be represented in structurally distinct ways. Second, with the integration of presuppositions into the DRS of a sentence, DRT provides just enough pragmatics inside the semantic representations to capture the contrast between law-like and episodic statements.

I classified NPIs in two dimensions: First, in (26), according to the allowed distance between the NPI and its licensing DRS, and second, in (36), with respect to their sensitivity to presuppositions. I consider it an open question whether these dimensions should be unified. The data in Giannakidou (2006) suggest that the two dimensions may, indeed, vary independently of each other. Her characterization of the distribution of certain Greek NPIs suggests that they may be licensed in weak licensing contexts such as in the scope of *few*, but that they show presupposition-sensitivity. Since Giannakidou's theory is cast in different terms, it is not clear whether the behaviour of Greek NPIs can be captured in the way I just sketched. More detailed and cross-linguistic data needs to be taken into account to settle this question.

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Vagueness in Degree Constructions

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Abstract

This paper presents a novel semantic analysis of unit names and gradable adjectives, inspired by measurement theory (Krantz et al 1971). Based on measurement theory's typology of measures, I claim that different predicates are associated with different types of measures whose special characteristics, together with features of the relations denoted by unit names, explain the puzzling limited distribution of measure phrases.

1 Introduction: Measurement theory in grammar

1.1 The aims and structure of this paper

Measures can be described as mappings of individuals to degrees along dimensions (height, width, loudness, etc.; cf., Krantz et al, 1971). My main claim in this paper is that the grammar of natural language is sensitive to the distinctions of measurement theory's taxonomy of measure types. This four level taxonomy goes back to Stevens (1946), who dubbed the by now widely used names for the four measure types – *ratio-scale* measures (also known as *extensive* measures), *interval-scale*, *ordinal-scale* and *nominal-scale* measures. Measurement theory was not only found useful in the analysis of the correct use of measurement in natural sciences such as physics. Its taxonomy is extensively used in statistics and its application for research methods in the social sciences (Babbie, 2004). It is also an important source of influence in the field of psychophysics, where it is found useful in describing the way subjects perceive and represent scalar properties of stimuli, ranging from properties such as sound, color, and weight to scales of, for instance, pain, well-being and even grammaticality judgments (Featherstone, to appear).

In order to demonstrate that grammar is sensitive to measurement theory's distinctions, in this paper I address problems pertaining to the interpretation and distribution of unit names, like *pound* and *meter*, that form measure phrases (as in *two pounds*). Measure phrases occur in constructions like *two meters tall* ('numerical

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degree predicates'), as well as *two pounds of cheese* ('classifier constructions'). I focus on the former structure, whose distribution is highly restricted.

Numerical degree phrases are not used with most predicates (*happy, beautiful, intelligent*, etc.) or nominalizations (*happiness, beauty, intelligence*, etc.), including adjectives for which conventional measuring systems exist (as the infelicity of *#two degrees warm, #two dollars expensive* and *#two kilos heavy* illustrates;Kennedy 2001; Schwarzschild, 2005). While in some languages, numerical degree modifiers are allowed with a restricted set of positive predicates (e.g., English), in other languages (like Hebrew), numerical degree modifiers are allowed with a restricted set of nominalizations (as in *gova* (*shel*) *shney meter* 'height (of) two meters'). In addition, the set of positive predicates, which indeed allows this modification, varies considerably between languages (Schwarzschild, 2005). Despite this limited distribution, in many languages, measure phrases do occur freely in the comparative form of *all* predicates (as in *two meters taller/shorter; two degrees warmer; two kilos heavier*, etc.), and speakers often creatively produce new numerical degree constructions, such as *two heads taller*, *two fingers wide(r)* and *two aspirins sick(er)* (I thank Louise McNally for this last example).

The licensing of ratio modifiers like *twice* is related in intricate ways to that of measure phrases. Ratio modifiers are most acceptable and most often used with positive adjectives that license measure phrases, as in, for instance, *Dan is twice as tall as Sam*. Negative adjectives in the positive form, combine neither with measure phrases (cf. *#Dan is two meters short*), nor with ratio modifiers (cf. *#Dan is twice as short as Sam)*. However, many positive adjectives (like *happy*), which resemble negative ones in not licensing measure phrases, *are* acceptable with *twice* (e.g., *I am twice as happy as I used to be* is not as bad as, e.g., *#Dan is twice as short as Sam*). In fact, speakers use *twice* more often with *happy* than with *short*. In a study of Google-search results, the proportion of ratio constructions ('*twice as Adj. as'*) out of the total amount of equative constructions ('*as Adj. as'*) was more than five times greater with *happy* (15%) than with *short* (~3%; Sassoon 2008, Table 1).

In part 1, I present the relevant taxonomy of measurements. In part 2, I present a new analysis of unit names and measure phrases, which is directly inspired by measurement theory (cf. Krantz et al, 1971; Klein, 1991). In part 3, I explore the consequences of this analysis. I show that different gradable predicates are associated with different types of measures, whose special characteristics, together with features of the relations denoted by unit names, explain the limited distribution of measure phrases.

1.2 Measurement types in measurement theory

I propose that in addressing grammatical facts pertaining to measurment, gradability and comparison, it is useful to consider the following classification of scalar properties or degree functions (assignments of numbers to objects along a dimension; Stevens 1946; Krantz et al 1971; see also Wikipedia, the free Encyclopedia under 'Level of measurement').

The first level in this classification is called *nominal*. The only significance of nominal degree functions lies in the fact that entities are assigned the same or different values. If the values are numerals, the choice of numerals is irrelevant and the only comparisons to be made between variable values are equality and inequality. There are no "less than" or "greater than" relations among the values, nor operations such as addition or subtraction. Examples are the set of eye colors (brown, blue, green, etc.) and the set of truth values {0,1}.

The second level is called *ordinal*. Here, the numbers assigned to objects represent their rank order (1st, 2nd, 3rd etc.). Comparisons of "greater than" and "less than" can be made, in addition to equality and inequality. However, operations such as addition and subtraction are still meaningless. Examples include the results of a horse race or a swimming competition, which state only which competitors arrived first, second, third, etc. but do not state time intervals.

The third level is called *interval*, where, in addition to the features of an ordinal level, equal differences between values represent equivalent intervals. Thus, operations such as subtraction are meaningful. But the zero point on the scale is arbitrary and negative values can be used. Thus, neither sums of nor ratios between numbers on the scale are meaningful, and operations such as multiplication, division and addition cannot be carried out directly (only ratios of differences between pairs of values can be expressed; one difference can be twice the other, etc., as demonstrated in Section 3.3) Examples are the year date in many calendars and temperature in the Celsius or Fahrenheit scale. The fact that the water freezing point is mapped to the zero Celsius degree is arbitrary (as arbitrary as the fact that the water boiling point is mapped to the 100 Celsius degree). The freezing point does not correspond to non-existence of temperature, in fact it corresponds to 273 Kelvin degrees. Accordingly, it is meaningless to say that 20 degrees Celsius is twice as hot as 10 degrees Celsius, in the sense that 20 degrees Celsius does not represent a double amount of heat (for a more complete discussion of the Celsius scale see Section 3.4).

The forth level is called *ratio*. Ratio functions have all the features of interval functions, in addition to meaningful ratios between values. Operations such as multiplication, division and addition are therefore meaningful. The zero value on a ratio scale is non-arbitrary. Most physical quantities, such as mass, length or energy are measured in ratio scales; so is temperature measured in Kelvin, that is, relative to absolute zero. Other examples include age, length of residence in a given place, etc.

Having presented measurement theory's levels of measurements, I now give my account of the semantics and distribution of unit names and measure phrases.

2 My Proposal

2.1 Vagueness pertaining to degrees

My implementation of ideas from measurement theory in the semantics of adjectives is unique in that it crucially relies on observations regarding the information that

different adjectival degree functions do or do not encode, i.e., the idea of vagueness as pertaining to degree constructions is central to the present analysis.

Let us call the linguistic and world knowledge of a given community of speakers *an actual context*. In standard vagueness models (van Fraassen 1969; Kamp 1975; Veltman 1984; etc.), expressions are assigned interpretation relative to information states (*contexts*) c, rather than relative to worlds w, so the interpretation of a statement in a context c may be *true*, *false* or *undetermined*. Only in (and in all) contexts of total information (*supervaluations*; van Fraassen 1969) is the truth value of all statements determined (it is either true or false). Let M_C be a vagueness model for a domain D and a set C of contexts. For any context $c \in C$, let $T_c \subseteq C$ be the set of contexts of total information extending c (c's *completions*). Let the set of statements that are *true in c* consist of the statements that are true in every completion $t \in T_c$ of c, and the set of statements that are *false in c* consist of the statements that are false in every completion t of c. For example, the truth of a statement like *it rains* is considered common knowledge in a given context c iff it holds true in every completion t in T_c; the falsity of a statement is considered common knowledge in c iff it is false (e.g., it does not rain) in every completion t in T_c. The truth value of a statement is *undetermined* in c iff T_c includes both a completion in which it is true (e.g., it rains) and a completion in which it is false (it does not rain). Generally, for any statement φ:

(1) a. $[\![\varphi]\!]_c = 1$ iff $\forall t \in T_c, [\![\varphi]\!]_t = 1$
b. $[\![\varphi]\!]_c = 0$ iff $\forall t \in T_c, [\![\varphi]\!]_t = 0$
c. Otherwise, $[\![\varphi]\!]_c$ is *undetermined*

Let T be the set of total contexts in C. In this paper, I associate gradable adjectives with the following semantics:

(2) For any $t \in T$, and any gradable adjective P:
a. Let $f_{P,t} \in \Re^D$ be *the degree function of P in t* (where $\Re$ is the set of real numbers).
b. Let $c_{P,t} \in \{0,1\}^D$ be *the characteristic function of P in t* (where 1 and 0 stand for truth values).
c. P denotes either $f_{P,t}$ or $c_{P,t}$, depending on the linguistic context. For example, in statements like *Dan is taller than Sam*, the adjective *tall* denotes $f_{tall,t}$, while in statements like *Dan is tall*, *tall* (or its projection) denotes $c_{tall,t}$ (Kennedy, 1999).

While in standard vagueness models, supervaluations represent different cutoff points for vague adjectives like *tall*, in the present proposal, they serve to represent different measuring conventions for gradable adjectives. For example, while in a total context t_1 the values of $f_{tall,t1}$ may correspond to the outcome of measuring entities' heights with a centimeter ruler (so, e.g., the meter is mapped to the number 100), in another total context t_2 the values of $f_{tall,t2}$ may correspond to the outcome of measuring entities' heights with an inch ruler (so, e.g., the meter is mapped to 39.4).

We need a representation of vagueness pertaining to degrees, because some information is *not* encoded by adjectival degree functions. In particular, ordering dimensions (height, heat, happiness, etc.) are typically mass noun interpretations, although we cannot directly count quantities of the 'stuff' denoted by such nouns. No given quantity of water, height, heat or happiness is unequivocally associated with a given (context-invariant) value like 1 or 2 or 345. Thus, objects d with a non-zero quantity of, e.g., height, should be mapped to different numbers in different total contexts in T_c of an actual context c ($\exists t_1,t_2 \in T_c$: $f_{tall,t1}(d) \neq f_{tall,t2}(d)$).

In fact, many functions (many types of rulers, if you like) adequately represent heights. Any function that maps equally tall entities to the same number and that maps the concatenation of n equally tall entities to n times that number, is *additive with respect to height*, i.e. adequately represents differences and ratios between entities' heights. For example, the mapping of two equally tall entities, d_1 and d_2, and their concatenation, $d_1 \oplus_{height} d_2$, to the values 5, 5 and 10, respectively, is additive. But so is their mapping to 2,2, and 4, respectively, and so is their mapping to 100, 100 and 200, respectively, etc. Each mapping corresponds to (the outcome of measuring entities' heights with) some possible ruler (inch, centimeter, meter, etc.)

2.2 Information about degree ratios and the interpretation of unit names

We see that many different functions may be associated with adjectives like *tall*. Despite this intrinsic vagueness regarding the mapping of entities to degrees, some information *is* encoded by adjectival degree functions. In particular, all the functions that may be associated with adjectives like *tall* adequately represent height ratios. This means that they share the same ratios between degrees, e.g., since the height of $d_1 \oplus_{height} d_2$ is twice the height of d_1 in all the examples just given, the ratio between their degrees is the number 2 in all these examples ($\mathbf{2} \times 5 = 10$; $\mathbf{2} \times 2 = 4$ and $\mathbf{2} \times 100 = 200$). In fact, all rulers (meter rulers, inch rulers, etc.) specify the same ratios between entities' degrees (precisely the ratios between the entities' heights). As these ratios are easily accessible to us (they are unequivocally determined numbers, identical in all the additive measuring systems), in any t, $f_{tall,t}$ should adequately represent them. Thus, in every $t \in T_c$, entities with n times d's height are mapped to the number $n \times f_{tall,t}(d)$. All *tall*'s functions in T_c, then, yield the same ratios between entities' degrees (these ratios are context-invariant).[1]

The moral to be drawn from the above observations is the following. It is not the case that, say, *Dan is 2 meters tall* is true in a context c iff in every total context t of T_c, $f_{tall,t}$ maps Dan to 2. In any actual context c, the value to which $f_{tall,t}$ maps Dan varies across accessible total contexts, rendering Dan's value undetermined ($\neg\exists n \in \Re$: $\forall t \in T_c$, $f_{tall,t}([[Dan]]_t) = n$). Rather, the truth of statements with numerical degree

[1] Surely, degree functions of adjectives like *tall* map entities to numbers per a given total context *and* time point, and entities' height ratios are identical in every total context *per* a given time point. It is only for simplicity that I omit indices such as those representing time points.

predicates must be determined based on information regarding height ratios. In particular, directly based on measurement theory (cf. Klein, 1991), I propose that an entity d falls under the predicate *2 meters tall* iff the ratio between d's degree in *tall* and the degree in *tall* of the original meter stick in Paris or any other entity that is one meter tall ('a meter unit-object'), $r_{m,t}$, is 2:

(3) $[[\text{Dan is two-meters tall}]]_c = 1$ iff $\forall T \in T_c$: $f_{tall,t}([[\text{Dan}]]_t) = 2 \times r_{m,t}$.

Thus, I take unit nouns (e.g., *meter*) to be extensional, in the sense of being *directly* linked to a set of entities which, by virtue of a convention, are regarded as *unit objects*, e.g., the entities whose height we call 'one meter'. This set, then, does not vary across the total contexts of any given context c. For any unit name *unit*, let $D_u \subseteq D$ be the set of unit objects of *unit*. I claim that, the word *meters* in statements such as *Dan is two meters tall* is interpreted as equivalent to the predicate "$\lambda P.\lambda n.\lambda x.$ x is n times as P as a meter unit-object". In this interpretation, in every total context t, the unit name denotes (the Schonfinkelized function of) a relation between (the degree function of) an adjective P (e.g. *tall, wide, long,* etc.), a number n, an and entity d in D, such that d's amount of P-hood (e.g., d's height, represented numerically by the value $f_{tall,t}(d)$) equals n times that of a meter unit-object (represented by the value $f_{tall,t}(d_m)$, for any meter unit object $d_m \in D_m$; Since all unit objects are equally tall, we can represent their degree as a constant, $r_{m,t} = \sigma(\{ f_{tall,t}(d_m): d_m \in D_m\})$, where σ is a function from singletons to their unique members). Thus, we can give a general interpretation rule for unit names and numerical degree predicates. Let us add to the language the category UNIT $\subseteq$ NOUN[3] that consists of words like *meter*(*s*)*, gram*(*s*), etc.:

(4) Unit names and numerical degree predicates
$\forall t \in T$, $\forall P \in ADJ$, $\forall u \in UNIT$:

a. $\exists r_{u,P} \in \Re$, $r_{u,P} \neq 0$: $D_u = \{d \in D: f_{P,t}(d) = r_{u,P}\}$.

b. $[\![\lambda n.\lambda x.u(P,n,x)]\!]_t = \lambda r \in \Re.\lambda d \in D.$ for some $d_u \in D_u$: $f_{P,t}(d) = r \times f_{P,t}(d_u)$.
In any t, the denotation of a numerical degree predicate that is based on u and P is a relation between numbers r and objects d, such that d's degree in P equals r times the degree of any unit-object d_u.

For example, $[\![\text{centimeters}]\!]_t = \lambda f_{P,t} \in \Re^D.\lambda r \in \Re.\lambda d \in D.$ for some $d_{cm} \in D_{cm}$: $f_{P,t}(d) = r \times f_{P,t}(d_{cm})$. Table 1 illustrates my proposal by means of a simplified model with three individuals and three total contexts. According to my proposal, we consider individuals' degrees in *tall* as specified because: (i) The ratios between (values representing) heights do not vary across total contexts, e.g., as the ostrich in Table 1 is twice as tall as the chicken, the ratio between the degrees of the ostrich and the chicken is 2 in every total context; (ii) A set of unit objects exists, $D_{cm} = \{d_{cm}\}$, s.t. d is *n centimeters (cm) tall* iff the ratio between d's degree and the centimeter unit objects' degree is n, e.g., as the ratio between the degrees of the ostrich and the centimeter unit

object is 100 in every total context in our example, *the ostrich is 100 centimeters tall* is true in it.[2]

Table 1: An example of my proposal

	(i) $f_{tall,t}(d)$		$\mathbf{r_{cm,t}}$	**(ii) $f_{tall,t}(d) = n \times r_{cm,t}$**	
	$d_{ostrich}$	$d_{chicken}$	$\mathbf{d_{cm}}$	$d_{ostrich}$ is *100cm tall*:	$d_{chicken}$ is *50cm tall*:
t_1	100	50	1	$100 = \mathbf{100} \times 1$	$50 = \mathbf{50} \times 1$
t_2	200	100	2	$200 = \mathbf{100} \times 2$	$100 = \mathbf{50} \times 2$
t_3	300	150	3	$300 = \mathbf{100} \times 3$	$150 = \mathbf{50} \times 3$

3 Consequences

In Part 3, I describe in detail the various consequences of the analysis just presented. I argue in detail that it captures not only the interpretation, but also the puzzling limited distribution of measure phrases. In particular, I have argued for (5):

(5) In actual contexts c, speakers feel they have information about entities' degrees in *tall* only because the following two preconditions hold:

a. *Precondition (i)*: The ratios between entities' degrees are context-invariant numbers ($\forall d_1,d_2 \in D, \exists n \in \Re: \forall t \in T_c, f_{tall,t1}(d_1) / f_{tall,t1}(d_2) = n$), and

b. *Precondition (ii)*: There is a consensus regarding a set of unit-objects (e.g., the meters) that serves as a reference point, so that any entity d is mapped to a context-invariant number, representing the ratio between d's degree and the unit objects' degree in *tall*.

In the following, I show that in languages that allow adjectives to combine with measure pharses, an adjective does not license unit names and numerical degree predicates iff at least one of these preconditions is violated.

3.1 Violations of precondition (ii): No consensus about unit-objects

My proposal predicts that the absence of conventional unit objects will result in vagueness concerning the mapping of entities to numbers. I propose that some adjectives have no unit names associated with them because it is impossible to determine a convention for them regarding a set of unit objects. Consequently, we have the impression that these adjectives do not map entities to numerical degrees.

[2] Some unit names (like *Celsius*) are interpreted by other interpretation rules. Yet we will see in Section 3.4 that speakers often wrongly presuppose that the unit name *Celsius* is interpreted by the above given rule (4). Thus, this rule is productively used by speakers, while other rules invented by scientists are not.

Consider, for instance, *happy*. Emotions are internal states. It is hard to come up with conventions as to which emotional extent should be mapped to degree 1, 2, 3, etc. Even if one speaker treats a certain internal state as a unit object, no other speaker has access to this state. So no object d can be *agreed upon by all the community of speakers* to constitute a unit object. This is the case even if any one of the speakers associates with *happy* internal (subjective and non-conventional, but nonetheless actual) means of additively measuring happiness intensities (including a suitable 'concatenation' relation for such intensities).

Similarly, while *weight* can be measured by kilograms, the internal states of speakers when they lift objects (their feeling of the objects being *heavy*, *light*, etc.) cannot be measured by conventionally established unit names. If a language maps a predicate to the latter type of degrees, the predicate will *not license* unit names and numerical degree modifiers. But this does not show that predicates do not map entities to numbers. In fact, when no unit name is explicitly mentioned, it is rather meaningless to say that something is tall to degree 456 (456 what? Kilometers? Meters? Inches?) In adjectives like *happy,* this is always the situation.

This proposal improves upon non-numerical theories (cf. Moltmann, 2006) because it accounts for the compatibility of *happy* with ratio and difference modifiers. For example, *Dan is twice as happy as Sam* is a claim concerning the ratios between the arguments' *happiness* degrees (with no reference to unit objects):

(6) $[\![\text{Dan is twice as happy as Sam}]\!]_c = 1$ iff
$\forall t \in T_c$: $f_{happy,t}([\![\text{Dan}]\!]_t) = 2 \times f_{happy,t}([\![\text{Sam}]\!]_t)$.

In addition, we can present a unified analysis of comparative morphemes with and without numerical degree modifiers, whereby the interpretation of these morphemes is mediated by a difference operation, creating difference modifiers:

(7) a. $[\![\text{Dan is } \textit{2 meters taller} \text{ than Sam}]\!]_c = 1$ iff
$\forall t \in T_c$: $f_{tall,t}([\![\text{Dan}]\!]_t) - f_{tall,t}([\![\text{Sam}]\!]_t) = 2 \times r_{m,t}$.
b. $[\![\text{Dan is } \textit{happier} \text{ than Sam}]\!]_c = 1$ iff
$\forall t \in T_c, \exists r \in \Re, r>0$: $f_{happy,t}([\![\text{Dan}]\!]_t) - f_{happy,t}([\![\text{Sam}]\!]_t) = r$.

We see that speakers do not need to know the degrees of entities they refer to, only the ordering or ratios between their degrees. These are available to them (cf., Section 2.2).

Notice that speakers often assert, for instance, that they are *twice as happy*, as a manner of speech – a figurative way of stating that they are much happier. However, this does not show that *twice as happy* is ungrammatical. Presumably, we may not be familiar nor understand the nature of any ratio-scale measering means for *happy*. Still, there is no a-priory reason to think that such measurements are impossible (we do not possess information according to which perceptual and emotional measurements of our experiences *must* be non-ratio-scale). For this reason we do not judge utterances of expressions such as *twice as happy* ungrammatical, even if we do not completely understand what they mean (we will see in the next Section that this is not the case for expressions like *twice as short*).

Furthermore, even when speakers are willing to accommodate the presupposition that additive measuring systems exist for happiness, they cannot always be precise about degree ratios, e.g., "on Monday I was twice as happy as I was on Sunday" is a very precise conclusion to reach through introspection. Speakers may be reluctant to commit themselves to this level of precision regarding their emotions.

In sum, I propose that it is for these reasons, and not because it is ungrammatical in the literal sense, that *twice as happy* is used as a manner of speech. We *can* reason with statements like *I am ten times happier now than I used to be ten years ago* or *I am twice as happy now as I was ten minutes ago*. In fact, the 'figurative' use probably emerges by virtue of the fact that the literal sense does exist. Thus, one source for cross linguistic variation in the licensing of measure phrases with positive adjectives is formed by differences in the measure type associated with (translations of) an adjective, e.g., languages may vary as to whether predicates like *heavy* or *warm* are associated with measures of external or internal states or both. With internal measures, measure phrases are ruled out due to violations of condition (ii) (absence of conventional unit objects; cf. (5b)), i.e. regardless of whether the given adjectival measure encodes degree ratios or not.

