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Preface

Here it is: a brand new proceedings of Sinn und Bedeutung, the annual meeting of the Gesellschaft für Semantik. This ninth edition of Sinn und Bedeutung was hosted by the Nijmegen Centre of Semantics at the Radboud University Nijmegen (the Netherlands), November 1-3, 2004.

These proceedings contain a collection of papers that were presented at the conference. This year’s proceedings has a record number of entries, 38, among which 2 papers of invited speakers, making for a rather bulky (570 page) book. Copyright of all papers resides with the individual authors.

The organizers of Sinn und Bedeutung 9 would like to thank the members of the program committee for their judgments and all speakers for making the conference an inspiring event. In particular, the organization thanks the authors that contributed to the proceedings.

All papers, abstracts, bibliographic information and more are available from www.ru.nl/ncs/sub9

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\(^1\)Invited speaker  
\(^2\)Invited speaker
Remarks on Grimshaw’s Clausal Typology*

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1 Background

This paper discusses two generalizations (see Grimshaw 1979) concerning question embedding predicates. The examples in (1) reveal that predicates expressing surprise (surprise-predicates hereafter) do not take polar interrogatives as complements ((1b)) although other types of interrogatives are allowed. The examples also show that predicates like wonder (wonder-predicates hereafter) do embed polar interrogatives but are incompatible with wh-interrogatives where the wh-phrase is intensified ((1d-e)). For ease of reference, the generalizations are given as (2) and (3).

(1)  

a. Ian {✓knows | ✓is surprised | *is wondering} that Pam likes parties.  
b. Ian {✓knows | *is surprised | ✓is wondering} whether Pam likes parties.  
c. Peter {✓knows | ✓is surprised | ✓is wondering} who likes parties.  
d. Peter {✓knows | ✓is surprised | *is wondering} what a great success the party was.  
e. Peter {✓knows | ✓is surprised | *is wondering} how enormously wide the Ganges river is.

(2) Generalization I:  
Surprise-predicates do not embed polar interrogatives.

(3) Generalization II:  
Wonder-predicates do not embed questions with intensified wh-phrases.

Grimshaw introduces the features exclamative ([E]), proposition ([P]), and question ([Q]) to describe (1) and (4)-(6). In her system the complements in (1d-e) are unambiguously [E] because root interrogatives with intensified wh-phrases cannot function as questions ((4), (5)). The polar interrogative (1b) by contrast is unambiguously [Q] because root polar interrogatives are never exclamative ((6)).

(4)  
a. How (*enormously) wide is the Ganges river?  
b. ✓How (enormously) wide the Ganges river is!

(5)  
a. *What a (great) success was the party?

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b. What a (great) success the party was!

(6) a. Was Erna at the party?
   b. Was Erna at the party!

If the complement in (1c) is ambiguous between [E] and [Q], we can describe the facts in (1) using selection: wonder selects [Q], surprise [P] and [E], know all three.

This approach has often been criticized and the necessity of the clausal type feature ([E]) been questioned (see e.g. d’Avis 2001, 2002; Lahiri 2000; Zanuttini and Portner 2000, 2003). I agree with the thrust of this line of criticism (see Abels 2004 for review). If we reject Grimshaw’s system, we must derive Generalization I and II from independent considerations. Generalization I is the topic of the first part of this paper (I develop key ideas from d’Avis 2001, 2002, for an earlier version see Abels 2004). Generalization II is discussed in the second part (see also d’Avis 2001, 2002; Haida 2003).

Matrix exclamatives raise a number of further issues that I would like to sidestep here: What is the relation of sentence meaning and illocution? Which role does intonation play in constituting illocution (see e.g. Altmann 1993; Batliner 1988a, b, c; Oppenrieder 1988, 1989 for French Alter 1994)? How does intonation interact with the syntax? Etc.

2 Polar interrogatives under surprise-predicates

In section 2.1 I lay out my assumptions about interrogative semantics. The main point is the claim that polar interrogatives are singleton sets of propositions. Section 2.2 reviews and formalizes a number of presuppositions that surprise-predicates give rise to. In section 2.3 I show how the claims from 2.1 and 2.2 together entail that embedding a polar interrogative under a surprise-predicate leads to a presupposition failure in any context. This is the reason why polar interrogatives are not embeddable under surprise-predicates. In section 2.4 I address a potential counterargument from alternative questions.

2.1 Assumptions about questions and answers

I assume that both wh- and polar interrogatives denote (functions from possible worlds to) sets of propositions. The idea is Hamblin’s (1973). While following Hamblin in the treatment of wh-interrogatives ((7a))\(^1\), I depart from him for polar interrogatives. Hamblin treats polar interrogatives as two-membered sets of propositions, I treat them as singletons as in (7b) (see also d’Avis 2001; Roberts 1998).

7 a. \[ Q = \{ [\text{What did Frank buy}] = \{ p \mid \exists x \text{ thing'}(x) \& p = \{ w' \mid \text{bought}(x)(f')(w') \} \} \]
   b. \[ Q = \{ [\text{Did Frank buy milk}] = \{ p \mid p = \{ w' \mid \text{bought}(m')(f')(w') \} \} \]

\(^1\) I am assuming that wh-words range over (possibly plural) individuals (not quantifiers as the infelicity of many answers with quantifiers to questions shows). Furthermore, I assume that questions with simplex wh-words do not presuppose that there is a p in Q such that p is true in the evaluation world – which-interrogatives, on the other hand, are probably presuppositional.
There is a large body of research indicating that a number of different notions of answerhood to a question are needed (e.g. Beck and Rullmann 1999; Groenendijk and Stokhof 1982, 1984; Heim 1994). We need to distinguish at least between mention-some answers and strongly exhaustive answers. I will also use the more debatable notion of weakly exhaustive answer (Heim 1994), but in a non-essential way. The present approach to interrogative semantics claims that, while none of the kinds of answer is treated directly as the denotation of the question, all kinds of answers can be derived from the question denotation. In other words, the question denotation used here is the generator set for all kinds of answers. It is important to note that, while the Hamblin denotation for questions can easily generate the mention some, weakly exhaustive and strongly exhaustive answers, the opposite is not true (see Heim 1994). In that sense the Hamblin semantics is the most basic denotation we can give to a question.

If the question denotation is construed as the generator set for the answers, then it is natural to construe polar interrogatives as singleton sets. The singleton Q=\{p\}, trivially generates the answer p, but it also generates the answer \(\neg p\): \(\neg p\) is the strongly exhaustive answer to Q=\{p\} in those worlds where p is false (see d’Avis 2001 and below).

\[Q = \{\text{Did Frank buy milk}\} = \{p \mid p = \{w' \mid \text{bought(m')(f')(w')}\} \lor \neg p = \{w' \mid \text{bought(m')(f')(w')}\}\]

Consider the derivation of various answers from the Hamblin denotation Q_H. The weakest one is the mention-some answer. Some proposition p is a mention-some answer to Q iff p is the conjunction of some subset of members of Q_H (see (9)) and it is a true mention-some answer in w if it is a mention some answer and it is true ((10)) in w.

\[p \in \{ q_{<s,v>} \mid \exists S S \subseteq \{q' \mid q' \in Q_H\} \land q = \bigcap S\} \]

\[p \in \{ q_{<s,v>} \mid \exists S S \subseteq \{q' \mid q' \in Q_H\} \land q = \bigcap S \land w \in q\} \]

Given their construction, the set of mention-some answers with the subset relation form a lattice with the true mention-some answers as a sub-lattice. The latter contains as the most informative (smallest) member Heim’s (1994) weakly exhaustive answer (henceforth answ_1^w). answ_1^w is the conjunction of all true answers in the evaluation world.

\[\text{answ}_1^w = \bigcap\{p \mid p \in Q_H \& p(w)\}\]

Later on in the paper I discuss in several places the special case where the Hamblin denotation does not contain any true members. In this case the set of true members of Q_H is empty and the weakly exhaustive answer, technically still a mention-some answer, is the intersection of the empty set of propositions. Given the definition of intersection ((12)), the intersection of \(\emptyset\) is the domain ((13)). The intersection of the empty set of propositions is therefore the set of all worlds, the tautology. The definitions thus entail that the question (7a) and (7b) have as answ_1^w the tautology iff Frank didn’t buy anything and Frank in fact didn’t buy milk respectively.
12) \[ \bigcap S = \{ x \in D \mid \forall M \in S \rightarrow x \in M \} \]

13) \[ \bigcap \emptyset = D \]

From the weakly exhaustive answer we can derive the strongly exhaustive answer (\(\text{answ}_2^w\)). \(\text{answ}_2^w\) can be defined in two equivalent ways: either as the intersection of the weakly exhaustive answer with the negations of all the false members in the Hamblin set or more elegantly as in (14) (see Heim 1994).

14) \[ \text{answ}_2^w(Q) = \{ w' \mid \text{answ}_1^{w'} = \text{answ}_1^w \} \]

In the limiting case above, where no member of \(Q_H\) is true in the evaluation world and \(\text{answ}_1^w\) is the tautology, \(\text{answ}_2^w\) turns out to be the *nothing* - and the *no* - answer respectively; thus, if in (7a) there is no true member in \(Q_H\), then \(\text{answ}_2^w\) is the proposition that Frank bought nothing in \(w\), and if in (7b) Frank didn’t buy milk in \(w\), then \(\text{answ}_2^w\) is the proposition that Frank didn’t buy milk.

As a final note on the denotation of questions note that for any questions and any world \(\text{answ}_2^w\) entails \(\text{answ}_1^w\) and that \(\text{answ}_1^w\) entails all *mention-some* answers.

### 2.2 The presuppositions of *surprise*-predicates

With this as background, we are ready to consider the semantics of *surprise*-predicates (see d’Avis 2001, 2002; Heim 1994). In this paper I mainly discuss their presuppositions, not their assertive content. To be sure, they have assertive content, but it is irrelevant for what follows.\(^2\) I will use example (15a) for illustration in my discussion.

(15) a. Heinz is surprised (at) who Mary invited.
     b. Heinz is surprised (at) \(Q\).

*to be surprised* expresses a relation between two propositions and an individual: One of the propositions describes a state of affairs that the individual, the referent of the subject of the *surprise*-predicate, knows. The other proposition contradicts the first one and the referent of the subject of the *surprise*-predicate would have deemed more likely. When a *surprise*-predicate embeds a question both propositions stand in particular relations to that question. It always has to be possible to construct two appropriate propositions from the question – this fails in the case of polar interrogatives.

Let’s call the relevant proposition that Heinz knows \((p_2)\) and the proposition that expresses his expectations \((p_1)\). If the question does not allow the construction of two contradictory propositions in the way described below, the *surprise* relation cannot hold. We therefore start with an existence presupposition for two propositions ((16)).

\(^2\) See Sharvit 2002 and references cited there for discussion of the assertive content of *surprise*. 

4
\[ \exists p_1, p_2 \in D_{<s, t>} \; \cap p_1 \cap p_2 = \emptyset \]  

Condition I

\[ p_1 \] must also be compatible with some member of the Hamblin set ((17)).

\[ \exists p_1, p_2 \in D_{<s, t>} \; q \in Q \; [p_1 \cap p_2 = \emptyset \land q \cap p_1 \neq \emptyset] \]  

Condition II

To see this, consider a scenario in which Mary has invited people and in which Heinz’ expectation violates Condition II. Heinz must have expected that Mary wouldn’t invite anybody. In this a scenario (15a) is neither true nor false. It is infelicitous. Instead something like (15a’) would have to be said (see d’Avis 2001, 2002; Heim 1994).

(15) a’. \[ \checkmark\text{Heinz is surprised that Mary invited somebody.} \]

Let’s turn to \( p_2 \) now. Example (15a) presupposes that Heinz knows a mention-some answer to \( Q \) ((18)). If he were totally oblivious about the invitees, he could not be surprised about it or, for that matter, fail to be surprised. (Heim 1994 assumes a much stronger condition here, but without empirical support, I believe.)

(18) \( p_2 \) is the most informative mention-some answer to \( Q \) known by the referent of the subject of be surprised.³  

Condition III

\( p_2 \) is not Heinz’ total knowledge. Rather, it is the most informative mention-some answer entailed by Heinz’ total knowledge.⁴

We can never posit a proposition for \( p_2 \) which is not a mention-some answer. Suppose we tried. Suppose for example that Mary invited nobody and that Heinz knows this. No matter what Heinz’ expectation might have been (15a) is infelicitous in this situation – it is neither true nor false. Instead we have to describe this situation with (19a) or (19b).

(19) a. \[ \text{Heinz is surprised that Mary didn’t invite anybody.} \]

b. \[ \text{Heinz is not surprised that Mary didn’t invite anybody.} \]

Condition III captures this fact since ‘that Mary invited nobody’ is not a mention-some answer to \( Q \). Technically, the only available mention-some answer in this case is the tautology. But if \( p_2 \) is the tautology, then there is no \( p_1 \) which both contradicts \( p_2 \) and is

³ It is cumbersome but straightforward to cast this condition formally. \( p_2 \) is the single member in the set of mention-some answers that is (i) true, (ii) known by the referent of the subject, and (iii) entails all other members of the set of mention-some answers that fulfill (i) and (ii). In the limiting case, Heinz will know Heim’s weakly exhaustive answer (see 23).

⁴ Under certain circumstances it might be necessary to take recourse to disjunctions of mention-some answers (e.g. Heinz knows that Mary invited Harry or Sally but not which one of the two but both invitations would occasion surprise). Here disjunctions of mention-some answers seem to be required for \( p_2 \). I will ignore this complication since it is irrelevant to the point of this paper as far as I can see.
compatible with some member of $Q_H$. To fulfill the first requirement, $p_1$ must be the empty set (the contradiction) and to fulfill the second one $p_1$ must not be the empty set.

Since $p_2$ represents something that the referent of the subject of surprise knows, it follows that $p_2$ contains the evaluation world, which, in turn, entails that $p_2$ is not empty. From this and the discussion immediately above we derive Corollary I ((20)).

\[ \emptyset \neq p_2 \neq W \]

The point that $p_2$ must be a mention-some answer, can be shown in a number of additional ways. Consider a scenario where Heinz expected Mary to invite Peter and Frank, but in reality she invited only Peter, and Heinz knows this. In such a situation, (15a) is false. Instead (15a’’) might be uttered (this example goes back to Heim 1994).

\[(15) \quad \text{a. Heinz is surprised (at) who Mary invited.} \]
\[(15) \quad \text{a.’’ Heinz is surprised (at) who Mary didn’t invite.} \]

Heinz’ total knowledge is that Mary invited only Peter, which contradicts his expectation that she would invite both Peter and Frank. However, the most informative mention-some answer entailed by Heinz’ knowledge, i.e. $p_2$, is the proposition that Mary invited Peter. This proposition is compatible with Heinz’ expectation, hence (15a) is false.

A final illustration comes from scalar predicates. Consider a scenario where Heinz expected Mary to be 6ft tall, but really she is just under 4.5ft tall, and Heinz knows this. While (21b) can be truthfully uttered in this situation, (21a) cannot.

\[(21) \quad \text{a. Heinz is surprised (at) how tall Mary is.} \]
\[(21) \quad \text{b. Heinz is surprised (at) how short Mary is.} \]

The explanation for this is straightforward if we assume that tall is scalar and short means ‘not tall’ (see Heim 2000). Consider (21a) first. Assuming scalarity for tall, Heinz’ expectations entail that Mary is 4.5ft tall, i.e., he expects what he knows. This is true whether we describe Heinz’ expectations by (a) that Mary is tall to degree $\delta=6ft$ or (b) that the maximal degree $\delta$ to which Mary is tall is equal to 6ft or (c) that the maximal degree $\delta$ to which Mary is tall is at least 6ft. No matter which one we choose, the expectation does not contradict the knowledge; hence, the example is false.\(^5\) This only works because the maximality operators in (a), (b), and (c) apply to Heinz’ expectation not to his knowledge. If Heinz’ knowledge lost scalarity (as they would if we used $\text{answ}_2$) (21a) would become true.\(^6\)

Consider now (21b). The most informative mention-some answer to Q that Heinz knows is that Mary is not tall to degree $\delta$, $\delta=4.5ft$. Heinz’ expectation can again be coded in

\(^5\) Only the proposition that Mary is tall at least to degree $\delta$, $\delta=6ft$ would contradict what Heinz knows, but, given the assumed scalarity of the predicate tall, this proposition is the contradiction.

\(^6\) The present analysis is unavailable if exhaustivity is built into the denotation of questions as in e.g. Groenendijk and Stokhof 1982, 1984.
various forms: (a) *that Mary is not tall to degree δ=6ft* or (b) *that the minimal degree to which Mary is not tall is equal to 6ft* or (c) *that the minimal degree to which Mary is not tall is at least 6ft*. These correspond to the options given above for (21a). Under the first option Heinz’ expectation does not contradict his knowledge. The two other options however lead to a contradiction as desired – one of them must be what is actually used by speakers. The asymmetry between (21a) and (21b) can thus easily be accounted for by crucially assuming that p2 is a *mention-some* answer.

Briefly consider what conclusions we can draw from the above about the status of p1. It is probably uncontroversial to assume that Heinz can only be surprised if the expectation he was harboring was contingent ((22)). Condition (22) follows already without further stipulation. p1 \neq W, because otherwise p1 could not contradict p2 (p2 is not empty by Corollary I above (20)!). p1 \neq \emptyset, because otherwise p1 would not be compatible with any member of QH. Thus (22) is derived.

(22) \emptyset \neq p1 \neq W  
Corollary II

It further follows from (17) that Heinz expectation must be compatible with the presuppositions of some member of the question.

I summarize the presuppositions of *surprise*-predicates as (23). It says that there must exist two propositions that contradict each other. One of them is the most informative *mention-some* answer known by Heinz, the other one is consistent with some member of QH. Given that the actual knowledge (p2) is the most informative *mention-some* answer known by the referent of the subject of the *surprise*-predicate and given that the weakly exhaustive answer is the most informative *mention-some* answer, period, we can conclude the second line of (23): *surprise*-predicates presuppose that it must be possible to construct p1 in such a way as to be incompatible with the weakly exhaustive answer while being compatible with some member of QH.

(23) \exists p_1, p_2 \in D <s, t> \ast \ast [p_1 \cap p_2 = \emptyset \wedge \exists q \in Q \; q \cap p_1 \neq \emptyset \wedge p_2 \text{ is the maximally informative *mention-some* answer to } Q \text{ known by the referent of the subject of *surprise*}]  

\implies \exists p_1 \in D <s, t> \ast \ast [p_1 \cap \bigcap \{q \mid q \in Q \wedge q(\@)=1\} = \emptyset \wedge \exists q \in Q \; q \cap p_1 \neq \emptyset]

### 2.3 Why *surprise*-predicates do not embed polar interrogatives

In this short section I demonstrate that Generalization I, follows from (23) together with the assumption that polar interrogatives are singleton sets. The idea is that example (24) is excluded because of contradictory presuppositions.

(24) *Heinz is surprised (at) whether Mary invited Fritz.*  
(25) Q^{(24)} = \{q \mid q = \{w' \mid \text{invited(f')(m')(w')}\}\}.

Given our assumptions, the embedded interrogative is interpreted as (25). There are two possibilities to consider now: either (i) Mary did invite Fritz in the evaluation world (\@) or (ii) Mary didn’t invite Fritz in the evaluation world (\@).
Suppose the former is true, i.e., \(q(@)=1\). There are only two *mention-some* answers to the question: the tautology (W) and the proposition q, that Mary invited Fritz. \(p_2\) is not the tautology by Corollary I (20); thus, \(p_2 = q\). Since \(p_2\) must be incompatible with \(p_1\) by Condition I ((16)), \(p_1 \cap q = \emptyset\). However, Condition II ((17)) demands that \(p_1\) be compatible with some member of \(Q_H\), \(Q_H\) being a singleton set with the single member q, \(p_1 \cap q \neq \emptyset\). Obviously, there is no \(p_1\) that fulfills both requirements.

Suppose now that q is false in the evaluation world, i.e. \(q(@)=0\). Since \(Q_H\) is a singleton and q is, by assumption, false, the only true *mention-some* answer to Q in this case is W (see the discussion above (12)). It follows that \(p_2 = W\). By assumption there must be a \(p_1\) such that \(p_1 \cap p_2 = \emptyset\), but if \(p_2 = W\), then \(p_1 = \emptyset\). This contradicts the demand of Condition II ((17)), according to which there is member q in \(Q_H\) such that \(p_1 \cap q \neq \emptyset\). Clearly there is no \(p_1\) that can fulfill the requirements and the presupposition comes out false again. The fact that \(p_2 = W\) also contradicts Corollary I ((20)) of course. The presupposition of *surprise* cannot be satisfied just in case \(Q_H\) is a singleton. This explains Generalization I: the presupposition is necessarily false; there is no context in which the presuppositions of (24) are fulfilled. Example (24) is unusable because it has unsatisfiable presuppositions. This type of account is not novel. The idea that necessarily contradictory presupposition render a sentence unusable has previously been pursued successfully, in the study of negative polarity items (see Krifka 1995; Lahiri 1998).

It is crucial for my proposal that polar interrogatives are singleton sets. If they were two-membered sets as in Hamblin’s original proposal (\(Q_{\text{polar}} = \{p, \neg p\}\)), the above reasoning would not go through any more because the relevant contradictory presuppositions could no longer be derived. It is therefore instructive to look at *wh*-questions that plausibly have a two-membered Hamblin set. An example is given in (26).

(26)  \(\checkmark\)I am surprised (at) which of the two teams won the finals.

If we are talking about, say, the European soccer championship, then (26) is in relevant ways like the Hamblin denotation for a polar interrogative. There are two possible answers, the answers exclude each other, and the answers exhaust the space of possibilities. Yet (26) is acceptable unlike (32). This distinction is unexpected if polar interrogatives are two-membered sets, but is expected under the present approach.

(27)  *I am surprised (at) whether Greece won the finals.

The last two examples thus strengthen the argument for the present theory. If polar interrogatives are treated as singletons, Generalization I follows directly from the presuppositions of *surprise*-predicates without recourse to the clause type feature [E].

### 2.4 Remarks on Alternative Questions

The approach developed so far runs into difficulties with alternative questions (see (28)). *Surprise*-predicates do not embed alternative questions although they can plausibly be analyzed as two- (or more-) membered sets of propositions. We expect alternative questions to behave like example (26) and be acceptable counter to fact.
(28)  a. *Ian was surprised whether Amy drinks tea or whether she drinks coffee.
b.  *Ian was surprised whether Amy drinks tea or coffee.7

To understand the problem, consider the following simplistic theory of alternative questions. The disjunction takes two sets and forms their union8. In example (28b) disjunction can take scope in various positions. First, or could disjoin tea and coffee. This leads to the polar interrogative reading of (28b) ((29a)). This reading is ungrammatical as we saw. Second, or could take scope above the question forming operator (which outputs a set of propositions: ?? = \lambda p \lambda q: p=q) and below surprise. The disjunction of two polar interrogatives is a two-membered set of propositions.9 This is the problematic case (29b). Third, or could scope above surprise (29c). In this case surprise would have to embed polar interrogatives, which is ruled out as we saw.

(29)  Scope   |  Prediction  |  Comment
      a.  surprise > Qop > or      *  Qop returns a singleton
      b.  surprise > or > Qop   ✓  Or forms the union of two singleton sets. This situation is expected to be admissible counter to fact.
      c.  or > surprise > Qop     *  The disjuncts are ill-formed individually

To pursue the present theory, we would need to find out why disjunction cannot scope between the question forming operator and surprise. I do not have an answer to this, but I would like to point out that the observed restriction on the scope of disjunction is part of a larger generalization that extends to wh-questions. Consider example (30).

(30)  John was surprised who stayed long or who left early.

Again there are three logical possibilities for the scope of or. First, or could take scope below the question forming operator. This scope is syntactically unavailable for obvious reasons here (31a). Second, or could take scope between surprise and the question forming operator. This is the configuration that must be disallowed for alternative questions. Allowing it for wh-questions would make the following wrong prediction. Disjunction forms the union of both wh-questions. The result is the set of propositions that Andrew stayed long, that Barbara stayed long, that Chris stayed long, ... that Andrew left early, that Barbara left early, that Chris left early, ... . Suppose John knows \( p_2 = \) that Andrew stayed long and that Barbara left early. Clearly, \( p_2 \) is a mention-some

---

7 The strings of words in (28) actually have an acceptable but irrelevant reading: with a long pause after surprised and the interpretation John was surprised regardless whether Mary drinks tea of coffee. Clearly, the clause introduced by whether is not the complement of be surprised in this case.

8 The conjunctive interpretation of alternative questions (see Boërs 1978) is presumably an effect of the strong contexts in which they often appear.

9 This suggestion incidentally invalidates one of Krifka’s (2001:302-303) objections to the proposition set approach to questions.
answer to the disjoined question. Suppose furthermore that John expected $p_1 = \text{that Andrew would stay long or that Barbara would leave early but not both}$. Under this scenario $p_1$ is incompatible with $p_2$ and $p_1$ is compatible with some member(s) of the combined $Q_H$. Thus (30) is predicted to be true in this situation. However, surprisingly, it is not.\(^{10}\) Example (30) cannot be used in this situation. Finally, $or$ could scope above $\text{surprise}$. In this case the sentence means that John was surprised who stayed long or that John was surprised who left early. The sentence, in fact, has only this meaning ((31)).

<table>
<thead>
<tr>
<th>Scope</th>
<th>Prediction</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>surprise &gt; $Q_{OP}$ &gt; or</td>
<td>✓</td>
<td>or forms the union of two sets. This situation is expected to be admissible counter to fact.</td>
</tr>
<tr>
<td>or &gt; surprise &gt; $Q_{OP}$</td>
<td>✓</td>
<td>This reading (matrix disjunction) is possible.</td>
</tr>
<tr>
<td>surprise &gt; $Q_{OP}$ &gt; or</td>
<td>✓</td>
<td>Syntactically unavailable for (30)</td>
</tr>
</tbody>
</table>

It follows from this discussion that intermediate scope for disjunction is apparently impossible both in $wh$-questions and in alternative questions. The problem thus reduces to a more general question concerning the scope of disjunction.

### 3 Questions with intensifiers under wonder-predicates

Let’s turn to questions with intensifiers. They occur under surprise-predicates but not under wonder-predicates. This was illustrated in example (1) above. Below I concentrate on German. English is subtly different in ways that I do not quite understand.

The basic facts for German parallel the English facts above. It is usually impossible to use an intensified $wh$-phrase in a root question (32-33a) or as the complement of a wonder-predicate (32-33b), but as an exclamative (32-33c), as the complement of a surprise-predicate (32-33d), and under a verb like know (32-33e) they can occur. The examples show that adjectival and nominal intensifications show parallel behavior.\(^{11,12}\)

---

\(^{10}\) This is plausible if Andrew usually stays long and Barbara usually leaves early and additionally, Barbara is in love with Andrew which gives rise to the expectation that she will stay unusually late if Andrew stays late, too. The sketched scenario is parallel to the case where (i) is uttered truthfully in a situation where John knows $p_2 = \text{that Mary invited Frank and Sue}$ and he expected $p_1 = \text{that Mary invites Frank or Mary invites Sue but not both}$. But (i) is true in this case while (30) is not in the case described.

(i) John is surprised (at) who Mary invited.

\(^{11}\) The unacceptable examples improve if the $wh$-word is heavily stressed (see d’Avis 2001, 2002).

\(^{12}\) The occasional suggestion in the literature (Rosengren 1992) that these intensified questions are really free relatives has little plausibility. For example, intensified $wh$-question occur in the scope marking construction, which is impossible with all kinds of relative clauses, and they must be extraposed from the middlefield, which is obligatory with finite complements but optional with free relatives (see Abels in preparation). For additional arguments to the same effect see d’Avis 2001, 2002.
3.1 Deficient questions?!

Once we treat intensified wh-questions as questions, it is a natural move to treat them as somehow deficient. d’Avis 2001 makes a concrete proposal along these lines. For him they are semantically interrogatives (type \(<<s,t>, t>\)) which are deficient in the sense that they presuppose their own answer. d’Avis further assumes restriction (34), which is fairly natural, given that questioning requires indeterminacy, an open choice.\(^{13}\)

\[
\text{(34) Restriction:} \\
\text{Wh-clauses that presuppose their own answer cannot occur in question context.} \\
\text{(d’Avis 2001:67)}
\]

Although I agree with d’Avis’ intuitions, his implementation contradicts both the results from section 2 of this paper and, in fact, d’Avis’ own assumption. He treats intensifi ed wh-questions as singleton sets of propositions (he calls this the ‘one-proposition-inter- pretation’ d’Avis 2001:66). There are two main problems with this. First of all, we have seen that independently motivated presuppositions on predicates like be surprised bar

\(^{13}\) d’Avis’ independent justification for (34) rests on examples contrasts like (i) and (ii) that go back to Grimshaw’s work.

(i) \(\checkmark\) I wonder who went to the movies – John or Mary.

(ii) \(*\) I wonder who went to the movies – (namely) John and Mary.
such predicates from taking interrogatives denoting singletons as their complement. This should then rule out (32d) and (33d). Another way to put it is that for d’Avis intensified wh-questions come out as (a special kind of) polar questions, but since he himself treats polar questions as singletons, it is unclear how they could ever comply with the rationale given for (34), namely, that questioning requires choice. What is needed is a different way of stating the deficiency of intensified wh-questions.

Before attempting to do so, consider a few more examples ((35) and (36)). The former show that intensified wh-questions can actually be used as real questions and the latter show that intensified wh-questions can be embedded under wonder-predicates after all. The question is thus, what distinguishes these examples from unacceptable ones?

(35)  

a. In the theater:  
   ✓Wenn’s hier im Parkett schon so heiß ist, welche Bullenhitze herrscht dann (wohl/erst/wohl erst) oben auf dem Rang?  
   ’If it is already this hot down here on the main floor, what unbearable heat must there be up on the balcony?’

b. A river 10m deep and 20m wide that flows at 0.3km/h transports about 16m³ water per second.
   ✓Wie enorm breit müsste ein Fluss gleicher Tiefe und Fließgeschwindigkeit sein, um 100 000 m³ Wasser pro Sekunde zu führen? – 6km.
   ’How enormously wide would a river of the same depth and speed have to be to transport 100 000 m³ of water/second? – 6km.