3.2 Violations of precondition (i): No information about degree ratios

While we may acknowledge the ratios between, say, our degrees of happiness on separate occasions, we can hardly ever acknowledge the ratios between degrees of entities in predicates like *short*. This is illustrated by the fact that ratio modifiers are less acceptable with *short* (*#twice as short*) than with *tall* or with *long* (for similar contrasts in other antonym pairs see Kennedy, 2001). Sassoon (2008) empirically supports the claim that ratio modifiers are less often used with negative adjectives (e.g., *short*) than with their positive antonyms (e.g., *tall*), based on a study of Google search-results of equative comparisons and ratio comparisons with pairs of antonym adjectives.

Accordingly, the present analysis predicts that, in the absence of a specification of (or information concerning) ratios between degrees, numerical degree predicates are not licensed, i.e. we directly explain why negative adjectives fail to combine with measure phrases to form numerical degree predicates, e.g., the infelicity of *#two meters short*.

3.3 Measure phrases in comparison statements

Still, numerical degree predicates *are* acceptable in the comparative form of either positive or negative adjectives (cf. Kennedy, 1999), as ilustrated by the contrast between *#Dan is two meters short* and *Dan is two meters shorter than Sam*. In fact, in actual contexts, we can positively say that Dan's degree in *short* is n meters bigger than Sam's, iff Sam's degree in *tall* is n meters bigger than Dan's.

In Sassoon (2008), I show that we can predict these facts by assigning any negative adjective, in any index t, a degree function that linearly reverses and linearly transforms the degrees of its positive antonym. In other words, I propose that for any total context $t \in T_c$, there is a constant $Tran_{short,t} \in \Re$, such that **$f_{short,t}$ assigns any d in D the degree ($Tran_{short,t} - f_{tall,t}(d)$)**. Let me breifly motivate this proposal.

The motivation for assuming that degree-functions of negative adjectives are reversed compared to the functions of their positive antonyms is rather straightforward. This assumption represents the fact that, e.g., Dan is taller than Sam iff Sam is shorter than Dan, i.e. the ordering between the degrees assigned to any two entities by *short* is reversed in comparison with the ordering between the degrees assigned to them by *tall*.

The basic motivation for transformation values is the following (Sassoon 2008). We can positively say that an adjective like *tall*, which is linked to conventional additive measuring systems, maps entities with no height to zero. The outcome of measuring entities with no height, such as the surface of the floor, with a ruler (just any possible ruler) is systematically the number zero.[3] So in every $t \in T_c$, $f_{tall,t}$ maps entities with no height (abstract entities; surfaces) to 0 (it's additive). However, consider the adjective *short*. If, in every total context t of T, $f_{tall,t}$ is additive (it maps entities with no height to 0), and *short* is not transformed in a context c ($Tran_{short,t} = 0$ in every total context t of T_c, i.e. $f_{short,t} = - f_{tall,t}$), then the degree of entities d with no height in *short* is predicted to be 0 in c (because in every $t \in T_c$ it is $- f_{tall,t}(d) = - 0 = 0$). But is this so? Can we positively say that *short* maps entities with (almost) no height, such as the surface of the floor, to (almost) zero? (or, in other words, that the surface of the floor is short to degree zero?) Not really. As *tall* does not have a maximum point (we cannot tell which entities are the tallest), the antonym *short* does not have a minimum point (a zero). Some semantic theories (cf., von Stechow, 1984b; Kennedy, 1999) endorse the view that entities with (almost) no height are mapped to (a degree that approximates) infinity (formally, they are mapped to the largest interval $(0,\infty)$, not the zero interval (0,0)). Therefore, in these theories, too, the degree function of *short* transforms height quantities by a non-zero constant. When I ask speakers to examine their intuitions regarding this issue, they are puzzled. Our intuitions about the point of 'zero shortness', so to speak, are completely blurred. I propose that this is the natural sign of an unspecified transformation value. Hence, the degree function of *short* transforms height quantities by a non-zero constant, $Tran_{short}$. We know nothing about this constant. It may be any number (it varies across total contexts in T_c), rendering the zero point undetermined ($\neg\exists n \in \Re$: $\forall t \in T_c$, $Tran_{short,t} = n$).

But if $Tran_{short,t} \neq 0$, $f_{short,t}$ is not additive – it does not represent ratios between entities' heights. If, e.g., $f_{tall,t}(d_1)=f_{tall,t}(d_2)=5$, then by additivity $f_{tall,t}(d_1 \oplus_{height} d_2)=10$. But, say, a function f_{1-f} that maps each d to $(1 - f_{tall,t}(d))$ is such that ($f_{1\text{-}f}(d_1)= f_{1\text{-}f}(d_2)=$–

[3] Additive height-functions, as opposed to transformed ones, must map entities with no height to zero (and entities *with* height to degrees other than zero), for otherwise they will not adequately represent height ratios. In order to see this, consider, for example, a function f, such that f maps some entity d_0 with no height (say, the surface of the floor) to some number other than zero, say, 1/2 and f maps a meter unit-object to the number 1. The ratio between d_0's value and the value of a meter unit-object is then the non-zero number 1/2 (it is half a meter tall), while the ratio between d_0's height and the height of a meter unit-object (or any other object) is 0. Thus, f does not adequately represent height ratios.

4) and ($f_{1-f}(d_1 \oplus_{height} d_2) = 1 - f_{tall,t}(d_1 \oplus_{height} d_2) = -9 \neq (2 \times -4)$). The ratio between the degrees of $d_1 \oplus_{height} d_2$ and d_1 is 9/4, while the ratio between their heights is 8/4.

The fact that negative adjectives fail to represent ratios has consequences.

First, ratio modifiers are less acceptable when combined with negative adjectives than when combined with their positive antonyms (cf. the infelicity of, e.g., #*Dan is twice as short as Sam*).

Second, negative adjectives do not license unit names. The semantic value of unit names, e.g. *inches*, crucially relies on the fact that the function denoted by its adjectival argument P in each context of use encodes the ratios between the amounts of P-hood in entities (so to speak) and the amount of P-hood in a unit object. Thus, adjectives whose functions do not encode these ratios cannot form arguments for unit names. A unit name like *inches* exists for the adjective *tall* by virtue of the fact that the degree function of *tall* does encode the given ratios. Had the degree function of *tall* been transformed, like the degree function of *short*, inches would not constitute possible units for *tall*.

Nor can we use negative adjectives in the positive form with numerical degree phrases construed of their positive antonyms and their unit names (as in **two meters$_{tall}$ short*). Why? If, for instance, in c, *tall* maps some d to 2 meters ($\forall t \in T_c$, $f_{tall,t}(d) = 2 \times r_{m,t}$), *short* maps d to $Tran_{short}$ – 2 meters ($\forall t \in T_c$, $f_{short,t}(d) = Tran_{short,t} - 2 \times r_{m,t}$). As the transformation value of *short*, $Tran_{short,t}$, varies across total contexts in T_c, we cannot say which entities are *2 meters short* in c ($\neg \exists d$: $\forall t \in T_c$, $f_{short,t}(d) = 2 \times r_{m,t}$).

However, in computing degree-differences, the transformation values of the two degrees cancel one another: $\forall t \in t_c$, d_2 is 2 meters taller than d_1 (i.e., $f_{tall,t}$ maps d_2 to some $n \in \Re$ and d_1 to $n - 2 \times r_{m,t}$; the difference between these degrees is $2 \times r_{m,t}$) iff $\forall t \in T_c$, d_1 is 2 meters shorter (i.e., $f_{short,t}$ maps d_2 to $Tran_{short,t} - n$ and d_1 to $Tran_{short,t} - (n - 2 \times r_{m,t})$; the difference between these degrees is still $2 \times r_{m,t}$: $(Tran_{short,t} - (n - 2 \times r_{m,t})) - (Tran_{short,t} - n) = \cancel{Tran}_{short,t} - \cancel{n} + 2 \times r_{m,t} - \cancel{Tran}_{short,t} + \cancel{n}) = \mathbf{2 \times r_{m,t}}$). So the differences between degrees are preserved under the reversal induced by $f_{short,t}$ in every total context t of T_c of actual contexts c. For this reason, we can felicitously say that entity-pairs stand (or do not stand) in, e.g., the relation '*two meters$_{tall}$ shorter*'.

In sum, facts pertaining to the licensing of measure phrases with negative adjectives receive a straightforward explanation if negative adjectives are analyzed as denoting interval-scale properties, i.e. mappings of entities to values that do not encode their height ratios, but do encode differences in height (cf. Sassoon, 2008).

3.4 Celsius

The interpretation of some units is not generated by the general 'linguistic' rule for the interpretation of unit names proposed in (4). Rather, their interpretation is derived from the interpretation of other unit names in some systematic way. For example, the interpretation of *Celsius* is complicated in that its derivation involves transformation of (additive) Kelvin degrees by a fixed, conventionally established value. For any n, entities that are "n Kelvin hot" are "n – 273 Celsius hot". So a box is *1 degree Celsius*

iff it is *274 degrees Kelvin*, but a box is *1 degree Celsius more* than a shelf iff the box is *1 degree Kelvin more* than the shelf, not *274 degrees Kelvin* more.

The numbers that *Celsius* assigns to entities do not adequatly represent quantities of heat (or temperature), e.g., the fact that the heat in two cells together equals the sum of heat in the two separate cells (i.e. that for any t, $f_{hot,t}(d_1 \oplus d_2) = f_{hot,t}(d_1) + f_{hot,t}(d_2)$). For example, if cells d_1 and d_2 each contains the heat of 2 Kelvin degrees ($2\times r_{Kelvin}$), each falls under *(2 – 273) degrees Celsius*, and the heat contained in both of them together, the heat in 4 Kelvin unit objects ($4\times r_{Kelvin}$), falls under *(4 – 273) degrees Celsius*. But (2 – 273) + (2 – 273) = (4 – 546) ≠ (4 – 273). Thus, *Celsius* does not assign $d_1 \oplus d_2$ the sum of numbers it assigns to d_1 and d_2. The heat in any entity that is an instance of *2 degrees Celsius* is not twice the heat in an entity which is an instance of *1 degree Celsius*. In fact, handbooks of measurement theory are equipped with explanations as to why it is senseless to say that *4 degrees Celsius is twice as hot as 2 degrees Celsius*. However, despite these explanations, speakers cannot help judging this sentence to be perfectly acceptable (just like the sentence *4 meters is twice as long as 2 meters*). I submit that this further supports my proposal that speakers interpret unit names in terms of the interpretation rule in (4), which is, of course, erroneous for, e.g., *Celsius*. This mistake reveals the fact that a generative rule, such as the one in (4), is used productively when unit names are to be interpreted.

3.5 More on the infelicity of positive adjectives with measure phrases

Some positive adjectives resemble negative ones in terms of the licensing of measure phrases. For example, the statement *#The box is thirty degrees warm* resembles the statement *#The box is thirty degrees cold* in being somewhat awkward. Yet, *The box is 30 degrees warmer/colder than the shelf* is perfectly acceptable (Kennedy, 2001). So in terms of the licensing of numerical degree modifiers, *warm* resembles its negative antonym *cold* and not other positive adjectives. My proposal can capture these facts.

First, positive adjectives for which additive (ratio-scale) measures exist may have transformation values, too (even though their measures are not reversed). Temperature predicates are an example. Well established additive tools for measuring temperature, e.g. Kelvin thermometers, exist. However, in practice, more often than not, temperature is measured by transformed (interval-scale) thermometers. The reasons are pragmatic – while we never encounter entities with absolutely no temperature ('zero Kelvin hot'), we often experience events or entities that measure 273 Kelvin degrees. Thus, the use of transformed measures, such as the Celsius scale (which maps such entities to zero) is convenient. The existence of concepts like *Celsius* support the assumption that positive adjectives may be associated with transformed measures.

To summarize, the point of zero-Kelvin heat (i.e., – 273 Celsius degrees) is hardly ever relevant, experienced, or talked about by speakers who are not-scientists. Thus, for them, any choice of a zero is arbitrary (which, formally, means that in different total extensions of any actual context c, temperature predicates like *warm* are associated with different transformation values). Only when a unit name is explicitly

used, must an additive interpretation be accommodated (by switching to an extension c' of c where the transformation value equals zero for any t of $T_{c'}$).

In addition to capturing our blurred intuitions regarding entities with no temperature, the association of *warm* with an unspecified transformation value renders *#2 degrees warm*, but not *2 degrees warmer*, infelicitous, as desired (cf., Section 3.3).

Thus, another source of cross linguistic variations regarding the licensing of numerical degree predicates is formed by the fact that languages may vary as to whether the measure associated with a given adjective will be transformed or not. 'Extent'-based analyses of antonymy[4] fail to capture these facts (for details see Sassoon, 2008). This is a serious problem given the pervasiveness of these phenomena. Thus, the present proposal improves upon 'extent' theories of antonymy in terms of the set of facts it adequately captures, while employing the simpler and more intuitive assumption whereby gradable adjectives map entities to single points, single real numbers $r \in \Re$.

Featherstone (to appear) discusses current trends in Psychophysics, suggesting that people *can generally build and use scales that encode differences between measures of stimuli, and sometimes also, but not necessarily, ratios*. Featherstone also makes an interesting new case for this claim, based on the experimental research of judgments of linguistic wellformedness. Featherstone shows that more accurate and informative results are obtained when subjects are encouraged to rank differences, rather than ratios, between the wellformedness of different linguistic structures, and when the data is processed accordingly. Featherstone's new view is in line with my assumption that the degree functions of many positive adjectives do not represent ratios, as they do not have a uniquely determined, agreed upon zero point (either in the first place, or because they are transformed) and that ratio statements are used only when additional information is presupposed (regarding the zero point, or regarding the transformation value being equal to zero).[5] The adjective *felicitous* forms an example of an adjective for which no zero point exists in the first place, yet differences between degrees accurately describe differences in felicity. Most plausibly, the majority of positive adjectives denote measures with all the properties of interval-scales (and not necessarily all the properties of ratio-scales) in the first place. When subjective judgments or internal states (e.g., degrees to which things feel heavy, loud, warm, tasty, funny, felicitous, nice, happy, organized, etc.) are at stake, the likelihood that speakers will regard the measure as additive (ratio-scale) is reduced. Speakers may use ratio-statements (or consider them acceptable) to the extent that their beliefs allow for the possibility that ratio measures exist (and they may use measure phrases if, in addition, conventions regarding unit objects exist).

[4] Examples include von Stechow (1984b) and Kennedy (1999, 2001).

[5] A common experimental practice in the social sciences is to present subjects with a numerical scale while instructing them that the differences between any two adjacent values are identical. When the scale has a zero point (representing complete absence of the measured property), data analysis relying on addition and multiplication (e.g., averaging, t-test, etc.) is considered appropriate, i.e. subjects are thought of as capable of producing ratio judgments in the given circumstances.

3.6 Conclusions

Part 3 presents compelling support for my proposal, whereby measurement theory's taxonomy of measures (cf. Part 1) and its conception of unit based measurements (cf. Part 2) apply to linguistics and explain a large number of semantic and distributional facts regarding unit names and measure phrases, including facts pertaining to adjectives that combine with unit names to form measure phrases (e.g., *tall*), adjectives that have no unit names as it is impossible to agree on conventional unit objects for them (e.g., *happy*), and adjectives that have no unit names as their degree function does not encode ratios (e.g., *short*), but whose comparatives can be modified by measure phrases combined from, e.g., their positive antonyms and their unit names. Finally, *Celsius* is an exceptional unit name, which nonetheless is interpreted by native speakers based on rule (4), thus further supporting the view that based on this rule, unit names are productively generated and interpreted.

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On the Temporal Use of the Focus Particle *gerade*

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Abstract

In this paper, we demonstrate that the analysis for the non-temporal uses of the German particle *gerade* developed in Schaden & Tovena (2008) applies to the temporal use of the particle as well. We also show that the non-temporal uses of *gerade* display a conventional association with focus (cf. Beaver & Clark (2007)), and explore the hypothesis that the same type of focus dependency is at stake with the temporal use, namely the 'progressive' and the 'immediate anteriority' readings. These readings are analysed as cases of association with Aspect-Phrase and Perfect-Phrase, respectively.

1 Introduction

1.1 Uses of *Gerade*

The German particle *gerade*, whose literal meaning is 'straight', often translates in English as *just* or *precisely*. *Gerade* is generally considered to be a focus sensitive particle (Altmann, 1978; König, 1991b). A first use, which nicely illustrates its focus sensitivity, is exemplified in (1) and is referred to hereafter as the 'precisely' use. Considering cars that are often stolen, (1a) says that red cars are prototypical instances of such a car type. The alternative values for red cars are, for instance, green cars, blue cars, yellow cars, etc. On the other hand, in (1b), considering red things that are often stolen, it is said that red cars are prototypical instances of such red things. In this second example, the alternatives to be considered would be red bikes, red ships, red planes, etc. In line with what observed in much research on the meaning of focus, a different focus assignment, therefore, changes the alternatives to be considered.

(1) a. Gerade [ROTE]$_F$ Autos werden oft gestohlen
Gerade red cars become often stolen.
'Precisely RED cars are often stolen.'

b. Gerade rote [AUTOS]$_F$ werden oft gestohlen.
Gerade red cars become often stolen.
'Precisely red CARS are often stolen.'

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We have glossed above the meaning impact of *gerade* with 'prototypical'. Note, however, that the information in focus is highly contingent, in the sense that it is not understood to be related with other structures such as a scale, be it expected/probable/culturally standard or other. Though the exact nature of the particle continues to elude us, we have provided in (Schaden & Tovena, 2008) some arguments against characterising it as scalar in itself. Nevertheless, *gerade* is compatible with scalar readings brought about by other elements, e.g. the adverb *oft* in (1).

Gerade also exhibits a temporal use, which comes in two variants, namely the so-called progressive and immediate anteriority readings. The progressive reading arises with simple tenses (i.e., the *Präteritum, Präsens* and simple future), as illustrated in (2).

(2) a. Otto isst Schokolade.
O. eats chocolate.
(i) 'Otto eats chocolate (in general).'
(ii) 'Otto is eating chocolate (now).'

b. Otto isst gerade Schokolade.
O. eats gerade chocolate.
(i) *'Otto eats chocolate (in general).'
(ii) 'Otto is eating chocolate (now).'

In (2a), we see that a sentence with a verb in the present form can be interpreted as describing an enduring generic property, as well as an ongoing action or a (very) temporary habit. But when *gerade* is added, only the latter reading remains available, as is shown in (2b).

The second temporal reading is the so-called immediate anteriority reading, exemplified in (3). It resembles very closely the effect of English *just* when combined with a perfect tense.

(3) a. Kunigunde hat einen Brief geschrieben.
K. has a letter written.
'Kunigunde has written a letter.'

b. Kunigunde hat gerade einen Brief geschrieben.
K. has gerade a letter written.
'Kunigunde has just written a letter.'

In (3a), the verb in the perfect form indicates that the action took place at some time in the past. When *gerade* is added, the location in time is constrained insofar as the action is understood as having taken place in the very recent past.

Contrary to what we have seen for 'precisely' *gerade*, in sentences with temporal *gerade*, the association pattern with focus is not quite clear. Indeed, in such sentences, there is not necessarily a clear-cut, accent-marked associate like in sentences with 'precisely' *gerade*. One might wonder, however, if focus marking is really absent in such sentences, or if it is merely 'hidden' under other patterns of accent placement. If *gerade* associated in some way with the VP, a focus accent on the last VP constituent might be confounded with the default accent in unfocussed sentences. An obvious question to ask is then, whether the 'precisely' and the temporal uses are manifestations of the same

focus sensitive particle. It is worth trying to make more precise the type of sensitivity to focus marking that *gerade* displays.

1.2 On the type of association with focus

In their recent monograph, Beaver & Clark (2007) identify different types of sensitivity to focus. In particular, they characterise additive, e.g. *also*, exclusive, e.g. *only*, and intensive particles, e.g. *exactly*, all as items that show CONVENTIONAL ASSOCIATION to focus. These items are to be distinguished from adverbials such as *always*, that perform quantification over an implicit domain recovered from context and whose degree of association they argue is less strong. So, does *gerade* display a conventional association to focus, or not?

Building on an observation by Krifka (1992), Beaver & Clark (2007) demonstrate that *always* does not share the type of focus sensitivity of *only*. Their argument goes as follows.[1]

(4) a. Mary always took [FRED]$_F$ to the movies.
b. Mary only took [FRED]$_F$ to the movies.

(4a) means that if Mary took someone to the movies, it was always Fred; (4b) can be paraphrased as "the only person such that Mary took him to the movies is Fred". Now, what would happen if the focus-marked element were extracted? Could the focus sensitive element associate with the trace left behind? The answer of Beaver & Clark (2007) is that it depends. *Always* can, but *only* cannot. The relevant contrast is reproduced in (5) and (6).

(5) We should thank the man$_i$ whom Mary always took t$_i$ to the movies.
a. 'We should thank the man such that, if Mary took someone to the movies, it was always him.' [association with trace]
b. 'We should thank the man such that Mary has always taken him to the movies (and nowhere else).' [association with "*to the movies*"]

(6) We should thank the man$_i$ whom Mary only took t$_i$ to the movies.
a. *'We should thank the man such that, Mary took only HIM to the movies.' [association with trace]
b. 'We should thank the man such that Mary has only taken him to the movies (and nowhere else).' [association with "*to the movies*"]

As we can see, the relevant reading is impossible with *only*, but remains possible with *always*. How does *gerade* fare with respect to this test? First consider (7).

[1] Actually, their argument exploits several tests. We use the test on extraction because it is easy to replicate for *gerade*. Although we cannot elaborate on it here, as far as we have checked, the results of the other tests that can be applied to German concur with the extraction test with respect to the class of association with focus that *gerade* falls into.

(7) ... weil Maria gerade [DIESEN MANN]$_F$ zum Essen eingeladen hat.
... because M. gerade this man to eat invited has.
a. '... because Maria invited precisely THIS MAN for dinner.'
b. '... because Maria has just invited THIS MAN for dinner.'

A few remarks are in order with respect to (7). It is generally assumed that in German subordinate clauses, the constituents are in base position, which is SOV. With an intonation pattern like the one indicated in (7), the sentence may be interpreted in two ways: as containing either 'precisely' *gerade* focalising on *diesen Mann*, or as a immediate anteriority temporal *gerade*. Notice furthermore that, if the accent were on *zum Essen*, and if *gerade* remained where it occurs in (7), as is illustrated in (8), a '*precisely to dinner*' interpretation is not possible.[2]

(8) ... weil Maria gerade diesen Mann [ZUM ESSEN]$_F$ eingeladen hat.
... because M. gerade this man to eat invited has.
'... *because Maria invited this man precisely FOR DINNER.'

Therefore, unlike English *only*, *gerade* has to precede directly its associate, without the intervention of any non-focalised material.

Now, let us come back to the extraction test and check what happens when *diesen Mann* in (7) is extracted from its base position.

(9) Wir sollten diesem Mann$_i$, den$_i$ Maria gerade t$_i$ zum Essen eingeladen hat,
We should that man, whom M. gerade t$_i$ to the eating invited has,
danken.
thank.
a. *'We should thank the man such that Maria has invited precisely HIM for dinner.' ['precisely' *gerade*, association with trace]
b. 'We should thank the man such that Maria has just invited him for dinner.' [temporal gerade – VP association?]

As we can see, *gerade* cannot associate with the trace of the extracted element *diesen Mann* in (9).[3] This piece of data, therefore, provides evidence that *gerade* behaves like *only* and qualifies as conventionally associated to focus — at least in what we have qualified as the 'precisely' reading.

The question is whether the temporal *gerade* is also conventionally associated to focus. Examples like (10-a) might cast doubt about that, since the particle seems to associate with a trace here. Notice, however, that extremely similar phenomena have been

[2](8) has an immediate anteriority interpretation, which we leave aside for the moment.

[3]A sentence corresponding to (9) has a 'precisely' reading, where *gerade* focalises on *zum Essen*. But then, if our conclusion from example (8) is correct, *gerade* should directly precede *zum Essen*, and not the trace t_i, so that we obtain the structure in (10):

(i) den$_i$ Maria t_i gerade [ZUM ESSEN]$_F$ eingeladen hat.
whom M. t_i gerade to the eating invited has.