(36)  

Embedded Questions:

a. ✓Wenn die Temperaturen in Gujarat schon im Winter 30° übersteigen, fragen sich unsere Hörer natürlich, was für eine Bullenhitze dort im Sommer herrscht.
   ’If the temperature in Gujarat is above 30° C even in winter, our listeners of course wonder what unbearable heat there is there during the summer.’

b. ✓Mein Physiklehrer hat mich heute gefragt, wie enorm breit ein Fluss sein müsste, um bei einer Tiefe von 10m und einer Fließgeschwindigkeit von 0,3km/h 1 000 000 m³ Wasser pro Sekunde zu führen.
   ’My physics-teacher asked me today how enormously wide a river would have to be in order to carry 1 000 000 m³ water/second at 0.3km/h and a width or 10m.’

Andreas Haida (p.c.) suggests the following generalization: wh-questions with intensifiers can appear under wonder-predicates and as matrix questions if they occur with a filter for presuppositions (for the concept of ‘filter’ see Heim 1983; Karttunen and Peters 1979). 14 If-clauses and in order to clauses filter presuppositions ((37)). In (37a) o

14 Examples like (i) seem to be a different class of exceptions to generalization (3) since dass clauses do not seem to plug presuppositions. I do not currently have an analysis for these cases.
the existence presupposition of the definite description is not fulfilled. This presupposition is filtered in (37b-c), which makes them acceptable (if tedious without the epithet).

(37) a. #You have to lure the alien into the trap.
b. If you want to catch an alien, you have to lure the alien/sucker into the trap.
c. In order to catch an alien, you have to lure the alien/sucker into the trap.

The fact that presupposition plugs allow intensified wh-questions to appear under wonder-predicates indicates that d’Avis’ basic intuition is correct. Intensified wh-questions have presuppositions that make them incompatible with questioning. They are filtered in (35) and (36), which explains their felicity. However, unlike d’Avis we cannot treat this as a presupposition of the members of the Hamblin set. If we did so, the Hamblin set would shrink to a singleton with the consequences noted. Instead we need to treat the presuppositions of the question as an object separate from the presuppositions of the members of the Hamblin set. Once these types of presuppositions are properly distinguished, the contradiction that d’Avis proposal gave rise to can be avoided. At the moment I do not have a concrete implementation of this proposal, however.

4 Conclusion

In this paper the question is raised whether Grimshaw’s clause type feature [E] is necessary to capture Generalizations I and II. Generalization I follows directly from independently motivated presuppositions of surprise-predicates once the (nonstandard) assumption is made that polar interrogatives are singleton sets of proposition. The first part of this paper thus constitutes an argument for this approach to polar interrogatives. In fn. 9 we noted that this approach to polar interrogatives also solves one of Krifka’s objections to the proposition set approach to questions – which constitutes a second argument.

Generalization II also seems to be analyzable in terms of presuppositions, those of wonder-predicates and intensified questions. D’Avis’ intuition that intensified questions are defective appears to lead to a workable result once d’Avis specific implementation is abandoned. A new argument for this view came from the fact that filters for presuppositions interact in the expected way with acceptability judgments. A compositional analysis of the facts in Generalization II is yet to be provided, though.

References


(i) ✓Mit welchem Affenzahn rast du denn/eigentlich durch die Stadt, dass du jetzt schon hier bist?
   ′At what breakneck speed do you blow through town that you are here already?’


This paper proposes a novel solution to the problem of determining the domain of an adverbial quantifier. We observe that adverbial and nominal quantification differ with respect to their ability to incorporate presuppositions into their domain restrictions, and we use that observation to motivate an account of qadverbs as quantifiers over polar alternatives. Along the way to explaining incorporation, we also provide an analysis of presupposing achievement verbs that clarifies the connection between presupposed and asserted situations.

1 Introduction

At first glance, adverbial and nominal quantification appear to differ in their interaction with presupposition. Presuppositions in the scope of a QNP cannot further restrict the domain of the quantifier, whereas some presuppositions in the scope of a qadverb obligatorily restrict the domain. We present an account of adverbial quantification that resolves this apparent difference.

2 Motivating data

Schubert and Pelletier (1987) and Berman (1991) point out that certain presuppositions triggered in the scope of a qadverb seem to be incorporated into the restrictor of the qadverb. Consider the sentences in (1).

(1) a. Canada Post sometimes loses letters. (Schubert and Pelletier 1987, (234))
    b. John usually beats Marvin at ping pong. (Schubert and Pelletier 1987, (235))
    c. John usually manages to see a film by Fellini. (Berman 1991, (56))
    d. John usually finishes reading an article by Chomsky. (Berman 1991, (55))

Sentences (1a), (1b), and (1c) are all examples of what Schubert and Pelletier call presuppositional verbs. In each case, the verb gives rise to a presupposition which provides the restrictor material for the qadverb. Thus, the presupposition of sentence (1a) is that the Canada Post has some letters to begin with; the presupposition of sentence (1b) is that...
John plays ping pong with Marvin sometimes; and the presupposition (1c) is that John sometimes tries to see a film by Fellini. Sentence (1d) contains an aspectual verb, finish, which triggers the presupposition that the event it modifies has started. Thus, in this example, it is situations in which John starts reading an article by Chomsky that form the domain of quantification for usually.

These examples seem to demonstrate that presuppositions can easily be incorporated into qadverb domains. The same cannot be said of qdeterminer domains. Sentence (2), adapted from Beaver (1994), demonstrates the unavailability of presupposition incorporation in QNPs.

(2) a. Few team members have cars,
    b. #but every team member came in her car.

If incorporation of the presupposition triggered by her car were available, we would expect that this sentence should have a reading roughly equivalent to (3).

(3) Few team members have cars, but every team member who has a car came in her car.

Clearly, though, sentences (2) and (3) are not equivalent.

As it turns out, the situation is not entirely straightforward with qadverbs. With an explicit restrictor for the qadverb (i.e., a restrictive when-clause), we see a similar failure of incorporation.

(4) a. When John and Marvin meet, they rarely play badminton.
    b. #When they meet, though, John always beats Marvin at badminton.

If the presupposition triggered by beat could be incorporated in the restrictor of (4b), we would expect that it would be roughly equivalent to sentence (5).

(5) When they meet and they do play badminton, John always beats Marvin.

In fact, though, as in (2), such incorporation is not available in (4b).

When we compare examples of qdeterminers and qadverbs without explicit restrictors, we see divergent behavior.

(6) a. Few team members can drive,
    b. #but each will arrive in her car.

(7) a. When John and Marvin meet, they rarely play a game of badminton.
    b. John always beats Marvin at badminton, though.

In sentence (6), we see that the presupposition triggered by her car cannot be incorporated into the restriction of each. In sentence (7b), however, the domain of always is taken to be those situations in which John and Marvin do play badminton: thus, the presupposition triggered by beat is incorporated into the restrictor.
We see further that this phenomenon of presupposition incorporation can force the domain set itself to bridge to a subset of an existing set.

(8) a. When John and Marvin meet, they play various games.
    b. John always beats Marvin at badminton.

Sentence (8a) makes available two sets of situations for subsequent reference: those situations of John and Marvin meeting and those situations of John and Marvin playing games (each member of this second set is a sub-situation of some member of the first). The domain of (8b), however, is not resolved directly to either of these sets. Instead, the domain bridges to a subset of the set of situations of John and Marvin playing games — those situations in which they play badminton. This fact plays a role in our evaluation of other analyses of this phenomenon in section 3.

3 Previous approaches

In this section, we review several approaches to the problem of presupposition incorporation in quantifier domains (section 3.1) and point out several shortcomings of these analyses (section 3.2). We also briefly discuss another theory of adverbial quantification that does not directly address presupposition incorporation but that is related to the analysis we present in this paper (section 3.3).

3.1 The empty-restrictor hypothesis

According to the binding theory of presupposition (van der Sandt 1992), together with the standard assumption that the restrictor of a quantifier is accessible to the nuclear scope, presupposition incorporation can be seen simply as the accommodation by the restrictor of presuppositions triggered in the nuclear scope. Proceeding from this observation, several accounts of adverbial quantification have been given in which the restrictor of a qadverb is simply an empty DRS that may accommodate scopal presuppositions, thus incorporating them into the domain restriction (Kuhn 1996, Ahn 2001).\footnote{von Fintel (1995) can also be seen as a variant of this view, although not couched in the framework of the binding theory.} We refer to this basic analysis in which qadverb restrictors are initially completely unspecified as the empty-restrictor hypothesis.

In light of evidence that incorporation is not possible for qdeterminers (e.g., sentence (2) above), Geurts and van der Sandt (1999) present a revised account of the binding theory in which left-to-right resolution order is enforced and the restrictor of a quantifier is itself a presupposition that must be resolved to an accessible domain. On this account, the accommodation of nuclear scope presuppositions by the restrictor actually results in the accommodation of such presuppositions by the antecedent domain set to which the restrictor has been resolved. Such accommodation, then, may be blocked because of inconsistency with the antecedent set. For example, in (2), the restrictor of every is first bound to the set of team members introduced in the first half. The presupposition triggered by her car must then be resolved. Accommodation by the restrictor is not an option, because, while
the presupposition of car ownership is compatible with the restrictor material alone, it is inconsistent with the set to which the restrictor has been resolved. While this account seems right for QNPs, Geurts et al. simply adopt an empty-restrictor representation for qadverbs, which results in incorrect predictions. According to their account, the restrictor of always in (8b) would first be resolved to the various games John and Marvin play. The presupposition that John and Marvin play badminton would then be accommodated by the restrictor, resulting in a reading on which all of the various games are badminton. As we have noted, though, on the reading that is actually preferred, however, the presupposition incorporated into the restrictor guides the resolution of the restrictor, so that the domain of always bridges to the antecedent set through the subset relation.

3.2 Shortcomings of the empty-restrictor hypothesis

According to the variations on the empty-restrictor hypothesis reviewed above, a qadverb does not have a meaningful restrictor until it has accommodated some of its nuclear scope presuppositions. While these theories do provide some explanation of how qadverb domains are determined, they also suffer from a variety of problems, some of which we have already mentioned.

First of all, the empty-restrictor hypothesis is subject to the problem that, as laid out in section 2, qadverbs and qdeterminers appear to behave differently with respect to accommodation of nuclear scope presuppositions. The standard binding theory account (Kuhn 1996, Ahn 2001) stipulates that qadverb and qdeterminer logical forms, which are otherwise identical, must be somehow distinguished for the purposes of presupposition resolution. The revised account (Geurts and van der Sandt 1999) does not distinguish qadverbs and qdeterminers and, as a result, makes incorrect predictions about the binding of qadverb domain set presuppositions.

The empty-restrictor hypothesis is also subject to the problem that although intermediate accommodation is supposed to be dispreferred to global accommodation (van der Sandt 1992), it appears to be necessary to explain presupposition incorporation. Neither variant of the hypothesis makes any attempt to explain why this preference should be violated.

Finally, both variants of the hypothesis distinguish between what is traditionally considered to be nuclear scope material and the actual nuclear scope of a qadverb’s logical form. In particular, they take the nuclear scope set of a qadverb to be composed of those situations characterized by the restrictor that can somehow be extended to satisfy the nuclear scope material.

For example, consider the sentence (9).

(9) When a farmer beats donkey, he always receives a citation.

On the traditional view of adverbial quantification, in which the qadverb quantifies over free variables introduced by indefinites in the restrictor (Lewis 1975), the restrictor material consists of the when-clause, when a farmer beats a donkey, while the nuclear scope material consists of the main clause, he always receives a citation.

According to the variants of the empty-restrictor hypothesis (as well as any other situation-
based accounts of adverbial quantification, such as Heim (1990) and von Fintel (1995)), though, the restrictor material has to be included, along with the nuclear scope material, in the actual nuclear scope of the logical form representation. If it were not, the qadverb would be rather hopelessly comparing two completely disjoint sets of situations—situations of a farmer beating a donkey and situations of someone receiving a citation.

The idea of requiring restrictor material to be in both the restrictor and the nuclear scope is not a new one. Both in order to preserve conservativity for qadverbs and in order to get binding facts right, the restrictor material is often assumed to be carried over into the nuclear scope (Schubert and Pelletier 1989). In the empty-restrictor hypothesis, the mechanism by which the restrictor material ends up in both places is novel (i.e., by starting out there to begin with), but the end result is the same.

Given the kind of situation theories in which these versions of the empty-restrictor hypothesis are couched (Kratzer 1989, Schubert 2000), the notion that a nuclear scope situation is simply a restrictor situation that can be extended to a situation that satisfies the nuclear scope material is problematic. In these situation theories, the set of situations is closed under arbitrary mereological joins, though, so any situation can be extended to any other situation, without any additional stipulations. Thus, matching each restrictor situation to the “right” nuclear scope situation is a challenge.

Sharing arguments through dynamic binding does help cut down on the possible extensions, but it is possible for a qadverb restrictor and nuclear scope not to share any variables at all. Consider sentence (10).

(10) When Sue leaves, John always sighs.

The two clauses of this sentence do not even have to share a temporal parameter, making an account that simply relies on extending restrictor situations into nuclear scope situations untenable (in this sentence, for example, even if there are many situations of Sue leaving and only one of John sighing, without any further stipulations, each situation of Sue leaving could be extended to one that includes the same situation of John sighing, thus (incorrectly) satisfying the quantification).

The empty-restrictor hypothesis also suffers from a more conceptual problem: in order for an adverbially quantified sentence to obtain any meaningful semantic interpretation, a pragmatic repair operation—accommodation—is required. Prior to accommodation, the representation of an adverbially quantified sentence involves a completely trivial restrictor.

3.3 Focus and alternatives

The analysis of adverbial quantifiers we give in section 4 is based on the idea that qadverbs, rather than starting out life with a trivial empty restrictor that is filled in through accommodation, quantify directly over a set of alternatives. As Rooth observes, qadverbs are focus-sensitive—their domains depend partly on the focus structure of their scope. On his view of focus, it principal purpose is to evoke alternatives (Rooth 1985, Rooth 1992).

\[\text{2As von Fintel (1995) puts it, “there is a situation that contains all and only my left earlobe, the square root of 2, and Brutus stabbing Caesar.”}\]
Thus, in Rooth (1995), he gives an account of qadverbs as quantifiers over these alternatives. He takes the restrictor of a qadverb to be a free variable, much as in the empty-restrictor hypotheses. This free variable, though, is subject to restriction by the focus semantic value of the scope of the qadverb. Since the principal function of focus is to evoke alternatives, the focus semantic value of a sentence is the set of alternative propositions generated by substituting for the focused constituent. A qadverb, then, quantifies over this set of alternative propositions.

For example, consider sentences (11a) and (11b), which differ only in their stress placement (marked by the brackets and subscript \( F \)).

\[
(11) \quad \text{a. In St. Petersburg, an officer always escorts [ a ballerina. ]}_F \\
\text{b. In St. Petersburg, [ an officer ]}_F \text{ always escorts a ballerina.}
\]

In (11a), the focal stress on the \textit{a ballerina} evokes a set of (contextually dependent) alternatives to a ballerina; the qadverb always, then, quantifies over (potential) situations of an officer escorting any of these alternatives. Similarly, sentence (11b) quantifies over situations of ballerinas being escorted by alternatives to officers.

This focus-based theory of adverbial quantification does not directly address the problem of incorporating verbal presuppositions, but it does suggest another way of looking at the problem of incorporation, which we explore in the rest of this paper. We come back to the question of focus—in particular, its interaction with presupposition incorporation—in section 5.

### 4 Polar alternatives

Instead of thinking of presupposition incorporation in adverbial quantification as unmotivated intermediate accommodation, as in the empty-restrictor hypothesis, we propose a novel account on which the restrictor of a qadverb quantifies directly over alternatives of the nuclear scope. Thus, the presuppositions triggered by the nuclear scope are also triggered \textit{within the restrictor}. Incorporation, then, is dependent on the interaction of the trapping constraint on presuppositions (van der Sandt 1992) and the plurality condition on quantifier domains (de Swart 1991).

On our account of adverbial quantification, restrictors do not start out life empty. Instead, we take as our starting point Rooth’s idea that qadverb domains are sets of alternatives. What we propose here is that a qadverb domain \textit{description} (i.e., a qadverb restrictor) consists of the disjunction of a minimal set of alternative propositions—what we call the \textit{polar alternatives} of the scope. In particular, these alternatives are expressed by the scope of the quantifier and its negation. Thus, in gross outline, the semantic representation of \textit{always} \( S \) would be the formula (12), where ‘::’ represents a situation description operator.

\[
(12) \quad \forall (x, x :: ([S] \lor \neg [S]), x :: [S])
\]

Note that our account is embedded in a situation theory in which the description relation between situations and sentences—\textit{characterization}—is partial (Schubert 2000, Ahn and Schubert 2003), so that the disjunction in the restrictor is non-trivial. In fact, such a disjunction must minimally satisfy the presuppositions of positive disjunct. Thus, the
restrictor always shares the presuppositions of the nuclear scope. (See Ahn (2004) for more details on extending DRT with this situation theory.)

Note that these polar alternatives can be determined semantically, without recourse to pragmatics or world knowledge, which means that a meaningful logical form for adverbial quantification can be obtained without requiring pragmatic operations. This is not to say, though, that pragmatics and world knowledge play no role in adverbial quantification; in fact, they are crucial in determining the actual domain set. On our analysis, though, it will be clearer what exactly their role is.

Given this initial representation, our explanation of incorporation depends on three factors: trapping, a plurality condition on quantifier domains, and the structure of the presuppositions triggered by presuppositional verbs. We discuss each of these factors in turn.

The trapping constraint is part of the standard binding theory (van der Sandt 1992) and states simply that presupposition resolution cannot create free discourse referents. To see how trapping works in QNPs, consider sentence (13).

(13) Few team members have cars, but every team member who has enough gas in her car will arrive in her car.

This sentence does not have the incoherence of (2). The presupposition triggered by the occurrence of her car (the DRS with double lines in (14)) in the restrictive NP every team member who has enough gas in her car contains X, the discourse referent introduced by the quantifier, and thus it is trapped in the restrictor and obligatorily restricts the quantification to those team members who own cars.

The plurality condition on quantifier domains is due to de Swart (1991). It states simply that a quantifier cannot felicitously quantify over a set if it is known that the set’s cardinality is less than two. In order to support this condition, de Swart adduces examples such as (15), for nominal quantification, and (16), for adverbial quantification.

(15) a. #Every mother of Mary got a present.
   b. Every mother of a linguist got a present.

(16) a. #When Mary knows French, she always knows it well.
   b. When Mary speaks French, she always speaks it well.
   c. #When Anne made “Dangerous liaisons,” she always recommended it to her friends.
The sentences in (15) demonstrate the condition clearly: Mary can be generally assumed to have only one mother, thus, the domain of every in (15a) is known to be a singleton set, and hence the use of the quantifier is infelicitous. Similarly, in (16), we see that adverbial quantification is infelicitous for restrictors that describe "once-only" predicates (regardless of whether they are stage- or individual-level).

The final piece in our presupposition incorporation puzzle is the content of the presuppositions that actually get incorporated. Note that all the presupposition triggers in (1)—lose, beat, manage, finish—have something in common: they are all achievement verbs, and what they are normally taken to presuppose is the state of activity leading up to the achievement. Thus, lose presupposes a state of possession, beat presupposes an activity of game playing, and so on. We take the position that there is an additional component to the presupposition besides the mere existence of an appropriate eventuality—a culmination relation holding between the presupposed eventuality and the eventuality described by the trigger (what we will call the asserted event).

One important characteristic of this culmination relation is that it is, in a sense, functional. In other words, for any given eventuality, there is at most one culminating event. For example, a game of John and Marvin playing ping pong has at most one culmination—an event of John winning, an event of Marvin winning, or an event of the game ending in a tie. Similarly, while a state of the Canada Post possessing a particular letter may never culminate (i.e., the state may persist forever), but if it does, it does so only once. Once the possession has ended (in a losing event, for instance), and re-possession of the same letter is a distinct state.

So, how do our three elements combine to force incorporation? Consider a simple adverbially quantified sentence, such as (17).

(17) Robin Hood never misses.

The preliminary DRS for this sentence is given as (18).
Now, first of all, note that the same presuppositional DRS triggered by *misses* (repeated as (19)) occurs three times: twice in the restrictor and once in the nuclear scope (with distinct presupposed referents). Further, note that the culminating event argument of the presupposed culmination relation is $S$, the variable of quantification introduced by the quantifier. Thus, at least the culmination relation must be trapped in the restrictor. According to the standard binding theory, binding of presuppositions is preferred to accommodation, and, if accommodation is required, global accommodation is preferred to local. Since the three presuppositions triggered by *miss* are identical, resolution options
in which only one of the presuppositions is accommodated and the others are bound to that one are generally preferred. Given that the restrictor of the quantifier is accessible to the nuclear scope and not *vice versa*, the two most highly preferred readings are (20a) and (20b), in that order (note that we are glossing over the resolution of the discourse referent for the target).

Of the two readings, the second most preferred reading, DRS (20b), is actually the reading we would like to obtain. Happily, though, the plurality condition rules out (20a). Consider the interpretation of DRS (20a): there exists a target \( X \) and a (single) situation \( S' \) such that \( S' \) is a situation of Robin Hood trying to hit \( X \). Now, the quantifier NEVER quantifies over the set of situations \( S \), such that \( S \) is either a situation of Robin Hood missing the target or of Robin Hood not missing the target and, crucially, \( S \) culminates \( S' \). But we know that the culmination relation is functional, so that there is at most one culmination of \( S' \). Since \( S' \) only refers to a single situation, then, this reading is infelicitous, and we are left with DRS (20b) as the most preferred reading.

This account of adverbial quantification is compatible with the general picture of the interaction between quantification and presupposition presented in (Geurts and van der Sandt 1999). Note that DRSs (20a) and (20b) are actually only partially resolved. The
restrictor itself is still an unresolved presupposition, which must be bound to a set in context or accommodated. Note, though, that on our account, unlike the empty restrictor account, the restrictor of a qadverb always contains the exactly information necessary to guide resolution, including possible bridging, to an antecedent domain.

5 Interaction with focus

One thing we have not considered so far in our analysis of adverbial quantification is the interaction of presupposition incorporation with focus. Consider the discourse in (21).\(^3\)

(21) a. When John and Marvin meet, John always beats Marvin at some game.
   b. He usually beats him [at badminton]\(_F\).

The domain of *usually* is *not* a set of situations of John and Marvin playing badminton, as you might expect from the the analysis presented so far. Instead, it is the set of situations of John beating Marvin at some game, as the association-with-focus account would predict. The question for our polar alternative account, then, is: what happens to the presupposition triggered by *beat*?

The answer we advance here is that focus is presuppositional and thus has a direct effect on the presupposition triggered within a sentence (Geurts and van der Sandt 2004).\(^4\) In particular, we claim that the focus-based division of material into presupposed and asserted content precedes the computation of verbal presuppositions. Thus, in (21b), the focal stress induces a division of the scope into presupposed material (i.e., that John beats Marvin at something) and asserted material (i.e., that that “something” is badminton). Only then is the presupposition triggered by *beat* computed: that John and Marvin play “something” and that this playing situation is culminated by the (also presupposed) situation of John beating Marvin at “something.” A rough preliminary representation of (21b) is given in (22).

\(^3\)Adapted from Orin Percus, p.c.

\(^4\)The notion that focus is presuppositional is somewhat controversial, but, in fact, the solution we present here could be reconciled with a non-presuppositional account of focus, as long as negation is still taken to associate with focus and with an adequate account of combining presuppositions of disjunctions (perhaps along the lines of Krahmer (1998)).
The same considerations apply in resolving (22) as in resolving (18), so the preferred (partially) resolved reading is (23).

Note that the restrictor in (23) describes exactly the right set of situations—a domain situation $S$ is one which culminates a situation of John and Marvin playing (some game) by John winning and which is either (part of) a badminton game or not (part of) a bad-
minton game. Thus, the presupposition triggered by *beat* does not disappear; rather, the presupposition introduced by the focal stress alters its computation.

6 Conclusion

In this paper, we have presented a novel account of adverbial quantification that takes as its starting point the phenomenon of presupposition incorporation in quantifier domains and that explains the difference with respect to incorporation between nominal and adverbial quantification without resorting to different presupposition resolution strategies. There is still much left unaddressed by this work—the incorporation of presuppositions triggered by something other than achievement verbs, the interaction of presuppositions with explicit restrictors, as well as with definite and indefinite NPs, and the justification of the particulars of our proposed logical form—but in the course of attempting to provide an adequate account of incorporation, we have also provided an analysis of the presuppositions triggered by presuppositional achievement verbs, as well as a claim regarding the relative order of computation for presuppositions triggered by focus and presuppositions triggered by presuppositional verbs, both of which merit further investigation on their own.

References


NEGATIVE BIAS IN POLAR QUESTIONS

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Abstract

This paper investigates the discourse function of negative bias in questions. How and what such questions contribute to the logical form of discourse has not been the focus of previous work. We believe that such a discourse oriented approach, however, provides useful insight into the formal characteristics of bias. Adopting this perspective, we develop an analysis of biased questions as complex speech acts, i.e. illocutionary acts comprised of both an assertion and a question. This analysis, we feel, is useful in accounting for the behavior of biased questions in discourse and dialogue.

1 Introduction

Certain questions convey an expectation on the part of the speaker for a negative answer. Such utterances are said to be biased or to express a biased question. Previous research varies on how to characterize this bias formally. Guerzoni (2002) and Han (2002) treat biased questions as being in essence assertions. For Krifka (1995) and van Rooy (2003), on the other hand, interrogatives whose use conveys a bias express a true question but carry a strong presupposition or implicature that the speaker takes the question to be more or less settled.

This paper investigates in detail the discourse function of biased questions. How and what such questions contribute to the logical form of discourse has not been the focus of previous work, which is unfortunate, as we believe that such a study provides invaluable insight into how bias should be formally characterized. We develop an analysis of biased questions as complex speech acts. We provide evidence that biased questions convey both an assertion and a question and show how this analysis leads to an account of their contribution to discourse and dialogue.

2 Bias and Discourse Function

2.1 Bias, NPIs and Intonation

Borkin (1971) notes that the presence in an interrogative of a minimizer NPI like a red cent or lift a finger necessarily conveys an expectation by the speaker of a negative answer. The examples in (1) all convey a negative bias; the speaker of (1a), for example, expects that Fred contributed nothing to the campaign.

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Consequently, most previous research attempts to derive bias through the interaction of the semantics and pragmatics of interrogative sentences and minimizers (Krifka 1995, Guerzoni 2002, van Rooy 2003).

But intonation also appears to contribute to bias. Minimizer NPIs necessarily carry an emphatic stress (Krifka 1995), while so-called weak NPIs such as any and ever may or may not be so emphasized. When a weak NPI in an interrogative is emphatically stressed, however, the question is biased (3b). An unstressed weak NPI, on the other hand, results in a neutral question (3a).\

\[ \text{(2) a. Did Fred contribute anything to the campaign?} \]
\[ \text{b. Did Fred contribute ANYthing to the campaign?} \]

\[ \text{(3) a. Has John ever voted for a democrat?} \]
\[ \text{b. Has John EVER voted for a democrat?} \]

Finally, intonation alone can convey bias, as shown by (4b), which does not contain an NPI, but which carries a narrow focus on the main verb similar to that found on strong NPIs.

\[ \text{(4) a. Do you need that porkchop?} \]
\[ \text{b. Do you NEED that porkchop?} \]

So the presence of a minimizer NPI in an interrogative sentence is sufficient, but not necessary, to convey negative bias. We are tempted to go further and say that this is because the only natural way of reading such interrogatives assigns minimizer NPIs the same sort of prosodic stress as the one responsible for the bias in (3b) and (4b). The account developed below, however, is consistent with their being other ways of inducing bias.

2.2 Responses to Biased Questions

That the discourse function of questions conveying a negative bias goes beyond a simple request for information, as predicted by Krifka (1995) and van Rooy (2003) for example, is shown by examining the felicitous responses to questions like (5). Although positive answers are permitted, a simple “yes” as in (5a) feels incomplete or uncooperative in some sense. Lengthy positive answers, on the other hand, are acceptable but intuitively seem to offer counterevidence of some sort as indicated by actually in (5b) or the CT tone on dishes in (5c).

\[ \text{(5) Does Fred do a damn thing around the house?} \]
\[ \text{a. ?Yes.} \]

\[ \text{1} \]We use capital letters to indicate prosodically prominent constituents but remain agnostic regarding the exact nature of the prominence.
b. Well, he actually does quite a lot.
c. He does the DISHES.
d. No. [You’re right. He doesn’t.]

Negative answers also exhibit a complex behavior in that they seem to pattern with assertions expressing agreement. (5d), for instance, can be followed by the explicit agreement shown in square brackets.

(6) a. A: Fred doesn’t do a damn thing around the house.
b. B: You’re right. He doesn’t.

This bracketed material can also be used to express agreement with a negative assertion, as in (6). Furthermore, the bracketed material in (5d) can by itself serve as a felicitous response to the question in (5).

2.3 Contextual Constraints on Biased Questions

Biased questions seem to carry certain constraints on their felicitous contexts of use. Our intuition is that there must be contextually supplied evidence that not only supports the bias of the biased question, but also a prior attitude on the part of the addressee that the bias appears to attack. In (7f), for example, the progression of the dialogue in (7a) – (7d) supports the bias toward a negative answer, but A’s initial assertion can be taken to (non-monotonically) entail that John does in fact do something, be it minimal, around the house.

(7) a. A: John is a decent husband.
b. B: Does he do the dishes?
c. A: Well... no.
d. B: Does he do the laundry?
e. A: Well... no.
f. B: Does he do a damn thing around the house?

In other words there is some issue about which the participants in the dialogue are in dispute. This point is also demonstrated by examples like (8), which shows that the negative bias cannot be jointly accepted by the dialogue participants.

(8) a. A: John never does the dishes, never cleans the house. All he does is lie about, drink beer and watch TV.
b. S: #Does he lift a finger to help around the house?

This condition applies for biased questions like (4b) as well the other examples in section 2.1.

3 Evidence for a Complex Speech Act

We take biased questions to simultaneously express an assertion and a question. We develop two lines of argument in support of this claim. First, we use the fact that discourse
markers generally select for specific types of speech act. *Please*, for example, marks requests. We identify discourse markers that either occur with assertions or questions and show that biased questions can occur with both. Next, we examine the pattern of responses to biased questions. There is a certain class of response that depending on intonational contour can either challenge or mark agreement with a previous assertion or which can serve as an answer to a polar question. These responses, consequently, are good indicators of whether the prior turn in a dialogue is understood as a question or an assertion.

### 3.1 Discourse Markers

Following Sadock (1971, 1974), we use the sentence initial discourse marker *after all* to test whether a given utterance is used as an assertion. *After all* can be prefixed to an assertion, as shown by (9a), but not to a neutral question, as in (9b).

(9) Its fine if you don’t finish the article today.
   a. After all, your adviser is out of the country.
   b. #After all, is your adviser out of the country?

Sentence initial *yet* also co-occurs with assertions. *Yet* can be prefixed to a clause following an assertion, as shown by (10a), but not to one following a neutral question, (10b).

(10) a. John is consistently late for work. Yet, he continues to be promoted.
    b. #Is John consistently late for work? Yet, he continues to be promoted.

Therefore, if a sentence occurs with one of these discourse markers, we take it as evidence that it is being used as an assertion.

Similar tests exist for questions. Again following Sadock (1974), we note that the phrases *by any chance* and *tell me* require the sentences they co-occur with to be questions, rather than assertions, as demonstrated in (11a) and (12a).

(11) a. #John, by any chance, owns a car.
    b. Does John, by any chance, own a car?

(12) a. #Tell me, John owns a car.
    b. Tell me, does John own a car?

Applying the tests to the interrogative sentences introduced above clearly shows that they are able to function as assertions and questions, as shown in (13) – (16).

(13) a. After all, does John lift a finger to help around the house?
    b. Does John lift a finger to help around the house? Yet you continue to reward him.
    c. Does John, by any chance, lift a finger to help around the house?
    d. Tell me, does John lift a finger to help around the house?

(14) I don’t understand why you think that John is a liberal.
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(15) a. John hasn’t ever voted for a democrat. Yet you continue to claim that he is a liberal.
b. Has John EVER voted for a democrat? Yet you continue to claim that he is a liberal.
c. #Has John ever voted for a democrat? Yet you continue to claim that he is a liberal.

(16) a. Has John, by any chance, EVER voted for a democrat?
b. Tell me, has John EVER voted for a democrat?

(17) [Nicholas is reaching for the last porkchop, after already having had three.]
a. You should have some fruit instead. After all, do you NEED that porkchop?
b. Tell me Nicholas, do you NEED that porkchop?

Furthermore, it is not the case that the illocutionary force of biased questions is ambiguous or underdetermined. Rather, it is overdetermined. Biased questions are simultaneously assertions and questions as shown by (18).

(18) After all, has John by any chance EVER voted for a democrat?

Assuming that the arguments to after all and by any chance are restricted to assertions and questions respectively, then both speech acts must be available in the context, otherwise a type clash should arise in (18) with respect to the needs of one of the discourse markers.

3.2 Responses

Next, we investigate responses composed of an (optional) answer particle, i.e. yes or no, followed by a subject pronoun and an auxiliary verb that matches the polarity of the particle. These responses come with two distinct intonational contours corresponding to distinct uses.²

The agreement contour contains a slight intonational pause between the answer particle and the Pro + Aux combination. Both intonational phrases show low boundary tones. This type of response is usually used to mark agreement with a previous assertion or to assert some uncontested information. It occurs in dialogues with assertions of the same polarity, (19c), and as answers to questions, (20b) and (20c). We place a slash between the answer particle and the Pro + Aux component to indicate this contour: Yes.He does.

The second contour we refer to as the challenge contour. The challenge contour consists of a single intonational contour with a high boundary tone and increased intensity or stress on the auxiliary. This contour usually functions as a correction or challenge to a previous assertion. It only occurs as a response to assertions of the opposite polarity (19d). We

²It is important to distinguish answers from responses. I don’t know, for example, is a response to the question Is Mary coming?, but not an answer. In some cases the utterances we are concerned with are answers, but not always, as they sometimes follow assertions.
write it *Yes.* = *He DOES.*

(19)  
\begin{itemize}
  \item a. A: Fred doesn’t lift a finger to help around the house.
  \item b. #B: Yes. / He does.
  \item c. B: No. / He doesn’t.
  \item d. B: Yes. = He DOES.
\end{itemize}

(20)  
\begin{itemize}
  \item a. A: Is Kim coming to the party?
  \item b. B: Yes. / She is.
  \item c. B: No. / She isn’t.
  \item d. #B: Yes. = She IS. (# No. = She ISN’T.)
\end{itemize}

These types of response are useful to us because if a challenge response occurs with an interrogative sentence, then the sentence must be functioning at least in part as an assertion. Agreement responses, on the other hand, are ambiguous. They can function as real answers and as responses to prior assertions. However, if an agreement response is functioning as a real answer in a given context, that is as an answer to a neutral question, then the alternative response of the opposite polarity should be equally felicitous in the same context.

All of the interrogative sentences that we claim convey a negative bias can be responded to using the challenge contour, (21d) – (23d). Some biased questions must in part be assertions. The agreement responses to these interrogatives are more interesting. While the negative responses are perfectly felicitous, the positive responses are slightly marked. We take this to indicate that these interrogatives do in fact express questions, since agreement responses of both polarities are (more or less) felicitous. The slight markedness of the positive response, however, we take to be indicative of the presence of the negative assertion, i.e. the negative bias. Since the agreement contour is only felicitous with assertions of the *same* polarity, a response such as (22c), for example, can only be taken as answering the question component of the speech act, leaving the assertion, which contradicts the answer, unaddressed.

(21)  
\begin{itemize}
  \item a. A: Does John lift a finger to help around the house?
  \item b. B: No. / He doesn’t.
  \item c. B′: Yes. / He does.
  \item d. B′′: Yes. = He DOES.
\end{itemize}

(22)  
\begin{itemize}
  \item a. A: Has John EVER voted for a democrat?
  \item b. B: No. / He hasn’t.
  \item c. B′: Yes. / He has.
  \item d. B′′: Yes. = He HAS.
\end{itemize}

(23)  
\begin{itemize}
  \item a. Do you NEED that porkchop?
  \item b. B: No. / I don’t.
  \item c. B′: Yes. / I do.
  \item d. B′′: Yes. = I DO.
\end{itemize}

\footnote{Some of the speakers we consulted found the challenge response more natural if the optional answer particle were omitted.}
4 Previous Approaches

Before discussing our proposal, we present two recent papers addressing negative bias in questions. There are two basic problems with these accounts: first, the analyses are tied to the presence of a minimizer NPI, but as we have argued bias arises in interrogatives with stressed *any* or *ever* and with marked intonation alone. Second, these proposals do not capture the complex nature of biased questions discussed in section 3.

Previous researchers have treated biased questions as either assertions (Guerzoni 2002, Han 2002) or as true questions, accounting for the bias through the presence of a presupposition or implicature (Krifka 1995, van Rooy 2003). Guerzoni’s (2002) analysis, for example, derives bias from the interaction of the presuppositions of minimizer NPIs in questions with the semantics and pragmatics of scales. These elements conspire to reduce the set of contextually permissible answers to a singleton consisting of the negative answer. The relevant presupposition results from the presence of a covert *even* at logical form.

The presupposition of a question containing *even* is ambiguous according to which endpoint along some scale the focused constituent of the sentence denotes.

(24) Can Eric even speak [Japanese]$_F$?

(24), for example, either presupposes that the proposition that Eric can speak Japanese is the least likely among the set of alternative propositions, or that it is the most likely, depending on whether it is assumed that Japanese is hard or easy to speak.

Guerzoni (2002) derives these two readings through a syntactic ambiguity. She assumes that polar interrogatives contain a covert *whether* that moves over the set introducing question morpheme at logical form. The covert *even* introduced by minimizer NPIs is allowed to scope either above or below the trace of *whether*. When *even* outscopes the trace, the positive answer carries the “hard” reading and the negative answer carries the “easy” reading. But the fact that minimizers denote the lower endpoint of the scales they introduce is inconsistent with the “hard” reading. Consequently, the positive answer is contextually infelicitous. Furthermore, on the reading where *even* scopes under the trace of *whether*, both answers carry the “hard” presupposition.

Therefore, given *any* context $c$ and question $Q = \{q, \neg q\}$ containing a minimizer NPI, the restriction of $Q$ to $c$ will be $\{\neg q\}$. Only the presuppositions of the negative answer are satisfiable and, consequently, only the negative answer is felicitous. The “question” leaves no choice in the matter and so, if we follow the advice of Hamblin (1973), the interrogative will essentially function as an assertion.\(^4\)

We think that Guerzoni is absolutely right that interrogatives like (26) express assertions, as we established already in section 3. But they clearly do more than that. As our tests show, such interrogatives also convey questions. Furthermore, assertions have a particular role to play in discourse which biased questions are unable to play. For instance, biased questions cannot be used to mark agreement in the way that ordinary assertions

\(^4\)Guerzoni (2002) herself notes a potential criticism of her syntactic approach. *Even* must be the only focus sensitive particle allowed to move over the trace of *whether*, otherwise *Did only [Mary]$_F$ attend?* has an unintuitive interpretation in which the negative answer presupposes that Mary *did not* attend and asserts that everyone besides Mary *did* attend.
can. Contrast the discourse in (25) with (8).

(25)  
  a. A: John is a slob. He never helps out with the housework.  
  b. B: He doesn’t do anything around the house.  

van Rooy’s (2003) analysis is in many respects similar to Guerzoni’s. Once again the denotation of minimizer NPIs and the semantics of scales play a pivotal role. Relying on appropriateness conditions on asking questions, van Rooy derives the presupposition that the question is settled for all non-minimal values along whatever scale the NPI makes salient. (1b), for example, presupposes that for all non-minimal amounts of help \( x \), John did not provide \( x \) amount of help to Mary and asks whether he did the minimal amount to help her or nothing at all. This is enough, van Rooy claims, to account for the rhetorical effect of the question.

But it is not clear that this presupposition is able play the role of the assertion noted in section 3. van Rooy (2003) predicts that negative polar interrogatives like (26) have the same presupposition as positive polar interrogatives such as (1b).

(26) Didn’t John lift a finger to help Mary?

But negative polar interrogatives with NPIs do not contain an assertion according to our tests, as demonstrated in (27b).

(27) Why does Mary feel that she owes John anything?  
  a. After all, did he lift a finger to help her?  
  b. #After all, didn’t he lift a finger to help her?

5 Our Approach

Our approach to bias uses the background framework of SDRT (Asher and Lascarides 2003), a theory of discourse interpretation incorporating rhetorical structure into a dynamic semantic account of meaning. Each contribution to a discourse or dialogue must be rhetorically linked to previous contributions. Each discourse relation can be thought of as a relational speech act type: providing an explanation, for example, requires both an \textit{exlanandum} and an \textit{explanans}. In dialogue, an answer requires a previous contribution understood as a question. We need SDRT for analyzing some of the observations we have made about interrogatives that convey bias, since we are concerned with the speech act performed in uttering a biased question and how this relates to their behavior in discourse and dialogue. For example, why are short positive responses to biased questions marked?

In SDRT, a set of DRSS or dynamic logic formulae \( \Phi \) represents the compositional semantics of clauses. These formulae are labelled by labels \( \pi_1, \pi_2, \ldots, \pi_n \) that are typed generally according to the semantics of the formulas they label. For instance a standard dynamic logic formula that denotes a dynamic proposition will be typed as an assertion, while a formula denoting a question will be typed as a question, and similarly for requests. Each labelled formula constitutes for us a \textit{discourse constituent} in an SDRS (a segmented discourse representation structure). More than one discourse relation may relate one discourse constituent to another constituent in an SDRS.
5.1 Complex Speech Acts

Sometimes one and the same utterance may give rise to two discourse constituents of different, even incompatible, semantic types that may bear different rhetorical relations to other discourse constituents as well as bearing non-symmetric relations to each other. This is what happens in SDRT’s analysis of complex speech acts of which the indirect request in (28a) is an example. (28a) behaves both like a question and a request (Asher and Lascarides 2001, Asher and Lascarides 2003). For example, it can co-occur with please, which collocates with genuine requests, such as (29a), i.e. requests expressed by the use of an imperative sentence, but not with interrogatives that express true questions as in (29b). Furthermore, like genuine (polar) questions, indirect requests can be answered with yes or no.

(28) a. A: Can you pass the salt, please?
   b. B: Yes [(uttered as B passes the salt)]

(29) a. Pass the salt, please.
   b. #Are you coming to the party, please?

Questions and requests are assigned incompatible semantic types by compositional semantics. Adopting some machinery from Asher and Pustejovsky (2004) for lexical semantics, (28a) can be assigned a complex type – or “dot type” – \textit{question} \textbullet \textit{request} (Asher and Lascarides 2003). Both components of this complex type can be exploited by the logic for constructing discourse structure and Asher and Lascarides (2003) argue that Gricean style pragmatic reasoning naturally connects the question to the request. Depending on the particular discourse connection for the constituent of complex type, SDRT allows the complex type to be exploited into its constituent types.

Our view is that biased questions are also complex speech acts that introduce a complex type on the label of the constituent. Biased questions are assigned a dot type \textit{question} \textbullet \textit{assertion}. Discourse connectives like \textit{yet} or \textit{after all} can exploit the assertoric component of the dot type; \textit{tell me} and \textit{by any chance} can exploit the question component. Finally, we assume that maximally coherent responses to biased questions should address both component speech acts.

5.2 Linking Intonation to an Assertion

As noted above, we believe intonation to be critical in the promotion of bias. Furthermore, as noted in section 3, we take the presence of an assertion in the illocutionary act performed in uttering a biased question to be characteristic of bias. However, we have said very little about how this assertion is linked to any particular intonation. The examples in section 2.1 all involve a peculiar intonational contour, intuitively, a L* or L*+H pitch accent followed by a final rise. The L*+H pitch accent is phonetically realized as local F0 minima on the accented syllable, followed by a sharp rise potentially extending into the following syllable. The final rise may be realized as either L H% or H H% in the Pierrehumbert notation (Ladd 1996).

We assume that a L* or L*+H pitch accent contributes to logical form a default assertion operator that applies to one of the answers introduced by the question. We gloss the
meaning assigned to these tones as (30).

\[(30) \quad \lambda C \exists p. [p \in C \land \lor \neg p]\]

(30) is a strong statement of the intuition in previous analyses that these tones convey uncertainty, incredulity (Ward and Hirschberg 1988) or a refusal by the speaker to make some predication (Pierrehumbert and Hirschberg 1990).

Assuming a standard partition semantics of interrogatives, sentences of the form \(?\phi\) yield the set of propositions \{\|\phi\|, \|\neg\phi\|\}. This set is of the right type to combine with \(C\). Pragmatic reasoning then determines which answer or alternative is asserted. In order to get the bias right, the positive answer must be chosen; that is, what gets asserted is \(\neg\phi\). This choice is consistent with previous ideas about how speakers choose to phrase their questions. Gunlogson (2001), for example, analyzes the typical final rise of interrogative sentences as conveying a lack of commitment to the propositional core of the question. Our examples are all positive polar interrogatives and so convey a lack of commitment to the proposition expressing the positive answer. Selecting the negative answer to instantiate the existentially quantified variable in (30) results in the assertion of \(\phi\), which is inconsistent with the lack of commitment conveyed by the final rise.\(^5\)

The L*+H L H% contour has been extensively studied by Ward and Hirschberg (1988). They note that assertions with this contour convey alternatively uncertainty or incredulity depending on factors independent of the F0 contour itself, such as duration, loudness and pitch range.

(31) a. A: I’d like you here tomorrow morning at eleven.
   b. B: !Eleven in the morning! \quad \text{(incredulity)}

(32) a. A: Do you tend to come in pretty late?
   b. B: \Eleven in the morning.\ / \quad \text{(uncertainty)}

Ward and Hirschberg (1988) subsume both of these concepts, uncertainty and incredulity, under the heading of lack of speaker commitment. Pierrehumbert and Hirschberg (1990) locate these meanings in the pitch accent itself, rather than the entire tune.

We propose that the intonational meaning of the pitch contour contribute basically something similar to (30), though depending on the measure of intensity we might have either (33a) for the incredulity reading or (33b) for the uncertainty reading.

\[(33) \quad a. \quad \lambda C \exists p. [p \in C \land \text{Expect } \neg p] \\
   b. \quad \lambda C \exists p. [p \in C \land \neg \text{Certain } p]\]

The examples that Ward and Hirschberg investigate are assertions with the L* + H L H% contour. In these cases, we may coerce the argument of \(C\) to the singleton set \{\(\phi\)\}, which will give us the right interpretation for both the incredulity and uncertainty readings. The prosodic facts, however, are not entirely clear to us. It may be that we have the same con-

\(^5\)Alternatively, we may assume along with Han (2002) and van Rooy and Šafářová (2003) that speakers base interrogatives on the most informative proposition, where the most informative proposition is the one assigned the lowest subjective probability by the speaker. Therefore, if a speaker bases an interrogative on \(\phi\), they believe \(\phi\) to be less likely than \(\neg\phi\).
tour as the one occurring in Ward and Hirschberg’s (1988) examples, though noted above a H H% phrase and boundary tone combination seems more likely. Further intonational research on this question is needed. If the contour is the same, then we hypothesize that there are subtle interactions between the syntax and the prosody that distinguish between the meanings of B’s utterance in (31) and (32) and in biased questions like (1). On the other hand, the intonational facts may be different, if not in the basic F0 contour then perhaps with respect to other factors – like lengthening over the tone – that may alter the meaning slightly. In that case, there appear to be a number of ways of making an assertion with complex intonational contours, each with slightly different prosodic realizations.

5.3 The Discourse Contribution of Biased Questions

The analysis that we have given of questions like (34a) as complex speech acts of the type question • assertion raises the question: what is the intention of the speaker in uttering such an interrogative? Normally the intention behind asking a question is that the speaker come to know an answer to it. But if the speaker already believes some proposition that is an answer to the question, this default intention is surely blocked. That is, if (34a) asserts (34b), the speaker of (34a) must not simply intend to find out whether John does the minimal amount to help around the house or nothing at all.

(34) a. Does John lift a finger to help around the house?
   b. John does nothing to help around the house.

Recall the dialogue in (7), repeated here as (35).

(35) a. A: John is a decent husband.
   b. B: Does he do the dishes?
   c. A: Well... no.
   d. B: Does he do the laundry?
   e. A: Well... no.
   f. B: Does he lift a finger to help around the house?

(35f) is assigned a complex semantic type question • assertion by the grammar. This complex type can be exploited to introduce a new speech act referent \( \pi_a \) that labels the appropriate assertion, i.e. a formula to the effect that John does nothing to help around the house. \( \pi_a \) provides evidence against (35a) in the discourse context. The complex type of (35f) can also be exploited to introduce a speech act referent \( \pi_q \) that labels a question. Our problem then is to compute the content of the question as well as its discourse contribution. Following the discussion in section 2.3, (35a) can be taken to provide some evidence for the proposition that John does something around the house. Therefore \( \pi_a \), which is the negation of this proposition, must attack or provide counterevidence to A’s assertion in (35a).

A’s intention in uttering (35a) is to get B to believe that John is a decent husband. B doesn’t take up this belief as shown by (35f), although he doesn’t reject or correct (35a) either. Rather B asserts something incompatible with (35a) and the question naturally connects to this constituent as a challenge to A to explain why B should take up the
assertion in (35a). Following Maudet, Muller and Prevot (2004), we define the discourse relation *Challenge* using the SDRT meta-talk relation *Explanation*:

\[(36) \quad \text{Challenge}(\alpha, \beta)(\equiv \text{Explanation}_q^*(\alpha, \beta)) \text{ iff } \beta \text{ labels a question such that some answer to that question explains why the speaker of } \alpha \text{ has the goal associated with the utterance of } \alpha.\]

The default goal of assertions is belief transfer. The challenge to A, then, is to convince B that John is in fact a decent husband.

So more specifically (35f) is a complex speech act of type *counterevidence • challenge* and responses should address both components of the speech act. As noted in section 2.2, short positive answers are infelicitous. This is because although they address the challenge, their propositional content conflicts with the counterevidence, i.e. the assertoric aspect of the biased question. In order to be felicitous, positive answers must provide further evidence or counterevidence, as in (37b) and (37c), or issue a challenge themselves, as in (38c).

\[(37) \quad \begin{align*}
\text{a.} & \quad \text{A: No. [You’re right. He doesn’t.]}
\text{b.} & \quad \text{A: Well, he actually does quite a lot of YARDwork.}
\text{c.} & \quad \text{A: He does the WINDOWS (with a contrastive topic tone on windows).}
\end{align*}\]

Negative answers on the other hand concede the challenge and accept the counterevidence, as in (37a) and (38b).

\[(38) \quad \begin{align*}
\text{a.} & \quad \text{B: #Yes. / He does.}
\text{b.} & \quad \text{B: No. / He doesn’t.}
\text{c.} & \quad \text{B: Yes. = He DOES.}
\end{align*}\]

6 Conclusion

The two main contributions of this paper are (1) the observation that the kind of negative bias typical of interrogatives with a minimizer NPI is evident in other types of interrogative sentence as well and (2) that biased questions are best understood as complex speech acts. The first point is important because prior research tends to focus rather narrowly on interrogatives with minimizer NPIs to the detriment of interrogatives like (4b) where intonation alone appears to engender bias. To the extent that the pitch accents in questions like (1b), (3b) and (4b) are the same or similar one would hope to be able to develop a unified explanation of why these examples all convey a negative bias. Of course, instrumental studies are needed to confirm whether or not this line of inquiry is justified.

The second point allows us to account for the facts noted about the behavior of biased questions in discourse and dialogue. Perhaps the most interesting of these observations regards the complex pattern of responses to biased questions noted in sections 2.2 and 3.2. Since you can agreee with a negative statement with “No”, simple negative responses to negatively biased questions are felicitous because they can address both components of the complex speech act. Positive answers, however, need to do more. Specifically, they must address the negative attitude of the speaker of the biased question. Hence, they often
feel like the speaker is issuing a correction as in (5b) and (5c).

Finally, our approach seems promising for addressing other instances of bias. Negative polar interrogatives on their “outer negation” reading, as in (39b), appear to convey a positive bias (Ladd 1981). As (39b) shows, this bias once again seems to be able to be characterized in terms of a complex speech act.

(39)    a. A: Sue can’t attend the meeting, so there’ll be no syntacticians there.
    b. B: What do you mean? After all, isn’t Jane coming too?
    c. #B’: What do you mean? After all, isn’t Jane coming either?

Furthermore, this assertion has gone unrecognized and unaddressed by previous research (van Rooy and Šafářová 2003, Romero and Han 2004), with the possible exception of (Sadock 1971). Our approach, therefore, appears to be promising and extendable to a variety of kinds of bias.

References


ON THE COMMON FORMAT OF EVENTIVES AND TOO-COMPARATIVES*

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Abstract

Should events be conceived of as primitive or should they be decomposed into more basic elements with certain syntax? This talk presents new evidence for the latter view: If events are represented as contradictory propositional meanings representing their pre- and post states, a uniform analysis of certain eventive and certain too-comparative constructions is possible; this is wanted given striking parallels between the two types of structure. The analysis goes some way, among other, toward explaining ‘repetitive/restitutive’ asymmetries familiar from eventive constructions (von Stechow 1996) but similarly arising in too-comparative constructions.

1 Introduction

1.1 Events as primitives or as pre- and post states

The assumption of Davidsonian variables makes for a simple representation of the logical form of natural language sentences encoding events. Accepting quantification over events, a sentence like *Otto flew a spaceship to Mars* can be translated into a logical form as in (1):

(1)  \( \exists e \ & flight(e) \ & with-spaceship(e) \ & to-Mars(e) \ & PAST(e) \)

The format in (1) immediately tells us what entailments the sentence as a whole gives rise to – (1) simply entails the conjuncts it is made up of. If there are event variables, the ease with which we appear to talk about events as well as refer to them with anaphora is no mystery, and so on (see, e.g., Casati and Varzi 1996).

This paper does not develop alternative means to arrive at the virtues connected to the assumption of event variables just mentioned (but see e.g. Condoravdi and Beaver 2004). Its purpose is to add evidence to the view that events are not primitive but have a certain decomposable structure, similar to what has been proposed by authors like von Wright 1965 or Dowty 1979. According to these authors, events are really composed of states connected by operators. Abstracting from detail, *Otto flew a spaceship to Mars* looks as in (2) on the decompositional approach:

(2)  \( \exists t,t' \rightarrow AT(Mars, Otto, spaceship, t) \ & AT(Mars, Otto, spaceship, t') \ & t' > t \)

*I would like to thank Magdalena Schwager and Ede Zimmermann who helped me get clearer about scopal issues. Shortcomings are my responsibility.*
A famous argument that the representation of events should be as in (2) and not as in (1) comes from patterns with the presupposition triggering adverb *again*. In eventive predications, *again* may trigger a presupposition that the event as a whole occurred before or that merely the ‘resultant state’ held before. These are the repetitive and restitutive readings respectively that *again* may give rise to, cf. (3) (presuppositional meanings are written in spaced type where this enhances readability). Note the ‘certain’ below (3-b) – it is the same door talked about in the assertion that figures in the presupposition triggered by *wieder* under the restitutive reading:

(3) Otto closed a door again
   a. there was an earlier door-closing repetitive
   b. there was a certain closed door earlier restitutive

The reading that *again* gives rise to is syntactically conditioned, as can be seen with its German counterpart *wieder*. If *wieder* occurs to the left of the direct object in an agentive structure, only a repetitive reading is available. If it occurs to the right of the direct object, it naturally triggers a restitutive reading as well (the repetitive reading being hardly available in this particular case).

(4) a. Otto hat *wieder* eine Türe geschlossen
    Otto has again a door closed
    there was an earlier door-closing repetitive
   b. Otto hat eine Türe *wieder* geschlossen
    Otto has a door again closed
    there was a certain closed door earlier restitutive

Von Stechow 1996 offers an analysis of the pattern just illustrated. According to it, the presupposition that *wieder* triggers is computed on the basis of its c-command domain; in structures like (4-a), *wieder* has in its scope the structure encoding both the pre- and the post state of the event in question; in structures like (4-b), it has in its scope only the structure encoding the event’s post state.

The Davidsonian approach to event representation has nothing to say about the repetitive/restitutive pattern, simply because it does not represent pre- and post states seperately – there are only events as a whole on the Davidsonian approach.

### 1.2 Argument and Plan

#### 1.2.1 *too*-comparatives

Comparison involves looking at different things or states of affairs. In the case of *too*-comparatives, the two things or states of affairs cannot be part of the same situation.\(^2\) Consider an example:

(5) Otto found the water too warm.

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\(^1\)It seems to be possible for quantifiers, therefore, to bind variables occurring in presuppositions. Cf. Brandt (to appear) for some discussion of related issues.

\(^2\)We use the term *too-comparative* also for constructions involving *(not)... enough.*
Interpreting (5) involves looking at a non-actual situation; roughly, (5) conveys that the water is warm to a degree \( d \) that is above (or below, if we use *not... enough*) a degree \( d' \) such that if the water were warm to degree \( d' \), it would be appropriate for Otto’s purposes (cf. von Stechow 1984 and Meier 2003 on the counterfactuality of *too*-comparatives). For *too*-comparatives, it is obvious that their interpretation involves reference to incompatible situations (e.g., something cannot be both acceptably warm and too warm at the same time).

If it can be shown that the structure of *too*-comparative constructions is like that of eventive constructions, the decompositional approach to event representation is supported. The decompositional approach says that the linguistically relevant representation of events is in terms of pre- and post-states holding at different times. This is just the obvious format for the representation of *too*-comparatives, widening the concept of times to indices (situations/‘worlds’) at which certain states of affairs hold and abstracting from the unidirectionality of time.

1.2.2 Constructions and scope of *again*

The point of the paper is to argue that repetitive/restitutive asymmetries familiar from eventive constructions arise in a parallel fashion in *too*-comparative structures. Consider (6) and (7), exemplifying the ‘dative experiencer construction’ that will be the focus of investigation here and illustrating the kind of asymmetry we are interested in:

(6) a. ...weil wieder einem Warlord Millionen in die Finger kamen
    ...because again a warlord-DAT millions in the fingers came

b. ...weil einem Warlord Millionen wieder in die Finger kamen
    ...because a warlord millions again in the fingers came

   ‘...because a warlord got hold of millions again’

(7) a. ...weil wieder einem das Wasser zu warm war
    ...because again someone-DAT the water too warm was

b. ...weil einem wieder das Wasser zu warm war
    ...because someone-DAT again the water too warm was

   ‘because someone found the water too warm again’

Considering first the eventive case in (6), the intuitive difference between (6-a) and (6-b) is this: for (6-a) to be felicitous, a presupposition has to hold that an event of a warlord getting hold of millions occurred before. There has to be a warlord that went from poor to rich at an earlier time. For (6-b), in contrast, it is enough if there is an earlier time at which a warlord had millions – the warlord in question could have been born rich, for example. In structures like (6-b), only the post state of an event of a warlord getting hold of millions is presupposed.

We argue that the contrast between (7-a) and (7-b) is parallel. At this point, the difference can be described as follows: for (7-a) to be felicitous, there has to have been someone at an earlier time whose standard regarding water temperature (and some purpose) was exceeded by the actual water temperature. This individual can be different from the one involved in the actually asserted meaning. For (7-b), in contrast, the prominent reading
is that there is an individual whose standard is such that it was exceeded by the water temperature at an earlier time and is exceeded by the water temperature at a later time (the ‘assertion time’) as well. In (7-a), wieder takes scope over the standard of the individual in question as well as over the degree to which the individual actually experiences the water temperature. In (7-b), in contrast, the individual talked about in the presupposition and assertion appears to remain constant (but cf. section 4 below for qualification): there is an individual with a certain standard regarding water temperature (and some purpose), and this standard is exceeded at an earlier as well as at a later time.

Just as wieder in eventive constructions may take scope over pre- and post states or just post states, it may take scope over standards and actual degree instantiations or just over actual degree instantiations in too- comparative structures. This is expected if at the relevant level of representation, pre-states in eventive constructions correspond to standards in comparative constructions, and post-states correspond to actual degree instantiations.

1.2.3 Overview

The structure of the paper is as follows: section 2 presents the constructions that will be the empirical focus of investigation and briefly summarizes the main aspects of their analysis developed elsewhere (Brandt 2003, to appear). Section 3 introduces a simple representational format that will be suitable for the purpose here. The format is developed with simple (but non-transparent) comparative constructions for illustrative purposes, it is then shown how it applies to the productively occurring (and more transparent) too-comparative and eventive constructions in focus. Section 4 comprises the analysis of repetitive/restitutive asymmetries in both types of construction. Section 5 concludes.