.

observed with rather unproblematic exclusive particles of German where no polysemy has ever been considered (at least as far as we know).

(10) a. Maria tanzt$_i$ gerade t_i.
M. dances gerade t_i.
'Maria is dancing.

b. Maria küsst$_i$ ihn nur t_i.
M. kisses him only t_i.
'Maria only KISSES him.'

Beaver & Clark (2007) consider several different possibilities in order to account for (10-b), while still allowing a particle like *nur* to be within the realm of conventional association with focus. In this paper, we do not want to commit ourselves to any specific possibility. The only point we want to make with the examples in (10) is that there is no need to postulate two different homonymous *gerade*s on the basis of different focus association properties. We also want to point out that (potential) problems for the account of Beaver & Clark (2007) arise in German when focus on the verb (or elements encoded on the verb) are involved.[4] Our account of the temporal readings of *gerade*, as developed in section 3 (p. 491ff.) will assume an association with the Aspect-Phrase of a clause.

In order to account for the temporal interpretation that is available in (9), we can hypothesise that it arises when *gerade* scopes right above the functional projection Aspect-Phrase. Pitch accent may signal a lower attachment to the DP node, which results in the particle scoping only over the object in a sentence like (7a), although the endresult is the same as in (7b) in terms of linear order.

This hypothesis is compatible with the fact that *gerade* preposed to the focus marked subject DP allows only for a 'precisely' reading, as shown in (11).

(11) Gerade [MARIA]$_F$ hat diesen Mann zum Essen eingeladen.
gerade M. has that man to the eating invited.
'Precisely Maria invited this man to dinner.'

We assume thus that the temporal reading can be analysed as involving the same item *gerade*, with the same semantics that gives also rise to the 'precisely' reading. This seeming case of polysemy would be a case of multi-typed element, typical of additive and exclusive particles, and the readings should be linked to the nature of the focused element. Therefore, tackling first things first, in this paper we set ourselves the task of showing that it is possible to extend to the temporal uses the analysis of *gerade* that we presented in (Schaden & Tovena, 2008), according to which it is a focus sensitive element that sharpens the perception of adequacy of the description provided by the associate.

The rest of this paper is organised as follows. In section 2, we briefly recall the main tenets of our proposal. Then in section 3, we show that it can cover the temporal use. We discuss the progressive reading and we show how temporal progression is blocked and that the state of affairs is contingent. We then examine the immediate anteriority reading, which arises with perfects. The discussion of the case where perfects give rise to progressive readings closes the section. Finally, section 4 concludes the paper.

[4] In (10-b), the exclusive seems to be either associated with a trace or to be non-contiguous postpositional.

2 A proposal for 'precisely' *gerade*

In this section, we summarise the analysis proposed in (Schaden & Tovena, 2008), where we have argued that *gerade* sharpens the perception of adequacy of a property for characterising a particular entity. Our proposal captures this identificational flavour, which seems to be the same intuition that König (1991a) expresses by saying that *gerade* is used to emphatically express identity between two values. However, it differs from König's proposal in some crucial points. On the one hand, we have argued that it is not just plain identity between two equal values. The set characterised by the associate is said to provide the best match for the most prototypical part of the set characterised by the background. Furthermore, the correspondence holds between extensions, hence it is contingent and informative. For König, on the contrary, informativity comes from the dissonance between the two identified values.

We stated our idea within the foreground-background implementation of focus developed by von Heusinger (1999) inside the DRT framework and within an alternative-based approach to focus. In short, focus is assumed to induce the construction of two different and related representations of a sentence, namely the FOREGROUND, containing all material supplied by the host sentence, and the BACKGROUND, which is a way of representing the alternatives, as it corresponds to a representation like the foreground where the focus value has been abstracted away and replaced by a variable. This is illustrated, in a simplified version, in (12) for (1a).

(12) a. Background:

x
$\text{car}(x)$
$\mathbf{X}(x)$
$\text{get\_often\_stolen}(x)$

b. Foreground:

x
$\text{car}(x)$
$\mathbf{red}(x)$
$\text{get\_often\_stolen}(x)$

Background and foreground are related by a function h that corresponds to the assignment function for the designated variable X for the focus information, and which is an extension of function g that has fixed all values in the background. *Gerade* denotes conditions on assignment functions between background and foreground.

Reconsider example (1a). Given the background information B cars that are often stolen, *gerade* points at the subset of it which is viewed as the most prototypical one and tells us that this (nonempty) subset extensionally corresponds to the set characterised by the associate. The correspondence is computed via a measure function μ that, when applied to the focussed property P, here 'red', returns a higher value than that returned by any other property P' considered to be a relevant alternative to P in the given context C. The function μ establishes the match between the prototype of B and the associate as the best fit in C, although not necessarily unique in general. The definition is provided in (13), where AFV stands for 'actual focus value', and $\phi[X]$ stands for a formula ϕ containing a condition X.

(13) $[\![\text{gerade}]\!] = \exists h \exists g[([\![\phi[X]]\!]^{g,h} = 1) \wedge h(X) = \text{AFV} \wedge \exists \mu[C(\mu) \wedge \forall h'[h'(X) \neq h(X) \rightarrow \mu(h(X)) > \mu(h'(X))]]]$

For example (1a), (13) amounts to saying that all alternative assignments h' for cars with some property X other than being red, are contextually lower valued for being often stolen cars, so cars that are most typically often stolen are the red ones. Hence, the effect of sharpening the descriptive power of a property is the result of a comparative instruction. *Gerade* expresses an evaluation of the associate, not a direct ranking among alternatives.

The next step is to show that this analysis can cover the temporal uses.

3 Analysing the temporal uses

3.1 The progressive use

We call the first temporal reading the 'progressive' reading, since in Dahl (1985), *gerade* has been identified as the German expression of a progressive aspect. Notice, however, that the effect of *gerade* does not always correspond to a standard progressive like the English *be -ing*, cf. (Schaden, 2007, to appear). Rather, the progressive use appears when the particle is associated with aspectually neutral tenses, in the sense of Smith (1991). Such tenses—for instance, the German *Präteritum, Präsens* or simple future tense—display a systematic ambiguity between two readings, namely a causal, sequential reading, i.e. one event after the other, cf. (14-a), and an incidental reading, i.e. one event has already begun when the other takes place, cf. (14-b).

(14) Als Maria das Zimmer betrat, pfiff Max.
When M. the room entered, whistled M.
a. 'When Maria entered the room, Max whistled.'
b. 'When Maria entered the room, Max was whisteling.'

If *gerade* is added to the main clause of such a sentence, it blocks the normally possible sequential or causal reading and forces an incidental reading, even where the context strongly favours the sequential reading, cf. (15). Thus, *gerade* eliminates a reading, rather than introducing one.

(15) a. Als der Polizist seine Papiere verlangte, rastete Otto aus.
When the policeman his documents demanded$_{\text{Prät}}$, flipped$_{\text{Prät}}$ O. out.
(i) 'When the policeman asked for his identity card, Otto flipped out.' [extremely dominant reading]
(ii) 'When the policeman asked for his identity card, Otto was flipping out.' [extremely marginal reading]

b. Als der Polizist seine Papiere verlangte, rastete Otto
When the policeman his documents demanded$_{\text{Prät}}$, flipped$_{\text{Prät}}$ O.
gerade aus.
gerade out.
(i) *'When the policeman asked for his identity card, Otto flipped out.'
(ii) 'When the policeman asked for his identity card, Otto was flipping out.'

Progressive *gerade* can combine in principle felicitously with states, but this only to the extent that these states are temporary and open to change. States that are not supposed to change are inacceptable (or acceptable only to the degree that they can be coerced into a temporary state), cf. (16).

(16) a. ??7 ist gerade eine Primzahl.
7 $\text{is}_{\text{Präs}}$ gerade a prime number.
'7 is a prime number (for now/these days).'

b. ??Fred Sinowatz ist gerade tot.
F. S. $\text{is}_{\text{Präs}}$ gerade dead.
'Fred Sinowatz is dead (for now).'

(16-a,b) are perfectly acceptable in circumstances where the rules of mathematics change periodically, and in which Fred Sinowatz rises periodically from the death.

We assume that the temporal readings can be derived via a focus-background structure just like the non-temporal uses of *gerade*. In case of the progressive reading, we assume that the verbal predicate is part of the associate, and this holds in general for both temporal readings. More precisely the associate is formed by the Aspect-Phrase and the VP in (17).

(17) a. Als Peter kam, ging Paul gerade.
'When Peter came, Paul was leaving.'

b. Background:

x, n, i	
named(Paul, x)	
$i \prec n$	[Tense]
$\mathbf{X}(i)$	

c. Foreground:

x, n, i, e	
named(Paul, x)	
$i \prec n$	[Tense]
$e \circ i$[5]	[Aspect]
leave(x, e)	[VP]

Here, n stands for the moment of utterance. The important thing to notice is that the interval i, which corresponds to the Reichenbachian moment of reference R, is part of the background. Therefore, it must be discourse-given. Narrative progression in DRT is achieved by the introduction of a new point R into the DRS. Since R is given here, it must be identified in the context, and one cannot introduce freely a new point of reference. In this way, we can block temporal progression, and thus eliminate the sequential reading. Note that, according to this analysis, *gerade* does not impact directly the admissible aspectual relations, contra what has been proposed in (Schaden, 2007, to appear).

The same move also enables us to correctly predict the oddity of sentences containing *gerade*, where R cannot be inferred from the context, as identical to the moment of utterance, or by discourse anaphora. For instance, assume (18) is uttered out of the blue.[6]

[5]We note the neutral aspectual configuration by '$\circ$'. See Smith (1991), Pancheva (2003), Reyle et al. (2007) or Schaden (2008) for different definitions of the exact content of such a relation.

[6]An anonymous reviewer suggested to place R in the foreground. But example (18) provides good evidence for placing R in the background.

(18) #Otto rastete gerade aus.
Otto flipped$_{\text{Prät}}$ gerade out.
'Otto was flipping out.'

Because of the past tense, we cannot identify R with the moment of utterance. At the same time, we cannot resolve R anaphorically either, since there is no context. Therefore, (18) cannot be felicitous.

So far, we have accounted for parts of the progressive effects. We need to derive one thing more, namely that the predicate must be open for change under the progressive reading. In order to see how this can be achieved, first recall that, as a focaliser, by definition *gerade* involves comparison amongst alternatives to the asserted focus value. Furthermore, the focus value at R needs to be contingent. Whenever this value is necessarily true or excludes relevant alternatives, we predict it to be infelicitous. This correctly excludes examples such as (16), at least in normal worlds.

The contingent nature of the predicate is derived by requiring additionally that the predicate be able to evolve through time. Intuitively, sentences like (16) become felicitous if one can have moments of p and moments of $\neg p$. A sentence with progressive *gerade* is true at R, but as a contingent fact. This is the basic contribution of the particle. Facts that are contingent at one moment in time normally do not become necessary truths for other moments. Although nothing is explicitly asserted about whether the state of affairs expressed by the sentence is true or not for moments other than R, it is the case that such as a state of affairs must be able to be false at these other moments, in virtue of its being contingent.

Adding a specific constraint imposing $\neg p$ at a time prior to R whould be too strong, as can be illustrated with example (19).

(19) Die Kinder, die gerade in diesem Krankenhaus waren, wurden alle mit
The children, which gerade in this hospital were, became all with
dem Virus infiziert.
the virus infected.
'The children who happened to be in this hospital were all infected with the virus.'

(19) can be paraphrased as follows, for any x such that x is a child and x was at the hospital at t, x was infected with the virus at t. Crucially, (19) does imply that children who have never been at any other place than the hospital are excluded from contamination, e.g. new-born babies.

3.2 The immediate anteriority reading

3.2.1 Perfect forms and the immediate anteriority reading

Immediate anteriority readings arise with perfects, cf. (20-a), and double-compound perfects (20-b). A more detailed exposition of the data is provided in (Schaden, 2007, to appear).

(20) a. Als Kunigunde gerade alle Beweise beseitigt hatte, stürmte die
When K. gerade all proof eliminated had, stormed the
Polizei ihre Wohnung.
police her flat.
'When Kunigunde had just eliminated all proof, the police stormed her flat.'

b. Otto sagte mir, als er Herrn Meier angerufen habe, habe dieser seinen
Otto told me, when he Herrn Meier called had_{KI}, had_{KI} this his
Artikel gerade gelesen gehabt.
article gerade read had.
'Otto told me that, when he had called Meier, Meier had just finished reading his article.'

There is a slight complication to this generalisation, however: *gerade*, when combined with perfects, also allows for *progressive* readings:

(21) Als Maria das Zimmer betreten hat, hat Max gerade gepfiffen.
when M. the room entered has, has M. gerade whistled.
a. 'When Maria entered the room, Otto was whistling.'
b. *'When Maria entered the room, Otto whistled.'[7]

In order to properly account for the behaviour of perfects, which allow for both progressive and immediate anteriority readings, we assume that *gerade* can scope either over the anteriority relation—contained in both double-compound and 'simple' perfects—, or the underdetermined aspectual relation—contained only in 'simple' perfects. As we will see below, in the latter case our analysis is identical to those of the progressive case with the *Präteritum*.

According to the literature, the anteriority relation might be encoded at two different levels, namely as an aspect, see e.g. de Swart (1998), or as a relative tense, see e.g. Pancheva (2003). Even if one assumes that in 'simple' perfects, the anteriority relation is encoded as a relative tense, the aspectual variant is required at least for double-compound perfects, see (Schaden, 2007) for an argument that German double-compound perfects are aspectually resultative. Thus, a sentence like (22) might be analysed either as in (23), which corresponds to the aspectual variant, or as in (24), which is the temporal variant.

(22) Hans ist gerade angekommen.
Hans is gerade arrived.
'Hans has just arrived.'

In (23), the background contains tense, and the distinguished variable is a predicate over the moment of reference. The perfect semantics used here is the one of de Swart (1998). The perfect introduces a result state *s*, which temporally abuts the temporal trace of the eventuality *e*.

[7]The reading marked as unavailable would be possible if (21) did not contain *gerade*.

(23) a. Background:

x, n, i
Named(Hans, x)
$n \subseteq i$
$\mathbf{X}(i)$

b. Foreground:

x, n, i, e
Named(Hans, x)
$n \subseteq i$
$i \subseteq s$
$e \supset\subset s$
arrive(x, e)

The temporal variant of (22) assumes that the perfect is a relative tense introducing a *perfect state s* (cf. Nishiyama & Koenig (2004)), under which there is an aspectual projection.

(24) a. Background:

x, n, i
Named(Hans, x)
$n \subseteq i$
$\mathbf{X}(i)$

b. Foreground:

x, n, i, i', e	
Named(Hans, x)	
$n \subseteq i$	[Tense]
$i \subseteq s$	
$Q(s)$	
$i' \prec i$	[relative T.]
$e \circ i'$	[Aspect]
arrive(x, e)	[VP]

In (24), the two lines between what we have marked *Tense* and *relative Tense* concern the temporal location of the perfect state s, and its nature Q. Q is assumed to be a free variable, and has to be inferred by pragmatic means based on the context.

Though the formulæ in (23) and (24) are not identical, they are quite similar. The state s plays a crucial role in both cases. The explanation for the immediate anteriority effect will follow the following pattern in both cases. The effect of *gerade* is to establish a state s as best match for the interval i. Now, s is only very vaguely specified. Its characterization depends on the main eventuality e of the sentence, and possibly also on the relation of e with the preceding discourse-context, cf. Portner (2003). If s is determined by e, e will play a role in the evaluation of the adequacy of s. In order for e to be maximally pertinent for s, and reciprocally, there need to be no other intervening event of the same type or of a type that could interfere in the relation between e and s. This will involve a certain degree of temporal proximity, though a rather vague one. What is not vague is the perception of a relevant type of proximity, and it is important to underscore that here what is taken into consideration are not only elements known to both speaker and hearer. It is not a question of (subjective) relevance, but an objective constraint of proximity.[8]

3.2.2 Accounting for the progressive reading of perfects

Under the assumption that the German Perfect encodes a relative-tense feature, we can tackle also the progressive readings that arise with such tenses. We only have to assume

[8] *Gerade* seems to be 'objective' in this sense in some of its non-temporal uses too, cf. Schaden & Tovena (2008).

that, in this case, *gerade* applies to an underspecified Aspect-Phrase below the Perfect-projection, as is illustrated in (26). Contrary to what has happened in all preceding examples, there is more structure in the background here than just the tense relation and presuppositional elements of the DRS.

(25) Der Hans ist gerade angekommen, [als die Maria auf die Bühne gegangen
The Hans is gerade arrived, when the Maria on the stage went
ist.]
is.
'Hans was arriving, [when Maria went on the stage.]'

(26) a. Background:

x, i, i', n	
Named(Hans, x)	
$n \subseteq i$	[Tense]
$i \subseteq s$	
$Q(s)$	
$i' \prec i$	[relative T.]
$\mathbf{X}(i')$	

b. Foreground:

x, i, i', n, e
Named(Hans, x)
$n \subseteq i$
$i \subseteq s$
$Q(s)$
$i' \prec i$
$e \circ i'$
arrive(x, e)

The remainder of the argument goes as for the progressive reading we have already seen.

4 Conclusion

In this paper, we have shown that *gerade* displays a conventional association with focus in its non-temporal use, and we have argued that nothing prevents the extension of this analysis to the temporal use.

Given this uniform type of focus dependency, we have proposed a unified semantic analysis. We have built on our previous proposal (Schaden & Tovena, 2008) that the different readings of *gerade* can be analysed as manifestations of a unique role of the particle, namely indicating the optimal match. Technically, this unique role is captured via a measure function that assigns the highest measure to the associate (via an evaluation of the focus). The indication of an optimal match is also at work in the temporal uses. The progressive and immediate-anteriority readings follow from the scope of *gerade* w.r.t. different temporo-aspectual relations.

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What is Amazement all about?

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Abstract

This paper deals with DPs embedded in expletive constructions with emotive adjectives that are interpreted like *wh*-exclamatives. This class of DPs seems to be constrained to degree and kind referring ones. I focus on the problem of a uniform semantics for the construction given that monotonicity entailments arise for the first but not for the latter.

1 Introduction

Adjectives or adverbs like *amazing(ly), surprising(ly),...* can appear in expletive constructions that contain a DP which could be replaced by a *wh*-exclamative without a noticeable change in literal meaning.

(1) a. It's amazing [$_{DP}$ the big car he bought].
≈ *what a big car he bought*

b. It's amazing [$_{DP}$ the height of that building].
≈ *what a height that building has*

Grimshaw (1979) calls such DPs **Concealed Exclamations** (henceforth, CEs). Further examples are given in (2).

(2) a. John couldn't believe [$_{DP}$ the height of the building].
≈ *what a height the building was*

b. You wouldn't believe [$_{DP}$ the things I see here on the roads].
≈ *what things I see here on the roads*[1]

The name makes explicit an obvious parallel with **Concealed Questions** (CQs) - DPs that make the semantic contribution of embedded interrogatives (cf. Baker, 1968; Heim, 1979).[2]

[1] http://twitter.com/TomRaftery/statuses/934123003

[2] For recent discussion see Nathan (2006) and further references in Castroviejo-Miró and Schwager (2008).

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(3) John told me [$_{DP}$ the capital of Italy]. ≈ *what the capital of Italy is*

CEs and CQs raise the question of how DPs come to behave like embedded clauses. Following the by now prevalent view, I assume that these phrases are truly DPs in syntax (and not clauses parts of which have undergone deletion).

CEs and CQs are highly restrictive in what DPs they allow as an argument. In Castroviejo-Miró and Schwager (2008) (henceforth, CS-08), we show that the restrictions imposed differ across these two classes, but even across different CE-constructions. We consider this evidence that the lexical entry of the embedding predicate is responsible for the clause-like contribution of the respective DP as well as for the restrictions on its syntactic and semantic properties. Therefore, in this paper, I focus exclusively on CEs occurring in expletive constructions like (1).

I build on CS-08's generalisation that the crucial restriction concerns the DPs ability to pick out a degree or a kind. I recapitulate our proposal to unify degrees and kinds as dual types and focus on a problem arising with monotonicity: if (1-b) is true, the speaker expected the house to be smaller, not just of any other height.[3] Ultimately, I argue for a modification of CS-08's account that brings it closer to Rett (2008a)'s analysis for unembedded exclamatives, while maintaining the restrictions on what DPs can occur in such expletive CE-constructions.

2 Getting to know the *amazing*-constructions

Evaluative adjectives like *amazing, surprising, terrible, awful, stupid,...* and the corresponding adverbs appear in various syntactic configurations. This gives rise to interesting differences in interpretation, e.g. Morzycki (2004); Katz (2005); Nouwen (2005) for conrasts between (4-a) vs. (4-b).

(4) a. John is amazingly tall.
b. Amazingly, John is tall.
c. It is amazing that John is tall.
d. It's amazing how tall John is.

In this paper, I focus on the contrast between *amazing* as occurring in predicative position (*amazing*$_{\text{simpl}}$, exemplified in (5-a)) vs. the expletive CE-construction (*amazing*$_{\text{expl}}$, exemplified in (5-b)).

(5) a. John is amazing. *amazing*$_{\text{simpl}}$
b. It's amazing the stupid things he says. *amazing*$_{\text{expl}}$

[3] Despite its seemingly propositional form, the *amazing*$_{\text{expl}}$-construction gives rise to linguistic objects that do not seem fit for assertive (properly descriptive) usage. Rather, and in contrast to declative embedding *it's amazing (that)*, they look a little like an explicit encoding of Rett (2008a)'s illocutionary foce operator DEGREE E-FORCE. Being in general unsympathetic to force operators as part of the syntactic structure (cf. Schwager (2006); Portner (2005) for a similar spirit), I stick to a propositional analysis and assume that an additional meaning component (in terms of presuppositions and/or conventional implicatures) may be needed.

Syntactically, *amazing*$_{\text{simpl}}$ allows for any type of quantificational or referential DP, but *amazing*$_{\text{expl}}$ requires its postposed DP to be a definite DP (cf. Portner and Zanuttini, 2005).

(6) It's amazing the/*a/*every secret that Matthew spread.

Semantically, we observe at least the following differences between *amazing*$_{\text{simpl}}$ and *amazing*$_{\text{expl}}$. Firstly, *amazing*$_{\text{simpl}}$ allows for substitution of co-extensional expressions *salva veritate*, cf. (7), while *amazing*$_{\text{expl}}$ does not, cf. (8):

(7) John is amazing.
John is Mary's boyfriend.
$\therefore$ Mary's boyfriend is amazing.

(8) It's amazing the boyfriends Mary had last year.
The boyfriends Mary had last year were exactly the students Peter had last year.
$\not\therefore$ It's amazing the students Peter had last year.

Secondly, *amazing*$_{\text{simpl}}$ attributes amazingness to an individual. In contrast, *amazing*$_{\text{expl}}$ expresses (roughly) that the DP has a different extension from what was expected.

(9) It's amazing the number of people who look the other way.
$\approx$ *It's amazing what n is such that n-many people look the other way.*

But the difference cannot just be between individuals and individual concepts. The examples in (11-b) and (11-c) are just as bad as (11-a) and cannot be understood in the obvious sense.[4]

(10) a. The president of the US is amazing.
b. Barack Obama is amazing.

(11) a. #It's amazing Barack Obama.
b. #It's amazing the president of the US.
$\neq$ *It's amazing who is the president of the US.*
c. #It's amazing the presidents of the most powerful countries.
$\neq$ *It's amazing who are the presidents of the most powerful countries.*

Perspicuously many DPs following *amazing*$_{\text{expl}}$ contain relative clauses. Portner and Zanuttini (2005) argue that the presence of a relative clause is (*i*) obligatory and (*ii*) directly responsible for the phenomenon that these DPs achieve exclamative like meanings. In CS-08, we argue against both assumptions. On the one hand, we find both DPs without relative clauses that can appear under *it's amazing* (cf. (12-a)), and DPs with relative clauses that cannot (cf. (12-b)).