2 Background

I have argued earlier that there is a particular ‘cipient predication’ structure that is shared by a range of productively occurring constructions typically featuring dative arguments in German (Brandt 2003, to appear). For the purposes of this paper, I will focus on constructions as given in (8).

\[(8)\]
\[
a. \text{Otto ist die Suppe *(zu) salzig} \\
\text{Otto-DAT is the soup-NOM (too) salty} \\
\text{‘Otto finds the soup too hot’}
\]
\[
b. \text{Otto ist die Suppe *(zu Boden) gefallen} \\
\text{Otto-DAT is the soup-NOM (to ground) fallen} \\
\text{‘The soup fell to the ground to Otto’s misfortune’}
\]

Example (8-a) illustrates the too- comparative construction, (8-b) illustrates the eventive construction. I will not review here in any detail the arguments leading to the view that (8-a) and (8-b) indeed share a common structure. At core, the constructions share a dative subject (‘cipient’) with analagous properties; they further comprise a theme and a (degree) location argument, presence of the latter being a necessary condition for the licensing of

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3See the summary and review of my dissertation that appeared in GLOT 7:9/10 for quick reference.
the dative subject, as the examples already indicate. The structure I have argued to underly both (8-a) and (8-b) is given in (9).

(9)  

```
        tP
         /
        /   
       /     
      /      
     /       
     /        
    /         
   /          
  /           
 tP
  /
 XP    t YP
  /
 cipient t
     /
      /
       /
       /
      /
      /
     Y VP/AP
     /
    D/NP
    /
   V/A
   /
 theme V/A
   /
 PRO PP/DegP
   /
 theme P/Deg
   /
 P/Deg
   /
 to(o) ZP
```

The main idea behind (9) is that cipient datives are licensed as subjects of particular predicates. The core properties of the predication structure are the following:

- the VP/AP encodes a propositional ‘thingatloc’ meaning, corresponding to there being something at a certain location
- a presupposition is projected from the VP/AP predicate that corresponds just to the negation of thingatloc
- the category ‘little t’ establishes a predication relation between the predicate and the dative cipient subject – it abstracts over a variable for the cipient to bind (a super-location of the (degree) location argument) and existentially closes the thingatloc meaning
- the dative cipient argument accommodates (‘binds’) the presuppositional meaning projected from the predicate.  

A feature of the analysis that is important here is that the (degree) location argument is definite with respect to the cipient, acting as the subject of predication. This is most obvious in the case of the *too* -comparative structure, consider (10-a) vs. (10-b):

(10)  

```
(10) a. Die Suppe ist zu salzig
    the soup is too salty
```

---

4 Merger of the cipient argument therefore leads to a fully interpretable structure. Combined with Chomsky’s 1999 proposal that structure that can be interpreted must not be kept in syntax, this gives a basic explanation of why the theme argument situated in VP/AP cannot enter local syntactic relations (the traditional ‘A-relations’) with material situated above the cipient. Cf. the references cited.
b. Die Suppe ist dem Otto zu salzig
   the soup is the Otto-DAT too salty
   ‘Otto found the soup too salty’

Interpreting (10-a) involves comparing the actual degree to which saltiness is experienced to a standard that comes with the utterance situation: the actual degree of saltiness is above a certain degree (range) defining appropriate saltiness (regarding soup and some purpose) – it is the speaker or a group comprising the speaker that defines what the appropriate degree is. In (10-b), in contrast, it is the cipient referent that defines appropriate saltiness – the standard needed to interpret the too- comparative comes with the cipient referent. Similarly (but harder to pin down) in the eventive construction:

(11) a. Die Suppe fiel zu boden
   the soup fell to ground
   ‘the soup fell to the ground’

b. Die Suppe fiel dem Otto zu boden
   the soup fell the Otto-DAT to ground
   ‘the soup fell to the ground to Otto’s misfortune’

The location at which the soup ends up in (11-a) is defined with respect to some location set in the utterance context; it could be the location of an aforementioned agent or container but also e.g. the location of the speaker. In (11-b), it is the cipient that sets the location with respect to which the location at which the soup ends up is defined; in the usual case (abstracting from telekinesis and the like), it will be a location on the cipient referent’s vertical axis.

It is crucial for the discussion to follow that the meaning amounting to the actual (degree) location of the theme is encoded below the cipient, in fact below the theme that binds a PRO element in the PP/DegP respectively; therefore, the PP/DegP already comprises all the variables involved in the ‘thingatloc’ meaning.

The negated thingatloc meaning, projected from the predicate, is available only at the stage where the cipient is merged – it is the cipient that anchors (or binds) the negated thingatloc meaning (cf. section 3.2 for elaboration).

It is, in sum, the part of structure comprising the cipient that encodes the complete event (a change from ‘not: theme at location’ to ‘theme at location’) and the comparison as a whole respectively (‘not: theme at (degree-) location’ to ‘theme at (degree-) location’).

3 Representation

3.1 Wieder

Taking events to be made up from pre- and post-states, the repetetive and restitutive readings associated with wieder can be represented as follows:⁵

³Less perspicuously but more explicitly, the repetitive and restitutive readings respectively look as follows:

(i) a. ∃t’,t”,t”’ ¬p(t”) & p(t”) & t”’ < t” & t”,t”’ ⊂ ET & ¬p(t’) & p(t) & t’ < t & t’.t’ ⊂ LT
(12) wieder/again:
   a. ET: \( \neg p(t'') \) & \( p(t'') \) & \( t'' < t' \) & LT: \( \neg p(t') \) & \( p(t) \) & \( t' < t \) repetitive
   b. ET: \( p(t'') \) & LT: \( \neg p(t') \) & \( p(t) \) & \( t' < t \) restitutive

If wieder applies to a structure encoding a complete event, it triggers a presupposition that at an earlier time, a change from a state of not p to a state p occurred. If it applies to a structure just encoding the post-state of an event, it triggers a presupposition that at an earlier time, the post state of the event held.

3.2 Too-comparatives

If I say Mir ist schlecht (Me-DAT is sick, ‘I feel sick’), I assert that the degree of sickness that I experience is above some standard of well-being, call it ‘sickness standard’. Taking \( d' \) to be the degree to which I actually experience sickness and \( d \) my sickness standard, we have:

\[
(13) \exists d', d_{\text{standard}} \land d' > d_{\text{standard}}
\]

If I say Mir ist wieder schlecht (‘I feel sick again’), I assert the above and commit myself that there was an earlier time where I felt sick as well. A short way of writing this is (14):

\[
(14) \text{ET: } \exists d', d_{\text{standard}} \land d' > d_{\text{standard}} \land \text{LT: } \exists d', d_{\text{standard}} \land d' > d_{\text{standard}}
\]

Standards determining what is appropriate with regard to some property, thing instantiating that property (and purpose in question) are different for different individuals; however, we do not take standards as associated with particular individuals to change at unreasonable rates. Our expectations are that standards that individuals have are stable. Therefore, (14) can be written as follows under normal circumstances:

\[
(15) \exists d_{\text{standard}} \land \text{ET: } \exists d > d_{\text{standard}} \land \text{LT: } \exists d' > d_{\text{standard}}
\]

There are a range of superficially simple predicates licensing dative cipients in German (and similarly in a variety of languages); these predicates usually speak about bodily and/or sense experience (being sick, being hot/cold, tasty, unpleasant)

Arbitrary scalar predicates productively license the construction under investigation to the extent that a degree element like too or (not...) enough is involved – the degree element makes it explicit that we are talking about exceeding (or not reaching) individuals’ standards with respect to some thing, property and purpose. As far as the semantics is concerned, I assume that nothing changes. Thus a too-comparative like the water was too warm has truth conditions as sketched in (16):

\[
(16) \exists d_{\text{standard}}, d' > d_{\text{standard}} \land \text{AT(water,d_{\text{standard}},i)} \land \text{AT(water,d',i')} \land d > d_{\text{standard}} \land i > i'
\]

\[
b. \exists t', t'' p(t'') \land t'' < t' \land \neg p(t') \land p(t) \land t' < t \land t', t' \subset \text{LT}
\]

\[6\]We now write \( i \) for ‘index’ instead of \( t \) for ‘time’ as in the eventive case. The ordering can be taken to correspond to preferability.
There are duals in the domain of comparison; all of the following express that the actual degree of warmth diverges from what we call the standard:

\(\text{(17) a. the water was too warm}\)
\(\text{b. the water was not cold enough}\)
\(\text{c. the water was too cold}\)
\(\text{d. the water was not cold enough}\)

All of (17) license the cipient construction; it does not matter whether the actual degree exceeds the standard or vice versa. The condition relevant for cipient licensing is simply that the standard and the actual degree diverge. More generally, we can therefore write the portion of meaning mattering for cipient licensing as two contradictory meanings, one corresponding to the standard and one to the actual instantiation:

\(\text{(18) }\)
\(d_{\text{standard}}: \neg\text{AT}(x, d, i)\)
\(d_{\text{actual}}: \text{AT}(x, d, i')\)

The cipient defines the range of degrees of potential property instantiation, the degrees to which the pertaining individual can experience the instantiation of some property (its ‘quality space’ (Quine 1960)); in particular, the cipient determines the standard with respect to which comparison takes place. For brevity, we write the individual that determines the degree range and standard as an index on the d variable. Reminding us that standards are more or less fixed over time for particular individuals, the interesting portion of meaning a sentence like *Dem Otto war das Wasser wieder zu warm* (‘Otto found the water too warm again’) translates into can be written as in (19):

\(\text{(19) }\exists x \neg\text{AT(water, d_x, i)} \& \text{ET: AT(water, d_x, i)} \& \text{LT: AT(water,d'_x,i)}\)

The eventive cases we are talking about are unaccusatives with location arguments. A sentence like *Dem Otto kamen Millionen in die Finger* (‘Otto got hold of millions’) translates into (20), where \(l\) ranges over locations (associated with the cipient, written again as an index on the location variable).

\(\text{(20) }\exists x \neg\text{AT(millions,l_x,i)} \& \text{AT(millions,l_x,i')} \& i < i'\)

Depending on whether *wieder* takes scope over both the pre- and the post-state or just the post state, we get (21-a) or (21-b) respectively:

\(\text{(21) a. }\exists x \text{ ET: } \neg\text{AT(millions,l_x,i)} \& \text{AT(millions,l_x,i')} \& i < i'\)
\(\& \text{LT: } \neg\text{AT(millions,l_x,i'')} \& \text{AT(millions,l_x,i''')} \& i'' < i'''\)
\(\text{b. }\exists x \text{ ET: } \text{AT(millions,l_x,i)} \& \text{LT: } \text{AT(millions,l_x,i')}\)

### 3.3 A note on presupposition, *wieder* and negation

Under the analysis presented here, the different readings that *wieder* gives rise to depend on whether or not it has in its scope the dative cipient argument that accommodates the negated thingatloc meaning, projected from the VP/AP as a presupposition.
That *wieder* may indeed take scope over meanings that have themselves presuppositional status can be seen in the following examples featuring the aspectual verb *anfangen* (‘start’):

\[
\text{(22) Er hat wieder angefangen seine Frau zu schlagen}
\]

‘He started beating his wife again’

- a. ET: he went from not beating his wife to beating his wife & LT: he went from not beating to beating his wife
- b. ET: he beat his wife & LT: he went from not beating his wife to beating his wife

Aspectual verbs like *start* or *stop* presuppose that what is started or stopped has not been (*start*) or has been (*stop*) the case before. *Wieder* may trigger a reading according to which there was an earlier starting or stopping (going from p to ¬p or v.v.) or just a reading according to which what is started or stopped was (not) the case before. Interestingly, negation appears to help to get the ‘narrow’ reading:

\[
\text{(23) Er hat nicht wieder angefangen seine Frau zu schlagen}
\]

‘He has not again started his wife to beat’

- a. ET: he beat his wife. LT: he did not go from not beating his wife to beating his wife

The ‘repeated starting’ reading does not appear to be excluded in (23); however, the natural reading that (23) has is the one according to which the action that was started was in process at an earlier time.

It is well known that negation creates islands, e.g. for the scope of existential quantifiers that are otherwise amazingly free as respects scope taking (cf. Reinhart 1997). Negation appears to have a scope-trapping effect on *wieder* as well.

### 4 Repetitive/Restitutive asymmetries

In section 3 above, a simple format for representation of the readings that *wieder* gives rise to was developed. Still earlier in section 2, the cipient structure was sketched, the immediately relevant point being that the actually asserted thingatloc meaning (loc standing for locations as well as degrees) is encoded in the VP/AP while the negated thingatloc meaning corresponding to the pre-state and standard respectively is associated with the cipient argument.

This section is devoted to showing that repetitive/restitutive readings with *wieder* arise in the eventive and comparative structure in an analogous fashion. A problem is that while post states are independent portions of meaning (they are just states), this is not so for the portion of meaning encoding actual property instantiation in the *too*-comparative structure. *Too*-comparatives always have to be interpreted with respect to a standard; special means are necessary therefore to bring out the scope asymmetry in the *too*-comparative structure.
4.1 Eventives

Consider again the repetitive/restitutive pattern in the eventive case:

(24)  a. ...weil wieder einem Warlord Millionen in die Finger kamen
      ...because again a warlord millions in the fingers came

b. ...weil einem Warlord Millionen wieder in die Finger kamen
      ...because a warlord millions again in the fingers came
      ‘...because a warlord got hold of millions again’

For (24-a) to be felicitous, there must have been an earlier event of a warlord getting hold of millions. For (24-b) to be felicitous, it suffices if a certain warlord had millions before. The truth/felicity conditions for (24-b) are given in (25):

(25)  ∃x (warlord(x)) & ET: AT(millions, locx, i’) &
      LT: ¬AT(millions, locx, i) & AT(millions, locx, i’) & i < i’

In (25), the presupposition triggered by wie der is ET: AT(millions, locwarlord, i’), the one triggered by the predicate is ¬AT(millions, locwarlord, i). Adding the latter presupposition to the presupposition triggered by wieder and furthermore quantifying over warlords seperately at ET and LT, we have the representation of the repetitive reading.

While the first reading one gets for (24-b) is indeed the restitutive one, a repetitive reading appears available as well, especially if one plays with focus. Introducing negation helps to single out the restitutive reading, though, cf. (26):

(26)  ...weil keinem Warlord wieder Millionen in die Finger kamen
      ...because no warlord millions again in the fingers came
      ‘...because no warlord got hold of millions again’

The reading that (26) gives rise to is just as the one in (25), except that we have a negative existential quantifier now; there is no warlord such that he has millions after the event that had millions earlier. Negation appears to prevent wieder from taking scope over the cipient and hence from taking scope over the negated ‘thingatloc’ meaning corresponding to the pre-state that is accommodated/bound by the cipient.

4.2 Too-comparatives

It is helpful to consider the examples that follow within scenarios. Imagine that there is a friendly contest between the German and the Palestinian national swimming teams. The contest is held in Palestine/Israel for the second time, the teams are the same. Due to circumstances, the water in the Palestinian pool is warmer than the German swimmers are used to. The German coach has reason to be worried that this may be a disadvantage for his team.

Under the first scenario, one of the German swimmers fails at the second contest. The German coach comments apologetically:
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(27)  
\begin{align*}
\text{a. Es war wieder einem Schwimmer das Wasser zu warm} \\
\quad \text{it was again a swimmer-DAT the water too warm} \\
\text{b. Es war einem Schwimmer wieder das Wasser zu warm} \\
\quad \text{it was a swimmer again the water too warm} \\
\text{‘A swimmer found the water too warm again’}
\end{align*}

Both comments presuppose that at the first contest, a swimmer failed as well; the difference between (27-a) and (27-b) is that there is a clear tendency to interpret (27-b) such that it was in fact one and the same swimmer that failed at both contests; again, however, intuitions become somewhat elusive after some consideration, especially if the focus structure is changed.

Under the second scenario, none of the German swimmers fails at the second contest. The German coach comments triumphantly:

(28)  
\begin{align*}
\text{a. Es war wieder keinem Schwimmer das Wasser zu warm} \\
\quad \text{it was again no swimmer-DAT the water too warm} \\
\text{b. Es war keinem Schwimmer wieder das Wasser zu warm} \\
\quad \text{it was no swimmer again the water too warm} \\
\text{‘No swimmer found the water too warm again’}
\end{align*}

The scope difference between (28-a) and (28-b) is clear: For (28-a) to be felicitous, it must have been the case at both contests that there was no swimmer that found the water too warm. In contrast, (28-b) is felicitous if at the first contest, there was in fact a swimmer that found the water too warm (and hence failed). Let us look how this comes about.

As in (27-a), \textit{wieder} has wide scope with respect to the cipient argument in (28-a). Therefore, we get the reading sketched in (29):

(29)  
\begin{align*}
\text{ET: } & \neg \exists x \text{(swimmer(x)) } \& \text{LT: } \neg \exists x \text{(swimmer(x))...}
\end{align*}

In (28-b), the cipient has wide scope with respect to \textit{wieder}; negation traps \textit{wieder} below the quantifier. \textit{Wieder} therefore cannot take scope over the standard, itself a presupposition (the negated thingatloc meaning) that is represented at the level of the cipient argument. Since we are talking about one and the same individual, we can ‘pull out’ the propositional meaning defining the cipient’s standard, that is, give it wide scope with respect to both ET and LT (cf. discussion in section 3.2):

(30)  
\begin{align*}
\neg \exists x \text{(schwimmer(x)) } & \& \neg \text{AT(water, deg}_{x}, i) \& \text{ET: } \text{AT(water, deg}_{x}, i) \\
& \& \text{LT: } \text{AT(water, deg}_{x}, i)
\end{align*}

The translation of (28-b) says that there is no individual with a certain standard as regards (acceptable) water temperature such that at an earlier (the presupposition) time and at a later (the assertion time), the actual degree to which water temperature was experienced exceeded the standard. (30) is however perfectly compatible with there being an individual that found the water too warm at an earlier time but not at a later time. In contrast to (28-a), (28-b) does not exclude this situation.
5 Summary

I have argued that an analysis of eventive and too comparative cipient constructions along the lines of (31) can account for ‘repetitive/restitutive ambiguities’ familiar from the eventive domain but similarly arising in too- comparative constructions:

(31)

\[
\begin{align*}
\text{NEG} & \quad \text{tP} \\
\text{XP} & \quad \text{tP} \\
& \quad \text{t} \\
\text{wieder} & \quad \text{PP/DegP} \\
\text{theme to(o) ground/much} & \quad \text{AT(theme,ground/much)}
\end{align*}
\]

In (31), the actually asserted meaning is encoded in the VP/AP; it says that there is something at a certain (degree) location, corresponding to the post state in the eventive case and to the actual degree instantiation in the comparative case. The pre-state (event) and standard (comparison) is represented at the level where the cipient is merged. If \textit{wieder} is prevented from taking scope over the cipient, it triggers a presupposition only corresponding to the post-state and actual degree instantiation respectively. Negation as amalgamating with the cipient quantifier in German appears to create such an island for \textit{wieder}. In eventive structures, post-states are essentially independent portions of meaning. The interpretation of too- comparative structures, in contrast, always involves reference to a standard. It is for this reason that repetitive/restitutive asymmetries are harder to detect in the latter case; it must be insured, in particular, that the cipient referent is the same in the presupposition triggered by \textit{wieder} and in the asserted meaning. Negation achieves this and brings out the analogy.

More work is needed on distinguishing kinds of presuppositions and their interaction with syntactic structure. A core feature of the analysis employed here is that syntactically present argument expressions may act as accommodators/binders for presuppositions projected from predicates.
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Abstract

In this paper, I argue that ‘two’ means ‘exactly two’ and in cases where there is an ‘at least two’ interpretation, this is due to pragmatic presupposition (often about speaker’s grounds). By contrast, I argue that ‘some’ means ‘a quantity (of)’. Where there is an ‘and not all’ interpretation this is due to pragmatic inference/implicature (about speaker’s grounds) based on some kind of Gricean Quantity maxim/principle - even in cases where the implicature is embedded.

1 Numerals

1.1 The Unilateral View

Consider a normal implication of (1a) given in (1b):

(1) a. Two of Mary’s students did well on the test
    b. No more than two of Mary’s students did well on the test

This probably would be a scalar conversational implicature if ‘two’ has a ‘unilateral meaning’. For instance if its lexical meaning could be characterised as follows:

(2) \( \text{two Fs } \leftrightarrow |\cup \{X: F(X) \land G(X)\}| \geq 2 \)

There have been many proposals that this implication is an implicature which would be premised on some Quantity maxim. (Gazdar 1979, Levinson 1981, van Rooy & Shulz 2004). Although these accounts differ, they are at pains to ensure that the implicature does not normally arise in downward entailing (DE) contexts. For example, that the implication in (1b) does not fall within the scope of the conditional in (3):

(3) If two of Mary’s students did well on the test, then Mary won’t be fired

This is reasonable when we look at other triggers for scalar implications. For instance, (4a) might often imply no one other than John did well on the test. This exhaustive implication does not attach to the antecedent of the conditional in (5a). Mutatis
mutandis, (4b) tends to imply that not both John and Bill did well while this implication disappears from the antecedent in (5b):

(4) a. John did well on the test  
    b. John or Bill did well on the test
(5) a. If John did well on the test, then Mary won’t be fired  
    b. If John or Bill did well on the test, then Mary won’t be fired

Intuitively, this makes sense from a Gricean perspective since implicatures based on the Quantity maxims turn on there being a more informative alternative content of what the speaker *says*. In the case of ‘A or B’ this alternative is ‘A and B’. Where there is embedding in a conditional, the alternative, ‘if A and B then P’ is no longer more informative and so there is no ground for this kind of implicature. We can characterise a unilateral view as follows:

Unilateral View: ‘two’ has unilateral lexical meaning (as suggested in (2)) and common scalar implications arise as Quantity-based conversational implicatures.

1.2 Problems for the Unilateral View

A great many observations have been made which suggest that numerals are different to other scalar items. It seems that numerals don’t behave like they have unilateral interpretations (Carston 1988, 1998, Horn 1992, Geurts 1998, i.a.). Here I will add some observations of my own (in I and III) in a survey of some of arguments.

I Downward Entailing Contexts: Consider the examples in (6):

(6) a. Everyone who has two children receives tax benefits  
    {Implies that the same goes for people with 3 kids, 4 kids etc}
    b. Everyone who has two children received tax benefits  
    {? Sort of implies that the same goes for people with 3 kids, 4 kids etc}
    c. No one who has two children received tax benefits  
    {No implication about 3, 4 etc kids}
    d. No one who has two children receives tax benefits  
    {May imply that people with 3, 4 etc kids receive benefit}

If the unilateral view is right, these should all have implications along the lines of (6a). But they do not. In particular, (6d) seems to imply that people with more than two children receive benefits. Even the suggested implication of (6a) seems to turn on a presupposed ‘covering law’ concerning how tax benefit rules are devised. Consider (7) by contrast where no such covering law would be presupposed:

(7) Everyone who has two children is happy

It seems that on its most accessible reading, what (7) says would be true if John is miserable but has five children. Note that, by contrast with (7), (8) seems to quantify
over people who have children and pets - as we would expect with the normal (unilateral) inclusive meaning of disjunction:

(8) Everyone who has children or pets is happy.

Indeed, it is easy to show how numerals should behave if the unilateral view is right by considering disjunction in contexts similar to those in (6). In each of (9a-d) the domain of quantification seems to include people who have children and pets. I.e. the negative quantifier makes no difference:

(9) a. Everyone who has children or pets receives tax benefits
    b. Everyone who has children or pets received tax benefits
    c. No one who has children or pets received tax benefits
    d. No one who has children or pets receives tax benefits

These data should make us suspicious. If the unilateralists are right, then we should understand all of these examples with downward entailing contexts in the same way - where ‘two Fs G’ has its unilateral interpretation. In fact, what we find is that the examples with numerals where there is a reading which is consistent the unilateralist view are only those where we can make some kind of presupposition about a covering law about receiving tax benefits. This is brought home by considering (10a) in two contexts (10b) and (10c):

(10) a. No one who has three children is happy
    b. Context A: People in society under discussion tend to be more stressed the more children they have
    c. Context B: The society under discussion is poor and more children means more prosperity

Indeed, contrary to the unilateralist view, it seems the that this data could be better explained if we assumed that numerals have a bilateral, ‘exactly’ meaning. In the case of (6a) the understanding could be explained by the presupposed covering law. This alternative account would also better explain the facts in (6d). The implication for (6d) could not be analysed as a conversational implicature based on the Quantity maxim if we assume that the meaning of ‘two’ is unilateral. It could be a quantity implicature if we assume a bilateral meaning for numerals and a contextual question along the lines of, ‘What’s the greatest number of children one can have and not receive benefits’.

Given that in many of these downward entailing cases, our intuitions would be explained if we assume the numerals are interpreted bilaterally, there is another problem for the unilateral view: normally, bilateral interpretations of scalars terms in DE contexts involves a marked operation (needing focus or special contexts). Eg where ‘some’ is concerned, there is no bilateral interpretation unless there is focus on ‘some’. Consider that (11a) wouldn’t be considered false given (11c) whereas (11b) would:

(11) a. John didn’t answer SOME$_F$ of the questions
    b. John DIDN’T$_F$ answer some of the questions
    c. Fact: John actually answered all ten of the questions
With focus on the polarity expression (as in (11b)), one could suppose that the example is read as a direct response to ‘John answered some of the questions’ where normally the scalar implicature is conveyed. Only if the focus is on “some” (as in (11)), do we get the reading where ‘some and not all’ is denied. We will return to this phenomenon in the second part of the paper.

Summary: There is unexpected behavior of numerals in DE contexts. In contrast to ‘some’ and ‘or’ it does not look like the favoured reading in DE contexts is the unilateral reading. It looks like ‘at least’ reading for numerals in DE contexts turns on special presuppositions. This weakens the case for the unilateral view since the ‘at least’ reading should be the ‘default’.

Where there is a bilateral interpretation of numerals in DE contexts, unilateralists would have to concede that some form of pragmatic intrusion is going on. This form of intrusion yields a weaker interpretation overall than the literal meaning. This effect is not explicable in terms of (neo-) Gricean principles.

II Questions (Horn 1992): Consider the possible answers to the question in (12a).

The markedness of the answer to the ‘at least’ construal of the question is in contrast to the opposite pattern of markedness in the ‘many’ and disjunction cases.

(12) a. Do you have three children?
    b. No. I have two
    c. No. I have four
    d. ?Yes. (In fact) I have four

(13) a. Do some of your friends have children?
    b. ?No. All of them do
    c. Yes. (In fact) all of them do

(14) a. Did John or Mary pass the exam?
    b. ?No. They both did
    c. Yes. (In fact) they both did

On a Gricean view of scalar implications, the oddness in (13) and (14) make sense, since in the context of questions, the quantity maxims do not apply (questions in fact set the level of informativeness required). So, the pattern in (12) is unexpected if numerals have a unilateral meaning.

III Distribution of readings in root clauses: The implication of (1a) suggested in (1b) is meant to be a defeasible pragmatic implication. Factors which normally give rise to the cancellation of such implications are (i) explicit denial, (ii) contextual relevance or (iii) contextual or world knowledge. (15b) and (16b) are cases where contextual/world knowledge blocks a defeasible inference:

(15) a. Mary enjoyed the book
    {Defeasibly implies the enjoyment stems from reading}
    b. The goat enjoyed the book  (Lascarides & Copestake)
According to unilateralists, the ‘at most’ implication for numerals is defeasible and should be cancellable where world knowledge dictates. But consider (17a,b) - where in spite of world knowledge, they tend to be read as having bilateral interpretations:

\[(17)\]
\[
a. \text{Two people watched the big football final} \\
b. \text{Two people played in the big football final}
\]

Here things seem the other way around. It seems that, in order that we get the ‘at least two’ readings in root clauses, we need some special kinds of context. In particular, we need contexts where the speaker is employing the rhetorical device of introducing individuals (for instance, into a narrative).

\[(18)\]
\[
a. \text{Let me tell you a story. Two people watched the big football final...} \\
b. \text{Let me tell you a story. Two people were watching the big football final...}
\]

The ‘at least’ reading becomes easier in (18b) where we use the English imperfective. This is a standard device for ‘zooming in’ on a specific situation.

The individual-introducing rhetorical move is usually employed in examples to motivate dynamic analyses of anaphoric relations:

\[(19)\] (Let me tell you a story) Two men were walking in the park. They were whistling.

Example discourses such as in (18b) and (19) are an important source for intuitions that numeral terms have unilateral meanings. It is important to note here that while the discourses in (19) as a whole does not imply that only two men walked in the park, the speaker’s referent introduced in the first sentence is a collection containing exactly two men (the set containing the two men the speaker has in mind - see Stalnaker 1998). This speaker’s referent is then the referent of the pronoun in the second sentence. According to the analysis in Stalnaker (1998), the proposition that at least two men were walking in the park and were whistling does not directly follow from what is said by the constituent sentences but can only be obtained through some combination of what is said and a pragmatic inference.

### 1.3 Alternatives to the Unilateral View of Numerals

It has become more widely accepted that the unilateralist position for numerals is not well supported. This is in contrast to the unilateralist position for ‘some’ and ‘or’. Considerations like those above have led many to make an exception of the numerals among so-called scalar terms.

Carston (1998) entertains two analyses of numerals. One is the bilateral account being defended here. The other is an ‘underspecification’ account. According to the latter,
whether a numeral is understood as ‘at least n’, ‘exactly n’ or ‘at most n’ could be left unspecified by the meaning of “n Fs” - just as the relation between John and the book in “John’s book” is unspecified by the meaning of the possessive construction. Although she expresses a mild preference for the underspecification account, she leaves the matter open.

Some of the data discussed above suggest that the underspecification account may not be correct. For example, it does not explain the asymmetry in the downward entailing contexts (I) and root clause cases (III). For instance, one would expect a general default-to-the-strongest-meaning strategy being employed in DE cases. That is, given the underspecification proposal it is open whether numerals have a unilateral or bilateral interpretation and only the context is the determining factor. But it is well known that where there are two logically related candidate interpretations of an expression, then the interpretation which is favoured, ceteris paribus, is the logically stronger. In the DE case, this would be the unilateral interpretation. But intuition suggests that in DE contexts the bi-lateral interpretation is favoured.