(12) a. It's amazing [the height of that building].
b. #It's amazing [the man [who climbed Mount Everest]].

[4] I ignore referential readings for *it* in (11) and other examples.

Portner and Zanuttini (2005) claim that (*i*) and (*ii*) apply also to DPs used as stand-alone exclamatives, henceforth, **Nominal Exclamatives** (NE).[5] Our findings carry over to this class as well:

(13) a. The height of that building!
b. (*to the proud architect*:) ?The height of the dome!
c. #The man who climbd Mount Everest!

On the other hand, in some cases, the relative clauses seem to be embedded too deeply in order for Portner and Zanuttini (2005)'s mechanism to derive the intended exclamative denotation (a particular set of propositions).

(14) It's amazing [$_{DP}$ the number of [people [$_{CP}$ you meet at those parties]].

On the basis of a small databasis collected online,[6] CS-08 conclude that the class of DPs embeddable in the *amazing*$_{expl}$-construction contain either (*i*) arbitrary head nouns modified by relative clauses (class 1), or (*ii*) head nouns that express gradable properties (*height, amount,...*; class 2), or (*ii*) overt kind/manner-like modifiers (*kind, way*,...; class 3).[7]

Moreover, examples in class 1 (that is, DPs containing relative clauses that modify the head noun), express either (*a*) amazement at the amount/number of the modified property's extension, or (*b*) amazement at the kind of entities that fall under the thus modified property.

(15) It's amazing the people you meet at these conferences.
a. ...*the number of people you meet at these conferences*
b. ...*the kind of people you meet at these conferences*

Relative clauses are well-known to induce kind or degree readings in other contexts as well (cf. Carlson, 1977; Heim, 1987; Grosu and Landman, 1998).

(16) a. It will take us the rest of our lives to drink the champagne they spilt last night. *the amount of*
b. We will never be able to recruit the soldiers the Chinese paraded on May 1. *the number of*
c. You no longer see the telephones that there were in my grandmother's time. *the kind of*

So, obviously, the DP embedded under *amazing*$_{expl}$ has to be interpreted as referring to degrees or kinds. Furthermore, this degree or kind reference has to be index-dependent.

[5]This use of the terminology follows Rett (2008a) and is at odds with Portner and Zanuttini (2005)'s use.

[6]We google searched for strings like "it's amazing the", "it's surprising the", "it's stupid the", "it's terrible the", "it's wonderful the", "it's awful the" and manually evaluated whether the results were instances of the construction in question, and whether the context suggested native speaker competence of the source. This left us with a sample of 62 clear-cut examples.

[7]The only exception to this classification came up in König (2008), who cites *The nerves of some people!*. Due to the idiomatic nature of the expression we will leave it aside.

Expressions that can only be rigid kind or degree designators are disallowed:

(17) a. #It's amazing dogs/the dog.
b. #It's amazing six meters.

Therefore, we postulate the following semantic restriction on the DP embedded under $amazing_{\text{expl}}$:

(18) **CS-08's restriction**:
The DP embedded under $amazing_{\text{expl}}$ has to denote a function from indices to degrees or to kinds.

In section 5.2, I will compare this assumption to Rett (2008a)'s analysis of unembedded exclamatives.

3 Dual types and different properties

Having established (18) as the restriction on the argument of $amazing_{\text{expl}}$, CS-08 proceed to solve two puzzles: (*i*) what is the relation between $amazing_{\text{simpl}}$ and $amazing_{\text{expl}}$ as occurring in (19-a) and (19-b) respectively?

(19) a. John is amazing. $amazing_{\text{simpl}}$
b. It's amazing the things you can find in the dumpster. $amazing_{\text{expl}}$

And (*ii*), why do degrees and kinds pattern together, that is, why are (non-trivial) functions from indices to kinds/degrees acceptable in the argument position of $amazing_{\text{expl}}$, but ordinary individual concepts are not?

3.1 Kinds and degres on a par: dual types

It is well-known that kinds and degrees pattern together in many constructions. Examples include anaphora like English *such* (Carlson, 1977; Heim, 1987), German *so* (cf. (20)) and Polish *taki* (e.g. Landman and Morzycki, 2003; Landman, 2006; Umbach and Endriss, 2008).

(20) a. Hans ist 1.80m und Maria ist auch **so** groß.
Hans is 1.80m and Maria is also so tall
b. Hans hat einen Beagle, und Maria will auch **so** einen Hund.
Hans owns a beagle and Maria wants also such a dog

In CS-08, we argue that kinds and degrees pattern together because they share the same dual nature of being properties (type $\langle s, et \rangle$) and entities. The correspondence between kinds and properties is well-established (cf. Chierchia, 1984, 1998; Landman, 2006). Non-rigid properties that are contextually associated with 'sufficiently regular behavior' can be mapped onto kinds by the kind operator $\cap$.[8]

[8]The possibility of a shift between entities and properties has been argued to be independently necessary for nominalizations as in *John is nice* vs. *Being nice is nice*. For an implementation that avoids

(21) for P of type $\langle s,et\rangle$: $^{\cap}P$:= the kind P (type e), if P picks out a class of objects that display sufficiently regular behavior, undefined else.[9]

But what is the relation between degrees and properties? Degrees of instantiation of a gradable property P are often considered primitive. But we can also construe the degrees to which a gradable property P is instantiated by comparing individuals across worlds w.r.t. P (cf. discussion in Cresswell, 1976). Such a construal leads to a one-to-one correspondence between degrees and properties.[10] Consider P = *height*.

(22) a. The Empire State building is higher than the Commerzbank tower.
b. The Commerzbank tower could have been higher.
c. Sherlock Holmes is as tall as G. W. Bush.

Comparing them in this way, we group together individuals in a world according to their exact sizes there (we form the equivalence classes induced on $W \times D_e$ by the dimension of height):

$c_{1.80m}$:	$\langle w_1, g.w.bush\rangle$, $\langle w_2, s.holmes\rangle$, $\langle w_3, g.w.bush\rangle$,...
$c_{1.90m}$:	$\langle w_2, g.w.bush\rangle$, $\langle w_3, s.holmes\rangle$, $\langle w_4, g.w.bush\rangle$,...
...	...
c_{259m}:	$\langle w_1, commerzbank-tower\rangle$, $\langle w_2, empire-state\rangle$,...
...	...

In the same sense, the dimension of height gives us the preorder $\preceq_{\text{height}}$:

(23) $\langle w,x\rangle \preceq_{\text{height}} \langle v,y\rangle$ iff y in v is at least as tall as x is in w.

To derive degree predicates (e.g. *tall*, cf. Cresswell, 1976) as monotone (cf. Heim, 2000), I will not identify degrees with equivalence classes directly. Rather, I use them together with $\preceq_{\text{height}}$ and construe the set H of degrees of height as in (24).[11]

(24) the set of degrees of height H :=
$\{\{\langle w,x\rangle \mid \langle v,y\rangle \preceq_{\text{height}} \langle w,x\rangle\} \mid \langle v,y\rangle \in W \times D_e\}$

obvious inconsistencies as would arise in standard set theory, cf. Chierchia (1984).

[9]Note that this is a slight deviation from Chierchia (1984)'s operator that treats kinds as individual concepts. I follow Carlson (1977) and Landman (2006) in treating kinds as individuals proper.

[10]Note that I do not make a case for the ontological status of degrees. Thanks to Christopher Piñon (p.c.) for discussion of this point.

[11]Here I am elaborating on and deviating from the very condensed sketch in CS-08. We could equally well identify degrees with the equivalence classes and make use of $\preceq_{\text{height}}$ in the specification of degree predicates instead (replacing (26-a)).

$d_{1.80m}$:	$\langle w_1, g.w.bush\rangle$, $\langle w_2, s.holmes\rangle$, $\langle w_3, g.w.bush\rangle$, $\langle w_2, g.w.bush\rangle$, $\langle w_3, s.holmes\rangle$, $\langle w_4, g.w.bush\rangle$, $\langle w_1, commerzbank-tower\rangle$, $\langle w_2, empire-state\rangle$,...
$d_{1.90m}$:	$\langle w_2, g.w.bush\rangle$, $\langle w_3, s.holmes\rangle$, $\langle w_4, g.w.bush\rangle$, $\langle w_1, commerzbank-tower\rangle$, $\langle w_2, empire-state\rangle$,...
...	...
d_{259m}:	$\langle w_1, commerzbank-tower\rangle$, $\langle w_2, empire-state\rangle$,...
...	...

Each degree d_i is a subset of $W \times D_e$, and can thus be characterized by a function δ_i of type $\langle s, et\rangle$:

(25) For each d_i, there is a function $\delta_i \in D_{\langle s,et\rangle}$, s.t. $\delta_i(w)(x) = 1$ iff $\langle w,x\rangle \in d_i$. (notation: DEG($\delta_i$) = d_i.)

If an individual x is tall to degree d in world w, this means that $\langle w,x\rangle$ is in the class called d. This ensures that degree predicates are downward monotone; d-tall entails d'-tall for any $d' \leq d$.

(26) a. $\text{tall}_w(d)(x) \leftrightarrow \langle w,x\rangle \in d$
b. The tower is d-tall for $d = 259m$.
$\therefore$ The tower is d'-tall for $d' = 1m$.

Now that degrees can be construed as functions of type $\langle s, et\rangle$ we obtain:

(27) [the height of that building]](w) =
e: ... the maximal degree of height d s.t. $\text{tall}_w(d)$(that building)
$\langle s, et\rangle$: ... $\lambda w \lambda x.x$ is in w at least as high as that building is in w

Given this conception of kinds and degrees as dual types, CS-08 adopt the following domain restriction for $amazing_{\text{expl}}$ (in the following, I will often abbreviate this restriction as DUALTYPE(x)).[12]

(28) [$amazing_{\text{expl}}$]] =
$\lambda w \lambda x_{se} : \forall w' \exists P[x(w') = \text{DEG}(P)]$ or $\forall w' \exists P[x(w') =^{\cap} P]$.[... *value* ...]

Ideally, the value assigned should be related to the semantics of $amazing_{\text{simpl}}$.

3.2 *amazing* as having different properties

In section 2, we have seen that $amazing_{\text{simpl}}$ behaves like an ordinary modifier and allows for substitution of extensionally equivalent expressions *salva veritate*. From that, we can conclude that it takes arguments of type e.

In CS-08, we try to find a common semantic core for $amazing_{\text{simpl}}$ and $amazing_{\text{expl}}$ that fits both ordinary individuals and (index-dependent) kinds/degrees. We spell it out as the metalanguage predicate AMAZING. It picks out the set of worlds that fulfill

[12] Following the convention in Heim and Kratzer (1998), the domain restriction is indicated between a colon that follows the λ-bound argument variable and the dot preceding the value.

all the speaker's expectations and expresses that a certain x has different properties there from what properties x has in the actual world.[13,14]

(29) $\text{AMAZING}(w)(x) := \forall w' \in \text{Exp}_{w,Speaker}(w)[\{P \mid P_{w'}(x)\} \neq \{P \mid P_w(x)\}]$

According to the generalization in (18), for $amazing_{\text{simpl}}$, x has to be of type e (that is, it can combine with ordinary individuals, kinds or degrees). For $amazing_{\text{expl}}$, x has to be of type $\langle s, e\rangle$ and meet the DUALTYPE-requirement introduced above, that is, either it is a degree assigning individual concept, or it is a kind assigning individual concept.

This accounts for the substitution patterns observed in (7) vs. (8): $amazing_{\text{simpl}}$ allows for substitution *salva veritate* of extensionally equivalent expressions, while $amazing_{\text{expl}}$ does not. The infelicity of DPs that are rigid kind or degree denoting expressions can be explained in terms of blocking by $amazing_{\text{simpl}}$.

Of course, 'having different properties' from what is expected looks like a straightforward account for why an individual (or a particular kind) is amazing. Yet, it may not obvious why 'having different properties' should give rise to the reading of degrees/kinds being different ones at the actual index of evaluation vs. at all worlds comforming to the speaker's expectations. At least certain neurotic properties have to be excluded by stipulation. For degrees, we argue that the properties in question are always of the sort of what x instantiate the gradable property to degree d at a given world, which entails that we are talking about a different degree.[15] Hence, for degree refering expressions like *the height of this building*, $amazing_{\text{simpl}}$ and $amazing_{\text{expl}}$ are predicted to come out as synonymous, which might look satisfactory at first glance.

4 The monotonicity problem

The analysis in CS-08 looks promising as it captures the empirically established restrictions on the argument of $amazing_{\text{expl}}$ in a natural way and predicts the facts about index (in)dependence. Yet, there is reason to worry.

A maybe minor problem is related to the analysis in terms of sets of differing properties. Already with $amazing_{\text{simpl}}$, we face the problem that not any old property should be taken into account. Apart from notoriously neurotic properties (e.g. being situated in a particular world w'), more innocent looking ones have to be banned as well. From (30-a) it follows that the property '$\lambda w \lambda x$.people think in w that x is weird' holds of John, but was not expected to. Yet, (30-b) need not be true.[16]

(30) a. It's amazing that people think John is weird.
b. John is amazing.

[13] Several people have pointed out that *amazing* is not the same as *surprising*. Maybe expectations should be replaced by stereotypical assumptions. As far as I can tell, the point is not crucial to my concerns here.

[14] In order to have such a fully uniform core for $amazing_{\text{simpl}}$ and $amazing_{\text{expl}}$, we have to allow a shift from x_e to the corresponding constant individual concept.

[15] Note that it gives rise to technical complications with $amazing_{\text{simpl}}$.

[16] Independently, Rett (2008b) acknowledges her analysis to be besieged by this problem, too (p.152, fn 7). But not only speaker evaluative properties cause problems.

Worse, the analysis has to resort to **monotonicity** in order to avoid overgeneration. Consider (31).

(31) It's amazing the height of this house.

In CS-08 we discuss the worry that our semantics for $amazing_{\text{expl}}$ might predict (31) to be true because something other than the house is higher than expected. Assume that we do not have strong feelings about the height of this house, yet, we would have expected the church to be lower than the house. In fact, they are of the same height, namely d_{30}. In this scenario, *the height of this house* denotes different degrees at various expectation worlds, but at each of these worlds, it picks out a higher degree than *the height of this church* does. Therefore, at all expectation worlds w', the property $\lambda w \lambda d.\langle church, w\rangle \in d$ does not hold of the degree d' that is picked out by *the height of this house* in w'. Yet, at the actual world $w_@$ this property does apply to the actual height of this house d_{30}. In CS-08, we argued that this needs to be blocked because amazement involves monotonicity. The intuition that monotonicity should play a role here is certainly correct. But instead of evoking monotonicity as an external principle to save the analysis, we need to derive it as a property of the $amazing_{\text{expl}}$-construction.

If (31) is true, we conclude that any higher degree would be a source of amazement as well. But not all occurrences of *amazing(ly)* are subject to this constraint (cf. Morzycki, 2004; Katz, 2005; Nouwen, 2005). Consider a scenario like (32) (along the lines of Morzycki, 2004):

(32) scenario: *this house was built in 1865; due to heavy weather conditions, the soil got very wet and the building sunk a bit; we measure its 'new' height and discover it to be exactly 18m65cm.*

Clearly, in this scenario, the height of the house has a puzzling property, roughly '$\lambda w \lambda d$.*the name of its height d in meters is the building date of the house in w*'; nevertheless, there is not expectation that the house should have been lower. Consequently, only non-monotone expressions are acceptable in the given scenario. Acceptability in a scenario like (32) induces the following classification:

(33)
a.	The house is amazingly high.	*montone*
b.	Amazingly, the house is high.	*non-monotone*
c.	The height of the house is amazing.	*non-monotone*
d.	It's amazing the height of this house.	*montone*

Note that despite our original intuitions, the interpretation of $amazing_{\text{simpl}}$ and $amazing_{\text{expl}}$ differs for degree properties: $amazing_{\text{simpl}}$ does not give rise to monotonicity of expectations (cf. Morzycki (2004)), but $amazing_{\text{expl}}$ does.

5 Solving the monotonicity problem

5.1 The disjunction

Given the above considerations, CS-08's account needs to be revised. For the moment, I give up the quest for a common AMAZING-core and adopt a more straightforward analysis of $amazing_{\text{simpl}}$. According to (34), it expresses unexpected behavior w.r.t. a particular contextually salient property *P*.

(34) $[\![amazing_{\text{simpl}}]\!] =$
$\lambda w \lambda x_e . \exists P[P \text{ contextually salient } \& \ P_w(x) \ \& \ \forall w' \in \text{Exp}_{w,Speaker}[\neg P_{w'}(x)]$.

Returning to our original intuitions for $amazing_{\text{expl}}$ ('the height/kind/... is a different one than what we expected it to be'), (35) looks like the most straightforward interpretation.

(35) $[\![amazing_{\text{expl}}]\!] = \lambda w \lambda x_{se} : \text{DUALTYPE}(x). \forall w'' \in \text{Exp}_{w,Speaker}[x(w'') \neq x(w)]$.

Indeed, the predictions look good for the kind reading:

(36) It's amazing the kind of marine life that you will experience on a Galapagos vacation.
$\approx$ *At all speaker-stereotypical worlds you experience a different kind of marine life.*

Nevertheless, for the degree case the analysis fails just like CS-08's property analysis. With (35), we have assimilated (37-a) to (37-b). But while the first is monotone, the second is not.

(37) a. It's amazing the height of this house.
b. It's amazing that this house has the height it actually has.

Even if we have unified the type of the argument DP (thanks to CS-08's condition of DUALTYPE), we cannot come up with a strictly uniform value: degrees come with an order and require instantiation to a smaller degree (cf. (38)), kinds do not come with such an order and require simple inequality as in (35).

(38) $[\![amazing_{\text{expl}}]\!] = \lambda w \lambda x_{se} : \text{DUALTYPE}(x). \forall w'' \in \text{Exp}_{w,Speaker}[x(w'') < x(w)]$.

Of course, this is not a nice result. An attractive way out would be to come up with a nested construal of kinds, much along the lines of what we find with degrees.[17] At the moment, I do not see how to make it work. I will thus leave the re-ordering of kinds for further research. Instead, I will resort to a somewhat more conservative strategy arising from comparison of the account in CS-08 with the treatment of *wh*-exclamatives and nominal exclamatives in Rett (2008a,b).

[17] I'd like to thank Chris Potts (p.c.), who suggested to look for a solution along these lines.

5.2 Kinds induce slots for gradable properties

Rett (2008a) does not talk about *amazing*$_{\text{expl}}$, but she deals with main clause *wh*-exclamatives, inversion exclamatives and nominal exclamatives. Remember that nominal exclamatives obey the same restrictions as DPs embedded under *amazing*$_{\text{expl}}$ (cf. section 2). Following assumptions in the literature,[18], Rett assumes that surprise as expressed in exclamatives can only target (extreme) degrees.[19] A *wh*-exclamative like (39) can be appropriate because (*i*) Mimi speaks a high amount of languages (the **amount reading**), or because (*ii*) Mimi speaks very exotic languages. It cannot express that Mimi speaks two particular languages different from what the speaker had expected (but without independently surprising properties).

(39) (My,) What languages Mimi speaks!

The possible readings are exactly those observed for *amazing*$_{\text{expl}}$. Yet, in CS-08 and above, reading (*ii*) is described as targeting the **kind** of languages Mimi speaks. In contrast, Rett (2008a) calls it the **gradable reading**. She assumes that the gradable reading requires the presence of a contextually given gradable property $\mathbb{P}$ (here: being exotic) which holds to an unexpectedly high degree. Her argument runs as follows: *how*-questions are in principle ambiguous between asking for manner or for evaluation, cf. (40).

(40) How does Buch ride his horse?
   a. **manner**: bare-backed, saddled,...
   b. **evaluation**: beautifully, dangerously, clumsily,...

Only evaluations are gradable. For the corresponding exclamative in (41) only the evaluation reading is available, which follows if exclamatives can only be about degrees, but not about non-gradable things like manners (or kinds).

(41) (My), How Buck rode his horse!

From this, Rett (2008a) concludes that all exclamatives express surprise with respect to an extreme degree. The semantics is spelt out in terms of an illocutionary force operator that constrains expressive adequacy. Note that Rett (2008a) assumes exclamatives to denote degree properties. For me, at an index, *the height of this house* would pick out the maximal degree to which the house is high; for her, it would select the set of degrees d such that the house is d-high.

(42) DEGREE E-FORCE($D_{\langle d,\langle s,t\rangle\rangle}$) is expressively correct in context C iff D is salient in C and $\exists d.d > c_{\text{standard}}$[the speaker is surprised that $\lambda w.D(d)(w)$][20]

[18] Cf. references in Rett (2008b).

[19] Note that this holds only for a formally identifiable class of exclamatives. Declarative clauses like *Sue wore orange shoes!* can be used as exclamations (i.e., expressions of surprise) without being subject to such a constraint.

[20] In contrast to Katz (2005) and Nouwen (2005), Rett (2008b) assumes that exclamatives require not only instantiation to a degree above the expectations, but also to a degree above the contextual standard. I find her arguments convincing.

Consequently, the putative kind readings have to be construed as gradable readings thanks to a contextually given gradable property $\mathbb{P}$. As Rett (2008a) herself observes, the disbribution of such covert gradable properties is far from clear. In particular, unlike the amount reading she derives from another silent predicate QUANTITY, they hve no parallel with (headed) relative clauses.

But this turns out to be a severe problem. NEs obey the same restrictions as *amazing*$_{\text{expl}}$-DPs, hence, they have to contain a degree NP, or a relative clause. But nothing in Rett (2008a)'s analysis predicts the infelicity of (43-a) in contrast to (43-b) (which carries over to the corresponding *amazing*$_{\text{expl}}$-clauses). Her framework does nothing to prevent the insertion of a contextually given gradable property $\mathbb{P}$ which would save (43-a).[21]

(43) a. #The people from Italy!
b. The people who come from Italy!

In order to have our cake and eat it, I propose the following: Rett (2008a) is right in that amazement is always about degrees and not about kinds directly. But $\mathbb{P}$ can only appear with kind-referring expressions. Hence, two steps are necessary to obtain the kind/gradable-reading of (39): first, the relative clause generates *kind of languages s.t. Mimi speaks languages of that kind*, then, a contextually given gradable property can be inserted. Given that, the entry for *amazing*$_{\text{expl}}$ can be simplified to (44) while still predicting the restrictions observed.

(44) $[\![\textit{amazing}_{\text{expl}}]\!] =$
$\lambda w \lambda x_{se} : \forall w' \exists P[x(w') = \text{DEG}(P). \forall w'' \in \text{Exp}_{w,Speaker}[x(w'') < x(w)]$.

In the absence of a relative clause, neither QUANTITY nor $\mathbb{P}$ can apply and (43-a) fails to denote a degree property/individual concept.

6 Conclusion

The proposal in CS-08 spells out the correct restrictions on what DPs can occur in expletive emotive constructions like *it's amazing*. Nevertheless, our uniform semantics for kinds and degrees fails to cope with the monotonicity properties that are observed with degree readings, but are inapplicable to kinds. In order to maintain a uniform account, I follow Rett (2008a) in treating putative kind readings as degree readings that involve covert gradable properties. Yet, in order to predict what DPs can appear under *it's amazing* or as NEs, I maintain the assumption that relative clauses are needed for shifts to amounts and kinds, and I argue that covert gradable properties can only be inserted with kinds.

[21] Note that QUANTITY cannot apply: it is independently motivated to combine with two properties ($\lambda P \lambda d \lambda Q. \exists X[P(X)$ & $Q(X)$ & $measure(X) = d]$), so the relative clause is needed to fill the second property argument. A similar two-place semantics for the covert gradable properties would be at odds with their other occurrences and their inability to occur in headed relative clauses.

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Maximize Presupposition! and Informationally Encapsulated Implicatures

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Abstract
This paper attempts to overcome certain objections to the idea that *Maximize Presupposition!* (Heim 1991) is reducible to the theory of implicature.

1 Introduction

Heim's (1991) *Maximize Presupposition!* (henceforth MP) states, roughly, that given two contextually equivalent alternatives, speakers must use that alternative whose presuppositions are stronger and happen to be met in the context of use. Given our common knowledge that there is exactly one sun, for example, the principle accounts for why # *A sun is shining* is such an odd sentence; the speaker should have used *The sun is shining* instead. The principle is technically sound, and fully predictive. The puzzle facing us is a conceptual one: why should language use be constrained by such a principle?

The goal of this paper is to explore the extent to which MP might be reduced to more general principles. More specifically, my goal is to explore the extent to which MP might be reducible to the theory of scalar implicature. Heim (1991) suggested a way to derive MP effects from implicature reasoning, but concluded that the context-dependence of this reasoning prevented the reduction from succeeding. In response to this, Magri (To Appear) noted that if the system that computes implicatures can be prevented from accessing contextual information, Heim's derivation can go through unencumbered. However, even with modularity assumptions in place, Magri argued (from new data that he discovered) that the reduction is not possible, concluding that a separate principle will be needed. I will attempt to defend the reduction against these objections.

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2 MP as Global, Pragmatic Competition

Consider the contrasts below:

1. (a) # A sun is shining
   (b) The sun is shining

2. (a) # All of John's eyes are open[1]
   (b) Both of John's eyes are open

Take the contrast in (1), for instance. How would MP account for it? We should begin by setting up some background assumptions.

First, let us assume the following lexical entries for the articles:

Lexical Entry 1 (The Definite Article)

$[[theX]Y]$ *expresses that proposition which is: (a) true at index i if there is exactly one X at i, and it is Y at i, (b) false at i if there is exactly one X at i, and it is not Y at i, (c) truth-valueless at i if there isn't exactly one X at i*

Lexical Entry 2 (The Indefinite Article)

$[[a(n)X]Y]$ *expresses that proposition which is true at index i iff there is at least one individual at i that is both X at i and Y and i.*

We also assume the following definition of 'contextual equivalence,' borrowed from Sauerland (2003) and Schlenker (2006):

Definition 1 (Contextual Equivalence)

LFs ϕ *and* ψ *are* contextually equivalent with respect to context *c iff* $\{w \in c : [[\phi]](w) = 1\} = \{w \in c : [[\psi(w)]] = 1\}$

Let us return now to our contrast in (1). First note that our common knowledge entails that there is exactly one sun. As such, given our definition of contextual equivalence, it turns out that (1a) and (1b) end up being contextually equivalent. If there is exactly one sun in every world of evaluation, both (1a) and (1b) are true in the same worlds in the context, namely those worlds where this one sun is shining. But if both LFs serve the same communicative function (i.e. map the same input context to the same output context), why should (1a) be odd, while (1b) is perfectly felicitous?

The contrast was first noted in Hawkins (1978). He used it to argue that definites are subject to an 'inclusiveness' condition and indefinites to an 'exclusiveness' condition, by which was meant simply that *the N* can only be used if there is exactly one N in the context, and *a(n) N* can be used only if there are many N in the context. Heim (1991) presents crucial evidence against the exclusiveness condition for indefinites. For instance, the following sentence does not presuppose that there are at least two 20 ft. catfish:[2]

[1] From Chemla (2007) and Magri (To Appear).

[2] One diagnostic for this is that you can't felicitously apply the *Hey Wait a Minute!* Test (von Fintel 2004) here: # *Hey wait a minute! I didn't know there are multiple 20 ft. catfish!* See also Sauerland (2008) for relevant discussion.

3. Robert caught a 20 ft. catfish

Heim proposes instead that only the definite is presuppositional (cf. our lexical entries above). In addition, she suggests that there must be a principle in force urging us to use [[*the X*] *Y*] instead of [[$a(n)$ *X*] Y] in contexts where the presuppositions of the former are met. She speculates that perhaps a maxim guiding us to make our conversational contributions presuppose as much as possible might generally be operative in communication. Sauerland (2003, 2008), Percus (2006), and Schlenker (2006) generalize and formalize Heim's speculative remarks. Sweeping certain irrelevant differences in their formulations under the rug, here, roughly, is a statement of MP that is (I believe) faithful to the intentions of all these works, which I'll call 'Standard MP:'

Standard MP: MP as Global, Pragmatic Competition If ϕ, ψ are contextually equivalent alternatives, and the presuppositions of ψ are stronger than those of ϕ, and are met in the context of utterance c, then one must use ψ in c, not ϕ.

This statement presents Standard MP as a solution to an optimization problem: Given a set of competing LFs that all update the current context c to a new output context c', Standard MP determines that the best LF for carrying out this update is the one with the strongest presupposition satisfied in c. The reader will no doubt have noticed that the statement of Standard MP makes reference to an unanalyzed notion of 'alternatives.' To make the principle precise, therefore, it is necessary to spell out what this space of competing alternatives is. Much like work on scalar implicature, it has been thought that certain lexical items trigger MP competitions, and that the items themselves rest on certain scales. These scales have generally had to be stipulated. However, they are the only point at which stipulation is allowed. Once given, they can be used to mechanically derive the space of competing LFs. In our examples, for instance, the following lexical scales would need t! o be available: $< a, the >$, $< all, both >$. These can multiply more generally: $< believe, know >$, etc.[3]

Alternatives for Standard MP If $< \alpha, \beta >$ is a scale, and ϕ is an LF containing lexical item α, and ψ is an LF that is everywhere like ϕ except that at some terminal node it contains β where ϕ contains α, then ϕ and ψ are alternatives.

With this machinery in place, let us return now to our contrast in (1). As discussed above, given that it is common knowledge that there is exactly one sun, both sentences are true in the same worlds in the context. They are also alternatives to one another under the above definition. Furthermore, since the presupposition of (1b) (that there is exactly one sun) is met in the context of use, Standard MP requires that the speaker use (1b), rather than (1a). By uttering (1a), the speaker will have blatantly violated this principle of language use, generating the peculiar kind of oddness we detect upon hearing it. Technically, all seems well. The question is: why should language use be constrained by a principle like MP?

[3]Much like with scalar implicatures, it would be better if one had an intensional characterization of the alternatives. I believe that such a characterization can be provided using Katzir's (2007) procedure for generating scalar alternatives. For ease of exposition here, I will simply assume the more familiar scalar approach.

3 On Deriving MP

Heim (1991) writes that 'it would be desirable to derive [MP] from general principles of some sort...[MP] reminds one at first glance of the phenomenon of scalar implicature.' She then asks us to imagine how scalar implicatures might be used to generate MP like effects. She focusses on the articles. Under the classical interpretation of indefinites and definites assumed here, the latter asymmetrically entail the former.[4] Thus, assertion of [[$a(n)$ X] Y] generates the implicature that the speaker doesn't believe [[*the* X] Y].[5] Thus, if the speaker believes the content of her assertion, the conclusion is that the speaker doesn't believe (by implicature) that there is exactly one X. In the case of *A sun is shining*, the implicature would be that the speaker doesn't believe that there is exactly one sun. Since this contradicts common knowledge, the result is odd.[6]

Having derived the essential effect for us, Heim goes on to argue that the derivation will not succeed. The basis of her skepticism lies in the pragmatic nature of scalar implicatures. For example, since it is common knowledge that there is exactly one sun, the indefinite and the definite contribute the same *new information* to the context. As such, scalar reasoning doesn't apply, since the maxim of quantity is made inert by the contextual equivalence of the scalar alternatives. Hence the required implicature cannot be generated.[7]

Schlenker (2006), reporting on a personal communication from Emmanuel Chemla, presents some compelling evidence suggesting that the effect of MP might nonetheless follow from scalar implicatures, for the same effect seems to come up with scalar alternatives that carry no relevant presuppositions (so that MP, if operative at all, would be irrelevant to such cases):

4. John assigned the same grade to all of his students. He gave an A to {all / #some} of them.

As in Heim's argument, we see that when the scalar implicature contradicts common knowledge, the result is distinctly odd. In (4), the second sentence is evaluated with respect to a context updated by the information conveyed by the first sentence. The implicature that John gave an A to some but not all of his students contradicts the contextually entailed information that John assigned the same grade to all of his students.

But what of Heim's argument concerning the inapplicability of scalar reasoning? Given the Chemla-Schlenker observation, we might be led to believe that the difficulty lies not in the application of scalar reasoning to MP phenomena, but in the theory of scalar implicature itself. Indeed, working within a theory of scalar implicature whereby implicatures are computed within the grammar (eg. Chierchia 2004, Fox and Hackl

[4]For this to be true under a presuppositional analyses of definites one needs to assume that if a sentence S presupposes p, then it also entails p. Most theories abide by this assumption, though some do not (eg. Karttunen and Peters 1979). I will assume in this paper that presuppositions are indeed also entailed.

[5]See Footnote 11 for a sample computation. I ignore for now issues of primary versus secondary implicatures. ! See Sauerland (2004) and Fox (2007) for recent discussion. I return to the epistemic status of this implicature towards the end of the paper (Section 4, cf. also Chemla 2008, Sauerland 2008).

[6]The more general idea is, of course, that use of sentence ϕ will be odd if it gives rise to an implicature that contradicts common knowledge. We will return to this more general idea in just a few moments.

[7]Percus (2006) and Sauerland (2008) make a similar argument.

2006, Fox 2007, Chierchia, Fox, and Spector 2008), Magri (To Appear) develops a general theory of oddness along lines envisioned by Heim (1991), one that readily accounts for the oddness of sentences like (4). My claim here is that Heim's derivation of MP from scalar implicature also goes through if one adopts Magri's theory of oddness. Let me say a bit about the latter.

3.1 Mismatches and Oddness

Magri (To Appear) develops and defends at length the idea that scalar implicatures are computed on the basis of *semantic* asymmetric entailment relations, without access to contextual information, such as that there is only one sun, etc. He calls this the Blindness Hypothesis (since the implicature system is 'blind' to common knowledge):[8]

Blindness Hypothesis (BH) Implicatures are computed over the output of semantics without access to contextual information.

BH can be implemented in several different ways. For concreteness, we'll assume that given the proposition denoted by the asserted sentence ϕ, and a set C of alternative propositions (the propositions denoted by the scalar alternatives of ϕ), $\neg\psi$ will be a blind scalar implicature of ϕ if only if:[9] (i) $\psi \in C$, (ii) ψ entails ϕ, (iii) $\phi \wedge \neg\psi$ is consistent.[10]

Magri also generalizes Heim's observation concerning the interaction of scalar implicatures and common knowledge by defending a principle from Hawkins (1991) that he calls the *Mismatch Hypothesis* (MH). MH states that whenever a (blind) scalar implicature contradicts common knowledge, the result is a sensation of oddness:

Mismatch Hypothesis (MH) If the blind scalar implicatures of the asserted sentence contradict common knowledge, the result is odd.

As Magri points out, BH and MH together (I'll write this as BH/MH from now on) correctly predict the oddness of the Chemla-Schlenker sentence (4). He further shows that BH/MH can be used to account for a host of complex properties concerning individual level predicates, such as that the following sentence is odd (inter alia):

5. #John is sometimes tall

The above sentence generates the implicature that John isn't always tall, which contradicts our common knowledge that *tallness* is a permanent property. I refer the reader to Magri's paper for many further applications of BH/MH.

[8]For further arguments in favour of the Blindness Hypothesis, see Fox and Hackl (2006), Chierchia, Fox, and Spector (2008).

[9]Our notation does not distinguish between sentences and the propositions they denote, but the reasoning works over content, not form.

[10]Various considerations require this statement to be modified (cf. Groenendijk and Stokhof 1984, van Rooij and Schulz 2004, Spector 2006, Fox 2007), but these complications need not detain us at this point.

3.2 Mismatches and MP

The claim I wish to defend here is that BH/MH is all that is needed to derive MP:

Claim: *Maximize Presupposition!* follows as a consequence of BH/MH.

I will try to argue that Heim's argument goes through unencumbered so long as implicature computation is divorced from contextual reasoning. For note that what prevented Heim's derivation from succeeding was the idea that the implicature system had access to common knowledge, since it (the implicature system) was thought to be pragmatic. Relatived to contextual information, it could deduce that the two sentences contribute the same new information to the context. However, if implicatures are computed within the grammar, hence encapsulated from common knowledge, the implicature system cannot make this deduction. Working with semantic information alone, *the sun is shining* asymmetrically entails *a sun is shining*, and the desired implicature can thus be computed.[11]

But why am I putting this forth as a claim here if it's an obvious consequence of BH/MH? The reason is that Magri, having defended these principles, presents new data suggesting that MP might not actually be derivable from them. Consider contrasts like the following (from Magri (To Appear)):

6. Context: Every child inherits the last name of their father.
   (a) # Every child of Couple C has a French last name
   (b) The children of Couple C have a French last name

Magri suggests that the oddness of (6a) should be related to the oddness of (1a) (# *A sun is shining*) and (2a) (# *All of John's eyes are open*). To use BH/MH, first, we need a competitor to (6a). Magri proposes that (6b) is a scalar alternative of (6a). This is derived by assuming that <every, the> is a Horn scale. Second, he argues that due to certain properties of distributive predication with plural definites, (6b) has a homogeneity presupposition that (6a) lacks, viz. that either every child of Couple C has a French last name or none of them do. Thus, (6b) has a stronger presupposition than (6a). Despite this, the two sentences end up semantically equivalent, both conveying the proposition that every one of the children of Couple C has a French last name.[12] As such, even under the assumption that implicatures are computed blindly, when (6a) is uttered there is no relevant implicature that can be generated in order for MH to be applicable. The oddness of (6a) is hence left unaccounted for, at least if BH/MH are the only operative principles.

Magri concludes from this difficulty that the difference in *presuppositional* strength between (6a) and (6b) should be held responsible for the oddness of the former.

[11] $[[a(n)\ X]\ Y]$ is true in a set of worlds E where there exists an individual that is both an X and a Y. $[[the\ X]\ Y]$ is true in that subset of E, U, where there is a unique indi! vidual that is an X, and that that unique individual is also a Y. A blind implicature thus generates the proposition $E \setminus U$. When common knowledge entails U, the result is odd (under MH).

[12] This example differs in important ways from examples like (1)/(2) in that (6b) has the curious property of being a sentence whose asserted meaning (that every child of Couple C has a French l! ast name) entails its presupposed meaning (that either every child of Couple C has a French last name or no child of Couple C does).

He thus needs a principle that is sensitive not to the semantic content of the alternatives, but to their presupposed content alone. The technical innovation involves formulating a Blindness Hypothesis and a Mismatch Hypothesis for presuppositions, BHP and MHP. These principles work separately from the Blindness Hypothesis and the Mismatch Hypothesis for semantic content. Very roughly, these principles use the same objects as BH/MH (the scalar alternatives of the sentence), and the same method of computing inferences, but instead of working with the propositions denoted by the alternatives, they use the projected presuppositions of the alternatives. More specifically, under BHP, the grammatical system considers the presuppositions of the scalar alternatives, and for those alternative presuppositions that ! are stronger than those of the asserted sentence, the system concludes (blindly) that they are false. Call such inferences *blind implicated presuppositions* to distinguish them from the outputs of BH (blind scalar implicatures). In addition, under MHP, if these blind implicated presuppositions contradict common knowledge, the result is odd (in parallel with BH/MH).

With BHP and MHP in place, the oddness of (6a) can be derived. When (6a) is asserted, the system computes (by BHP) that the homogeneity presupposition of (6b) is false, i.e. it infers that some but not all of the children of Couple C have a French last name. But this of course contradicts the common knowledge that all the children of Couple C have the same last name, and (given MHP) the sentence is destined to be odd.

Thus, we have four principles, BH and MH for semantic content, and BHP and MHP for presuppositional content. Independent of *Maximize Presupposition!* related facts, we have seen evidence (eg. the Chemla-Schlenker sentences like (4)) that something like BH/MH is needed. We saw furthermore that BH/MH can in fact be extended to the cases we started out with (examples (1) and (2)), as desired, but, as observed by Magri, they have nothing to offer in accounting for the oddness of (6a). This fact led Magri to propose that the linguistic system also incorporates principles like BHP and MHP, principles sensitive solely to presupposed information. This move, in effect, concedes that MP cannot be reduced to standard implicature reasoning (BH/MH). However, I believe that the introduction of BHP/MHP should be met with some caution. For note that BHP/MHP introduce a redundancy in the theoretical account of standard MP facts (eg. (1) and (2)), in that their oddness now has two disti! nct explanations, one deriving from BH/MH, and the other from BHP/MHP. The apparent need for BHP/MHP arises only under the assumption that the oddness of (6a) is indeed related to the oddness of (1a) and (2a). If so, one needs an account in terms of alternatives, and, as argued by Magri, (6b) presents just the right kind of alternative. Against this idea, I will present evidence that (6a) and (6b) cannot be alternatives. If the argument is sound, then the oddness of (6a) probably has a different source. I will suggest that this source is a separate pragmatic constraint governing felicitous discourse, and will try to present evidence that such a constraint is needed on independent grounds. To the extent that the argument is correct, (6a) will no longer stand as a barrier to the reduction of MP to BH/MH.

3.3 No Escape from Oddness: Alternatives and Relevance

There are four prima facie worries about the assumption that (6a) and (6b) are alternatives. First, one would have to make sense of the fact that the subjects in the alternatives

differ in number (singular versus plural). Second, assuming that the distributive operator *DIST* is represented at LF, (6b) would not be an alternative to (6a) under Katzir's (2007) theory of alternatives, for it is strictly more complex than (6a).[13] If it is indeed better to have an intensional characterization of the alternatives than a stipulative one, and if Katzir's arguments in favour of his particular characterization are sound, this might be problematic. Third, scalar alternatives are normally ordered by asymmetric entailment, whereas (6a) and (6b) are in fact equivalent. Fourth, members of a scale are normally the same semantic type. It is not at all clear! that *every* and *the* can be thought to satisfy this condition.

Putting these worries aside, I think that there is a good diagnostic for probing whether two hypothesized alternatives actually are alternatives. Let's consider the basic MP effect again. The current proposals argue that the oddness of the asserted sentence ϕ arises because ϕ generates a scalar implicature that contradicts common knowledge. But if that's the account, there seems to be an obvious escape hatch: given the optionality of implicature computation, why not simply exploit this optionality to avoid or cancel the offending inference?

Magri (To Appear) proposes a very interesting response. He argues that in the cases under consideration the escape hatch is actually unavailable, i.e. that the implicatures in such cases are mandatory. He locates the cause of the mandatoriness in the contextual equivalence of the alternatives. By virtue of having been asserted, ϕ can be assumed to be relevant. But since ϕ and ψ are contextually equivalent, under the assumption that relevance is contextually determined, it is natural to conclude that ψ will also be relevant. Assuming furthermore that a scalar alternative must be relevant if it is to be considered in implicature reasoning (eg. Gamut 1991), then ψ will necessarily be included in the reasoning, and the implicature will be mandatory. This accounts for why there is no escape from the oddness of sentences like (1a), (2a), (6a), and others like them.

Returning now to the issue of disputed alternatives, the above reasoning makes a clear prediction. Suppose we have reason to believe ϕ and ψ are alternatives (and ψ is stronger along some dimension of interest), but are unsure whether they in fact are. The above reasoning provides a way to at least determine a negative answer: if we can find contexts in which ϕ and ψ are equivalent, but in which ϕ is NOT odd, then it can't be that ϕ and ψ are alternatives (since there should be no escape from oddness). Returning to the question of whether (6a) and (6b) are actually alternatives, consider the following dialogue:[14]

7. Q: Who here has a French last name?
   (a) Well, John, Mary, every child of Couple C, my neighbours
   (b) Well, John, Mary, the children of Couple C, my neighbours

The fact that there is no oddness to (7a) in the way there is with (6a) suggests that <every, the> is not really a scale at all. The reasoning that leads to the conclusion

[13] In the normal case, Katzir allows only those LFs that are at most as complex as the asserted sentence to be alternatives to it.

[14] Irene Heim, p.c.

that (1a), (2a), (4), and the like are necessarily odd also leads to the conclusion that (6a) should necessarily be odd. Note that the reasoning itself seems correct. For example, putting (6a) as part of a list answer obviates its oddness, but the same trick does not work in cases like (4), where the existence of a scale like <some, all> is generally taken to be true:

8. Context: John gave the same grade to all his students.
   Q: Who got an A this year?
   A: # Well, half of Ms. Smith's class, some of John's students, and all of Mary's students

Other attempts to obviate the oddness of (6a) can readily be found, while the oddness of (4) seems mandatory, as predicted by Magri's assumptions about relevance and mandatoriness. These facts in turn question the status of principles like BHP and MHP. If (6a) is not competing with (6b), then something else must be behind its oddness.

I would like to suggest that (6a) is odd because it tends to be read with focus on *every*, which, for whatever reason, suggests it is being offered as an answer to the question, *How many children of Couple C have a French last name?* And in the given context, this is an odd question to raise. It is odd even if asked overtly in such a context. It seems to be odd for the reason that Magri offered, namely, it suggests (in contradiction with common knowledge) that the names of the children of Couple C might well not be the same. However, Magri's account of the oddness in terms of competition with an alternative that grammatically encodes a homogeneity presupposition seems to be unable to make sense of the fact that the oddness disappears in certain contexts (cf. (6)-(8)). I am offering the alternative hypothesis that the oddness of (6a) instead has to do with broader discourse level concerns (eg. what makes certain questions appropriate in certain contexts). If this ! approach is on the right track, we expect to find an oddness similar to (6a) if we introduce the same information as (6a) by using a different linguistic form that probably does not generate alternatives with homogeneity presuppositions, but which nonetheless suggests (because of focus placement) that it is an answer to the odd question *How many children of Couple of C have a French last name?*. For example, suppose it is common knowledge that Couple C has five children:

9. (a) # FIVE children of Couple C have a French last name
   (b) # The number of children of Couple C with a French last name is FIVE

The alternatives to (9a) are presumably of the form $\{$*n children of Couple C have a French last name*: $n \in \mathbb{N}\}$, while the set of alternatives to (9b) is presumably $\{$*The number of children of Couple C with a French last name is n* : $n \in \mathbb{N}\}$. I do not see how a competition based account like BHP/MHP could be extended to these cases.

These facts suggest that there is a maxim of language use that might be stated in something like the following terms:[15]

Maintain Uniformity! Do not introduce questions into the discourse that have possible answers (qua cells of a partition, eg. Groenendijk and Stokhof 1984) that contradict common knowledge of uniformity of some set!

[15] Of course, it is to be hoped that this maxim follows from more general principles.

I am suggesting that, given the facts in (7)-(9), BH/MH along with the above maxim are better predictors of the data discussed in this paper than the combination of BH/MH and BHP/MHP. Crucially, both BH/MH and *Maintain Uniformity!* seem to receive support from cases where there are no presuppositions involved that seem directly related to MP (eg. (4), (9)). Ideally, nothing else should be needed. We might thus examine whether this proposal has any consequences for some of the other facts discussed by Magri. Although our discussion here will have to be limited, consider, for example, the oddness of the following (cf. also (5)):

10. # John is always tall

Magri argues that (10) competes with a structure that is like (10) except it contains a *GEN* operator in place of *always*. He proposes that these structures are alternatives. Now, although the two structures are semantically equivalent (both conveying the proposition that John is always tall), the structure with *GEN* introduces a homogeneity presupposition that (10) lacks (that either John is always tall, or he never is). It thus presupposes more than (10) and, therefore, would be odd under BHP/MHP. However, if (10) has a structure with *GEN* in place of *always* as an alternative, there should be no way for it to escape oddness, given our earlier discussion about Magri's (apparently correct, cf. (8)) assumptions about relevance and the mandatoriness of implicatures. But even here, it seems that the oddness of (10) is much reduced by asking the right kind of question. Consider the following dialogue, for instance:

11. Q: What property does John always have?
    Well, he's always tall, for one.

The above is funny, though not quite as odd as (10). It is funny in the same way that the answer, *Well, he's always identical with himself* might be funny. It is funny because it is entirely uninformative. But it doesn't feel odd in the way that (10) feels odd. If this judgment is correct, then we must reject the assumption that the LF with *always* and the one with *GEN* are alternatives at all. Instead, the oddness of (10) might better be explained as a violation of *Maintain Uniformity!* The sentence seems to me to be offered as an answer to a question like, *How often is John tall*, or *Who is always tall?* (depending on focus marking). Forcing the hearer to accommodate such a question into the discourse violates *Maintain Uniformity!*.