One would also expect an ‘at least’ preference in root clauses where world knowledge is incompatible with the ‘exactly’ reading. But, again, intuition suggests that we understand numerals bilaterally even where this understanding conflicts with world knowledge. This suggests that the interpretations are not underspecified by the meaning in the way Carston suggests.¹

Of the other discussions of numerals mentioned, although Horn (1992) provides much evidence for the fact that numerals are not the same as other scalar terms, no positive account is offered. Geurts (1998) only says that ‘two’ has a bilateral meaning. (It could also, therefore be homonymous between a unilateral and bilateral meaning). No account of cases where there is an ‘at least’ reading for numerals is offered.

Kratzer (2003) suggests that it wouldn’t be crazy to say that all scalar terms have bilateral meaning if one assumed that all natural language predicate expressions contain situation variables and that what NL sentences express is a property of situations. Thus:

\[(20) \begin{align*}
\text{a. } ||\text{some children}|| &= \lambda P \lambda s. \exists x [\text{child}(x)(w_s) &\langle P(x)(s) \rangle &\exists x [\text{child}(x)(w_s) &\langle \neg P(x)(s) \rangle \\
\text{b. } ||\text{two children}|| &= \lambda P \lambda s. |\{x: \text{children}(x)(w_s) &\langle P(x)(s) \rangle| = 2
\end{align*}\]

As Kratzer observes, one could get an account of the different readings by assuming that either the situation variable is fixed by context or ‘bound by the usual existential closure operations’. But in fact she does not advocate this analysis since, according to (20), the proposition which “Some/Two children play” expresses would not be persistent.

¹ Carston’s proposal may seem to have an advantage over the current one since it also covers the ‘at most’ reading of numerals that arises in modal and related contexts - eg (i):

(i) I can fit four people in my car

While there is little room to discuss these cases in detail, it will hopefully be apparent that, given a bilateral meaning for numerals, the ‘at most’ reading would follow as plausible inferences in these contexts.
Independently of theory-internal problems, Kratzer’s idea seems to be on the right track - at least for numerals. Where the speaker gets us to ‘zoom in’ to some specific situation, then there is no impression that “Two Fs G” implies that no Fs have G beyond the situation under discussion. Somehow in these cases we restrict what is said to be just about this specific situation.

1.4 Proposal

So, the proposal is that numerals have a bilateral meaning. For instance:

\[(21) \quad \text{two Fs G} \leftrightarrow |\cup \{X: F(X) \land G(X)\}| = 2\]

In cases where there is an ‘at least reading’ this can be due either to contextual restriction (to a specific situation), speaker presupposition or both. In the next section, I will discuss how contextual restriction involving specific situations may be accounted for.

1.5 Contextual Restriction: Situation variables or ‘Contextual Supplementation’?

Kratzer’s (2003) suggestions for the bi-lateralist treatment of scalar terms is of a piece with Kratzer (2004) which motivates the use of situation variables in natural language predicates as a means to account for implicit contextual restriction in quantification. The use of situation variables for quantifier domain restriction is familiar from Barwise & Perry (1983) who introduced the idea of a ‘resource situation’. The restriction of predicates in natural language to specific situations is less often discussed but just as easily motivated. For instance, we normally understand what is said by (22) to be about a specific place. This fact could be explained in terms of the reference of a situation variable - of the type Kratzer suggests.

\[(22) \quad \text{It’s raining}\]

However, there is a well-known argument due to Soames (1986) contra Barwise & Perry that not all restriction can be via the reference of situation variables. The strategy Soames adopted to demonstrate this involved the referential-attributive use of definite descriptions. The idea is that there are cases of so-called incomplete descriptions that only involve some kind of attributive characterisation of the reference, so that what is said does not involve the individual in the resource situation directly. For example, the truth-conditions of the proposition expressed by an utterance of (23) upon the discovery of the mutilated body of Smith does not involve the actual murderer across counterfactual possible worlds. But they would do if the (murder) situation under discussion were meant to supply the contextual information:

\[(23) \quad \text{The murderer is insane}\]

Similar considerations apply to cases of implicit propositional restriction - demonstrated by (22) above. An example parallel to Soames’ (23) would involving a non-persistent sentence where the contextually determined proposition is, in the appropriate sense,
attributive. So, were (24) to be uttered upon the discovery of Smith’s body floating down a river, then the relevant resource situation would be that preceding Smith’s death (by multiple stabbing). But the intended proposition expressed would be attributive - that Smith wasn’t stabbed just once in whatever situation he was murdered.

(24) Smith wasn’t stabbed just once

So, there is reason to be sceptical that situation variables alone will suffice to account for implicit restriction. Moreover, there is reason to think that the presence of such variables in linguistic forms complicates the analysis of quantificational sentences. This is so since special stipulations would be required for non-monotonic quantification - given Kratzer’s own persistence criterion. That is, in order to preserve this criterion, one would have to specify that what a sentence like ‘Exactly two Fs G’ expresses is only a function of total situations (worlds).

So, while we want to claim in this paper that utterances can be about specific situations - in some sense - we will avoid the complications of Kratzer’s framework by assuming that what general statements (containing quantificational expressions) express is a function of worlds. We will assume instead that reference to less-than-worldly situations using general statements is indirect and that specification of such situations can appear as part of what gets expressed via implicit contextual restriction. (Cf Kripke (1977) on referential uses of definite descriptions).

Apart from Kratzer’s approach (and outside of dynamic approaches), contextual restriction is accounted for either with hidden variables (Stanley 2000, Stanley & Szabo 2000) or not (see Perry 1998, Recanati 2002, Breheny 2003 i.a.). Either way, we end up with a proposition where the contextually supplied material itself is (or can be) attributive. This assumption happens to conflict with Soames’ precept that only objects can be supplied by context. There is however reason to think that Soames’ precept is too severe (see Stanley & Szabo, 2000). In what follows, we will not adopt any particular framework for the analysis of contextual restriction. Instead we will offer descriptive characterisations of the effects of contextual supplementation - however achieved.

1.6 (Implicit) Specificity in Utterances

The main idea to be employed here is that implicit contextual restriction can involve a kind of token-reflexive, deferential situational specification (or token-reflexive, deferential individual specification). I.e. the restriction will be along the lines of ‘whatever is the identifying situation type the speaker has in mind in uttering u’. The predicate expression certain\textsubscript{s} will be used in translations for such a description:

(25) a. certain\textsubscript{s} to express the identifying property (of situations) which the speaker has in mind in making u.

b. certain\textsubscript{i} to express the identifying property (of individuals) the speaker has in mind in uttering u.

In both cases, certain\textsubscript{s} is necessarily satisfied by one thing if at all.

Let’s reconsider (19):
Following Stalnaker (1998) (see also Breheny 2004, 2002), we get the geachian reading for such discourses where we make assumptions about the speaker’s ground for her utterance. We can suppose that we have the option of restricting the interpretation of the first sentence along the lines in (26) where the bracketed material is supplied by contextual supplementation.

(26) Two men were walking in the park [in a certain situation].

We have independent motivation for this kind of contextual supplementation from the case of specific indefinites. Both (27a,b) can be understood so that they do not imply (28a) but (28b)

(27) a. If a certain uncle of John’s dies, John will be rich
    b. If an uncle of John’s dies, John will be rich

(28) a. $\exists x [\text{uncle_of}_j(x) \land \text{die}(x)] \rightarrow \text{rich}(j)$
b. $\exists x [\text{uncle_of}_j(x) \land (\text{die}(x) \rightarrow \text{rich}(j))]$

An appealing analysis of both (27a,b) is that the indefinite is behaving more like a definite description, picking out a unique individual. Which individual? The one which figures as the denotation of an identifying property in the speaker’s ground for the claim. The role of ‘certain’ in (27a) is to express that identifying property explicitly, but in (27b) we need to assume that this property enters what is expressed via implicit contextual supplementation. Thus, the proposition expressed in both cases can be rendered as in (29):

(29) $\exists x [\text{certain}_u(x) \land \text{uncle_of}_j(x) \land \text{die}(x)] \rightarrow \text{rich}(j)$

As appealing as this analysis is, it has its detractors who feel that it is not sufficient. One kind of argument to this effect turns on the observation that not all uses of even explicitly specific indefinites involve the speaker having an individual ‘in mind’.

I have argued elsewhere (see Breheny 2002/3) that many apparent cases where specifics are used without the speaker having someone definite in mind are cases where there is a deferential property attribution in the mind of the speaker herself. Important in that account is the idea of notion networks from Perry (2001). These constitute the basis of causal chains among agents’ representations of some individual. Where one agent gains information about an individual from a second agent’s utterance, it may be that the only identifying property the first agent can attribute to the individual under discussion is that of standing at the end of the notion network in which the second agent’s notion is embedded.

While contextual supplementation involving a specific situation could account for ‘at least two’ readings of numerals in root clauses, there are still many other kinds of case where there seems to be unilateral reading.
Let us consider again (6a):

6a. Everyone who has two children receives tax benefits
    {Implies that the same goes for 3 kids, 4 kids etc}

Assuming the bilateral analysis for ‘two’, the appearance of a unilateral reading may due to a presupposed covering law:

(30) Tax benefit laws are designed such that for each number above the minimum fixed by the government, everyone with that number of children receives benefit.

As was suggested above, this kind of account is consistent with our intuitions where it is difficult to infer such a covering law - such as in (7).

But there may be cases where in a DE or other context, we want to say that what is conveyed involves a unilateral proposition. For example, we may wish to say that (31a) expresses a proposition similar to that for (31b) in a case where (31a) itself is embedded - as in (31c):

(31) a. If two students fail then the teacher will be fired
    b. If any two students (in the context) fail then the teacher will be fired
    c. It’s not true that if two students fail then the teacher will be fired

This kind of problem is similar to that raised in Chierchia (2001a) in relation to our account of specific indefinites (outlined in relation to (27) above). Chierchia’s objection to our account involves an ‘intermediate scope’ reading of a specific indefinite where negation is involved. Consider that both (32a,b) can be read as being equivalent to (32c):

(32) a. It’s not the case that if an uncle of John’s dies, John will be rich
    b. It’s not the case that if a certain uncle of John’s dies, John will be rich
    c. $\neg \exists x \left[\text{uncle_of_J(x)} \land (\text{dies(x)} \rightarrow \text{rich(j)})\right]$

For cases like these, Chierchia suggests that one needs an analysis of indefinites as introducing a variable (over choice functions) which can be bound by a free existential closure mechanism. But such a proposal has little appeal since there is no independent motivation for such a mechanism existing in language.

For both kinds of case, (31) and (32), we need further presuppositions about the type of the individual or situation the speaker has in mind (see Breheny 2002). In the case of (32), we could presuppose (33) (where $\Box$ is for speaker presupposition):

(33) $\forall x \Box \text{certain}_a(x) \rightarrow (\exists y[\text{uncle_of_John(y)} \land (\text{die(y)} \rightarrow \text{rich(j)})] \rightarrow (\text{die(x)} \rightarrow \text{rich(j)})$)

This says that it is presupposed about the identifying property that whatever it applies to is such that if there is an uncle of John’s who is such that if he dies John gets rich then
the certain uncle is such that if it dies, John gets rich.

In general, if we have the specific indefinite in the scope of some operator, $O...a certain F$, and this whole construction is in some downward entailing environment, $neg O...a certain F$, then we can always construct such a presupposition for $certain$ so that we can have the intermediate scope effect without movement. Suppose $\phi(x)$ is the result of extracting a certain $F$ from inside the operator, $O...$, then the presupposition in general looks like:

$$\forall x \, □\, certain_u(x) \rightarrow (\exists y[Fy \land \phi(y)] \rightarrow \phi(x))$$

A similar analysis can be given for the cardinal case where the contextually supplied restriction can characterize a specific situation - as above. Consider again (31a) with an ‘at least’ reading as in (31b). The local $∃$-closure effect can be achieved firstly if, ‘two students fail’ is contextually restricted as ‘two students fail in a certain situation'; and secondly the presupposition in (35) is made (where $s = \phi$ reads ‘$\phi$ holds in $s$’):

$$\Box_w \forall s [s \subseteq w \land certain_u(s) \rightarrow (∃s’ [s’ \subseteq w \land s’ = two(student’)(fail’)] \rightarrow s = two(student’)(fail’))$$

The kinds of situation type which would be appropriate include the one where the first two students who fail fail.

Other cases where there is a fairly clear embedded ‘at least’ reading include universal modal contexts, predictions and bets ((37) is taken from Carston 1998):

$$\Box_w \forall w’ [w’ R w \rightarrow \forall s [s \subseteq w’ \land certain_u(s) \rightarrow (∃s’ [s’ \subseteq w’ \land s’ = two(F)(G)] \rightarrow s = two(F)(G))$$

2 ‘Some’: A Globalist or Localist Account?

The unilateralist view of ‘some’ goes roughly as follows: ‘Some Fs G’ has a unilateral

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2 See Cooper 1996 for GQ relations and situations. Note that while we are assuming that semantic conventions dictate that quantificational sentences express Russellian propositions, this presupposition assumes that two(student)(fail) can hold in situations. We do not pursue the details of that idea here but assume it is intuitively clear what this means.
meaning and where it is understood to imply that not all Fs G, this is due to some form of pragmatic inference based on Quantity principles. This view is much less problematic than the numeral case. There are however different versions of the unilateral view available. In this section, the unilateralist view of ‘some’ is adopted and some proposals are made concerning the lexical meaning and pragmatics of ‘some’ which hopefully make a globalist account of the computation of the pragmatic inference more desirable. The globalist account of a given pragmatic inference just says the inference is made based on global pragmatic principles as they apply to the given utterance in the given context. Alternatives to the globalist account exist in a variety of forms. Recently, Chierchia (2001b) has defended a localist account according to which common scalar implicatures are computed as default components of the model-theoretic, compositional interpretation of the trigger-containing sentence. A key factor Chierchia uses to support his view concerns the embedding of scalar implicatures in the scope of epistemic verbs and other contexts. Here I will explain how one could maintain a globalist account in such cases.

The first step is to say something about the lexical meaning of ‘some’. Intuition suggests it means simply, ‘a quantity of’. Here is a suggested translation based on that intuition:

\[(39) \text{some}_{\text{count}} = \lambda P,Q \ \exists n [\text{cardinal}(n) \land n(P)(Q)]
\]

\[\text{[where } n(P)(Q) \leftrightarrow |\bigcup \{X:P(X) \land Q(X)\}| = n]\]

Although the lexical meaning of ‘some’ is comparable to ‘a quantity of’, when it is used, the speaker may be suggesting something about the grounds he has for his utterance. In particular, the speaker may be suggesting he has a specific quantity in mind. This can be built into what gets expressed by the utterance as part of an implicit contextual restriction:

\[(40) \lambda P,Q [ \exists n [n \in \text{Card} \land \text{certain}_a(n) \land n(P)(Q)]]\]

Such contextual variability of determiner meanings is attested elsewhere - particularly with ‘many’ and ‘few’. Even ‘most’ is often understood as ‘almost all’ rather than ‘more than half’. So there is motivation that determiner interpretations may involve implicit contextual supplementation, just as their restrictors do.

Where the contextual supplementation suggested in (40) is made, and where it would be more relevant to know whether the totality of Fs have G, then we have the key condition for a scalar implicature - since the speaker could just as well have said ‘all’. That is, assuming we can take for granted that the speaker is in a position to know whether all Fs G and assuming he would tell us if he knew, then we can infer that he does not tell us because he thinks (knows) it to be not true. Hence we infer that not all F’s G.

Note that this could be referred to as a scalar implicature given the form that the inference takes. However, the content of that implication can be accommodated via a presupposition about certain - the quantity the speaker has in mind. I.e. in each alternative in the context set, the quantity of Fs which G is not the totality of Fs.

Given that the content of this pragmatic inference can be accommodated via speaker presupposition about the content of what ‘some Fs G’ expresses, we account for
Chierchia’s (2001b) examples where the implicature is apparently in the scope of ‘believes’. Eg (41) could be understood so that the speaker presupposes that in each of John’s epistemic alternatives, exactly a certain non-total quantity of Mary’s students do syntax.

(41)  John thinks that some of Mary’s students work on syntax

That is, the embedded sentence in (41) could be rendered, \( \exists n \in \text{Card} \wedge \text{certain}_n(n) \wedge n(M’s \text{ students’})(work_{on \text{ syntax’})] \) where it is presupposed that the quantity the speaker has in mind is non-total. So, the motivation for this case of ‘embedded implicature’ is still an application of scalar implicature based on a Quantity principle.

The treatment of ‘some’ being suggested here is based on the idea that the determiner’s interpretation is open to contextual specification and that 'some' is relatively non-specific about quantity. Other determiners which give rise to scalar implicatures include, ‘many’, ‘most’, ‘more than half’, ‘a few’ are similar to ‘some’ in as far as they relatively unspecific about quantity. Thus we could motivate a similar treatment of these determiners involving implicit contextual restriction so that scalar implicatures could be built into their interpretation.

The issue of other scalar triggers and their embedability is left open for another occasion save for the observation that one must look at things on a case by case basis. For example, it is very difficult to get embedded implicatures with disjunction. This can be illustrated with the pair in (44a,b).

(44)  a. If you eat SOME of the cake, you won't get fat
     b. If you eat the cake OR the cookies you won't get fat

In (44a) the implicature can be understood as embedded in the antecedent. By contrast, it is very difficult to understand (44b) to mean that you will get fat if you eat both the cake and cookies. Given that this is a genuine asymmetry, one could suppose that it is due, in part, to the fact that disjunction is relatively resistant to contextual supplementation.

3 Conclusion

Hopefully, the arguments of this paper add force to the to the suggestion that numerals ought to be treated differently to other scalar terms. Perhaps one reason why there has not been a broader consensus on this matter already has to do with the very many cases where numerals are apparently understood to mean 'at least n'. In this paper, I have tried to work through some of the more salient cases and give an account of the 'at least' readings in pragmatic terms. Crucial use was made of the idea of contextual supplementation, of the ideas concerning specificity and also of speaker presupposition. These three factors were also made use of in a defence of the 'globalist' treatment of genuine scalar implicature cases - like 'some'. The 'globalist' treatment has been under threat from proponents of the idea that common scalar implications are somehow grammaticalised. The basis of this alternative stems from the apparent embedability of these implications. Here, an account was given of how the content of these genuinely global inferences may come to be embedded.
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SOME SCALAR IMPLICATURES REALLY AREN'T QUANTITY IMPLICATURES
- BUT 'SOME''S ARE


THE CAMALEONIC NATURE OF FRENCH NI: NEGATIVE COORDINATION IN A NEGATIVE CONCORD LANGUAGE *

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Abstract

The main goal of this paper is to defend the claim that ni, the French counterpart of neither and nor is always a negative conjunction which takes part in the negative concord system of French. The interpretation one seems to get for this negative concord ni varies depending on the environment where it occurs: depending on its scope position with respect to other negative expressions in the sentence it may alternate with and, or and and not. The paper considers some consequences of this cameleontic behaviour for theories of negative concord.

1 How different are ni1 and ni2?

There are two instances of ni in French. One (ni1) that precedes the first conjunct and one that precedes the second (or third etc.) conjunct (ni2). The first ni can often be omitted. At first sight, the two instances of ni seem to be fundamentally different (see De Swart 2001). Whereas ni1 functions as a negative concord expression, ni2 seems to be a negative polarity item. This claim can be defended on the basis of the data in (1) and (2).

The paradigm in (1) shows that a single ni2 needs a negative environment. Without further negative material ni2 is excluded. Once ni1 is added, the problem is solved. This can be understood once we assume that ni2 is an NPI, and thus needs a negative environment, while ni1 is negative and as such does not need a negative environment and acts as a licenser of ni2.

(1) a. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    b. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    c. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    d. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    e. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    f. Personne n’a mangé ni bu
    nobody ne has eaten ni drunk
    ‘Nobody ate or drank’

    * This paper results from a class I teach at the French Department in Leiden, in which we read Henriëtte de Swart’s paper on ni, and compare ni to its Dutch counterpart noch. I wish to thank the students of these classes, as well as Henriëtte de Swart, the participants of LUSH (in particular Evangelia Vlachou, Joost Zwarts and Rick Nouwen), Johan Rooryck and the audience of SuB 9 for comments and fruitful discussion. I am grateful to Madeleine van Strien-Chardonneau, Feray Baskin, Brigitte Kamper-Mahne, Elisabeth Delais-Roussarie, Jean-Marie Marandin and Myriam Landard for French judgements. The research for this paper has been partly financed by NWO (grant #355-70-003).
b. *Jean a mangé ni bu
   Jean has eaten NI drunk

c. Jean (n’) a ni mangé ni bu
   Jean NE has NI eaten NI drunk
   ‘Jean did not eat or drink.’

The data in (2) confirm this hypothesis. As shown in (2a), ni2 can be found in the context of pas. Normally, this context is excluded for negative expressions in French, unless a double negative reading can be obtained. Ni1 patterns with other negative expressions such as rien. It is incompatible with pas unless a double negative reading is obtained (see Corblin et al., 2004). Again De Swart’s conclusion seems to be justified: ni2 is an NPI (can be licensed by pas), while ni1 is a negative expression (double negation in context of pas).

(2) a. Jean n’a pas mangé ni bu
   Jean NE has not eaten NI drunk
   ‘Jean did not eat or drink.’

   b. ?Jean n’a pas ni mangé ni bu
      Jean NE has not ni eaten NI drunk
      ‘Jean did not neither eat nor drink.’

   c. ?Jean n’a pas rien mangé
      Jean NE has not nothing eaten
      ‘Jean did not eat nothing.’

The main claim made in this paper is that this conclusion is wrong. Both instances of ni are negative concord expressions, similar to rien ‘nothing’. This claim will be defended on the basis of a comparison of ni and its Dutch counterpart noch. Before that, some basic information on negation in French will be given. The last sections of the paper consider consequences of this claim for theories of negative concord (NC), and more in particular, for theories that treat NC in terms of negative polarity (Ladusaw 1992, Van der Wouden & Zwarts 1993, Herburger 2001) and in terms of polyadic quantification (De Swart & Sag 2002).

2 Negation in French: some basic facts

French is a so called negative concord language. Several expressions that may function as single negative expressions are interpreted as a single negation when co-occurring in the same clause. This is illustrated in (4). The expressions rien and personne introduce a negation, and when used together they have preferrably a single negation reading:

(4) a. Pierre n’a rien dit
      Pierre NE has nothing said

   b. Personne n’a dit cela
      nobody NE has said that

   c. Personne n’a rien dit
      nobody NE has nothing said
      ‘Nobody said anything’ (double negation hard to get for most speakers)
Negative concord differs from negative polarity in several respects. In the first place, negative polarity items (or NPIs) need a negative expression in their environment. Negative concord expressions (NCEs) do not:

(6) a. \textit{Personne n’a dit quoi que ce soit} \hspace{1cm} \textit{CF. (4c)}
\textit{nobody NE has said anything}
\textit{‘Nobody said anything’}

b. \textit{*Pierre n’a dit \textit{quoi que ce soit}} \hspace{1cm} \textit{CF. (4a)}
\textit{Pierre NE has said anything}

Related to this is the impossibility to use bare NPIs as negative answers to questions. NCEs can be used in this context:

(7) a. – Qui a cassé le vase? \hspace{1cm} – \textit{*Qui que ce soit!}
\textit{who has broken the vase anybody}

b. – Qui a cassé le vase? \hspace{1cm} – \textit{Personne!}
\textit{who has broken the vase nobody}

French has a further test to distinguish NPIs and NCEs, which is compatibility with \textit{pas}. As already mentioned with respect to (2), NCEs are incompatible with \textit{pas} or give rise to double negation readings, while \textit{pas} is otherwise one of the best licensors for NPIs in the language:

(8) a. Il n’a pas dit \textit{quoi que ce soit}
\textit{he NE has not said anything}
\textit{‘He did not say anything’}

b. ?Il n’a pas \textit{vu personne}
\textit{he NE has not seen nobody}
\textit{‘He did not see nobody’}

NCEs in French are usually accompanied by \textit{ne}. The presence of \textit{ne} is not obligatory. It is usually left out in spoken French, especially in informal speech. In this respect French differs from a number of other NC languages, including Italian and Greek (for details on NC in these languages, see Zanuttini, 1991, and Giannakidou, 2000).

(9) a. Pierre a vu personne \hspace{1cm} \textit{[INFORMAL FRENCH]}
Pierre has seen nobody

b. *(Non) ho visto nessuno \hspace{1cm} \textit{[ITALIAN]}
not I-have seen nobody

b. *(Dhen) ipa TIPOTA \hspace{1cm} \textit{[GREEK]}
not said n-thing

It is not true, however, that \textit{ne} is meaningless. \textit{Ne} can be used as a negation in certain contexts, as illustrated in (10) (see Schapansky 2002):

(10) a. Si je ne me trompe
\textit{if I NE me mistake}
\textit{‘If I am not mistaken’}
The crucial properties of NCEs and NPIs, playing an important role in the rest of this paper, are summarized below.

**NEGATIVE CONCORD EXPRESSIONS**

**P1**
- **NCE**: give rise to single negation readings when used in combination with negative expressions
- **P2**: can have negative force (answers, use without other negative operator)
- **P3**: give rise to double negation readings in the context of *pas*

**NEGATIVE POLARITY ITEMS**

**P1**
- **NPI**: give rise to single negation readings when used in combination with negative expressions
- **P2**: do not have negative force
- **P3**: give rise to single negation readings when used with *pas*

3  **Ni2 is not an NPI but an NCE**

As discussed above, first sight evidence points towards an analysis of *ni* that distinguishes between the NCE *ni1* and the NPI *ni2*. Unless *ni1* is present, *ni2* cannot be used in bare coordination, and thus contrasts with NCEs such as *personne* ‘nobody’ (13a,b). Note that *ni2* also contrasts with Dutch *noch2*. The contrast between (13b) and (13c) suggests strongly that *noch2* has negative force while *ni2* does not.

(13)  

a. Qui as-tu vu? – Personne  
‘Who have you seen? – Nobody.’

b. Qui as-tu vu, Jean ou Pierre? – *Jean ni Pierre/ Ni Jean ni Pierre  
‘Who have you seen, Jean or Pierre? – Neither Jean nor Pierre.’

c. Wie heb je gezien, Jan of Piet? – (Noch) Jan noch Piet  
‘Who have you seen, Jan or Piet? – Neither Jan nor Piet.’

If we add to this that *ni2* is compatible with *pas* as shown in (2) above, the conclusion seems to be rather straightforward: *ni2* is an NPI.

However, if we consider the example in (14), this conclusion is untenable. *Ni2* turns out to function as a real negation whenever the first conjunct is negated in the discourse.

(14)  

a. Qui est-ce qui va semer ce blé? dit la petite poule rouge. – Pas moi, dit le dindon. – Ni moi, dit le canard  
‘Who will plant this seed? the little red hen asked. – Not me, said the turkey. – And not me, said the duck’

b. ...mais qui donc osera y entrer le premier ? Ce ne sera pas moi. – Ni moi. – Ni moi. – Ni moi.  
‘But who then dares to enter first? It won’t be me. – Me neither etc.’
How can this observation be accommodated with the facts in (1), (2), and (13)? First, note that Dutch noch2 fails to negate the first conjunct in some configurations as well. Whenever the conjunct preceded by noch2 is extraposed, a separate negation for the first conjunct has to be included.

(15) a. *Ik heb Jan gezien, noch Piet  
    I have Jan seen       NOCH Piet
b. Ik heb Jan niet gezien, noch Piet  
    I have Jan not seen    NOCH Piet
c. Ik heb noch Jan gezien, noch Piet  
    I have NOCH Jan seen    NOCH Piet

The examples in (13)-(15) point towards a different analysis of (13b) and of the contrast between ni2 and noch2. Both ni2 and noch2 need a negative first conjunct. Ni and noch differ in their capacity to negate the first conjunct. Ni2 simply never negates the first conjunct, and hence the presence of a separate negation for the first conjunct is always necessary. On the other hand, noch2 may license a negative reading of the first conjunct, but only in certain syntactic configurations. Whenever the two conjuncts do not form a constituent at the surface, as in (15), where the second conjunct has been extraposed, noch2 depends on the presence of a separate negation for the first conjunct.

In a sense, noch2 seems to be the more surprising case. How does a negative conjunction, that precedes the second conjunct, negate the first conjunct? I will leave this question aside, but wish to emphasize that the French pattern, in which ni is simply incapable to negate a first conjunct, but still requires the first conjunct to be negative, seems to be easier to explain, for instance in terms of a presupposition similar to the one introduced by expressions such as also. Note also that in older stages of French ni could be used with a positive first conjunct (see for instance Foulet 1977).

So far it has been shown that ni2 behaves like an NCE with respect to negative force; it has P2NCE rather than P2NP. But what about P3NP? As shown in (2), ni2 is compatible with pas, while normally NCEs are not. Given that ni2 has negative force and thus should be analysed as an NCE, we do not expect it to be compatible with pas. Before turning to the French data, it is useful to look once more to the examples in (15). More in particular, the examples do not have a double negation reading on the second conjunct, showing that the second conjunct is not in the scope of the negation marking the first conjunct. This conclusion is not very surprising, as the second conjunct has been extraposed.

This immediately suggests an alternative analysis to the data in (2). As the second conjunct is sentence final, it might very well be compatible with pas because it has been extraposed. In that case ni2 is outside of the scope of pas. Pas simply provides the independently necessary negation for the first conjunct. This hypothesis can be tested in various ways. Consider first the data in (18). The ungrammaticality of (18a) and (18b) show that aucun ‘no’ cannot be used in the scope of pas. This is in accordance with its NCE status. As soon as ou ‘or’ in (18b) is replaced by ni, as in (18c), the sentence is fine. This is strong evidence for the ideas put forward above. Aucun cannot be in the scope of pas, and thus the second conjunct in (16c) cannot be in the scope of pas and has to be extraposed. The extraposition of the second conjunct has two further
consequences. In the first place, *ni* is a negative conjunction, and in the second place, there is negative concord of *ni* and *aucun*.

\[
\begin{align*}
\text{(16) } & a. \quad ?*\text{Jean n’a pas lu aucun livre de Diderot} \\
& \quad \text{Jean NE-has not read no book of Diderot} \\
& b. \quad ?*\text{Jean n’a pas [lu [Candide ou aucun livre de Diderot]]} \\
& \quad \text{Jean NE-has not read Candide or no book of Diderot} \\
& c. \quad \text{Jean n’a pas [lu [Candide] [ni aucun livre de Diderot]} \\
& \quad \text{Jean NE-has not read Candide NI no book of Diderot} \\
& \quad \text{‘Jean did not read Candide nor any book by Diderot.’}
\end{align*}
\]

The hypothesis is further confirmed by the behaviour of coordinated subjects. In case extraposition is crucial for the compatibility of *ni* and *pas*, cases where the second conjunct is not sentence final and does not have an alternative analysis in terms of extraposition are expected to be excluded. This turns out to be true. Note that that the impossibility of (17a) is really due to the presence of *pas* and not to the impossibility to license NPIs in subject position. As soon as *pas* is left out the sentence is fine.

\[
\begin{align*}
\text{(17) } & a. \quad *\text{Pierre ni Marie n’ont pas pu participer au séminaire} \\
& \quad \text{Pierre NI Marie NE have not been able to attend the workshop} \\
& b. \quad \text{Pierre ni Marie n’ont pas pu participer au séminaire} \\
& \quad \text{Pierre NI Marie NE have been able to attend the workshop}
\end{align*}
\]

The conclusion so far is that *ni* is always a NCE. It has properties P2^{NCE} and P3^{NCE} and lacks P2^{NPI} and P3^{NPI}. The following sections will be devoted to the question how this special type of NCE interacts with other NCEs. In the first place, the interpretation of *ni* will be investigated. After that, some consequences for theories of NC will be explored.