Let me try to summarize where we are. The goal of this paper was to try to argue that *Maximize Presupposition!* can and should be eliminated from the basic inventory of linguistic principles. In so doing, we attempted to show that Heim's (1991) attempted derivation could go through by adopting a grammatical theory of implicature (the Blindness Hypothesis) along with the Mismatch Hypothesis (Hawkins 1991, Fox and Hackl 2006, Magri 2007). We were met with the counterexample of (6a), which cannot be accounted for by BH/MH. This (and other facts, eg. (10)) led Magri (To Appear) to formulate a new pair of principles (BHP/MHP) that essentially end up restating MP. Magri defended his analysis over an intricate, non-trivial set of data, and I cannot do full justice to that work in the space allotted to me here. Limiting ourselves to the data discussed in this paper, I have argued that BH/MH and *Maintain Uniformity!* provide a better account of these facts than BH/MH and BHP/! MHP. But with this we seem to be back at

the problem we started with: we seem to have gotten rid of *Maximize Presupposition!* well enough, but we've replaced it with another principle we don't understand, *Maintain Uniformity!*. Given the facts in (6)-(11), the latter would seem to be needed anyhow (in place of BHP/MHP), and (4) teaches us that we need BH/MH. Since BH/MH also captures (1)/(2), we should enrich the theory beyond BH/MH and *Maximize Uniformity!* only if necessary. If the preliminary investigations here can be further supported, we will have gone some way toward simplifying the inventory of linguistic principles.

4 More Concerns About the Reduction of MP to Implicatures

Suppose that the cases of MP discussed above (eg. (1), (2)) can indeed be reduced to the theory of implicature (BH/MH). The prospects for a more general reduction of MP facts to implicature would still be faced with at least three difficulties.

First, the epistemic status of the implicatures predicted by the system assumed here are 'secondary implicatures,' i.e. of the form 'it is certain that not p' (cf. Footnote 11). For example, sentences with an indefinite are currently predicted to generate the implicature that the speaker is certain that the presupposition of the definite does not hold. However, Sauerland (2008) has argued that such implicatures have the weaker status of primary implicatures, i.e. of the form 'it is not certain that p.' He argues that this difference in epistemic status is one reason to think that these inferences are due to a mechanism that is different from the one responsible for scalar implicature.

Second, Percus (2006) discovered a class of sentences that carry identical presuppositions, and are semantically equivalent, and yet still undergo something very much like an MP competition. For example, (12a) and (12b) both presuppose nothing (under standard theories of presupposition projection, eg. Karttunen and Peters 1979, Heim 1983, Schlenker 2007), and are truth-conditionally equivalent, but (12b) seems to be blocking (12a) nonetheless:

12. (a) # Every teacher with exactly two students gave them all an A
    (b) Every teacher with exactly two students gave them both an A

Neither a Gricean, context-sensitive implicature system, nor a grammatical, context-blind one that operates over semantic propositions, seems capable of delivering the required implicature here, since (12a) and (12b) denote the same proposition.

Third, if MP effects were due to implicature computation, we would need to make sense of the fact that unlike run of the mill cases of implicatures (eg. (13b)), the implicature shows up in downward entailing environments (eg. (13a)):

13. (a) # A sun isn't shining
    (b) John didn't eat beef or pork at the party

The second sentence does not (without marked intonation) generate the implicature that John ate beef and pork at the party (= $\neg(\neg(B \wedge P))$). However, if (13a) is

to be accounted for by BH/MH, we would need the implicature (that the speaker is uncertain that there is exactly one sun) to be generated here, despite the DE environment (and the lack of marked intonation). Sauerland (2008) has cited this divergence in DE environments as yet a further reason to keep MP and the theory of implicature apart.

Despite these objections, I believe each of these difficulties can be overcome. The second difficulty can be overcome if implicatures are computed by a 'supermodular' system, one that operates over logical forms that are stripped of all non-logical information. More precisely, the level of representation that's needed is a structure in which all non-logical symbols are replaced by variables, but whose logical terms remain visible. Evidence that the semantic system employs such a level of representation is given in Gajewski (2004), and Fox and Hackl (2006) argue (from different data) that such a level is the one used by the implicature system. If their arguments are correct, then the oddness of (12a) would be readily predicted. The first and third difficulties can be overcome by adopting revisions to the theory of implicature that I've argued elsewhere (Singh 2008) are needed independently to solve certain problems that arise in the theory of presupposition (cf. the proviso pro! blem of Geurts 1996). Support for these assertions will have to wait for a future occasion.

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Counterfactuality and Future Time Reference: The Case of Paraguayan Guaraní *–mo'ã*

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Abstract

Paraguayan Guaraní has a verbal suffix *–mo'ã* that realizes future time reference in one type of clause and counterfactuality in another. This paper explores the truth-conditional semantics of *–mo'ã* in the two types of clauses and identifies parallels and differences between counterfactual and future time interpretation. The paper concludes by discussing the feasibility of a unified analysis of *–mo'ã*.

1 Introduction

The Paraguayan Guaraní (henceforth Guaraní) verbal suffix *–mo'ã* occurs in clauses with future time reference and clauses with a counterfactual interpretation. Which interpretation arises depends on the position of *–mo'ã* with respect to the circumfix *n(d)(a)–...–i*, which expresses sentential negation. The example in (1), where *–mo'ã* is inside the negation circumfix, has future time reference whereas the examples in (2), where *–mo'ã* occurs in a positive sentence (2-a) or outside of the circumfix (2-b), receive a counterfactual interpretation (translated with *almost*).[1]

(1) Nd-a-ha-**mo'ã**-i Paraguaý-pe.
NEG-A1sg-go-MOA-NEG Asunción-to
'I will not go to Asunción.' [E]

[1]Guaraní is spoken by about four million people in Paraguay and surrounding countries. The data presented here were collected during yearly fieldwork from 2004 to 2008. The Guaraní examples are given in the standardized orthography of Guaraní used in Paraguay (Ministerio de Educación y Cultura 2004, cf. also Velázquez-Castillo 2004, 1421f.), except that all postpositions are attached to their host. Following the official orthography, accents are not written for normally accented words (stress on the final syllable); stressed nasal syllables are marked with a tilde. Examples are marked to identify their origin; elicited examples are marked with [E], examples from a corpus of naturally occurring texts with [C]. The following glosses are used: 3 = 3rd person, A/B 1/2/3 sg/pl = set A/B 1st/2nd/3rd person singular/plural, COMPLETE = completive aspect, DEM = demonstrative, DIM = diminuitive, EMPH = emphatic, FUT = future marker, incl = inclusive, JE = reflexive/passive, NEG = negation, NOM = nominalizer, PERF = perfect aspect, PL = plural, PROG = progressive, RC = relative clause.

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(2) a. A-ha-**mo'ã** Paraguaý-pe.
A1sg-go-MOA Asunción-to
'I almost went to Asunción (but I didn't).' [E]
b. Nd-a-ha-i-**mo'ã** Paraguaý-pe.
NEG-A1sg-go-NEG-MOA Asunción-to
'I almost didn't go to Asunción (but I went).' [E]

After introducing relevant aspects of the temporal and modal system of Guaraní in §2, the paper explores the truth-conditional semantics of *–mo'ã* in these two kinds of clauses in §3 (future time interpretation) and §4 (counterfactual interpretation). In these sections, the suffix is semantically analyzed as $mo'ã_1$ and $mo'ã_2$, respectively, i.e. as if the suffix was ambiguous. Whether a unified analysis is possible is discussed in §5.[2] (The suffix is glossed as '–MOA' throughout the paper.)

2 Basics of Guaraní temporality and modality

Verb stems in Guaraní are obligatorily inflected for person and number with one of two sets of cross-reference markers (set A and set B, cf. e.g. Gregores and Suárez (1967) for details). The majority of verbs in natural discourse are only marked for person/number; in matrix clauses, these *unmarked verbs* are compatible only with a realis (non-future) interpretation, as illustrated in (3) and (4). The unmarked verb *o-ke* 'A3-sleep' in (3-a) has present time (and progressive aspectual) reference, whereas the unmarked verbs *o-heja* 'A3-leave' and *o-ho* 'A3-go' in (3-b) are interpreted at the past reference time of the given context. Guaraní has no present or past tense morphemes.

(3) a. Context: Maria returns from her daughter's room and reports:
Rossáni **o-ke**.
Rossani A3-sleep
'Rossani is sleeping.' [overheard]
b. Context: A woman had a child out of wedlock.
I-memby **o-heja** ha **o-ho** mombyry.
B3-child A3-leave and A3-go far
'She left her child and went far away.' [C]

Unmarked verbs in matrix clauses cannot cooccur with future time adverbs such as *ko'ẽro* 'tomorrow' in (4-a) and are incompatible with modal subordination contexts, as in (4-b):

(4) a. #Ko'ẽro **a-purahei**.
tomorrow A1sg-sing
(Intended: Tomorrow I will sing.) [E]

[2] Guaraní has a verb stem *mo'ã* 'think' that is homophonous with the suffix under discussion here. Whether the verb stem and the suffix are diachronically related is an open question.

b. Context: I'm hungry. Somebody tells me:
Re-'u-va'erã peteĩ pehengue sópa. #**Ne-ryvatã**./Ne-ryvatã-ta.
A2sg-eat-must one piece corn.bread A2sg-full/A2sg-full-FUT
'You should eat a piece of corn bread. #You are full./You'd be full.'[E]

Verbs marked with *–mo'ã* are part of a verbal paradigm that includes, in addition to unmarked verbs, verbs suffixed with the future marker *–ta* '–FUT', the modal markers *–se* '–want', *–ne* '–might' and *–va'erã* '–must' and the aspectual markers *–ma* '–PERF' and *–pa* '–COMPLETE' (see Gregores and Suárez (1967), Liuzzi and Kirtchuk (1989), and Tonhauser (2006) for details).

3 Future time reference with *–mo'ã*

As mentioned above, *–mo'ã* realizes future time reference when it is realized inside the negation circumfix *n(d)(a)–...–i*, cf. also (5-a). Future time reference in positive clauses is generally expressed with the suffix *–ta* '–FUT', as in (5-b):[3]

(5) a. Nd-a-ha-**mo'ã**-i Paraguaý-pe. (= (1))
NEG-A1sg-go-MOA-NEG Asunción-to
'I will not go to Asunción.' [E]
b. A-há-**ta** Paraguaý-pe.
A1sg-go-FUT Asunción-to
'I will go to Asunción.' [E]

The truth-conditional meaning of the suffix *–ta* is analyzed in detail in Tonhauser (2009). This section illustrates that clauses where *–mo'ã* occurs (morphologically) inside the negation circumfix (henceforth referred to as 'NEG-*mo'ã*-clauses') have the same temporal and modal properties as positive clauses with *–ta* (modulo negation). I analyze this meaning of *–mo'ã* as $mo'ã_1$.

[3] *–ta* can express future time reference with negated clauses, especially with embedded clauses, when it occurs outside the negation circumfix: (ia), for example, is as acceptable as (ib). In matrix clauses, however, my consultants strongly prefer (5-a) over (iia); (iib) is ungrammatical.

(i) a. Juan he'i ché-ve Maria nd-o-u-i-**ta**-ha araka'eve.
Juan A3.say B1sg-to Maria NEG-A3-come-NEG-FUT-NOM never
'Juan told me that Maria will never come.' [E]
b. Juan he'i ché-ve Maria nd-o-u-**mo'ã**-i-ha araka'eve.
Juan A3.say B1sg-to Maria NEG-A3-come-MOA-NEG-NOM never
'Juan told me that Maria will never come.' [E]

(ii) a. ?Nd-a-há-i-**ta** Paraguaý-pe.
NEG-A1sg-go-NEG-FUT Asunción-to
'I will not go to Asunción.' [E]
b. *Nd-a-guapý-**ta**-i.
NEG-A1sg-sit-FUT-NEG
(Intended: I will not sit down.) [E]

3.1 Future time reference

A first property shared by clauses with *–ta* and NEG-*mo'ã*-clauses is that they entail future time reference. All 77 sentences with *–ta* in a corpus[4] of naturally occurring data have future time reference, additional texts did not reveal examples where *–ta* does not express future time reference, and attempts to elicit such examples failed (Tonhauser 2009). Likewise, the 13 NEG-*mo'ã*-clauses in my corpus have future time reference, and additional texts did not reveal examples that did not have future time reference.

As expected, clauses with *–ta* and NEG-*mo'ã*-clauses are compatible in out-of-the-blue contexts (i.e. where the reference time is the utterance time) only with future time adverbs (6), not with past time ones (7):

(6) a. Ko'ẽro o-ký**-ta**.
tomorrow A3-rain-FUT
'Tomorrow it will rain.' [E]

b. Ko'ẽro nd-o-ky**-mo'ã**-i.
tomorrow NEG-A3-rain-MOA-NEG
'Tomorrow it will not rain.' [E]

(7) a. #Kuehe o-ký**-ta**.
yesterday A3-rain-FUT

b. #Kuehe nd-o-ky**-mo'ã**-i.
yesterday NEG-A3-rain-MOA-NEG

But the temporal reference of neither type of clause is restricted to deictic future time reference: in past contexts such as those in (8), both can realize future time reference relative to a past reference time.

(8) a. Context: A mother tells about her experiences with taking care of her daughter's wound: "I was the one who cleaned her wound..."
Priméra ve a-hechá**-ta** hĩna.
first time A1sg-see-FUT PROG
'I would be seeing it [her wound] for the first time.' [C]

b. Context: A mother reports on what the doctor said upon inspecting her daughter's wound.
Upé-rire he'í-ma-ramo chupe la nd-oi-pe'a**-mo'ã**-i-ha la
that-after A3.say-PERF-then 3.to the NEG-A3-open-MOA-NEG-NOM the
púnto ichupe.
stitch 3.to
'And then he said to her that he would not open her stitches.' [C]

[4]The corpus is a collection of nine texts from different genres (fables, personal narratives, conversation), and consists of about 7,300 Guaraní words (which correspond to about 20,000 English words since Guaraní is mildly polysynthetic).

In sum, clauses with *–ta* and NEG-*mo'ã*-clauses entail (relative) future time reference. The next section discusses the modal attitudes that are conveyed by these future sentences.

3.2 Modal attitudes: intention and prediction/expectation

Both *–ta* and *–mo'ã* convey future time reference with the modal attitudes of intention and prediction/expectation. Utterances with the modal attitude of intention convey an agent's mental state of intending to make a proposition be true at a time in the future; the intender is committed to do what s/he can to make the proposition true. The examples in (9) illustrate this modal attitude:

(9) a. Context: A woman is scheming on how to catch the monkey that is playing tricks on her. She says:

A-japó**-ta** ta'anga araity kakuaa porã-va.
A1sg-make-FUT figure wax big pretty-RC

'I will make a pretty big wax figure.' [C]

b. Context: A woman invites her visitor to sit down. The visitor replies:

Nd-a-guapy**-mo'ã**-i che-ama, sapy'a-ite-mí-nte a-ju.
NEG-A1sg-sit-MOA-NEG B1sg-lady quickly-very-DIM-only A1sg-come

'I will not sit down, my lady, I only came for a little while.' [C]

In (9-a), the woman expresses her intention to make a wax figure and, in (9-b), the speaker expresses the intention of not sitting down.

With predictions, the speaker asserts that the proposition will be true at a time in the future: the speaker conveys that, given her/his epistemic state, s/he is committed to the truth of the proposition at a future time. Unlike with intention, no commitment or implication of agency is necessarily associated with prediction. Expectations are a weaker kind of prediction: the speaker does not assert but conveys a strong conviction that, given her/his epistemic state, the proposition is true at a future time. In the examples in (10) the two modal markers are interpreted with the modal attitude of prediction/expectation:

(10) a. Context: A father is happy that his daughter will come back home.

Hasypevé-ko péina o-je-arreglá**-ta** ko asúnto.
finally-EMPH DEM A3-JE-resolve-FUT this matter

'Finally this matter will get resolved. [C]

b. Context: A teacher says to a student who has badly hurt her hand:

Na-ne-katu**-mo'ã**-i re-eskribi.
NEG-B2sg-possible-MOA-NEG A2sg-write

'You will not be able to write.' [C]

The speaker of (10-a), for example, asserts that, given his epistemic state, the matter (of his unmarried daughter not living at home) will be resolved.

The modal attitudes are formally analyzed as restrictions on the worlds quantified over by *–ta* and *–mo'ã*, using Kratzer's (1991) theory of modality. Intention involves a circumstantial modal base and an ordering source that specifies the agent's intentions, and prediction/expectation involves an epistemic modal base and a stereotypical ordering source (see Tonhauser (2009) for details).

3.3 Counterfactual implicature with *kuri* 'back then'

The Guaraní adverb *kuri*, translated as 'back then', is used in natural discourse to locate eventualities at a previously mentioned past time (see Tonhauser 2006, §7.3). I analyze *kuri* 'back then' as a past time anaphor. In out of the blue contexts, the past time is accommodated; an unmarked verb like *o-ke* 'A3-sleep' that occurs with *kuri* 'back then' receives a deictic past time interpretation.

(11) Rossáni o-ke **kuri**.
Rossani A3-sleep back.then
'Rossani slept.' (Not: Rossani is sleeping.) [E]

The suffixes *–ta* and *–mo'ã* are compatible with *kuri* 'back then'; such combinations give rise to an implicature that the eventuality denoted by the verb was not realized. Evidence for this counterfactual implicature is that consultants will spontaneously volunteer continuations that convey that the eventuality was not realized. Consider (12), and its continuation in (12-a):

(12) Context: Malena saw the weather report two days ago.

Kuehe o-ký**-ta** **kuri**.
yesterday A3-rain-FUT back.then

'It was going to/supposed to rain yesterday.' [E]

a. ...ha nd-o-ký-i.
...and NEG-A3-rain-NEG
'...but it didn't rain.' [spontaneously volunteered]

b. ...ha o-ky.
...and A3-rain
'...and it rained.' [E]

Evidence that the counterfactual implication is merely an implicature comes from the fact that (12) can also be felicitously continued with (12-b), which states that the eventuality was realized.

In (13), *kuri* 'back then' occurs in a NEG-*mo'ã*-clause. Here, the implication arises that Juan went to Buenos Aires (cf. (13-a)):

(13) Context: Juan's sister invited Juan to visit her in Buenos Aires. He told me he wouldn't go. I say:

Juan nd-o-ho-**mo'ã**-i **kuri** Buéno Áire-pe.
Juan NEG-A3-go-MOA-NEG back.then Buenos Aires-to

'Juan wasn't going to go to Buenos Aires.' [E]

a. ... hákatu o-ho.
but A3-go
'...but he went.' [E]

b. ... ha nd-o-hó-i.
and NEG-A3-go-NEG
'...and he didn't go.' [E]

Again, the fact that (13-b),too, is a felicitous continuation of (13) shows that the counterfactual implication is merely an implicature.

3.4 Interim summary and analysis

In sum, positive clauses with *–ta* and NEG-*mo'ã*-clauses share the following temporal and modal properties:

1. They entail relative future time reference.
2. Temporal adverbs constrain the temporal location of the future eventuality.
3. Only future time adverbs are acceptable in out-of-the-blue contexts (i.e. in contexts where the reference time is the utterance time); past time adverbs are acceptable in past contexts and with *kuri* 'back then'.
4. They are compatible with the modal attitudes of intention and prediction.
5. They implicate counterfactuality with the past-time temporal anaphor *kuri*.

Given these similarities between the two types of clauses (modulo negation), it is plausible to explore the hypothesis that *–ta* and *–mo'ã* contribute the same meaning to their respective clauses. Tonhauser (2009) analyzes *–ta* as a future marker with a modal meaning component:

(14) The meaning of *–ta*:
–ta presupposes an epistemic modal base with a stereotypical ordering source or a circumstantial modal base with a ordering source that specifies the agent's intentions. If defined:
$-ta \Rightarrow \lambda P_{\langle \omega, \langle \iota, t \rangle \rangle}[\forall w'(w' \in best(MB, OS, \langle w, rt \rangle) \rightarrow \exists t'(rt < t' \wedge P(w')(t')))]$

The suffix *–ta* applies to sentence radicals *P*, which denote functions from worlds (type ω) to functions from times (type ι) to truth values. Following Kratzer (1991), the modal base *MB* and the ordering source *OS* are contextually provided; the three-place operator 'best' (borrowed from Portner (1998)) denotes those worlds in the modal base *MB* that are closest to the ideal according to the ordering source *OS* at the index $\langle w, rt \rangle$ (both *w* and *rt* (reference time) are designated variables).

Assume somebody utters (15-a) out of the blue (i.e. the reference time is the utterance time) while staring into a sky with many dark clouds. The translation of *–ta* combines with the translation of the sentence radical *o-ky* 'A3-rain' (15-b), which denotes the set of world-time pairs (indices) at which it rains. This results in the translation in (15-c) for (15-a):

(15) a. O-ký**-ta**.
A3-rain-FUT
'It will rain' [E]
b. Sentence radical: *o-ky* 'A3-rain' $\Longrightarrow \lambda w \lambda t[rain'(t,w)]$
c. $\forall w'(w' \in best(MB, OS, \langle w, rt \rangle) \rightarrow \exists t'(rt < t' \wedge rain'(t', w')))$

According to (15-c), (15-a) is true at the actual world w_0 and the utterance time *now* if and only if in all worlds w' that are best with respect to an epistemic modal base and a stereotypical ordering source at $\langle w_0, now \rangle$ there is a time t' in the future of the utterance time at which it rains in w'.

Now consider (16-a), also uttered out of the blue and while staring into a dark and cloudy sky. If the suffix *–mo'ã̃* here has the same meaning as *–ta*, we have to assume that *–mo'ã̃* semantically outscopes negation even though it (morphologically) is inside the negation circumfix. (I discuss this morphology-semantics mismatch below.) The negated sentence radical *nd-o-ky-i* 'NEG-A3-rain-NEG' denotes the set of indices at which it does not rain (16-b). The meaning of *–mo'ã̃* is *mo'ã̃*$_1$, i.e. (14). Applying this to (16-b) results in (16-c).

(16) a. Nd-o-ky**-mo'ã̃**-i.
NEG-A3-rain-MOA-NEG
'It will not rain' [E]
b. *nd-o-ky-i* 'NEG-A3-rain-NEG' $\Longrightarrow \lambda w \lambda t[\neg rain'(t,w)]$
c. $\forall w'(w' \in best(MB, OS, \langle w, rt \rangle) \rightarrow \exists t'(rt < t' \wedge \neg rain'(t', w')))$

According to (16-c), (16-a) is true at w_0 and *now* if and only if in all worlds w' that are best with respect to an epistemic modal base and a stereotypical ordering source at $\langle w_0, now \rangle$ there is a time t' in the future of the utterance time at which it does not rain in w'. (This reading is too weak, cf. Partee (1973); I assume that this could be amended by assuming that t' is contextually given and not existentially bound in the scope of the modal.)