## 4 The many appearances of *ni*

This section deals with the interpretation of *ni* in various contexts. It turns out that *ni* has, at least at first sight, different interpretations, depending on its scope position with respect to other NCEs. The interpretations it seems to have vary from *and not to or and and*, and varies with the quantificational context in which *ni* occurs.

Let us consider first the simple case, already illustrated in (14). (14a) is partly repeated in (18). In this type of example the interpretation of *ni* is interpreted as Boolean ‘and’ followed by a negation (\(\wedge \neg\)), plus the presupposition that the first conjunct has to be negative as well.

\[
\begin{align*}
\text{(18) } & \quad \text{Pas moi, dit le dindon. – Ni moi, dit le canard} \quad \text{CF. (14a)} \\
& \quad \text{‘Not me, said the turkey. – And not me, said the duck’}
\end{align*}
\]

When *ni* is used in the scope of an NCE, it is equivalent to Boolean ‘or’ (\(\lor\)).

\[
\begin{align*}
\text{(19) } & a. \quad \text{Personne n’a mangé ni bu} \\
& \quad \text{nobody NE has eaten NI drunk}
\end{align*}
\]
When *ni* has wide scope over two NCEs (usually in a coordination of *aucun N* and *aucun N*), the interpretation seems to be Boolean ‘and’ (\(\wedge\)):

\[
(20) \quad a. \quad \text{Aucune réaction ni aucun effet ressenti}
\]
\[\text{‘No reaction and no experienced effect.’}\]

\[
b. \quad \text{Il n’existe aucun vaccin ni aucun traitement contre cette maladie}
\]
\[\text{‘There exists no vaccin and no treatment against this illness.’}\]

\[
c. \quad \text{NOx (reaction(x)) \wedge NOx (experienced effect(x))}
\]

Note that in this type of context both *et* and *ou* can be found as well. The possibility of *et* is not so surprising, but *ou* is not expected. This is, however, not related to the negative concord character of French, as similar disjunctions are found in Dutch and English, as shown in (22) (the data in (20)-(22) were found on internet). Given the interpretation of (21b) and (22a,b), *ou*, *of* and *or* have to be non-Boolean in these contexts. The non-Boolean interpretation of *or* will be left aside here, but see Alonso-Ovalle (2004).

\[
(21) \quad a. \quad \text{Ce thème n’a été traité dans aucune émission, aucun livre \textbf{et} aucun article}
\]
\[\text{‘This theme has been treated in no emission, no book and no article’}\]

\[
d. \quad \text{Aucune personne \textbf{ou!} aucun groupe n’est au-dessus de la loi dans notre société}
\]
\[\text{‘No person or no group is above the law in our society’}\]

\[
(22) \quad a. \quad \text{Hij vertoont geen enkel barstje \textbf{of!} geen enkel teken van een midlife crisis}
\]
\[\text{he shows not a single chap or not a single sign of a midlife crisis}\]

\[
b. \quad \text{No person \textbf{or!} no situation is totally perfect}
\]

A final context, and also the most intriguing one, is provided by sentences such as (23a), in which *ni* has intermediate scope. Given the equivalence to Boolean ‘or’, we expect that same interpretation here. However, two quite remarkable things occur. In the first place, *ou* is not very good in this context, and in the second place, some speakers think *et* is a better alternative to *ni* than *ou*. In the English translation *or* is used, as expected.

\[
(23) \quad a. \quad \text{Marie/personne n’avait jamais préparé aucune question \textbf{ni} aucun exercice}
\]
\[\text{Marie/nobody NE had never prepared no question NI no exercice}\]

\[
b. \quad \text{Marie/personne n’avait jamais préparé aucune question \textbf{? et/ ?*ou} aucun exercice}
\]
\[\text{‘Marie had never prepared any question or any exercise.’}\]

The pattern, however unclear it may be, is confirmed by what we find in NC Dutch. This variant of Dutch has particularly often sequences of the form *nooit geen* ‘never no’. However, coordinations of the form *nooit geen N en/of nooit geen N* are extremely
rare, and usually contain *en*. All examples found with help of the search engine Google for “nooit geen * en geen” and “nooit geen * of geen” are listed in (24). Note that the only example containing *or* originates from a 19th century text by Gerrit van der Linde.

(24) a. Nooit geen problemen en geen virii of spam op het netwerk hier
never no problems and no virusses or spam on the network here
‘There are never problems or virusses or spam on this network’

b. Nooit geen roest en geen slijtage
never no rust and no wear
‘Never rust or wear’

c. Ik heb nooit geen vader of geen schoondochter gehad
‘I never had a father or a daughter in law’

Speakers of this variant of Dutch prefer the use of *en* ‘and’ to the use of *or*:1

(25) a. Hij heeft nooit geen Engels en geen Frans geleerd
he has never no English and no French learned

b. Hij heeft nooit geen Engels of geen Frans geleerd
he has never no English or no French learned

Even though the judgements are not very clear, we can conclude that in intermediate contexts *ni* is the preferred option. In NC-Dutch coordinations of NCEs within the scope of nooit are avoided, and if they are found, the conjunction seems to be the preferred option.

This section can be summarized by a list of what we know so far about *ni* and offers an overview of the properties that should be explained by a theory of negative concord.

P1*ni*: *ni* is an NCE

P2*ni*: it cannot take scope over the first conjunct, even though it presupposes the presence of a negative first conjunct

P3*ni*: out of the scope of negation, *ni* is roughly interpreted as ‘and not’

P4*ni*: in the context *ni > NCE*, *ni* is roughly interpreted as ‘and’

P5*ni*: in the context NCE > *ni*, *ni* is roughly interpreted as ‘ou’

P6*ni*: in the context NCE > *ni > NCE*: status unclear and preference for *ni* above other conjunctions

P7*ni*: consequence of P3*ni*: we are dealing here with a negation, not with a negative quantifier ranging over events (*and not, not and never*)

1 Thanks to Henriëtte de Swart, Sergio Baauw, Marjoleine Alles and Joran van Hooijdonck for giving me judgements on this variety of Dutch. Note that speakers of this variety of Dutch interpret noch as if it means ‘or’ when used in the scope of negation. For speakers who do not accept NC (such as myself), noch is uninterpretable in the scope of negation:

(i) Niemand heeft gegeten noch gedronken
nobody has eaten NOCH drunk
‘Nobody ate or drank’ (or uninterpretable; double negation reading extremely hard to get)
5 Ni and the theoretical account of negative concord

In this section two approaches to negative concord will be examined in view of the data discussed above (for recent overviews of NC in the literature, see Corblin et al., 2004, and Zeijlstra, 2004). Given the data discussed so far, a theory of negative concord should account for the properties of ni listed above, as well as the three properties of negative concord expressions discussed in section 2. For reasons of space, the discussion will be restricted to two types of theories that at first sight at least are quite promising, even though the analysis of ni turns out to be problematic for both. A number of properties will not be taken into account in what follows. Obviously all theories of NC account for the fact that a series of NCEs in a sentence yields a single negation, and the claim that ni is an NCE has been defended above. Furthermore, I assume that the second property of ni (presupposition of a negative first conjunct) is independent from the theory of NC.

5.1 NPI-based approaches

In the literature various theories of NC have been proposed that make use of NPIs. According to some researchers, all NCs are NPIs. This type of account, however attractive it is at first sight, is not very convincing in view of French. As shown in section 2, NPIs and NCs have a very different behaviour in French. Moreover, an independent negation (non in Italian and dhen in Greek) is not necessarily present. Analyses that make use of real ambiguity seem to be more promising (see Ladusaw 1992, Van der Wouden & Zwarts 1993 and Herburger 2001). In this type of theory, NCEs are ambiguous between a negative quantifier or negation and an NPI, as illustrated in (26), where the highest NCE is the licenser of the lower NCE; the first is a negative expression while the second is an NPI:

\[(26) \text{Personne (n’)a rien vu NOx, } \exists y (\text{has seen } (x,y))\]

It is clear that the first and the second condition on NCs are met (P1,2\textsuperscript{NCE}). However, it has often been indicated in the literature that this type of approach has problems accounting for the fact that French pas is incompatible with a non-negative reading of NCs (P3\textsuperscript{NC}). Normally the sentential negation is one of the best licensors of NPIs, and the use of other NPIs such as quoi que ce soit is typically allowed in this context. This is one of the reasons why other theories such as the polyadic quantification theory have been developed (see Corblin et al., 2004, for discussion).

As for the properties of ni, the first relevant property (P3\textsuperscript{NI}: out of the scope of negation, ni is roughly interpreted as ‘and not’) suggests that negative ni means something like ‘and not’, or to be more precise, taking into account the presupposition with respect to the first conjunct, ‘and not … either’.

---

2 Two accounts that I regret not to include are Déprez’ (1998) analysis in terms of cumulative quantification and Zeijlstra’s (2004) recent approach to NC. As shown below there is quite some evidence that ni involves a non-Boolean, scopeless conjunction. This is interesting in view of Déprez’ idea that NCEs are essentially scopeless. On the other hand it is not immediately clear how ni should be accommodated in her theory, which only deals with negative quantifiers (see P7\textsuperscript{NI}).
When \( \mathit{ni} \) has scope over two NCEs (see P4\( ^{ni} \)), the interpretation of \( \mathit{ni} \) can be accounted for by assuming that the first of the NCEs functions as a negative quantifier, while the second is an NPI. This is illustrated in (27):

\[
\text{(27) a. aucune réaction ni aucun effet ressenti} \quad (= \text{(20a)})
\]
\[
\text{b. NOx (reaction(x))} \land \neg \exists y \text{ (experienced effect(y))}
\]

When \( \mathit{ni} \) is in the scope of another NCE, its interpretation is ‘or’, rather than ‘and’ (see P5\( ^{ni} \)):

\[
\text{(28) a. Personne n’a mangé ni bu}
\text{‘Nobody ate or drank’}
\]
\[
\text{b. Personne n’a mangé et bu}
\text{‘Nobody ate and drank’}
\]
\[
\text{c. Personne n’a mangé ou bu}
\text{‘Nobody ate or drank’}
\]

There is a truth conditional difference between (28a) and (28b), but not between (28a) and (28c). With in an NPI based account, this implies that the NPI interpretation is ‘or’ rather than ‘and’. The question is of course why this is so, given the negative interpretation ‘and not’.

There are two ways to address this. In the first place, it might simply be the case that \( \mathit{ni} \) is ambiguous between \textit{and not} and NPI \textit{ou}. The flip-flop in meaning between the two would might be related to one of the Morgan’s laws, which is given in (29).

\[
\text{(29) } \neg p \land \neg q = \neg (p \lor q)
\]

As a conjunction of two negated expressions is equivalent to a negated disjunction of the positive counterparts of these expressions, the change of meaning is not completely surprising. The negative variant of \( \mathit{ni} \) would be similar to a narrow scope negation in combination with a conjunction, while the NPI variant is a disjunction that needs to be in the scope of a negation.

A second approach would be the following. NC conjunctions entering in the scope of negation need not to be interpreted as non-Boolean conjunctions, as otherwise their scope interacts with negation in an undesirable way, again given the Morgan law in (29). Recently, the discussion of non-Boolean uses of conjunctions has been taken up by Szabolcsi & Haddican (2004). Szabolcsi & Haddican argue that Hungarian \( \mathit{és} \) is a non-Boolean conjunction, contrary to English \textit{and}, based on the contrast in (30). The meaning of the coordination in (30b) is similar to a definite description and obtained via sum formation (see also Hoeksema 1988).

\[
\text{(30) a. Mary didn’t take hockey \textbf{and} algebra}
\text{a. can mean ‘Mary did not take hockey \textbf{or} didn’t take algebra’}
\]
\[
\text{b. Mari nem járt hokira \textbf{és} algebrára}
\text{Mari not went hockey-to \textbf{and} algebra-to}
\]
b. cannot mean ‘Mary did not take hockey or didn’t take algebra’
   but can mean ‘Mary did not take hockey and did not take algebra’

The second way to account for the data in (28) is by assuming that ni is ambiguous
between ‘and not’ and ‘and’ after all, but that the NPI ni does not correspond to Boolean
and, but rather to non-Boolean and (represented as $\&^{\text{NB}}$), similar to Hungarian és.

\[(31) \quad \text{NOx} \ (\text{ate}(x) \ &^{\text{NB}} \ \text{drank}(x))\]

Even though at first sight appealing, this approach has a serious drawback (thanks to
Arnim Von Stechow for pointing out the importance of this issue). As seen above, ni
can be used to coordinate two quantificational expressions of the type aucun $N$ when
used under a negation, as in (23). This is not expected, as the quantificational status
of the two conjuncts should prevent sum-formation and a definite interpretation of the two
conjuncts. However, there are three arguments in favour of a non-Boolean approach that
suggest that under certain conditions at least, non-Boolean conjunctions should be
allowed to coordinate quantificational expressions. I will leave the analysis of this non-
Boolean and for further research.

The first argument for the idea that at least some instances of non-Boolean and may
coordinate two quantificational expressions is based on the distribution of et ‘and’ in
French. Usually, et is Boolean. This explains the truth-conditional difference between
(28b) and (28c). However, there are contexts, in which we expect to find ou given the
intended semantics, but we still find et, as in (32a). This is so in contexts where et is
embedded under sans. Interestingly, in these cases et can conjoin two expressions of the
form aucun $N$, as in (32b). The need for a non-Boolean interpretation of et in these
sentences is clear when comparing their interpretation to the examples in (30):

\[(32) \quad \begin{align*}
\text{a.} & \quad \text{essence sans plomb et additifs} \\
& \quad \text{petrol without lead and additives (no lead and no additives)} \\
\text{b.} & \quad \text{sans aucun médicament et aucun régime alimentaire} \\
& \quad \text{without no medicins and no alimentary regime} \\
& \quad (no medicins and no alimentary regime)
\end{align*}\]

The second argument is that, again in the context of sans, a double negation above ni
leads to the reading or, as shown in (33) and (34):

\[(33) \quad \text{Ce n’était pas sans intérêt ni beauté} \\
‘It wasn’t without interest or beauty’ \quad \neg \neg [p \ N I q] = p \land q \quad \text{(and not: } p \lor q)\]

\[(34) \quad \begin{align*}
\text{a.} & \quad \text{Nous ne pouvons pas commencer sans Jean ni Pierre} \\
& \quad \text{we NE can not start without Jean NI Pierre} \\
& \quad ‘\text{We need both Jean and Pierre to be present before we can start.’} \\
\text{b.} & \quad \text{Nous ne pouvons pas commencer sans Jean ou Pierre} \\
& \quad \text{we NE can not start without Jean or Pierre} \\
& \quad ‘\text{We need either Jean or Pierre to be present before we can start.’}
\end{align*}\]

These examples are particular interesting, especially when seen in contrast with (28). If
the NPI meaning of ni were simply ‘or’, the reading of ‘p $\ N I q$’ under a double negation

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(that is, two negations that cancel each other out) should be ‘p or q’ and not ‘p and q’. An analysis in terms of $\&^{NB}$ predicts exactly that under a single negation $ni$ resembles $ou$, while outside of the scope of negation and under a double negation, $ni$ resembles $et$.

A final argument in favour of an approach in terms of $\&^{NB}$ comes from the diachronic development of $ni$. Even though the predecessor of $ni$, $ne$, used to be an NPI in all of its uses, the ambiguity between $and$ above the scope of negation and $or$ below the scope of negation already existed (see Foulet, 1977). The following examples (Einhorn, 1974) illustrate this point. In (35a) the use of the NPI is licensed by a wide scope negation and the interpretation is $or$ and in (35b) the use of $ne$ is licensed by the fact that it introduces a question, and here the interpretation is $and$. These facts suggest that OF $ne$ was a (weak) NPI, meaning $\&^{NB}$.

(35)  
\begin{align*}
a. & \quad J \text{‘}n\text{‘}os \text{ Dieu reclamer ne ses saintz} \quad \text{(XIIIth century French)} \\
& \quad I \text{not dare god call-on NE his saints} \\
& \quad ‘I \text{do not dare to call on God } or \text{ his saints’} \\
b. & \quad D\text{o}nt \text{ estes vos, ne que querez?} \quad \text{(XIIIth century French)} \\
& \quad \text{from-where are you NE what do you want?} \\
& \quad ‘\text{Where are you from } and \text{ what do you want?’}
\end{align*}

The last context in which $ni$ can be used is the intermediate scope context. As shown above, the interpretation of $ni$ in these contexts is not so clear. The most important observation was the strong preference for the use of $ni$ in this context. The relevant data are given in (23) and repeated in (36):

(36)  
\begin{align*}
a. & \quad Marie/\text{nobody n’avait jamais préparé aucune question } ni \text{ aucun exercice} \\
& \quad Marie/\text{nobody NE had never prepared no question NI no exercice} \\
b. & \quad Marie/\text{personne n’avait jamais préparé aucune question? } et / ?*ou \text{ aucun exercice} \\
& \quad ‘\text{Marie had never prepared any question } or \text{ any exercice.’}
\end{align*}

Where does the preference for $ni$ come from, given that no such preference is found in other contexts? Ordinary NPIs do not have this property and $ou$ can be freely used in the scope of a negation (37a). A small internet search confirms the difference in pattern (37b,c).

(37)  
\begin{align*}
a. & \quad Je \text{‘}n\text{‘}ai aucun esprit de revanche contre qui que ce soit ou quoi que ce soit} \\
& \quad I \text{NE have no hard feelings towards whoever or whatever} \\
b. & \quad \text{Google hits: “qui que ce soit ou/ et/ ni quoi que ce soit”:} \\
& \quad \text{strong preference for } ou: \text{ ou: 173/ et: 22/ ni: 37} \\
c. & \quad \text{Google hits: jamais aucun * ou/ et/ ni aucun”} \\
& \quad \text{strong preference for } ni: \text{ ou: 2/ et: 1/ ni: 33}
\end{align*}

The discussion of NPI-based theories can end with a positive note: the fact that $ni$ is a conjunction fits in this theory very well. NPIs are known to be of various categories. Also, the NPI origin of these expressions is in accordance with this type of theory.

We may conclude that a theory that takes NCEs to be ambiguous between negative expressions and NPIs has a number of strong points in view of the analysis of $ni$. The
main problem of this type of analysis is that it fails to explain the strong preference for \textit{ni} in contexts such as (36). Furthermore, as pointed out already in the literature, NPI-based theories in general fail to predict the fact that NCEs give raise to double negation readings in the context of \textit{pas}. I will come back to this point in the next section.

5.2 NC in terms of polyadic quantification

De Swart & Sag (2002) argue that NC does not involve negative polarity, but really constitutes a different way of quantification: polyadic quantification. All negative expressions are taken together and form a single polyadic negative quantifier, as in (38):

\begin{equation}
\text{Personne n'a rien vu} \\
\text{NO} \left\{ \begin{array}{c}
\text{person(x), thing(y)} \\
\text{x, y}
\end{array} \right\} \text{ has seen(x, y)}
\end{equation}

An important advantage of this theory over the previously discussed one is that this theory predicts that a small set of expressions allows for NC readings when used together. These expressions can be part of a polyadic quantifier. \textit{Pas}, which cannot take part in the process of polyadic quantifier formation is thus excluded from the whole process and always introduces an extra negation. Thus, with respect to P3\textsubscript{NCE} (the one that says that \textit{pas} yields double negation readings when used with an NCE) the polyadic quantification analysis seems to be preferred.

It has to be noted, however, that NCEs are found in typical NPI contexts, other than \textit{pas}. For instance, adjectives such as \textit{incapable} and even negated adjectives such as \textit{pas capable} license the use of an NCE in their complement clause (see Herburger 2001 for similar data in Spanish). This shows that the question with respect to \textit{pas} and its consequences for the theory of NCE one choses needs further investigation.

\begin{equation}
\begin{array}{l}
a. \quad \text{Il est incapable/pas capable de rien faire/ faire quoi que ce soit} \\
\quad 'He is not capable of doing anything' \\
b. \quad \text{Par miracle, il refonctionne mais je suis incapable de dire ni pourquoi ni comment} \\
\quad 'Surprizingly, it functions again but I am incapable to say why or how'
\end{array}
\end{equation}

When considering polyadic quantification in the light of \textit{ni} an important question one has to ask is whether the negations on the two conjuncts are part of the same polyadic quantifier or not. The two possibilities are illustrated in (40):

\begin{equation}
\begin{array}{l}
a. \quad \text{Pierre n'a ni mangé ni bu} \\
b. \quad \neg \text{ate(Pierre)} \land \neg \text{drank(Pierre)} \\
c. \quad \neg [\text{ate(Pierre,e1)} \land \text{drank(Pierre, e2)}]
\end{array}
\end{equation}

There is an important argument against the second approach. Note that De Swart & Sag argue that the negative quantifiers in a sentence are first stacked and then interpreted either as a polyadic quantifier or a series of negative quantifiers the first of which has scope over the second and so on. Hence the theory predicts that two negative quantifiers only form a polyadic negative quantifier in case the first can have scope over the other
as well. It is a known fact that coordinations do not allow an expression in the first conjunct to take scope over an expression in the second conjunct (see Progovac 2000). Hence, the type of analysis in (40b) seems to be preferred.

The ‘and not’ and ‘and’ interpretations are not problematic in this view. The basic meaning of \( ni \) is again ‘and not’. In contexts such as (20a), a polyadic quantifier is formed in the second conjunct, yielding a single negation reading for \( ni \) and \( aucun \). \( Ni \) and the second \( aucun \) form a polyadic quantifier. If we pursue this approach in cases where \( ni \) is in the scope of an NCE, some problems arise. What we should get to is a representation along the lines of the one in (42b). As \( ni \) is a negation and not a negative quantifier, \( ni \) introduces no variable, which is indicated by 0. However, it is far from obvious how this representation can be obtained.

\[
(42) \quad \begin{align*}
&\text{a. Personne n’a ni mangé ni bu} \\
&\text{b.} \\
&\hspace{1cm}0, \text{person}(x) \\
&\hspace{1cm}\text{ate}(x) \\
&\hspace{1cm}0, x \\
&\hspace{1cm}0, \text{person}(x) \\
&\hspace{1cm}\text{drank}(x) \\
\end{align*}
\]

On the other hand, the preference for \( ni \) in contexts where \( ni \) is in an intermediate position between two other NCEs (see (23)/(36)). Note that within a polyadic approach, the question how the two negative quantifiers in the two conjuncts and the wide scope negative quantifiers should be analysed is similar to the question raised by the polyadic analysis of \( ni \). Should these two \( aucun N \) expressions be part of the same polyadic quantifier or do we have a structure similar to (36)? If the polyadic analysis can be maintained, the analysis might offer an explanation for the preference for \( ni \) in this type of context. Consider the following data, involving ellipsis and extraposition, which might give an indication how the polyadic analysis might be saved:

\[
(43) \quad \begin{align*}
&\text{Niemand ging naar het park gisteren? of/ en *(ook niet)/ noch naar de markt} \\
&\text{no one/ went to the park yesterday or/ and (also not)/ nor to the market} \\
\end{align*}
\]

The second conjunct is intended to mean ‘and nobody went to the market’. For that we need a conjunction, a negation and an expression indicating the presupposition that the first conjunct is negative as well. In other words: we need \( ni \).

6 Conclusions

I argued in this paper that \( ni \) is always an NCE, and that its interpretation seems to vary with its relative position with respect to other negative expressions in a sentence. The observational part of the paper led to a number of desiderata for theories of negative concord. Two theories have been investigated in some detail: the theory according to which NPIs are ambiguous between a negative reading and an NPI reading (o.a. Ladusaw 1992), and the polyadic quantification approach (De Swart & Sag 2004). Even though both theories encounter problems with \( ni \), the balance seems to go slightly towards the ambiguity approach. Further research is necessary, in which ‘special’ NCEs such as \( ni \) should play a major part.
THE CAMELEONTIC NATURE OF FRENCH 'NI':
NEGATIVE COORDINATION IN A NEGATIVE CONCORD LANGUAGE

References


Quantificational Variability Effects with Plural Definites*

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Abstract

In this paper we give evidence that Quantificational Variability Effects (Berman (1991)) in sentences containing plural definites come about as an indirect effect of quantification over sum eventualities. Evidence for this claim comes from the fact that those sentences – in contrast to minimally varying sentences where the Q-adverb has been replaced by a quantificational determiner – have to obey two newly observed constraints in order to get QV-readings. We show that those constraints can be explained if an analysis that is based on Nakanishi/Romero’s (2004) analysis of the Q-adverb for the most part is combined with the results of Endriss/Hinterwimmer (to appear), where we offer an explanation for similar constraints in adverbially quantified sentences that contain singular indefinites.

1 Introduction

Quantificational Variability Effects (QVEs) (Berman (1991)) do not only occur with adverbially quantified sentences that contain singular indefinites and bare plurals (see Lewis (1975), Kamp (1981), Heim (1982), Diesing (1992), Kratzer (1995)), but also with ones that contain plural definites. The latter then get readings that can be paraphrased by sentences where the respective Q-adverb has been replaced by a quantificational determiner of corresponding quantificational force. This is shown in (1a, b) below:

(1) a. The people that lectured on kangaroos at the conference last summer were usually open-minded.
   b. Most people that lectured on kangaroos at the conference last summer were open-minded.

This, however, is not always the case, as is shown by the contrast between (2a) and (3a), on the one hand, and (2b) and (3b), on the other: In both cases, the adverbially

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quantified sentences are unacceptable\(^1\), while the corresponding sentences containing quantificational determiners are perfectly fine.

(2) a. "??The people that lectured on kangaroos at the conference last summer are usually open-minded.
   
   b. Most people that lectured on kangaroos at the conference last summer are open-minded.

(3) a. "??The people that listened to Peter’s lecture on kangaroos at the conference last summer were usually open-minded.
   
   b. Most people that listened to Peter’s lecture on kangaroos at the conference last summer were open-minded.

Note that (2a) differs only minimally from (1a) with respect to the tense of the matrix predicate. In (2a) – in contrast to (1a) – the tenses of the matrix clause predicate and the relative clause predicate do not agree. (3a) contains agreeing tenses of the matrix and the relative clause predicate, but is still unacceptable for reasons that will be discussed below. We will show that the unacceptability of both (2a) and (3a) can be accounted for under the assumption that Q-adverbs exclusively quantify over eventualities. If Q-adverbs were unselective binders which are able to also quantify over individuals (as in Heim (1982), Kamp (1981), Diesing (1992), and Kratzer (1995)), the contrast above would be completely mysterious. (2a) would then get exactly the same representation as (2b), and (1b) the same as (1a). But sentence (2b) is just as good as (1b), whereas (2a) is distinctly worse than (1a). This means that at the level of semantic interpretation, there would be no means to distinguish between the two versions and this contrast could not be expressed.

2 Background assumptions: The interval resolution strategy in adverbially quantified sentences that contain indefinites

2.1 Preliminaries

We assume that \(QVEs\) in adverbially quantified sentences containing indefinites come about via quantification over sets of eventualities/situations (see Berman (1987), de Swart (1993), von Fintel (1994), Rooth (1995), Herburger (2000)). Thus, we take Q-adverbs to denote quantifiers over sets of eventualities. Whereas the arguments of quantificational determiners are provided by the syntax, the arguments of Q-adverbs are determined on the basis of information structure. Their first argument (the \textit{restrictor}) is the denotation of the non-focal or topical part of the clause they are contained in, while their second argument (the \textit{nucleus}) is the denotation of the whole clause minus the Q-adverb (see Rooth (1985), Krifka (1995), Partee (1995), Rooth (1995), Herburger

\(^1\) Sentences (1a) and (2a) actually can get a non-QV-reading saying that (all) the people that lectured on kangaroos at the conference last summer are sometimes open-minded and sometimes not. Here, we are only interested in the reading where \textit{open-minded} is interpreted as an individual level predicate in the sense that if a person is open-minded at some point, this property holds for his/her entire life.
Furthermore, we assume that indefinite DPs are ordinary Generalized Quantifiers with existential force. 

QVEs can be observed if singular indefinites are interpreted in the restriction of Q-adverbs, which is the case if these indefinites are de-accented and thus belong to the non-focal part of the sentence. Each eventuality quantified over is assumed to contain one and only one individual that fulfills the predicate denoted by the NP-complement of the indefinite determiner. It is furthermore assumed that the individuals vary with the eventualities quantifier (see Berman (1987), de Swart (1993), von Fintel (1994), and Herburger (2000) for discussion). So there is an indirect effect of quantification over theses individuals. According to these assumptions, sentence (4a) is interpreted as in (4b) below:

\[
(4) \quad \text{a. A police car is usually [blue].} \\
\text{b. Most e} \ \exists x \ [\text{Arg(e,x)} \wedge \text{police car(x)}] \\
[\exists x \ [\text{Arg(e,x)} \wedge \text{police car(x)} \wedge \text{blue(e)}] \\
\]

Now consider the contrast between (5a) and (5b) below: (5a), where the relative clause verb is marked for past tense and the matrix verb is marked for present tense, is only marginally acceptable, while (5b), where both verbs are marked for past tense, is fine. This effect has to be explained, which will be done in the following section (see Endriss and Hinterwimmer (to appear) for an in depth discussion of the constraints restricting QV readings).

\[
(5) \quad \text{a. A car that was bought in the eighties is usually [blue].} \\
\text{b. A car that was bought in the eighties was usually [blue].} \\
\]

2.2 The interval resolution strategy

It is commonly assumed that quantifiers come with a covert domain restriction in the form of a free context variable \( C \) ranging over predicates (cf. von Fintel (1994), Stanley (2000), Marti (2003)) which is added conjunctively to the overtly given predicate that functions as the first argument of the quantifier. As eventualities need to be located in time (cf. Partee (1973), Lenci and Bertinetto (1999)), we assume that the context

---

2 Due to limitations of space, we will not be able to discuss the compositional details of the required clause separation (see the references above for details).

3 We follow Chierchia (1995b) and Herburger (2000) in assuming that stage-level as well as individual-level predicates introduce eventuality variables that are bound by Q-adverbs (see Kratzer (1995) for a different opinion). Furthermore, we also assume a Neo-Davidsonian event-semantics (see Parsons (1990)), according to which the denotations of verbs are decomposed into a core verbal predicate and thematic role predicates, which are added conjunctively to the core predicate. Note that in this framework the requantification problem (von Fintel (1994), s. also Krifka (2001)) is avoided, because theta-roles are assigned exhaustively, i.e. each eventuality quantified over contains one and only one (atomic or plural) individual that fulfills the respective thematic role predicate.

4 For some speakers, (5a) has a non-QV-reading where a car is interpreted specifically. Again, we are not interested in this reading, but assume be blue to be an individual level predicate with respect to cars.
variable introduced in the restriction of Q-adverbs is resolved to the predicate given in (6). The eventualities involved are thereby located in a time interval $i$. This interval needs to be determined on the basis of contextual information.

(6) $\lambda e. \tau(e) \subseteq i_e$,
where $\tau(e)$ denotes the running time of $e$ and $i_e$ denotes a time interval$^5$.

Furthermore, we assume the following (simplified) tense semantics:

(7) a. $\text{pres}(e) := t_0 \subseteq \tau(e)$.
b. $\text{past}(e) := \tau(e) < t_0$,
where $t_0$ denotes the speech time.

Now, according to the above assumptions, the initial semantic representation of sentence (5a) is as in (8) below$^6$:

(8) Most $e$ $\exists x [\text{car}(x) \land \text{Arg}(e, x) \land \exists e'[\text{buy}(e') \land \text{Theme}(e' x) \land \text{past}(e') \land \tau(e') \subseteq 80s] \land \tau(e) \subseteq i_e]$
$\exists x [\text{car}(x) \land \text{Arg}(e, x) \land \exists e'[...] \land \text{pres}(e) \land \text{blue}(e)]$

The next step would be to find a value to which the free interval variable $i_e$ can be resolved. We assume that this is done according to a pragmatic strategy called interval resolution strategy (see Endriss and Hinterwimmer (to appear) for details):

(9) 1. Take overt information, i.e. intervals denoted by temporal adverbials.
2. If not available: Take (the most specific) contextual information from the same domain (restrictor vs. nucleus), i.e. the running time of another salient eventuality.
3. If not available: Take either contextual information from the other domain, or the default interval $t_{\text{world}}$, which denotes the whole time axis.

In case of (5a), step 1. is not applicable, as there is no temporal adverbial that applies to the eventuality variable introduced by the matrix verb (although there is of course one that applies to the eventuality variable introduced by the relative clause verb (the eighties)). On the other hand, the relative clause introduces a contextually salient eventuality within the same domain (i.e. the restrictor): the buying event $e'$. Therefore, step 2. applies, and $i_e$ needs to be resolved to the running times of the respective eventualities. This has the consequence that the final semantic representation of (5a) is the one given in (10) below$^7$:

---

$^5$ In case of stative verbs, we assume that the largest eventuality of the respective kind that is included in the interval $i_e$ is picked out (see Endriss and Hinterwimmer (to appear) for details).

$^6$ In formula (8) and subsequent formulas, [...] abbreviates material of the restrictor that has to be repeated in the nucleus. Here, it stands for the logical translation of the relative clause.

$^7$ We assume that the second occurrence of $e'$ in (10) is bound dynamically by the existential quantifier that also binds this variable within the relative clause (see Groenendijk and Stokhof (1990) and Chierchia (1995a) for a detailed discussion of the principles of dynamic binding).
As can be seen, the tense specification in the restrictor contradicts the one within the nucleus: According to the restrictor, the eventualities quantified over have to be located within the eighties (as they are set to the running times of the respective buying events that took place during the eighties). According to the tense marking of the matrix verb, which is interpreted in the nucleus, the very same eventualities have to include the speech time. But this has the consequence that the intersection between restrictor and nucleus is necessarily empty. We assume that this is the reason why (5a) is highly marked.

Following the same principles, it is predicted that (5b) comes out perfectly fine:

(11) Most e [\exists x [\text{car}(x) \land \text{Arg}(e, x) \land \exists e' [\text{buy}(e') \land \text{Theme}(e' x) \land \text{past}(e') \\land \tau(e') \subseteq 80s] \land \tau(e) \subseteq \tau(e')] ] \\
[\exists x [\text{car}(x) \land \text{Arg}(e, x) \land \exists e'[...] \land t_0 \subseteq \tau(e) \land \text{blue}(e)]}

The information contributed by the past tense marking of the matrix verb does not clash with the tense specification in the restrictor.

3 QVEs in sentences with plural definites

3.1 The first possibility: Bound eventuality-variables within the NP-complement of the definite determiner

Let us return to sentence (1a), which is repeated below as (12):

(12) The people that lectured on kangaroos at the conference last summer were usually [open-minded]$_F$.

QVEs in sentences with definites cannot arise in the same way as QVEs in sentences with indefinites. In contrast to the indefinite determiner, the definite determiner is not allowed to pick out different individuals from one and the same set. Rather, it has to pick out the maximal sum individual contained in the set it is applied to (see Link (1983)). But the consequence is that co-variation with the eventualities bound by the Q-adverb is excluded if the set denoted by the NP-complement of the definite determiner does not vary itself. To put it the other way around, co-variance would only be possible if the NP-complement of the plural definite included a variable that allows the objects denoted by the plural definite to vary.

There are indeed cases where QVEs come about in precisely this way (see Hinterwimmer (in preparation) for details). Consider the contrast between (13a) and
(13b) below: (13a) gets a QV-reading and is therefore acceptable, while (13b) does not get such a reading.

(13)  a. The people in Peter’s class are usually [French]F.
    b. ??The people in Peter’s current class are usually [French]F.

Intuitively, the contrast between the two sentences can be explained as follows: While in (13a) it is possible that the denotation of the noun class varies with the eventualities quantified over, this is excluded in (13b) due to the presence of the adjective current, which fixes the denotation of the noun to the speech time. We assume that the co-variation in (13a) is due to the presence of a silent eventuality variable in the noun class that may be bound by the Q-adverb contained within the same clause (otherwise it is resolved to a contextually salient eventuality). Furthermore, an eventuality predicate $\lambda \alpha . \text{school-year}(e)$ is inferred on the basis of clause internal information. (13a) then gets the semantic representation shown in (14) below.

(14)  Most $e . [\text{school-year}(e)]$

$$\exists e' \leq e . [\text{Arg}(e', \sigma \{X: \text{people}(X) \land \text{in}(X, \text{Peter’s class}_e)) \land \text{French}(e')]] ,$$

where $\sigma \{X: P(X)\} = \text{def} \forall X \{P(X) \land \forall Y . [P(Y) \rightarrow Y \leq X]\}$ (see Link (1983)).

As already mentioned, in the case of (13b), the adjective current fixes the denotation of class to a single eventuality. This has the effect that the denotation of the whole NP people in Peter’s class is also fixed. Therefore, each eventuality quantified over has to include the same sum individual, and the sentence is out for the same reason as sentence (15) below, which contains a proper name (cf. de Swart (1993), according to whom predicates like be French are once-only-predicates that can only be applied once to the same individual):

(15)  ??Peter is usually French.

The acceptability of sentence (12) cannot be explained in the same way. Neither is there an element like class that can plausibly be assumed to contain a silent eventuality variable, nor does the hearer get any clue that may help her to accommodate a predicate that characterizes a set of eventualities each of which contains a (different) sum individual of the required kind. Furthermore, at an intuitive level the sentence also does not seem to quantify over eventualities each of which contains a sum individual

---

8 It can only be interpreted as saying that there is a specific plural individual the elements of which are French most of the time, which would be a non-QV-reading that is of no interest to our concerns.

9 Note that we assume that definites of which the denotation is relativized with respect to the eventualities quantified over are mapped onto the nuclear scope of Q-adverbs, because they do not contribute anything to the determination of those eventualities. Rather it has to be guaranteed independently that each of those eventualities includes a plural individual of the respective kind, as the existence presupposition associated with the definite article would not be fulfilled otherwise. Therefore, such “relativized” definites are only acceptable if an eventuality predicate that serves as a suitable restriction for the Q-adverb is either explicitly given or can be accommodated easily (s. Hinterwimmer (in preparation) for details).
consisting of all the people that fulfil the relative clause predicate at that eventuality. The intuition is rather that the Q-adverb quantifies over eventualities each of which contains an atomic part of the sum individual denoted by the plural definite.

3.2 The second possibility: Quantification over the atomic parts of sum eventualities

Sentence (16) below, which contains the Q-adverb for the most part, receives a QV-reading that can be paraphrased as in (17):

(16) For the most part, the students admire [Mary]F (Nakanishi/Romero (2004): 7).
(17) Most of the students admire Mary.

Nakanishi and Romero (ibid.) – henceforth NR – assume that a sentence of the form For the most part NP VP has the truth conditions given in (17) below, where p corresponds to the denotation of the non-focussed part of the clause, while q corresponds to the denotation of the focussed part.

(17) \exists e [p(e) \land \exists e'[e' \leq e \land e' \geq \frac{1}{2} |e| \land \forall e''[e'' \leq e' \rightarrow q(e'')]] (ibid.: 8).

NR paraphrase the formula above as follows: “There is a general (possibly plural) event e for which p(e) holds and there is a (possibly plural) event e’ that is a major part of e such that, for all subevents e'' of e’, q(e'') holds” (ibid.: 8). They propose that a QV-reading “with respect to a given NP arises as a side effect of the following choices” (ibid.: 9):

(18) “
(i) The semantic content and thematic predicate of the NP are within the restrictor p.
(ii) The general event e is ‘measured’ by counting its atomic event units in [[V0]].
(iii) The NP is interpreted distributively in a one-to-one mapping” (ibid.: 9).

Thus, sentence (16) gets the semantic representation in (19a), which can be paraphrased as in (19b) below:

(19) a. \exists e [*admire(e) \land Agent(e, the students) \land \exists e'[e' \leq e \land e' \geq \frac{1}{2} |e| \land 
\forall e''[e'' \leq e' \rightarrow Theme(e'', Mary)]] (ibid.: 9).
b. “There is a general (possibly plural) event e such that *admire(e) \land Agent(e, the students) and there is a (possibly plural) event e’ that is a major part of e such that, for all subevents e’’ of e’, Theme(e’’, Mary)” (ibid.: 9).

Note that for this analysis to work it is important that the clause splitting algorithm proposed by Herburger (2000), which we adopted so far without further discussion, has to be slightly altered: It can no longer be assumed that the denotation of the whole clause (minus the Q-adverb) is mapped onto the (equivalent of the) nuclear scope. Then, no QV-reading would be available, as each of the universally quantified events
would contain the whole sum individual denoted by the definite DP. This, however, does not cause any harm with respect to the sentences discussed in the first part of this paper, as such an altered mapping algorithm would in these cases generate semantic representations that are truth conditionally equivalent to the ones given\footnote{There is problem, however, with both the mapping algorithm assumed by Herburger (2000) and the one assumed by NR: It is unclear how the denotation of the respective clause can be split up in the required way in a compositional manner, as the solution suggested by Herburger (ibid.) is problematic (see Hinterwimmer (in preparation) for discussion, where a different mapping algorithm is proposed).}

The idea that QV-readings are derived via quantification over the atomic parts of plural eventualities is attractive with respect to the problem under discussion. On the other hand, the analysis suggested by NR cannot be adopted directly in order to account for QV-readings of sentences that contain the Q-adverb \textit{usually} in general, as it only works for sentences that introduce (a set of) plural eventualities – which is obviously not the case in sentences that include singular indefinites. So, in order to account for the sentences discussed in section (2) of this paper, we still need to analyse \textit{usually} as a quantifier that operates on sets of (possibly atomic) eventualities directly\footnote{Of course, it would also be possible to assume that \textit{usually} is simply ambiguous – which is of course less desirable than offering a unified semantics.}

We propose that there is a uniform semantics for the adverb \textit{usually} (it relates the cardinalities of two sets of eventualities). But in case of sentences that introduce (sets of) plural eventualities, the relation between the respective set and the denotation of \textit{usually} is a little more indirect than in the case of sentences that introduce (sets of) atomic eventualities: We assume that in the former case it is also possible to insert a covert version of the $\sigma$-operator first, which turns the set of plural eventualities into the maximal plural eventuality contained within this set\footnote{We assume that this is just a principally available alternative to the more standardly assumed option of inserting a covert existential quantifier (cf. Herburger (2000)).}. Only after this operation, and after the resulting object has been split up according to the mapping algorithm assumed by NR, the denotation of \textit{usually} is applied to the two newly created plural eventualities. In (21) below it is shown how this works in the case of sentence (12) (repeated below as (20)): (21a) shows the result of applying the covert $\sigma$-operator to the denotation of the clause (minus the Q-adverb), and (21b) shows the result of mapping the non-focussed part of this object onto the restrictor, and the focussed part onto the nuclear scope of \textit{usually}:

(20) The people that lectured on kangaroos at the conference last summer were usually [open-minded]$_F$.

(21) a. $\sigma\{e: \text{Argument}(e, \sigma\{X: \text{people}(X) \land \exists e'[\text{Agent}(e', X) \land \text{lecture_on_k}(e') \land \text{at}(e', \text{conference_last_s}) \land \tau(e') < t_0]}) \land \text{open-minded}(e) \land \tau(e) < t_0}\}$

b. Most $\{e: \text{Argument}(e, \sigma\{X: \text{people}(X) \land \exists e'[\text{Agent}(e', X) \land \text{lecture_on_k}(e') \land \text{at}(e', \text{conference_last_s}) \land \tau(e') < t_0]})\}$

$[\sigma\{e: \text{open-minded}(e) \land \tau(e) < t_0\}]$
As the quantifier in (21) cannot be applied directly to its two arguments, we assume that
the next step consists in shifting the respective plural eventualities into the set of atoms
they consist of\(^{13}\) (cf. Link (1983), Landman (2000)). The result of this operation is
shown in (22) below, where furthermore the context variable \(C(e^{''})\) introduced by
usually has been added:

\[
(22) \quad \text{Most } e^{''} \left[ e^{''} \in \text{Atom}(\sigma \{ e: \text{Arg}(e, \sigma \{ X: \text{people}(X) \land \exists e'[\text{Agent}(e', X) \land \text{lecture_on}_k(e') \land \text{at}(e', \text{conference}_s) \land \tau(e') < t_0])}) \land C(e^{''})]\right]
\]

In the case of the restrictor, the atoms of the plural eventuality are most plausibly
determined via the atomic parts of the plural individual that functions as its argument,
i.e. we get the set of eventualities each of which has an atomic part of the plural
individual denoted by the definite DP as its argument. In the case of the nuclear scope,
the atoms have to be the smallest eventualities that fulfil the verbal predicate.
Remember from section (2.2) that the context variables introduced by Q-adverbs are
resolved to the predicate \(\lambda e. \tau(e) \subseteq i_e\), where \(i_e\) is a variable that ranges over time
intervals. This results in (23) below:

\[
(23) \quad \text{Most } e^{''} \left[ e^{''} \in \text{Atom}(\sigma \{ e: \text{Arg}(e, \sigma \{ X: \text{people}(X) \land \exists e'[\text{Agent}(e', X) \land \text{lecture_on}_k(e') \land \text{at}(e', \text{conference}_s) \land \tau(e') < t_0])}) \land \tau(e^{''}) \subseteq i_{e^{''}}\right]
\]

In the next two sections we will see that the resolution of the free interval variable in the
restrictor of usually provides the key to the explanation of the acceptability differences
noted at the outset of this paper.

### 3.3 The interval resolution strategy revisited

Recall from section 2.2 that we assume a pragmatic strategy which regulates the
resolution of the free interval variable in the restriction of Q-adverbs. It is repeated
below as (24):

\[
(24) \quad 1. \quad \text{Take overt information, i.e. intervals denoted by temporal adverbials.}
2. \quad \text{If not available: Take (the most specific) contextual information from the}
\quad \text{same domain (restrictor vs. nucleus), i.e. the running time of another}
\quad \text{salient eventuality.}
3. \quad \text{If not available: Take either contextual information from the other domain,}
\quad \text{or the default interval } t_{\text{world}}, \text{which denotes the whole time axis.}
\]

According to (24), the free interval variable \(i_{e^{''}}\) in (23) needs to be resolved to the
running time of the plural eventuality introduced by the relative clause verb. There is no

\(^{13}\) It is important not to confuse this set of atoms with the set of plural eventualities the \(\sigma\)-operator
previously was applied to.
temporal adverbial within the matrix clause, but there is contextual information available within the same domain (i.e. the restrictor) – namely the running time of the relative clause eventuality $e'$. The final semantic representation of sentence (20) is thus the one given in (25) below:

\[
\text{(25) Most } e'' [e'' \in \text{Atom } \sigma \{ e : \text{Argument } (e, X) \land \exists e' [\text{Agent } (e', X) \land \text{lecture_on_k } (e') \land \text{at } (e', \text{conference_last_s}) \land \tau (e') < t_0]\}] \land \tau (e'') \subseteq \tau (e')\]

But what does it mean to resolve the running time of an atomic eventuality to the running time of a plural eventuality? In order to answer this question, we first have to define the running time of a plural eventuality itself. We assume the running time of a plural eventuality to be the smallest interval such that the running times of all the atomic parts of the respective plural eventuality are contained in this interval. Note that we take this interval to be discontinuous, i.e. we assume that it does not include the stretches of time lying in between the running times of the atomic eventualities. The formal definition is given in (26) below:

\[
\text{(26) } \tau (e^*) \text{ if } e^* \text{ is a plural eventuality:}
\]

\[
t \text{ s. t. } \forall e' \in \text{Atom } (e^*) [\tau (e') \subseteq t] \land \forall t' [\forall e' \in \text{Atom } (e^*) [\tau (e') \subseteq t'] \rightarrow t \subseteq t']
\]

Furthermore, we define that the running time of a plural eventuality $e^*$ contains the running time of an atomic eventuality $e'$ (i.e. $\tau (e') \subseteq \tau (e^*)$) iff:

\[
\text{(27) } \exists e'' \in \text{Atom } (e^*) [\tau (e') \subseteq \tau (e'')]
\]

This has the consequence that resolving the running time of an atomic eventuality to the running time of a plural eventuality means resolving it to the running time of some atomic eventuality that is contained within the plural eventuality. With respect to (25) above this means that each of the eventualities quantified over has to correspond to one of the atoms contained within the lecturing event introduced by the relative clause. Those eventualities thus have to take place during the conference mentioned in the relative clause. The meaning of sentence (12) can therefore be paraphrased informally as follows: “Most of the eventualities which have one of the people who lectured on kangaroos at the conference last summer as argument, and which furthermore took place during that conference, are eventualities of being open-minded”. This accounts for the QV-reading the sentence intuitively gets.

Let us now return to the marked sentence (2a), repeated below as (28):

\[
\text{(28) The people that lectured on kangaroos at the conference last summer are usually [open-minded].F.}
\]

It should be obvious what goes wrong here: The interval resolution strategy forces the eventualities quantified over to be resolved to the running time of the relative clause event, which means that they have to be located during the conference mentioned in the relative clause. But this contradicts the tense specification in the nuclear scope: The
tense marking of the matrix verb forces the eventualities in the set that the \(\sigma\)-operator operates on to include the speech time. This has the consequence that the atomic parts of this maximal sum eventuality picked out by the \(\sigma\)-operator also include the speech time. But then, the intersection between restrictor and nucleus is empty, as an eventuality cannot at the same time take place one year before the speech time, and include the speech time. The ill-formed semantic representation for (28) is given in (29) below:

\[
(29) \quad \text{Most } e'' \in \text{Atom}(\sigma \{ e: \text{Arg}(e, \sigma \{ X: \text{people (X)} \land \exists e' \{ \text{Agent (e', X)} \land \text{lecture_on_k(e')} \land \text{at(e', conference_last_s)} \land \tau(e') < t_0 \}) \}) \land \tau(e'') \subseteq \tau(e')
\]

This reasoning is exactly along the lines of the one for the indefinite cases illustrated in (10) and (11).

3.4 The coincidence constraint

Let us finally return to the question why sentence (3a) – repeated below as (30a) – is unacceptable: According to everything said so far, it gets the semantic representation in (30b), which is not ill-formed in any obvious way.

\[
(30) \quad \text{a. ??The people that listened to Peter’s lecture on kangaroos at the conference last summer were usually [open-minded]}. \\
\text{b. Most } e'' \in \text{Atom}(\sigma \{ e: \text{Arg}(e, \sigma \{ X: \text{people (X)} \land \exists e' \{ \text{Experiencer (e', X)} \land \text{listen(e')} \land \text{Theme(e', P’s_lecture_on_k)} \land \text{at(e', conference_last_s)} \land \tau(e') < t_0 \}) \}) \land \tau(e'') \subseteq \tau(e')
\]

Note that there is no conflict between the tense specification in the restrictor and the one in the nucleus, as the matrix verb is marked for past tense. The ill-formedness of (30a) must therefore be due to something other than the tense conflict referred to in the examples above – namely the nature of the sum eventualities introduced in the relative clause.

In the case of (20a), the atomic parts of the relative clause eventuality are most naturally understood to be temporally distributed, i.e. one does not normally expect the lectures given at a conference to take place at the same time. This, however, is different in the case of (30a): Due to the definiteness of the DP Peter’s lecture on kangaroos, there can only be one lecture on kangaroos given by Peter that took place during the conference last summer. Furthermore, people usually listen to a lecture from start to finish. Now, these two things taken together imply that the running times of the atomic parts of the relative clause eventuality all coincide temporally. We assume that this difference provides the key to understanding the contrast in acceptability between (20a) and (30a). That this speculation is on the right track is further evidenced by the fact that (31) below is only acceptable under the assumption that the atomic parts of the plural meeting event

\[
(31) \quad \text{Most e'' } \in \text{Atom}(\sigma \{ e: \text{open-minded(e)} \land \tau(e) < t_0 \})
\]

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introduced by the relative clause did not all coincide temporally, i.e. under the assumption that Mary did not meet all people at the same time:

(31) The people that Mary met yesterday afternoon usually had [black hair].

Consider furthermore the unacceptable example (32) below: Also in this case, the atomic parts of the relative clause eventuality naturally coincide temporally.

(32) The people that were killed in the car accident yesterday afternoon were usually famous.

The argument for the illformedness of sentence (30a) now runs as follows: The running times of the eventualities quantified over are resolved to the running time of the plural eventuality introduced by the relative clause. Furthermore, the running time of a sum eventuality according to (26) is the smallest interval that includes the running times of all the atomic parts of this sum eventuality. This has the consequence that for each eventuality quantified over in (30a) there has to be a corresponding atomic eventuality contained within the sum eventuality introduced by the relative clause. Now remember that the running times of all the atomic parts of the relative clause eventuality in (30a) necessarily coincide. It is therefore necessarily the case that the running times of all the eventualities quantified over also coincide. Let us now assume that there is a constraint that prevents Q-adverbs from applying to sets of eventualities the running times of which coincide. This constraint is given formally in (33)\textsuperscript{14}.

(33) A Q-adverb may only be applied to a set of eventualities if the following condition holds: \(\neg \forall e, e' \in E: \tau(e) = \tau(e')\).

Let us finally compare the behaviour of \textit{usually} to the behaviour of the Q-adverb \textit{for the most part}: Interestingly, neither the interval resolution strategy nor the coincidence constraint seem to apply in the latter case, as is evidenced by the acceptability of (34a,b) below.

(34) a. For the most part, the people that lectured on kangaroos at the conference last summer are [open-minded].
   b. For the most part, the people that listened to Peter’s lecture on kangaroos at the conference last summer were [open-minded].

\textsuperscript{14} Note that Zimmermann (2003) – based on Lasersohn (1995) – has proposed a similar, but stronger constraint in his analysis of the Q-adverb \textit{occasionally}. This constraint requires there to be no two overlapping eventualities in the respective set. This, however, would be too strong for our purposes: It does not seem to be the case that sentence (20) is only acceptable under the condition that none of the lecturing events coincide. Rather, it seems to be required that not all of them coincide. It is therefore very well possible that (33) is too general, because different Q-adverbs come with related, but slightly different constraints concerning the temporal distribution of the eventualities they operate on. Due to limitations of space, we can not pursue this interesting question any further in this paper (but see Hinterwimmer (in preparation) and Endriss and Hinterwimmer (in preparation) for further discussion).
This difference between usually and for the most part can be explained in two ways: Under the assumption that eventualities are nothing but spatio-temporal slices (cf. Kratzer (1995)), it would be conceivable that there are Q-adverbs which are only able to operate on the temporal parameter of the eventualities they are applied to, while others may operate on the temporal as well as on the spatial parameter. The fact that usually is sensitive to the two constraints discussed in this paper could then be explained as a consequence of its membership to the first class, while for the most part would be a good candidate for the second class. This hypothesis gains plausibility if one furthermore takes the fact into account that there are also Q-adverbs like everywhere, which are only able to quantify over spatial locations, as is suggested by (35):

(35) A horse is loved everywhere.

Following this track, the coincidence constraint would no longer be stipulated, but the ungrammaticality of (30a) would directly follow as a consequence of the constraint against vacuous quantification (Kratzer (1995)).

Another possibility would be to assume that for the most part (contra NR) does not quantify over plural eventualities in the sentences above, but over plural individuals. This, however, would necessitate finding an alternative explanation for the differences between for the most part and most with respect to distributivity observed by NR (see NR for details) – something we cannot do within the limits of this paper.

4 Conclusion

In this paper we have given additional evidence for the assumption that Q-adverbs like usually are only able to quantify over (sets of) eventualities. Our main concern has been the restricted availability of QV-readings in adverbially quantified sentences that contain plural definites. First, we have shown that such readings can plausibly be analysed as resulting from quantification over the atomic parts of sum eventualities. Furthermore, we have identified two constraints, which the respective sentences have to fulfil in order to get QV-readings. First, the tense markings of the matrix verb and of the relative clause verb contained within the definite DP have to agree. Second, the sum eventualities introduced by the relative clause have to consist of atomic eventualities the running times of which do not necessarily coincide. We have shown that the first constraint directly follows if the results of Endriss and Hinterwimmer (to appear) are combined with the analysis of adverbially quantified sentences containing plural definites mentioned above. Furthermore, we have shown that a second constraint can naturally be explained if this analysis is furthermore combined with the assumption that Q-adverbs like usually only operate on the temporal component of the eventualities quantified over.

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QUANTIFICATIONAL VARIABILITY EFFECTS WITH PLURAL DEFINITES


Nakanishi, Kimiko and Maribel Romero: 2004, Two constructions with Most and their Semantic Properties, Proceedings of *NELS 34*.


BARE HABITUALS AND PLURAL DEFINITE DESCRIPTIONS*

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Abstract

This paper investigates semantic and pragmatic differences between habitual sentences with adverbs of quantification and habitual sentences without adverbs of quantification, which I will call bare habituals. I will argue for the idea that bare habituals involve plural definite descriptions of events/situations, whereas habituals with adverbs of quantification involve quantification over singular events/situations.

1 Introduction

Habitual sentences are used to express non-accidental generalizations based on occurrences of a certain type of situation or event. For instance, if after observing a certain number of events of John having dinner with friends, one notices that in each one of those occasions he drank wine, one might be tempted to conclude that the overlapping between the dinner events and the wine-drinking events is not accidental, but something typical about John’s habits. One way of expressing this conclusion is by means of a sentence like (1) below:

(1) When John has dinner with friends, he always drinks wine.

Here, the relation between the type of event described by the adverbial clause and the type of event described by the matrix clause seems to be mediated by the adverb always, which brings about a universal flavor similar to the one associated with nominal determiners like every and all. In fact, adverbs of quantification (AQs) are a common ingredient in habitual statements. Besides always, English has others, such as usually, and sometimes, all contributing a particular force to the generalizations being expressed by the sentences containing them.

(2) When John has dinner with friends, he usually/sometimes drinks wine.

Interestingly, AQs are not a crucial component of habitual sentences. Quite often, generalizations are expressed without the help of any overt AQ, as can be seen in (3), a sentence whose meaning seems quite similar to the meaning of (1) above:

(3) When John has dinner with friends, he drinks wine.

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This similarity between habitual sentences with AQs and habitual sentences without them has led to a widespread view according to which, the absence of an adverb of quantification in (3) is only apparent, and that in fact, a covert, phonetically null AQ is present in sentences like that as well (see Farkas and Sugioka 1983, Krifka, Pelletier, Carlson, ter Meulen, Chierchia and Link 1995, Cohen 1999), and references therein). Since then, the task of spelling out the meaning of this covert AQ has been a central issue in the semantics of habituality, and the topic is still a controversial one. For example, are (1) and (3) synonymous? What about (2) with usually and (3)?

The aim of this paper is to investigate semantic and pragmatic differences between habitual sentences with AQs and habitual sentences without AQs, which I will call bare habituals. I will argue for the idea that bare habituals involve plural definite descriptions of events/situations, whereas habituals with AQs involve quantification over singular events/situations. More precisely, although I assume the presence of a silent habitual operator in the structure of bare habituals, I assign to this operator the meaning of the English definite determiner ‘the’ (modulo a sortal distinction). I will defend this view by highlighting crucial differences concerning minimal pairs with and without AQs, and also several parallels between the nominal determiner the and the silent habitual determiner. Thus, according to the view to be defended here, (1) can be paraphrased as ‘Every event of John having dinner with friend overlaps with an event of him drinking wine’, whereas (3) is better paraphrased as ‘The events of John having dinner with friends overlap with events of John drinking wine.

The paper is organized as follows: in section 2, I discuss several contrasting pairs involving singular and plural noun phrases within which singular indefinites are embedded. This particular configuration will prove useful in bringing about certain differences concerning how singular, and especially plural, predicates are derived. Section 3 contains minimal background on event quantification. In section 4, I claim that similar differences exist in habitual sentences, and propose a similar treatment making crucial reference to plural events. In section 5, pragmatic differences between habituals with and without AQs are discussed and the similarity between plural definite nominals and bare habituals are highlighted. The emerging picture will then be that of bare habituals involving plural definite descriptions of events/situations, as stated in the brief conclusion in section 6.