The morphology-semantics mismatch is a problem for this analysis since there is independent evidence that morphological structure indicates semantic scope. This is illustrated in (17) for the necessity modal *–va'erã̃* '–must'. In (17-a), where *–va'erã̃* '–must' occurs inside the negation circumfix, negation has wide scope ($\neg\Box$); in (17-b), on the other hand, the marker occurs outside the circumfix and has scope over negation ($\Box\neg$). (Other verbal suffixes that show this pattern are *–ne* '–might', *–ve* '–more' and *–se* '–want'.)

(17) a. Context: A child complains that the teacher doesn't do his homework for him. The father says:

Nde-mbo'ehára na-ne-pytyvõ**-va'erã**-i.
B2sg-teacher NEG-B2sg-help-must-NEG

'Your teacher doesn't have to help you.' [E]

b. Context: A child doesn't know how to do anything alone because the teacher always helps him do things. The father says:

Nde-mbo'ehára na-ne-pytyvõ-i**-va'erã**.
B2sg-teacher NEG-B2sg-help-NEG-must

'Your teacher must not/should not help you.' [E]

Given the correlation between surface order and semantic scope observed with other verbal suffixes, an analysis of NEG-*mo'ã*-clauses where negation outscopes the meaning of the suffix would be preferable. I return to this in §5.

4 Counterfactual interpretations with *–mo'ã*

As mentioned in §1, clauses where *–mo'ã* does not appear inside the negation circumfix, henceforth '*mo'ã*-clauses', receive a counterfactual interpretation: the eventuality denoted by the (non-)negated verb to which *–mo'ã* attaches is implied to have almost been realized in the actual world, but not quite. Accordingly, Guaraní consultants often translate such examples using Spanish *casi* 'almost'.

(18) a. Context: A girl runs towards a door to prevent being locked out.

O-ñe-mboty**-mo'ã** hese puérta.
A3-JE-close-MOA to.3 door

'The door almost closed for her (but it didn't).' [C]

b. Context: The airline informs Marco that his flight to Mexico was cancelled. As he is getting ready to return home, the airline tells him that they found a seat on another flight, and he goes to Mexico.

Márko nd-o-ho-i**-mo'ã** Méhiko-pe.
Marco NEG-A3-go-NEG-MOA Mexico-to

'Marco almost didn't go to Mexico (but he went).' [E]

(18-a) expresses that at some past time the prediction (or expectation) arose that the door would close, but at the utterance time the door is not closed. With (18-b) the speaker reports a past expectation that Marco would not go to Mexico but also conveys that he did in fact go. Thus, both examples imply that the eventuality denoted by the (non-)negated verb was not realized; I refer to this as the counterfactual implication of *mo'ã*-clauses.

4.1 Counterfactuality is entailed

I argue in this section that the counterfactual implication of *mo'ã*-clauses is an entailment. Evidence that it is not merely an implicature comes from examples like (19) where the second conjunct is infelicitous in the context of the first.

(19) a. Context: Juan had a very bad accident.
O-mano**-mo'ã** #ha o-mano.
A3-die-MOA and A3-die
(Intended: He almost died and he died.) [E]

b. Context: Juan and Martin are presidential candidates.
La hente-kuéra oi-poravo**-mo'ã** Martín-pe #ha oi-poravo Martín-pe.
the people-PL A3-chose-MOA Martin-to and A3-chose Martin-to
(Intd.: The people almost chose Martin and they chose Martin.) [E]

The second conjunct in both examples denies the non-realization of the eventuality denoted by the first conjunct. In (19-b), for example, the first conjunct implies that Martin was not chosen (but Juan) and the second conjunct, which states that Martin was chosen, is not felicitous. Since the counterfactual implication cannot be cancelled, it is not an implicature (compare this to the examples in §3.3).

If the counterfactual implication of *mo'ã*-clauses were a presupposition, we would expect it to project in linguistic contexts that function as holes to presuppositions, such as the antecedents of conditionals (20-a) or modals (20-b). (Sentential negation is of course not a suitable test here since NEG-*mo'ã*-clauses receive a future time interpretation.)

(20) a. Context: Juan is participating in a competition. The person who reaches the top of Mount Everest wins a prize as well as the person who comes close to the top. We are waiting at the bottom and can't see what's going on at the top because of the clouds. Somebody says:
O-guahẽ**-mo'ã**-rõ Juan huã-me o-ganá-ma prémio, pero che
A3-reach-MOA-if Juan B3.top-to A3-win-PERF prize but B1sg
a-pensa o-guahẽ-ha huã-me.
B1sg-think A3-reach-NOM B3.top-to
'If Juan almost reached the top, he already won a prize, but I think he reached the top.' [E]

b. Context: Malena is in Asunción to participate in a running competition. Nobody of her family is accompanying her. On the day of the race, we're all in her parents' house to wait for her to call us after the race. Her kid brother is very impatient and keeps asking whether she won or not. Somebody snaps at him:
O-gana**-mo'ã**-ne, o-perdé-ne ha o-ganá-ne!
A3-win-MOA-might A3-lose-might and A3-win-might
'She might have almost won, she might have lost and she might have won!' [E]

If the counterfactual implication was a presupposition, we would expect these utterances to be infelicitous. Take (20-a). The antecedent of the conditional implies that Juan has not reached the top. If this implication was a presupposition, it should also be a presupposition of the entire conditional. The context given for (20-a), however, makes clear that Juan not reaching the top is not in the common ground (since the people at the bottom of the mountain cannot see what's going on). Evidence that the purported presupposition is not accommodated comes from the fact that the continuation *pero che a-pensa o-guahẽ-ha huã-me* 'but I think he reached the top' would be infelicitous with the accommodated presupposition — yet the entire discourse in (20-a) is felicitous. Hence, the counterfactual implication is not a presupposition, but an entailment. Likewise, (20-b) should be infelicitous if the implication that Malena did not win was presupposed by the first conjunct.

4.2 Temporal properties

A striking difference between NEG-*mo'ã*-clauses (§3) and *mo'ã*-clauses is their temporal reference. When interpreted at the utterance time, as in the context of (21), the former receive a future time interpretation (21-a), while the latter receive a past interpretation (21-b).

(21) Context: Laura had an accident and we are very concerned about her.

a. N-o-mano-**mo'ã**-i.
NEG-A3-die-MOA-NEG
'She will not die.' [E]

b. O-mano-**mo'ã**.
A3-die-MOA
'She almost died (but she didn't).' [E]

In the given context, the speaker uses (21-a) to predict Laura's not dying in the future of the utterance time. (21-b), on the other hand, expresses that at the contextually relevant past time (the accident) there was an expectation that Laura would die (but she didn't, in the end). Thus, while both examples involve a prediction/expectation about a future time, this time is in the future of the utterance time in (21-a) but in the future of a past time in (21-b).

As expected then, *mo'ã*-clauses are compatible with past time adverbs in out-of-the-blue contexts (in contrast NEG-*mo'ã*-clauses, cf. (7-b)):

(22) a. Kuehe o-ky-**mo'ã**.
yesterday A3-rain-MOA
'It almost rained/was supposed to rain yesterday (but it didn't).' [E]

b. Ambue mé-pe Márko nd-o-ho-i-**mo'ã** Méhiko-pe
other month-at Marco NEG-A3-go-NEG-MOA Mexico-to
'Last month, Marco almost didn't go to Mexico (but he went).' [E]

The temporal adverbs in these examples constrain the times at which the eventualities were predicted or intended to occur. In (22-a), for example, the temporal adverb *kuehe* 'yesterday' constrains the time at which it was supposed to rain.

mo'ã-clauses are also compatible with future time adverbs, such as *ko'ẽro* 'tomorrow'. In (23), the eventuality was intended to be realized in the future of the utterance time, at a time within tomorrow.

(23) Context: The speaker was scheduled to sing the next day but the concert was cancelled.

Ko'ẽro a-purahei-**mo'ã**.
tomorrow A1sg-sing-MOA
'Tomorrow I would have sung (but I won't).' [E]

Thus, the counterfactual interpretation does not depend on the intended (or predicted) eventuality not having occurred in the past. Rather, what is crucial is that there is a past time at which there is an intention (or prediction), and, at the utterance time, it is known that the actual world is not a world in the proposition comes true.

4.3 Towards a formal analysis

In sum, *mo'ã*-clauses have the following temporal and modal properties:

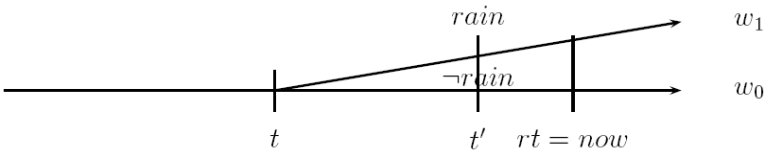
1. They entail that there is a time in the past of the utterance time at which there is an intention or prediction for the eventuality denoted by the verb to occur at a time in the (relative) future.
2. They entail counterfactuality, i.e. that the eventuality denoted by the verb is not realized at the intended or predicted time in the actual world.
3. Temporal adverbs constrain the temporal location of the intended/predicted counterfactual eventuality. In out-of-the-blue contexts, the counterfactual eventuality is located in the past of the utterance time (and hence they are compatible with past time adverbs) but future time adverbs are also acceptable.

To illustrate, imagine (24) being uttered by a disgruntled farmer:

(24) Kuehe o-ky-**mo'ã**.
yesterday A3-rain-MOA
'It was supposed to rain yesterday (but it didn't).' [E]

(24) is true at the utterance time if and only if there is a time t in the past of the utterance time at which there is a prediction that it rains at a time t' in the (relative) future of t and that t' is in the denotation of *kuehe* 'yesterday'. Additionally, as depicted informally in (25), (24) asserts that it did not rain in the actual world w_0 (but only in worlds w_1 that were like w_0 at least until t).

(25)



Since the temporal adverb *kuehe* 'yesterday' (26-a) constrains the temporal location of the counterfactual eventuality, it combines with the sentence radical *o-ky* 'A3-rain' (26-b) to give the translation in (26-c). I analyze the meaning of the suffix *–mo'ã* in *mo'ã*-clauses as *mo'ã*$_2$: the translation of *–mo'ã* in (26-d) applies to (26-c) to give (26-e), which is the meaning of (24).

(26) a. *kuehe* 'yesterday' $\Longrightarrow \lambda P_{\langle \omega,\langle \iota,t\rangle\rangle}\lambda w\lambda t[P(w)(t) \wedge t \subseteq yesterday']$

b. Sentence radical *o-ky* 'A3-rain' $\Longrightarrow \lambda w\lambda t[rain'(w)(t)]$

c. $\lambda w\lambda t[rain'(t,w) \wedge t \subseteq yesterday']$

d. $\text{–}mo'\tilde{a} \Longrightarrow \lambda P_{\langle \omega,\langle \iota,t\rangle\rangle}[\exists t'(t' < now \wedge \forall w'(w' \in best(MB,OS,\langle w,t'\rangle) \rightarrow \exists t''(t' < t'' \wedge P(w')(t'') \wedge \neg P(w)(t''))))]$

e. $\exists t'(t' < now \wedge \forall w'(w' \in best(MB,OS,\langle w,t'\rangle) \rightarrow \exists t''(t' < t'' \wedge t'' \subseteq yesterday' \wedge rain'(t'',w') \wedge \neg rain'(t'',w))))$

(24) is true if and only if there is a time t' before the utterance time such that in all worlds that are best with respect to an epistemic modal base and a stereotypical ordering source at $\langle w_0,t'\rangle$ there is a time t'' (in the future of t' and included in yesterday) at which it rains, and it does not rain at t'' in the actual world w_0.

5 Is a unified analysis of *–mo'ã* possible?

In Table 1, I compare the truth-conditional meanings of NEG-*mo'ã*- and *mo'ã*-clauses. (FTR stands for 'future time reference' and TADV for 'temporal adverb'.)

	NEG-*mo'ã*-clauses	*mo'ã*-clauses
FTR entailed relative to...	reference time	time before *now*
Modality: intention, prediction	✓	✓
Counterfactuality	implicated with *kuri*	entailed
Compatible w/ future TADV?	✓	✓
Compatible w/ past TADV?	in past contexts/with *kuri*	✓

Table 1: Comparison of NEG-*mo'ã*-clauses and *mo'ã*-clauses

NEG-*mo'ã*- and *mo'ã*-clauses share temporal and modal properties, which is reflected in the underlined part of the meanings *mo'ã*$_1$ and *mo'ã*$_2$: both involve relative future time reference and the modal attitudes of intention and prediction.

(27) a. *mo'ã*$_1$: $\lambda P_{\langle \omega,\langle \iota,t\rangle\rangle}[\underline{\forall w'(w' \in best(MB,OS,\langle w,rt\rangle) \rightarrow \exists t'(rt < t' \wedge P(w')(t')))}]$

b. $mo'\tilde{a}_2$: $\lambda P_{\langle \omega,\langle \iota,t\rangle\rangle}[\exists t'(t' < now \wedge \forall w'(w' \in best(MB, OS, \langle w, t'\rangle) \rightarrow \exists t''(t' < t'' \wedge P(w')(t'')) \wedge \neg P(w)(t'')))]$

Key differences between the two interpretations are the following. First, the counterfactual interpretation $mo'\tilde{a}_2$ involves an additional (past) time at which the best worlds are determined; hence *mo'ã*-clauses are compatible with past time adverbs in out of the blue contexts, in contrast to NEG-*mo'ã*-clauses. Second, while both types of clauses entail that the eventuality is not realized, this results from $mo'\tilde{a}_1$ combining with sentential negation and from the counterfactual entailment of $mo'\tilde{a}_2$. Third, while *mo'ã*-clauses entail counterfactuality, NEG-*mo'ã*-clauses only implicate it in the presence of *kuri* 'back then', just like clauses with *–ta*.

Is a unified analysis of the suffix possible? What is striking is that the two interpretations of *–mo'ã* are in complementary distribution: *–mo'ã* is interpreted as $mo'\tilde{a}_1$ when it appears inside the negation circumfix and as $mo'\tilde{a}_2$ when it does not. (Of all the suffixes that can occur both inside and outside the negation circumfix, only *–mo'ã* exhibits distinct interpretations depending on its position with respect to the circumfix.) A unified analysis of the suffix might capitalize on the idea that it is the relative scope of negation that results in the two interpretations: the meaning of *–mo'ã* would need to be specified such that the future time interpretation results from negation scoping over the suffix (which is desirable on independent grounds, cf. §3.4), and the counterfactual interpretation arises from *–mo'ã* not being in the scope of negation. Differences might also be attributable to context dependent elements in the meaning of *–mo'ã*, such as the modal base. Future research will have to determine the feasibility of this line of inquiry.

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Comparatives Combined with Additive Particles: The Case of German *noch*

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Abstract

This paper investigates comparatives combined with the German particle *noch* (*'still'*). Such comparatives trigger – in some but not all contexts – the entailment that the comparison base exceeds the standard of the comparison class, which is surprising since comparatives in general are assumed to be insensitive to the standard of the comparison class. It is shown that the entailment results from the fact that comparatives combined with *noch* are anaphoric. An interpretation is proposed which accounts for the fact that comparative *noch* is both scalar and additive.

1 Introduction

It is well-known that the unmodified positive form of a gradable adjective relates to a contextually given standard of comparison. Thus (1) entails that Berta is taller than some standard given by, e.g., the class of ten-year old girls. Following Bierwisch (1989) constructions relating to a contextually given standard of comparison will be called *norm-related* in this paper. The unmodified comparative form of a gradable adjective is clearly not norm-related – the sentence in (2) neither entails that Adam is tall nor that Berta is tall. Surprisingly, the comparative form seems to be norm-related when combined with the particle *noch* ('still'). The sentence in (3a), if presented out of the blue, entails that Adam, and thus Berta are tall. Similarly, from (3b) it will be concluded that the old web pages of the advertising company were customer-friendly and informative. There are, however, also contexts where the comparative form combined with *noch* is not norm-related. In (4a), for example, it is not entailed that the male brain is big, and in (4b) it is not entailed that the range of activities of physiotherapists was large at the end of the last year.

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(1) Berta ist groß.
'Berta is tall.'

(2) Berta ist größer als Adam.
'Berta is taller than Adam.'

(3) a. Berta ist noch größer als Adam.
'Berta is still taller than Adam.'

b. (A company praising their new web pages)
Unsere neuen Webseiten sind noch kundenorientierter und informativer.
'Our new web pages are still more customer-friendly and informative.'

(4) (from the web:)
a. Bei der Frau ist die Hemisphäreneinteilung in links und rechts nicht so stark. Das weibliche Gehirn ist kleiner als das männliche, also das männliche ist größer. Das Gehirn eines ausgewachsenen Ochsen ist noch größer.
'In women the division into a left and a right brain hemisphere is not that clear. The female brain is smaller than the male one, that is, the male one is bigger. The brain of a full-grown ox is still bigger.'

b. Der Betätigungsbereich für Physiotherapeuten ist im letzten Jahrzehnt größer geworden; er könnte aber durchaus noch größer sein.
'The range of activities of physiotherapists increased in the last decade, but it could be still larger.'

First of all, the above examples raise the question of why the comparative construction turns out to be norm-related when combined with the particle *noch*. How does *noch* affect the comparative to yield this effect? Secondly, what is the role of the context? Why do the contexts in (4a,b) prevent norm-relatedness? Thirdly, there is the question of what the particle *noch* in (3) and (4) means. The use of *noch* in (3) and (4) will be called the *comparative use of noch* in this paper.[1] Assuming that this use of *noch* does not constitute a separate reading, how does it relate to the other uses of *noch*?

In the literature, the comparative use of *noch* is widely ignored. In the field of comparison, side remarks can be found, for example in Bierwisch (1989) and Varnhorn (1993), acknowledging the fact that comparative *noch* may cause norm-relatedness. Prominent papers on the particle *noch*, e.g. Löbner (1989), Krifka (2000), disregard the comparative use, with the exception of König (1977), who makes an elegant proposal that will be basic for the analysis proposed in this paper.

The paper is organized as follows: Section 2 provides a brief survey of the uses of *noch* discussed in the literature. In section 3 König's (1977) proposal is examined. In section 4 an analysis of the comparative use of *noch* is presented which explains why, in some but not all contexts, it induces norm-relatedness of the comparative form. It will be argued that comparative *noch* is an instance of the additive use of *noch*, and

[1] Please note that there are combinations of *noch* plus comparative which are not subsumed by the notion of *comparative noch*, cf. (9) and (10) below.

that norm-relatedness is the result of an anaphoric relation of the comparative to an unmodified (i.e. norm-related) positive form. The final section points out open questions for future work.

2 Readings of *noch*

There are three major readings of the particle *noch* discussed in the literature, the temporal reading, the marginality reading and the additive reading. In all of these readings the particle presupposes an underlying scale and induces a "dynamic perspective". *Noch* is closely related to the particle *schon* ('already') which also presupposes an underlying scale but indicates a different perspective. Since *schon* is irrelevant for the analysis of comparative *noch* it will be ignored in this paper.

The temporal reading of *noch* is demonstrated in (5). The particle indicates that it has been raining before and might stop soon. Temporal *noch* (but not marginality and additive *noch*) may be positioned in the beginning of the sentence, and it usually occurs in imperfective sentences (for details see König 1991).

(5) Es regnet noch. / Noch regnet es.
'It is still raining.'

The second reading of *noch* is the marginality reading. The use of *noch* in (6) indicates that Osnabrück is a marginal case of being in the Lower Saxony territory. If Osnabrück were located further away from the center of Lower Saxony, it would be beyond the border. Marginality is enhanced by adding *gerade* ('just').

(6) Osnabrück liegt (gerade) noch in Niedersachsen.
'Osnabrück is still in Lower Saxony.'

The third reading of *noch* is the additive one. There is a stressed and an unstressed variant which differ in that the unstressed variant requires an additional entity distinct from the associated consitituent (i.e. the NP *einen Schnaps* in (7a,b), whereas the stressed variant requires the additional entity to be an instance of the same kind. In (7a), *noch* being unstressed, there has to be another drink ordered by Otto distinct from schnaps. In (7b), with stressed *noch*, the additional drink has to be a schnaps.

(7) a. Otto bestellte noch einen SCHNAPS (zusätzlich zu seinem Bier).
'Otto ordered a schnaps (in addition to his beer).'

b. Otto bestellte NOCH einen Schnaps (zusätzlich zu seinen anderen Schnäpsen).
'Otto ordered another schnaps (in addition to his other ones).'

The additive reading of *noch* is closely related to the additive particle *auch* ('also') which also appears in a stressed and an unstressed variant. Unstressed *auch* is similar in meaning (though not identical, cf. section 4.3) to unstressed *noch* presupposing an additional entity distinct from the associated constituent. For example, (8a) as well as

(7a) presuppose another drink distinct from schnaps. Stressed *auch* is clearly different from stressed *noch*, since it is associated with the subject (or contrastive topic, cf. Krifka 1999). Whereas stressed *noch* in (7b) presupposes another schnaps, stressed *auch* in (8b) presupposes another person ordering schnaps.

(8) a. Otto bestellte auch einen SCHNAPS (zusätzlich zu seinem Bier).
'Otto also ordered a schnaps (in addition to his beer).'

b. Otto bestellte AUCH einen Schnaps (zusätzlich zu anderen Gästen).
'Otto also ordered a schnaps (in addition to other guests).'

Considering the initial question of how the comparative use of *noch* in (3) and (4) relates to the readings of *noch* discussed in the literature, it is important to note that each of the uses mentioned above – temporal, marginality, additive – may combine with comparative forms. The example in (9) has a temporal reading indicating that Adam might be taller than Berta in the future (which is the only available reading if *noch* is positioned in the beginning of the sentence). In (10) the prominent reading is marginality (enhanced by adding *gerade*): The letter is a marginal case of weighing less than 20g.

(9) Berta ist noch größer als Adam. / Noch ist Berta größer als Adam.
'Berta is still taller than Adam.'

(10) Der Brief ist (gerade) noch leichter als 20g. (Eine 55 Cent Briefmarke reicht.)
'The letter still weighs less than 20g. (A 55 Cent stamp will be o.k.)'

As shown in (9) and (10), *noch* combined with a comparative form may have a temporal as well as a marginality reading. But if we try an additive reading we get the comparative use we were looking for. The additive reading of (11) presupposes an additional comparison, or an additional span of height, distinguishing Adam from someone else, which is characteristic for the comparative reading. Although comparative *noch* is usually stressed, stress may also be on the comparative form instead of the particle, for example in the context of an antonym as in (11b).[2] So we find the same pattern as in (7): the stressed variant presupposes the occurrence of the same adjective and unstressed variant presupposes the occurrence of a distinct one.

(11) a. (Adam ist groß/ größer als 1,80m.) Aber Berta ist NOCH größer.
'(Adam is tall / taller than 1,80m.) But Berta is still taller.'

b. (Adam ist nicht klein.) Aber Berta ist noch GRÖßER.
'(It is not the case that Adam is small.) But Berta is still taller.'

[2] For ease of presentation, comparative *noch* will be marked by caps (NOCH) in the rest of the paper, which is not meant to exclude unstressed occurrences.

This suggests that the comparative use of *noch* is an instance of the additive reading.[3] But what does it mean to "add another comparison", and why does it (in some contexts) trigger norm-relatedness? We will come back to these question in section 4.

3 The meaning of *noch*

The discussion of the meaning of *noch* in the literature has mainly been focused on the question of whether *noch/still* and *schon/already* are duals related by inner and outer negation, cf. Löbner (1989). Since the relation between *noch* and *schon* is irrelevant in this paper – comparative *noch* does not have a *schon* counterpart – we need not go into the problem of duality. It is commonly assumed that temporal and non-temporal uses of *noch/still* differ only with respect to the scale they make use of and presuppose the existence of an additional element ranked lower than the associated constituent.[4] For example, *It is still raining* presupposes a time t_i immediately preceding the reference time such that it is raining at t_i. The existence of an additional element has often led to the idea that *noch/still* is in general additive. König (1991), for example, argues that *noch* is both additive ('adding up to a larger whole') and scalar ('ranking elements along a scale'). Similarly, Ippolito (2007) claims for the temporal as well as the marginality reading of English *still* that they are additive ('presupposing an additional item') relating to the scale of times and degrees, respectively. While it seems plausible that the readings of *noch/still* differ only with respect to the underlying scale, the nature of the non-temporal scales is rarely discussed. Employing degrees in the case of marginality, as suggested by Ippolito, raises the question of which degrees are employed if the associated constituent is not gradable.[5] Obviously we have to make use of degrees of membership or prototypicality (cf. Kamp & Partee 1995). More vitally, if *noch/still* is always additive, what distinguishes the genuine additive reading

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[3] It has been suggested by one of the referees that comparative *noch* is scalar instead of additive, where *scalar* refers to the scale of likeliness. This suggests itself from the point of view of the English translations which often use *even* instead of *still*. But if comparative *noch* were scalar in the sense of likeliness, it should be equivalent to German *sogar* ('*even*'), which can't be true since it yields different entailments. For example, while *noch* in (i) triggers the entailment that the old web pages have been customer-friendly, substituting *sogar* for *noch* would entail that it is unlikely that the new web pages are more customer-friendly than the old ones, cf. (ii), which is clearly not intended. If you assume that any use of *noch* is scalar in presupposing an order relation, the comparative use of *noch* is, of course, scalar in addition to being additive.

(i) (A company praising their new web pages)
Unsere neuen Webseiten sind noch kundenorientierter.
'Our new web pages are still more customer-friendly.'

(ii) Unsere neuen Webseiten sind sogar kundenorientierter.
'Our new web pages are even more customer-friendly.'

[4] It is also agreed that *noch* triggers a conversational implicature about, in the case of the temporal interpretation, the future. Krifka (2000) offers a convincing account of how the implicature is induced by the alternative set triggered by *noch*.

[5] Ippolito (2007) considers only marginality readings of *still* involving gradable adjectives, like *Compact cars are still safe; subcompacts start to get dangerous.*

(cf. the schnaps example in (7)) from the other uses, and what is the underlying scale in this case? We will go into these questions at the end of section 4.

3.1 The proposal in König (1977)

König (1977) seems to be the only account in the literature including the comparative use of *noch*. König distinguishes between temporal and non-temporal uses and proposes the truth conditions presented in (12) and (13) (in a slightly adapted manner). The basic idea is that *noch* imposes an existential presupposition about an additional element – time point or individual – ranked lower on a scale. In the temporal case, *noch* combines with a sentence and presupposes a time point preceding the reference time such that the proposition is true at that time. In the non-temporal case *noch* combines with an individual and a predicate. The presupposition requires that there is an additional individual ranked lower according to an order on individuals, such that the predicate applies to this individual.

(12) temporal

noch (t_i, Φ)	assertion	$\Phi(t_i)$
	presupp.	$\exists\, t_j\, (j < i)$ such that for all t_k $(j \leq k \leq i)$ $\Phi(t_k)$

(13) non-temporal

noch (a, λx.P(x))	assertion	P(a)
	presupp.	$\exists$y. y$\neq$a & (y < a) & P(y)

Applying the temporal interpretation is straightforward. Applying the non-temporal interpretation raises the question of how to determine the order of individuals, which is left unspecified in König's proposal. Let us assume that it is provided by the degree of marginality – or inverse prototypicality – of an individual with respect to a given predicate. In (14), for example, the order is taken to be the order of being marginal in Lower Saxony ($<_{\mathbf{marg\_in\_LS}}$).

(14) a. Osnabrück liegt (gerade) noch in Niedersachsen.
'Osnabrück is still in Lower Saxony.'

b. noch(osna, λx.inLS(x))

assertion	inLS (osna)
presupp.	$\exists$y. y$\neq$osna & (y $<_{\mathbf{marg\_in\_LS}}$ osna) & inLS(y)

Before going into König's proposal for the comparative use of *noch*, we will consider the case of genuine marginality combined with a comparative form, cf. (15). The associated predicate in (15) is *being-taller-than-Adam* (for short: *taller-Adam*). How to spell out the marginality order of this predicate? Let us assume that an individual y is less marginal than an individual x in *taller-Adam* if y exceeds Adam's height by a larger span than x, cf. (15c). This order of marginality yields the intended

interpretation, that is, the presupposition that there is an individual which is taller than Adam and taller than Berta, cf. (15d).

(15) a. Berta ist (gerade) noch größer als Adam.
'Berta is still taller than Adam.'

b. noch (berta, λx. taller-adam(x))
assertion taller-adam(berta)
presupp. ∃y. y≠berta & (y $<_{\textbf{marg\_in\_taller-adam}}$ berta) & taller-adam(y)

c. (y $<_{\textbf{marg\_in\_taller-adam}}$ x) iff (x taller adam) & (y taller x)

d. adam $<_{height}$ berta $<_{height}$ y

Following König (1977), the comparative use of *noch* is a special case of marginality. That is, (16a) is understood as expressing that Adam is such that Berta is marginally taller than Adam. Compared to the genuine marginality case in (15) the roles of the participants are reversed: While in (15) the associated predicate is *being-taller-than-Adam*, in (16) it is taken to be *being-such-that-Berta-is-taller* (for short: *Berta-taller*). As before, König does not spell out the marginality order. So what would be a less marginal case of *Berta-taller*? Obviously, an individual y is less marginal than an individual x in *Berta-taller* if it falls below Berta's height by a larger span than x, cf. (16c). This yields the correct requirement that the presupposed individual is smaller than Adam and smaller than Berta, cf. (16d).

(16) a. Berta ist NOCH größer als Adam.
'Berta is still taller than Adam.'

b. noch (adam, λx. berta-taller(x))
assertion berta-taller (adam)
presupp. ∃y. y≠adam & (y $<_{\textbf{marg\_in\_berta-taller}}$ adam) & berta-taller(y)

c. (y $<_{\textbf{marg\_in\_berta-taller}}$ x) iff (berta is taller than x) & (x is taller than y)

d. y $<_{height}$ adam $<_{height}$ berta

Tracing back the comparative use of *noch* to a particular marginality reading is a truly elegant solution. And, provided that the marginality order is defined as above, it gives the correct results. But as it stands, it does not explain the finding we started out from, that is, the fact that the comparative use of *noch* may make the comparative form norm-related. König briefly mentions a second comparison. But he does not comment on the problem of norm-relatedness. More importantly, there is no hint on how to derive the proposed interpretation in a compositional way. Why should it be licensed to reverse the roles of the participants and take a sentence like (16a) to be about the comparison base? Is it just a trick giving correct results by mere chance?

3.2 How to license role reversal

The puzzle of how to license the reversal of participants in König's analysis of comparative *noch* is easily solved by assuming the syntactic structures in (17) and (18).[6] While in the genuine marginality case *noch* combines with a DegP including the comparison base, in the comparative reading it combines with an AP. Let us assume that the presupposition triggered by *noch* is composed compositionally and is linked to the outer most argument of the function given by the associated constituent. Then, in the marginality case, the presupposition relates to the predicate *being-taller-than-Adam*, whereas in the comparative case it relates to the predicate *being-such-that-someone-is-taller*, cf. (17c) and (18c). When combined with the remaining arguments we get presuppositions at the sentence level exhibiting the "role reversal" we found in König's original proposal.

(17) a. Berta ist (gerade) noch größer als Adam.
'Berta is still taller than Adam.'

b. [$_{CP}$ Berta [$_{VP}$ ist **[$_{DegP}$ noch [$_{DegP}$ [$_{AP}$größer] [als Adam]]**]]]

c. noch (λx. taller-adam(x)):
assertion λx. taller-adam(x)
presupp. λx. ∃z. z≠x & (z <$_{\textbf{marg\_in\_taller-adam}}$ x) & taller-adam(z)

(18) a. Berta ist NOCH größer als Adam.
'Berta is still taller than Adam.'

b. [$_{CP}$ Berta [$_{VP}$ ist [$_{DegP}$ **[$_{AP}$ noch [$_{AP}$ größer]]** [als Adam]]]]

c. noch (λy λx. x taller y):
assertion λy λx. x taller y
presupp. λy λx. ∃z. z≠y & (z <$_{\textbf{marg\_in\_x-is-taller}}$ y) & (x taller z)

According to the analyses above, the reversal of roles in the interpretation is just the outcome of different syntactic structures. Assuming the structure in (18) König's interpretation of comparative *noch* is fully justified. Still, it does not answer the initial question of why the comparative may trigger norm-relatedness when combined with comparative *noch*. And it does not explain why the comparative use patterns with the additive reading of *noch*.

[6] Many thanks to my colleague Stefan Evert for pointing that out to me.

4 The interpretation of comparative *noch*

It has been argued in section 2 that the comparative use of *noch* is just the additive reading of *noch* combined with comparatives, which is intuitively plausible assuming that the addition consists in another comparison and, as a result, in an additional span of height. In König (1977), on the other hand, the comparative use of *noch* is analyzed as a marginality reading with "reversed roles", which yields the correct predictions but does not account for the norm-relatedness effect.

In this section, it will first be shown that the comparative use of *noch* is anaphoric. The problem of norm-relatedness will turn out to be a consequence of anaphoricity. An interpretation of comparative *noch* will be proposed that takes anaphoricity into account. Finally, we will come back to the question of why the comparative reading appears to be an instance of the additive reading.

4.1 Contexts

There are basically three types of contexts of the comparative use of *noch*: The sentence containing comparative *noch* may (i) be preceded by a sentence containing the same comparative form, or (ii) be preceded by a sentence containing the positive form or its antonym, or (iii) occur 'out of the blue'. The first type of context is shown in (19a,b). The preceding sentence expresses a comparison between the comparison base of the *noch* comparative (i.e. the comparative combined with *noch*) and a third person or a measure phrase. The second type of context is shown in (20a,b). The preceding sentence either ascribes the positive form of the adjective to the comparison base of the *noch* comparative, or it denies the positive form of the antonym. In the third type of context there is no preceding sentence involving the adjective in question, cf. (21).[7]

(19) a. Adam ist größer als Chris. Aber Berta ist NOCH größer (als Adam).
'Adam is taller than Chris. But Berta is still taller (than Adam).'

b. Adam ist größer als 1,80m. Aber Berta ist NOCH größer (als Adam).
'Adam is taller than 1,80m. But Berta is still taller (than Adam).'

(20) a. Adam ist groß. Aber Berta ist NOCH größer (als Adam).
'Adam is tall. But Berta is still taller (than Adam)'

b. Adam ist nicht klein. Aber Berta ist NOCH größer (als Adam).
'Adam is not small. But Berta is still taller (than Adam).'

(21) Berta ist NOCH größer als Adam.
'Berta is still taller than Adam.'

[7] There are other contexts licensing comparative *noch*, which are taken to be subsumed by the above classification, e.g. *Adam ist so groß wie Chris.* ('Adam is as tall as Chris.') and *Adam ist ein Riese.* ('Adam is a giant.').

Following, e.g., Bierwisch (1989), the unmodified positive form of an adjective relates to a contextually given standard of comparison (what we called 'norm' in the introduction). Thus a statement involving the positive form is traced back to a comparative statement. As a result, the antecedent sentences in (20a,b) express comparative statements – in (a) Adam exceeds the norm of tallness (given by the comparison class), while in (b) he falls short of the norm of smallness. Thus, (19) as well as (20) express statements of the form "Adam is taller than degree d, and Berta is taller than Adam".

Now consider norm-relatedness: Neither (19a,b) nor (20b) entail that Berta is taller than the norm. Norm-relatedness is only entailed in the example in (20a), where the antecedent comparison involves the positive form of the same adjective. This suggests that the use of comparative *noch* triggers norm-relatedness, if and only if the comparison base of the antecedent statement is given by the norm of the adjective in the *noch* comparative. Norm-relatedness is not entailed if the comparison base of the antecedent is given by a third individual's height or a measure phrase, as in (19a,b), and if the comparison base of the antecedent is given by a different norm, as in (20b) (if someone is not small, he need not be tall).

Coming back to the third type of contexts, as shown in (21): Although there is no overt antecedent, the sentence clearly entails that Adam and Berta are tall. This suggests an analysis analogous to (20a), while accommodating the antecedent. The accommodated antecedent will be composed out of the comparison base of the *noch* comparative and the norm of the adjective (with respect to the comparison class), that is in (21): Adam is taller than the tallness norm.[8]

Accordingly, *noch* comparatives without overt antecedent mostly contain an explicit comparison base, and if they don't, reconstruction is straightforward. The sentence in (22), for example, is preferably interpreted such that the new web pages are more customer-friendly and informative than the old ones, and it clearly entails that the old ones were customer-friendly and informative.

(22) Unsere neuen Webseiten sind noch kundenorientierter und informativer.
'Our new web pages are still more customer-friendly and informative'

So finally, the finding that *noch* combined with comparatives entails norm-relatedness in some but not all contexts turns out to be a consequence of the fact that comparative *noch* is anaphoric requiring an antecedent comparison. The contexts triggering norm-relatedness are those where the antecedent comparison is related to the norm of the adjective of the *noch* comparative.

[8] It is important to note that the accommodated proposition is not an existential one, which would be trivially satisfied, but instead is about the comparison base of the *noch* comparative. Accommodation of mere existential propositions is a well-known problem for analyses of *auch* ('also'/'too') leading to the insight that particles do not allow for accommodation (of existential propositions), cf. Zeevat (2003).

4.2 Semantics

The examination of contexts revealed that the comparative use of *noch* is anaphoric relating to a preceding comparison. The subject of the antecedent comparison is identical to the comparison base of the *noch* comparative, and the comparison base of the antecedent comparison may be given by a third individual or a measure phrase or – if the preceding sentence contains an unmodified positive – a contextually determined standard of comparison, i.e. norm value.

Comparing the proposal in König (1977) with these findings there are two major shortcomings. König's presupposition requires the existence of an additional individual satisfying the associated predicate. But what we find is anaphoricity instead of mere existence, and the antecedent is not an individual but a comparison – a pair in a degree relation – such that the first element is equal to the degree of the comparison base of the *noch* comparative.

Since *noch* is known to be a focus particle, a satisfactory interpretation would have to be spelled out in a focus semantic framework (cf. Krifka 2000). Due to limitations of space we will not go into focus semantics in this paper, and instead base the interpretation on the notions of presupposition and anaphor. Following, e.g., Kennedy & McNally (2005), gradable adjectives denote relations between individuals and degrees and come with measure functions mapping their arguments onto the scale associated with the adjective. The adjective *groß* ('tall') thus denotes a relation between an individual x and a degree of height d such that the height of x is at least d, cf. (23a). For comparative forms, the degree argument picks up the degree of the comparison base, cf. (23c), and for positive forms the degree argument is bound by a contextually determined standard degree of tallness depending on the comparison class, $d_{\textbf{S-tall}}$, cf. (23d) ($d_{\textbf{S-tall}}$ is regarded as a free variable to be bound by the context).

(23) a. $[[\ [_{A}\ \textit{groß}]\ ]] = \lambda d\ \lambda x.\ ht(x) \geq d$
b. $[[\ [_{AP}\ \textit{größer}]\ ]] = \lambda y\ \lambda x.\ ht(x) > ht(y)$
c. $[[\ [_{DegP'}\ \textit{größer als Adam}]\ ]] = \lambda x.\ ht(x) > ht(adam)$
d. $[[\ [_{DegP}\ \textit{groß}]\ ]] = \lambda x.\ ht(x) \geq d_{\textbf{S-tall}}$

The interpretation of comparative *noch* is spelled out in (24). Following the *presupposition-as-anaphors* paradigm (cf. van der Sandt 1992) the comparison anaphor is formulated as a presupposition (underlined). It is of the form ht(y)>d, where y will be instantiated by the comparison base of the *noch*-comparative, and d is a free variable to be bound by the antecedent comparison.[9]

(24) $[[\ [_{AP}\ \textit{noch}\ [_{AP}\ \textit{größer}]]\ ]] = \lambda y\ \lambda x.:\ \underline{ht(y) > d}.\ ht(x) > ht(y)$

Applying the interpretation in (24) to the example in (25a) yields the sentence representation in (25b). When updating the sentence (i.e. merging it with the previous

[9] For ease of presentation " > " will be taken to subsume " ≥ " in (24)-(26) as a spezial case.

discourse, cf. Kamp & Reyle 1993) the presupposed part has to be bound to a suitable antecedent. A suitable antecedent will be one of (26a-d) (cf. the examples in (19) and (20)). Binding the comparison anaphor to one of these antecedents will result in binding the free variable d to one of the following degrees: ht(chris), 1,80m , $d_{\textbf{S-tall}}$, $d_{\textbf{S-small}}$. As a result, it will be entailed that Berta is taller than Chris, or taller than 1,80m, or taller than the tall-standard or the small-standard. Thus only the antecedent in (26c) triggers the entailment that Berta is tall, which is exactly what we want.

(25) a. Berta ist NOCH größer als Adam.
'Berta is still taller than Adam.'

b. ht(adam) > d. ht(berta) > ht(adam)

(26) a. ht(adam) > ht(chris) 'Adam is taller than Chris.'
b. ht(adam) > 1,80m 'Adam is taller than 1,80m.'
c. ht(adam) > $d_{\textbf{S-tall}}$ 'Adam is tall.'
d. ht(adam) > $d_{\textbf{S-small}}$ 'Adam is not small.'

The analysis of comparative *noch* as requiring an antecedent comparison explains the initial puzzle about its norm-relatedness in some but not all contexts: Norm-relatedness is a consequence of the nature of the antecedent. But although the interpretation of comparative *noch* in (24) yields the correct results, there seems to be something missing when comparing it to the proposal in König (1977): Where is the order – of time or marginality – which is commonly regarded as essential for the meaning of *noch*?

4.3 Additivity of comparative *noch*

In contrast to the additive particle *auch* ('also') additive *noch* has mainly been ignored in the literature (apart from Nederstigt 2003, who focuses on language acquisition). It will be argued in Umbach (in prep.) that additive *noch* – like *auch* – is always anaphoric. Thus the additional item has to be previously mentioned. The difference between the stressed and the unstressed variant (cf. the example in (7)) is accounted for by deaccenting requirements in the case of type-identical antecedents. The difference between additive *auch* and additive *noch* is attributed to the fact that additive *noch* – unlike *auch* – relates to a scale, as do the temporal and the marginality readings of *noch*. While temporal *noch* relates to the order of time and marginality *noch* relates to the order of (inverse) prototypicality, additive *noch* simply relates to the order of mentioning. The order of mentioning is, however, frequently aligned with a contextually given 'semantic' scale, for example, time in narratives.
Comparative *noch* requires an antecedent. This is what makes it additive. The related scale is, first of all, to the order of mentioning. But the order of mentioning is aligned to the order of degrees given by the adjective of the *noch*-comparative such that the latter preserves the former: If comparison1 one precedes comparison2 in mentioning,

the comparison subject of comparison1 has to precede the comparison subject and the comparison base of comparison2 with respect to the order of degrees. For example, the sequence in (27a) yields the order of mentioning of the comparison statements in (27b) which is preserved by the order of height, cf. (27c). This finally explains why for comparative *noch* the antecedent has to be such that its comparison subject is identical to comparison base of the *noch*-comparative. If it were the other way around, as shown in (27d), structure preserving alignment would not be possible.

(27) a. Adam ist größer als Chris. Berta ist NOCH größer als Adam.
'Adam is taller than Chris. Berta is still taller.'

b. (Adam $>_{\textbf{height}}$ Chris) $<_{\textbf{mention}}$ (Berta $>_{\textbf{height}}$ Adam)

c. Chris $<_{\textbf{height}}$ Adam $<_{\textbf{height}}$ Berta

d. # Chris ist größer als Adam. Berta ist NOCH größer als Adam.
' Chris is taller than Adam. Berta is still taller.'

Unlike additive *noch*, the additive particle *auch* does not relate to an underlying order. The order of mentioning, though trivially given, is not aligned with the order of the degree scale when *auch* is associated with a gradable adjective. So we find the sequence in (28a) where Berta may be taller than Adam or vice versa. And we even find sequences employing different adjectives relating to different scales of degree, cf. (28b).

(28) a. Adam ist größer als Chris. Berta ist AUCH größer als Chris.
'Adam is taller than Chris. Berta is also taller.'

b. Berta ist stärker als Adam. Sie ist auch größer.
'Berta is stronger than Adam. She is also taller.'

To conclude, the particle *noch* is commonly agreed to be scalar. At the same time it is said to be additive because it presupposes the existence of an element ranked lower than the one associated with *noch*. This conception of additivity, however, fails to characterize the genuinely additive reading of *noch* (which is, in fact, excluded in König 1977).[10] Viewing additive *noch* as anaphoric relating to the order of mention supports the idea that all uses of *noch* are scalar, while distinguishing the additive reading from the temporal and the marginality reading. Moreover, the comparative use of *noch* is subsumed as a particular instance of the additive reading relating primarily to the order of mention and secondarily to the order of degrees given by the adjective.

[10] Ippolito (2007), while maintaining the idea that English *still* is always additive, does not come across the problem of genuine additivity because English *still* does not have that reading.

5 Conclusion

The problem we started out from in this paper was the problem of norm-relatedness: In some but not all contexts the comparative use of *noch* triggers norm-relatedness, which is at odds with the fact that comparatives in general are not norm-related. A closer examination revealed that comparative *noch* is anaphoric relating to an antecedent comparison. An interpretation of comparative *noch* has been proposed which accounts for anaphoricity. The puzzle of norm-relatedness is explained by the nature of antecedents: Norm-relatedness is entailed if and only if the antecedent comparison is norm-related.

There are many open questions. Although the particle *noch* is undoubtedly focus-sensitive, the semantics of *noch* suggested in this paper has not been spelled out in a focus-semantic framework. The main obstacle is the fact that comparative *noch*, like additive *noch* in general, may carry an accent. It is unclear, however, how to interpret this accent: Is it a focus? If so, what are the alternatives? Unfortunately, an interpretation along the lines of Krifka's (1999) account of stressed *auch* is not viable because the associated constituent is the same for the unstressed and the stressed version of additive *noch*. The problem will be taken up in Umbach (in prep.).

Taking focus-sensitivity into account, it suggests itself to rephrase the present interpretation of comparative *noch* analogous to Krifka's (2000) proposal for temporal *noch*, where alternatives are ordered. The ordering yields a surprisingly simple explanation for the implicatures triggered by temporal as well as marginality *noch* (for example, *It is still raining* implicates that it might stop soon). But there are no such implicatures in the case of comparative *noch*. Why is that?

Another open issue is the relation of comparative *noch* to the scalar particle *sogar* ('even'). It has been argued that comparative *noch* does not relate to the scale of likeliness, since it cannot be substituted by *sogar* (cf. footnote 4). On the other hand, comparative *noch* is frequently translated into English by *even* indicating that the scale of likeliness must be close in some sense to the scale of degrees.

The meaning of *noch* is just one side of *noch* comparatives, the other one being gradability. Although the norm-relatedness of the *noch* comparative turned out to be harmless from the point of view of the semantics of gradability, it gives rise to subsequent questions. How to explain, for example, that with evaluative adjectives *noch* comparatives seem preferred to unmodified comparatives, the latter triggering a negative implicature? In (29) the (a)-example, but not the (b)-example, entails norm-relatedness, which has been discussed in this paper. But in addition, the latter but not the former gives rise to the implicature that the paintings are not impressive. What does that predict for the structure of evaluative adjectives?

(29) (about an art exhibition)

a. Die Foto sind NOCH beeindruckender als die Bilder.
'The photos are still more impressive than the paintings.'

b. Die Foto sind beeindruckender als die Bilder.
'The photos are more impressive than the paintings.'

In general, it would be interesting to investigate absolute adjectives like *voll* ('full') in *noch* comparatives, since they make use of the maximum of the scale instead of a contextually given threshhold (cf. Kennedy & McNally 2005). What does it mean to be *NOCH voller* if *voll* is maximum standard?

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