2 Preliminaries

We start by looking at the internal structure of some complex noun phrases, and making assumptions about how singular and plural predicates are formed. We will first look at lexical predicates and then at derived ones.

2.1 Pluralities and Lexical Predicates

Consider the pairs of sentences below:

(4)   a. Every mother of a one-year old child agreed to sign this form.
     b. #The mothers of a one-year old child agreed to sign this form.

(5)   a. Every wife of a graduate student came to the party.
When uttered in contexts in which it is common ground that each person has only one mother, men are not married to more than one woman, and South American countries have only one capital each, the b-sentences above sound rather strange, conveying information that go against these shared assumptions. They suggest the existence of multiple mothers of a single child, multiple wives of a single graduate student, and multiples capitals of a single South American country. On the other hand, the a-sentences all sound fine, totally compatible with what is common ground. At the origin of these contrasts is the singular/plural opposition overtly manifested in the pairs of nouns mother/mothers, wife/wives, and capital/capitals. That this is so can be seen by replacing the determiners every and the by other determiners without altering the number of the noun phrases. As attested below, in examples with the determiners no and some, the contrasts are preserved:

\[(7)\]
\[
\begin{align*}
&\text{a. } \text{No mother of a one-year old child agreed to sign this form.} \\
&\text{b. } \#\text{Some mothers of a one-year old child agreed to sign this form.}
\end{align*}
\]

\[(8)\]
\[
\begin{align*}
&\text{a. } \text{No wife of a graduate student came to the party.} \\
&\text{b. } \#\text{Some wives of a graduate student came to the party.}
\end{align*}
\]

\[(9)\]
\[
\begin{align*}
&\text{a. } \text{I will visit no capital of an African country.} \\
&\text{b. } \#\text{I will visit some capitals of an African country.}
\end{align*}
\]

Let us focus for the moment on the meaning of the noun phrases in question. Notice that these are headed by relational nouns, and that singular indefinites appear at the positions reserved for their first arguments. The only thing that distinguishes the members of the pairs above is the number associated with these NPs. If we assume with Link (1983) and much subsequent work that there are both singular and plural individuals, and that plural individuals have singular individuals as their minimal, proper parts, we can capture the contrasts described above by assigning the singular and plural NPs in (4)-(6) the denotations in (10)-(12), respectively:

\[(10)\]
\[
\begin{align*}
&\text{a. } [\text{SG mother of a one-year old child}] = \lambda x. \exists y : \text{child}(y) \land \text{mother}(x, y) \\
&\text{b. } [\text{PL mother of a one-year old child}] = \lambda X. \exists y : \text{child}(y) \land \text{mother}(X, y)
\end{align*}
\]

\[(11)\]
\[
\begin{align*}
&\text{a. } [\text{SG wife of a graduate student}] = \lambda x. \exists y : \text{GS}(y) \land \text{wife}(x, y) \\
&\text{b. } [\text{PL wife of a graduate student}] = \lambda X. \exists y : \text{GS}(y) \land \text{wife}(X, y)
\end{align*}
\]

\[(12)\]
\[
\begin{align*}
&\text{a. } [\text{SG capital of an African country}] = \lambda x. \exists y : \text{country}(y) \land \text{capital}(x, y) \\
&\text{b. } [\text{PL capital of an African country}] = \lambda X. \exists y : \text{country}(y) \land \text{capital}(X, y)
\end{align*}
\]

Take (11), for example. For an individual to belong to the set represented in (11a), this individual has to be a (singular) woman married to a (singular) graduate student. But for an individual to belong to the set represented in (11b), the individual has to be a plurality
whose minimal parts are women married to the same graduate student. Thus, unless there
is a graduate student with more than one wife, this set will be empty. That is why the
sentence sounds funny with monogamy in the background.

The next task is to make the analysis compositional. I assume that two pieces are put
together to form the inflected NPs above: a number morpheme (SG or PL) and a bare,
‘numberless’ noun phrase. I will follow Kratzer (2004), who proposes a semantic universal stating that all lexical predicates are cumulative. In the case of a one-place predicate \( P \),
this means that if \( a \) and \( b \) are both members of \( P \), so is \( a \oplus b \), the plural individual formed by \( a \) and \( b \). Thus, the extension of bare noun phrases denoting one-place predicates may contain both singular and plural individuals. In the case of a 2-place predicate \( R \), we have that if both \( <a, b> \) and \( <c, d> \) belong to \( R \), then \( <a \oplus c, b \oplus d> \) also belong to \( R \).

Take the lexical predicate \( \text{wife} \) for instance, and suppose that Mary is John’s wife and Marta is Paul’s wife. Then, the denotation of \( \text{wife} \) would have the pairs \( \langle \text{mary, john} \rangle \), \( \langle \text{marta, paul} \rangle \), and \( \langle \text{mary} \oplus \text{marta}, \text{john} \oplus \text{paul} \rangle \) as its members. Now, imagine John gives up monogamy and marries Susan too. Then, \( R \) will have two more members: \( \langle \text{susan, john} \rangle \) and \( \langle \text{mary} \oplus \text{susan}, \text{john} \rangle \). Finally, imagine that John and Paul are graduate students, and let us ask ourselves what the denotation of the predicate \( \text{wife of a graduate student} \) would be in this scenario, disregarding for the moment the question of how the indefinite and the noun combine to form this complex expression. We are looking for woman, or women, who are married to a graduate student. There are three: \( \text{mary} \), \( \text{susan} \), and \( \text{mary} \oplus \text{susan} \).

Turning now to the role of the number morphemes, SG/PL, I take them to select the atomic/non-atomic individuals in a predicate extension, as represented in the lexical entries below:

\[
\begin{align*}
[\text{SG}] & = \lambda P. \lambda x. P(x) = 1 \land AT(x) = 1 \\
[\text{PL}] & = \lambda P. \lambda X. P(X) = 1 \land \neg AT(X) = 1
\end{align*}
\]

Thus, in our previous example, the predicate \( \text{wife of a graduate student} \) will have two members, \( \text{mary} \) and \( \text{susan} \), after combining with \( \text{SG} \), and only one member, \( \text{mary} \oplus \text{susan} \) after combining with \( \text{PL} \). This is what we desired.

### 2.2 Distributivity and Derived Predicates

Consider now the examples in (14) and (15) below, consisting, as in the previous subsection, of minimal pairs containing nouns that contrast in number. This time, however, the nouns are modified by relative clauses.

\[
\begin{align*}
(14) & \quad \text{a. Every woman who has a six-month old child agreed to sign the form.} \\
 & \quad \text{b. The women who have a six-month old child agreed to sign the form.}
\end{align*}
\]

\[
\begin{align*}
(15) & \quad \text{a. In my family, every woman who married a professor is happy.} \\
 & \quad \text{b. In my family, the women who married a professor are happy.}
\end{align*}
\]

\( ^{2} \)The idea generalizes trivially for other n-place predicates.
Interestingly, the b-examples do not sound strange. They do not suggest the existence of multiple mothers of a single child or multiple wives of a single professor. In fact, if we compare (14b) and (15b) to (4b) and (5b), repeated below as (16a) and (16b), we see that the first two are much better in this respect than the other two.

(16)  
   a. #The mothers of a one-year old child agreed to sign the form.  
   b. #The wives of a professor came to the party.  

One salient aspect of the examples in (14) and (15) is the clausal nature of the noun modifier, within which the singular indefinite is embedded. The relative clause is formed with the help of a relative pronoun, which moves to the periphery of the clause to create a derived predicate of individuals. I follow the proposal in Heim and Kratzer (1998), according to which syntactic movement generates an index node right below the landing site of the moved element, which is interpreted as a lambda-abstractor, binding co-indexed traces and/or pronouns in its c-command domain. This gives us the following (simplified) representation for the relative clause of (15a):

(17)  
[ who [ 1 [ t₁ married a professor ] ] ]

The relative pronoun itself is vacuous, perhaps only adding selectional requirements in the form of semantic features, such as +HUMAN in the case of who.

I would like to suggest that besides its role as a lambda abstractor, the index created by movement can also perform the role of a distributive operator, allowing a predicate to apply to the atomic parts of a plural argument. The idea is that this starred index can be part of the representation of the relative clause in examples like (14b) and (15b):

(18)  
[ who [ 1* [ t₁ married a professor ] ] ]

The structures in (17) and (18) receive the interpretations in (19) and (20), respectively:

(19)  
[who 1 t₁ married a professor] = λx. ∃y : professor(y) ∧ wife(x, y)

(20)  
[who 1* t₁ married a professor] = λX. ∀x : x ≤ X → ∃y : professor(y) ∧ wife(x, y)

We have thus established a tight connection between syntactic movement and distributivity, and it should be clear now why there is a contrast between the interpretations of the sentences in the pairs below, all of them containing a plural noun phrase embedding a singular indefinite:

(21)  
   a. #The mothers of a one-year old child agreed to sign the form.  
   b. The women who have a six-month old child agreed to sign the form.

(22)  
   a. #In my family, the wives of a professor are happy.

---

3I will limit attention here to atomic distributivity involving one-place predicates. Whether or not distribution to non-atomic parts or simultaneous distribution involving multiple arguments of a single predicate is needed is a controversial topic beyond the scope of this paper. For discussion see Schwarzchild (1996), Winter (2000), Beck and Sauerland (2000), Kratzer (2004), among others.
b. In my family, the women who married a professor are happy.

Distribution is not possible in (21b) and (22b) because there are no predicates within the subject DPs, which were created by movement. In fact, I am assuming that the external argument of the relational nouns in these examples are never saturated by an individual-denoting entity in syntax. Thus, the representation of these DPs is the following:

(23) \[ \text{[ the [ PL [ mother/wife [ of a one-year old child/a professor ]]]]} \]

The dependency of distributivity on movement is also compatible with the simplest cases that have been used in the literature on plurals to argue for the existence of distributive operators in the grammar. These are transitive sentences with a plural definite subject and a singular indefinite object. (24) is an example taken from Winter (2000), which can be used to describe a situation in which each woman was wearing a different dress:

(24) The women were wearing a dress.

To allow for distributivity here, it is enough to assume that the subject of transitive sentences in English move from a base position inside the verb phrase to the specifier of a higher functional projection, an analytic move that has become standard in the Government and Binding tradition. Also relevant are cases involving raising predicates with plural subjects, as (25) below:

(25) The boys seemed to a police officer to be drunk.

This sentence can be used to describe a situation in which every boy seemed to a different police officer to be drunk. Assuming the subject gets to its surface position via movement, the availability of a distributive reading is again expected.

2.3 The i-within-i Constraint

If distributivity is indeed tightly connected to syntactic movement, we expect that its availability correlates with other syntactic-semantic phenomena that are also dependent on movement. In the system of Heim and Kratzer (1998), which I am adopting here, variable binding is such a phenomenon. Take for example the case of binding of a pronoun by a quantifier phrase:

(26) \[ \text{[everybody [likes his, mother]]} \]

In a structure like (26), if the quantifier does not move, the pronoun will be interpreted as a free variable, and the meaning of this structure will be assignment-dependent. In this case, the pronoun his would refer to a context salient individual. To get the reading according to which every x is such that x loves x’s mother, we have to move the quantifier, so that an index can be inserted and the derived predicate $\lambda x. x \text{ loves } x\text{'s mother}$ created:

(27) \[ \text{[ everybody 1 [ t, likes his, mother]]}. \]
The dependency of both variable binding and distributivity on movement leads to the prediction that in cases where one is not available, the other should not be either. To see that this prediction is indeed borne out, consider the following pair of sentences from Jacobson (1994):

(28) a. [The wife of the author of her, biography], arrived.
    b. [The woman who married the author of her, biography], arrived.

(28a) exemplify the so-called i-within-i constraint. The relevant fact here is that this sentence cannot mean ‘the woman x, such that x is the wife of the author of x’s biography arrived’. Interestingly, (28b), which one might have expected to mean exactly the same as (28a) can have such meaning. It seems that in the case of (28a), there is no potential binder for the pronoun, which remains free within DP. But notice that this is the same environment that we discussed before in connection to distributivity. There, we saw that plural NPs headed by relational nouns did not give rise to distributive readings within the NP. As I said, this should not be surprising anymore: no movement, therefore no distributivity and no binding. In (28b), with the noun being modified by a relative clause containing the pronoun, there is movement and movement creates a binding configuration, giving rise to the attested interpretation. Distributivity internal to NP, as we saw above, was also possible in these cases. In sum, I take all this as evidence that binding and distributivity are tied to the same formal mechanism, namely, syntactic movement.

3 Adverbial Quantification over Events

We now return to the main topic of this paper, namely, the semantics of habitual sentences. Recall our first example, repeated below as (29).

(29) When John has dinner with friends, he always drinks wine.

We have talked informally about (29) as involving universal quantification over events, with the initial adverbial clause acting as the restrictor of the quantifier and the matrix clause (minus always) acting as the so-called nuclear scope. Let us make this a bit more explicit. I assume that verbs have an event argument, so that after they combine with their individual arguments, the resultant projection (assume it is VP) denotes a set of events. An AQ acts as an event determiner, that is, it combines with a set of events (its restrictor) to form a generalized quantifier (of events), which then combines with another set of events to yield a truth-value (cf. de Swart 1991).

Exactly how syntactic material is mapped onto this tripartite structure formed by an adverbial quantifier, a restrictor and a nuclear scope is a much debatable matter. Fronted adverbial clauses, such as the when-clause in (29), for example, seem to be systematically interpreted as restricting the quantifier. When not in initial position, however, they can be mapped into the restrictor or the nuclear scope, each choice being accompanied by a characteristic intonational contour (Rooth 1985, Johnston 1994). The following examples from Rooth (1985) illustrate the point (capital letters indicate focus):

(30) a. John usually SHAVES when he is in the shower.
b. John usually shaves when he is the shower.

(30a), with intonational focus on the verb forces the adverbial clause to be interpreted as part of the restrictor. The sentence would mean that most events of John being in the shower overlap with events of him shaving. (30b), with focus on *shower* forces the adverbiaral clause to be part of the nuclear scope only, giving rise to a reading saying that most events of John shaving overlap with events of him being in the shower. Adverbial clauses themselves are not necessary ingredients in creating tripartite structures associated with habituality. Sometimes, contextual clues and intonation alone are enough. For example, in a discussion about John’s working habits, one can utter (31), meaning that every event of John working is an event located in his office.

(31) John always works in his office.

In this case, the material of the matrix clause is split into two parts, one going to the restrictor, the other to the nuclear scope.

An investigation into the complexities involved on the mapping to tripartite structures is well beyond the scope of this paper. Therefore, I will content myself here with dealing with representations in which the relevant pieces are already in place (though I will make some claims concerning the internal structure of the pieces.).

4 Bare Habituals and Plurality

With this much as background, consider the following scenario: You know that John, a pop singer, is busy right now writing a new romantic song. You need to talk to him, but you don’t know where he is. You tell a friend that you will call him at home, but your friend discourages you, replying with (32):

(32) John always writes a romantic song at the Main Street Pub.

What your friend is trying to tell you here is that whenever John is writing a romantic song, he does that at the Main Street Pub, so you would not find him at home. (32) is a habitual sentence in which material from the matrix clause ends up acting as the restrictor of the adverbial quantifier. In this case, it is the predicate denoted by the verb phrase (excluding the locative) that serves this function, as schematized below:

(33) John always writes a romantic song [at the pub]$_F$

Quantifier: $\forall_e$

Restrictor: $\lambda e. \exists y : \text{romantic song}(y) \land \text{writes}(j, y, e)$

Nuclear Scope: $\lambda e. \text{at the pub}(e)$

Any event of John writing any romantic song will belong to the restrictor set. Notice the presence of a singular indefinite within VP in (32), which makes the predicate of events combining with the AQ in (33) structurally similar to the nominal predicates we discussed.

---

4For in-depth discussions of this topic, see among others von Fintel (1994) and Partee (1995), and the references therein
in section 2 in connection with examples like (5a), repeated below as (34). And indeed, they behave just the same, with the indefinite scoping inside the restrictor.

(34) Every wife of a graduate student came to the party.

Now, compare (32) with its counterpart without an adverb of quantification:

(35) #John writes a romantic song at the MAIN STREET PUB.

Contrary to (32), (35) sounds quite odd in this context. It cannot be used to express a generalization over events of John writing romantic songs. To the extent that it is possible to make sense of it at all, it suggests that John has the habit of writing the same song again and again, always at the pub. In fact, it sounds as weird as (36), an example in which it is clear that a specific song is at issue.

(36) #John writes that romantic song at the MAIN STREET PUB.

Replacing the verb to write by another verb that gives rise to a repeatable event helps in this case, but notice that we are still talking about multiple events involving the same song. (37), for instance, could be used in a context in which you and I know that John was hired by a department store to play a certain Christmas song. I know it was Filene’s, but you think it was Macy’s. You say you are going to Macy’s to watch him playing, but I advise you not to, by using sentence (37).

(37) John plays a Christmas song at FILENE’S.

But (37) cannot be used to generalize over events of John performing Christmas songs. Notice that the behavior of the singular indefinite in (35) mirrors the behavior of singular indefinites inside plural noun phrases that we discussed before in cases like (5b), repeated here as (38):

(38) #The wives of a graduate student came to the party.

To account for this behavior, I would like to suggest that bare habituas involve plural definite descriptions of events. More precisely, I would like to propose that the structure of bare habituas contain a covert definite determiner, meaning what the nominal determiner the means (modulo a sortal distinction). This silent determiner appears at the same position that AQs appear in other habitual sentences. For (35), I assume that the following representation feeds the interpretive system:

(39) John writes a romantic song [in that pub]_f

   Determiner: THE_e
   Restrictor: λE. ∃y : romantic song(y) ∧ writes(j, y, E)
   Nuclear Scope: λE. in that pub(E)

Given what we said before when we dealt with cases like (8), a quick inspection at (39) should be enough to understand why the indefinite is behaving the way we have just
described. In (39), the restrictor is a set formed by plural events whose minimal parts are different events of John writing the same song. But that presupposes that one can write the same song more than once, giving rise to the oddness we attributed to that sentence. This is just the same explanation we gave to the oddness associated with (8), which presupposed the existence of multiple wives of a unique man. Moreover, (39) contrasts with (32) containing the AQ *always* precisely because the restrictor of *always* is a set of singular events. The same explanation was behind the contrast between (34) and (8). The only difference is the absence of overt morphology related to number distinctions in the event domain.

Consider now cases in which a singular indefinite appears within an adverbial *when*-clause:

(40)  
(a) When John writes a romantic song, he always goes to the Irish pub.  
(b) When John writes a romantic song, he goes to the Irish pub.

Despite the fact that the adverbial clauses act as restrictors in both (40a) and (40b), there is no contrast between them, and neither presupposes that John keeps writing the same song again and again. This should not be surprising, if we recall previous examples from section 2 in which singular indefinites were embedded in a relative clause modifying a head noun.

(41)  
(a) In my family, every woman who married a professor is happy.  
(b) In my family, the women who married a professor are happy.

If we assume that *when*-clauses are a kind of relative clause (maybe a free relative), then the same explanation we offered for why (41b) is fine becomes available for (40b) as well. Recall that the crucial point was the assumption that relative clauses are derived by movement and movement gives rise to distributivity. Thus, the structure of the *when*-clause in (40b) would be as in (42) below, and the representation of the sentence would be as in (43):

(42)  
[ when [ 1* [ t₁ John writes a romantic song ]]]

(43)  
When John writes a romantic song, he goes to the Irish Pub

- **Determiner**: THE\(_E\)
- **Restrictor**: \(\lambda E. \forall e : e \leq E [\exists y : \text{song}(y) \land \text{write}(j, y, e)]\)
- **Nuclear Scope**: \(\lambda E. \exists E' : \text{go to Irish Pub}(E') \land \theta(E, E')\)

The restrictor in (43) is a set of pluralities, with their minimal parts being events of John writing (different) songs. The definite description refers to the maximal element in this set, which would be the sum of all events in which John writes a romantic song. In the case of (40a), distributivity is not even necessary, since I am assuming that *always* is, so to speak, inherently distributive, quantifying over singular events only.

(44) When John writes a romantic song, he always goes to the Irish Pub

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\(^5\)The predicate \(\theta\) stands for a relation between events, which I assume is contextually determined. Possible values include spatial-temporal proximity, overlap, etc. See Rothstein (1995) for relevant discussion.
Quantifier: $\forall e$
Restrictor: $\lambda e. \exists y: \text{song}(y) \land \text{write}(j, y, e)$
Nuclear Scope: $\lambda e. \exists e': \text{go to the Irish Pub}(e) \land \theta(e, e')$

5 Bare Habituals and Definiteness

Plurality has hitherto been the central issue in our discussion of the contrasts between habituals with AQ and bare habituals. Although we have explicitly treated bare habituals as involving definite descriptions, we have not relied as much on the definite character of the silent habitual determiner as we have on its selection for plural predicates. It was this feature that played the most crucial role in teasing apart that determiner and AQs, such as *always*, which were treated as selecting for singular predicates. In this section, it is definiteness that will play the central role, and the contrasts we will be looking at will crucially involve definite descriptions and quantifier phrases.

Our first contrast is illustrated by the following pair of negative sentences:

(45) a. The boys didn’t come.
    b. Every boy didn’t come.

Sentence (45a) with a plural definite as its subject is true if, and only if, none of the boys came. If at least some of them did, then it is false. This is somewhat surprising. Imagine the boys in question are John and Bill. Then the positive sentence ‘The boys came’ is equivalent to ‘John came and Bill came’. But then the negative sentence (45a) should be equivalent to ‘It is not the case that ‘John came and Bill came’, which is compatible with ‘John came but Bill didn’t come’. What is peculiar then to negative statements with plural definite descriptions is the fact that they seem to validate inferences from $\neg F(A)$ to $\neg F(a_1) \land \neg F(a_2) \land \ldots \land \neg F(a_n)$, where $a_1, a_2, \ldots, a_n$ are the minimal parts of the plural individual $A$. (45b) behaves differently. It can be true even if some boys came, but others did not.

We will not look for an explanation for this asymmetry. What is relevant for us here is the fact that plural definites, but not universal quantifiers, give rise to ‘excluded middle’ or ‘all or nothing’ effects, as attested by the contrast discussed above. Now, what about habitual sentences? Here we also observe a similar contrast in that only bare habituals give rise to ‘excluded middle’ effects. Consider (46):

(46) a. When Bob gets hurt, he doesn’t cry.
    b. When Bob gets hurt, he doesn’t always cry.

(46a) is false if Bob cries approximately half of the times in which he gets hurt. (46b), on the other hand, can be true in such a situation. This is exactly parallel to what we just discussed in connection with DPs, and it receives a straightforward explanation, once we assume that bare habituals involve plural definite descriptions of events.

Our second point is based on the following considerations: there is a sense in which sentence (47a) is stronger than (47b). Although it is not clear where exactly the difference

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6See Löbner (1985) for discussion.
resides, hearers are prompt to judge (47a) as expressing a bolder statement than (47b).

(47)  
    a. When my dog sees a blond girl, it always barks.  
    b. When my dog sees a blond girl, it barks.

This is reminiscent of the phenomenon discussed by Brisson (1998), where she detected a similar contrast between plural definite descriptions and universally quantified expressions. For example, she observed that (48a), but not (48b), can be true in a situation which contains twelve girls, and in which only eleven jumped into the lake.

(48)  
    a. The girls jumped into the lake.  
    b. Every girl jumped into the lake

Whether this difference in judgments reflects differences built into the truth conditions of these sentences, or purely pragmatic phenomena (Gricean acts of charity?) is an important question that requires further investigation. What I want to stress here is the parallel between bare habituals and plural definite DPs on the one hand, and habituals with the AQ *always* and universally quantified statements on the other.

Acknowledging that bare habituals are ‘weaker’ than their counterparts with *always* may lead to the conclusion that the silent habitual operator should have the meaning of a proportional quantifier whose force is weaker than that of a universal quantifier. For instance, it could mean something like ‘usually’, ‘generally’, or ‘typically’. However, contrary to habitual sentences with these quantifiers, bare habituals do not give rise to implicatures denying the corresponding universal statements, as the examples below attest.

(49)  
    a. When John arrives at work, he is sober.  
    b. When John arrives at work, he is usually/generally/typically sober.

Notice the dramatic consequences this difference may have on the use of these habitual sentences. Imagine we are trying to defend John from rumors that he works drunk. Something like (49a) would be the right kind of thing to say in his support. (49b), however, would produce the opposite effect, suggesting that he sometimes arrives drunk at work. The use of this sentence might in fact be a good, subtle way of rising the level of suspicion against John’s bad working habits.

Once again, AOs behave like their corresponding quantificational determiners, whereas the silent habitual operator behave like a definite determiner.

(50)  
    a. The dogs barked.  
    b. Most dogs barked.

(50b) implicates that not every dog barked, whereas if (50a) implicates something, it is that every dog barked.

6 Conclusion

In this paper, I contrasted the semantics and pragmatics of habitual sentences with and without adverbs of quantification (AQ), and claimed that whereas an analysis based on
quantification over singular events is adequate for the ones with AQs, the ones without them, which I called ‘Bare Habituals’, are best analyzed as involving plural definite descriptions of events. I assumed the presence of a silent habitual operator for bare habituals, but I assigned to this operator the meaning of the English definite determiner The (modulo a sortal distinction). Several differences were discussed concerning minimal pairs with and without AQs, and several parallels were established between the plural nominal determiner The and the silent habitual determiner. Taken together, they point to the conclusion that plurality and definiteness are crucial ingredients in the interpretation of bare habituals.

References


ASPECT AND ACTUALITY ENTAILMENT: TOO AND ENOUGH CONSTRUCTIONS*

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Abstract

This paper discusses implicative readings of too and enough constructions (TECs), that is, readings where their complement clause is realized in the actual world. There appears to be a correlation between aspect and implication in these constructions: with perfective aspect, TECs are implicative, with imperfective, they aren’t. I show that previous analyses cannot handle this aspectual interaction, nor derive implicative readings at all. I propose a new analysis, in which the base meaning of TECs is implicative and non modal, and emerges with perfective aspect, while the non implicative readings of TECs arise with imperfective morphology, which I take to be a reflection of a covert genericity operator.

1 Introduction

This paper discusses a peculiar interaction between aspect and actuality entailment in too and enough constructions (TECs). The puzzling data is presented in the French examples (1a) and (1b), which differ only in the aspect of the matrix verb:

(1)  a. Jean a été assez rapide pour s’enfuir (#mais il ne s’est pas enfui)
    Jean was-pfv. quick enough to escape (#but he didn’t escape)
  b. Jean était assez rapide pour s’enfuir (mais il ne s’est pas enfui)
    Jean was-impf quick enough to escape (but he didn’t escape)

In (1b) the complement clause need not hold in the actual world, while in (1a) it must. Because they focused on English and German, whose morphology is impoverished, previous analyses (e.g., von Stechow 1984, Heim 2001, Meier 2003) overlooked this aspectual interaction with implicative readings, and, in fact, cannot capture the role of aspect, and possibly not derive implicative readings at all.

In this paper, I propose a new analysis of TECs, in which a basic TEC only asserts the complement clause (implicative reading) and presupposes that there is some degree of adjective sufficient and necessary for the realization of the complement clause. I derive

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the non implicative reading through a covert genericity operator, reflected by imperfective morphology (cf. Bhatt 1999 for the ability modal).

2 Previous analyses of TECs

At first blush, the meaning of TECs seems to involve a comparison of degrees, with an actual degree being compared to a hypothetical one. Thus Mary’s age in (2) seems to be compared to a relevant age at which one can drive, given certain requirements. Similarly, the goodness of the food in (3) seems to be compared to the relevant goodness at which one can throw it away.

(2) Mary is old enough to drive

(3) The food is too good to be thrown away

That the second degree is non-actual can be illustrated by a continuation that negates the complement clause. (2) is still felicitous with the continuation “but she doesn’t drive because she is legally blind”.

Standard analyses of TECs (e.g., Meier 2003, Heim 2001) cash out this intuition by treating them as comparative constructions, which involve covert modality in their complement clauses. (4) and (5) illustrate Meier’s analysis for (2) and (3), where the complement clause (e.g., Mary drives) is implicitly modalized by a modal of existential force (simplified somewhat for expository purposes):

(4) \[\max \{d: \text{Mary is } d\text{-old}\} \geq \min \{d*: \exists w \in \text{Acc}(\@) \text{ s.t., Mary is } d^*\text{-old in } w \& \text{Mary drives in } w\}\]

Mary is older than the minimal age at which one can drive in view of the law.

(5) \[\max \{d: \text{Mary is } d\text{-old}\} > \max \{d*: \exists w \in \text{Acc}(\@) \text{ s.t., the food is } d^*\text{-good in } w \& \text{one throws it in } w\}\]

The food is better than the goodness at which one is allowed to throw it away.

However, as first pointed out by Karttunen (1971) for English, the complement clause is not always understood as being hypothetical, that is, TECs can have “implicative readings” (i.e., entail the actualization of their complements). Consider the following pair of examples:

(6) a. John was clever enough to leave early (implicative)

b. John was clever enough to solve math problems (non implicative)

(6a) implicates that John actually left early, whereas (6b) doesn’t implicate that John actually solved math problems. Note that in English, the implication in (6a) can be cancelled. However, the implication that arises with perfective morphology in the French example (1a) cannot. I take the cancelability of the implication in English to be due to the language’s morphological impoverishment. While sentences like (6a) favor a perfective reading, they need not to, and when speakers accept a continuation that
denies the realization of the complement clause, they really read the matrix verb as being imperfective.

Meier (2003) takes implicative readings to be due to a contextual effect. To obtain the implicative reading of (6a), she uses a fatalistic accessibility relation, which trivializes the modality by picking out only the actual world (by providing all the facts describing it).

However, this move is problematic in two respects. First, it fails to capture the role of aspect in actuality entailments. As (1) illustrates, context alone cannot explain the difference in implication, given that in languages with a richer aspectual morphology (e.g., French) the implicative reading only appears with matrix perfective morphology. Thus to handle the contrast in (1) Meier would have to stipulate that perfective aspect in the matrix always triggers a fatalistic accessibility relation in the complement. But even then, it doesn’t seem that the semantics will work. With this accessibility relation, the only world that is quantified over is the actual world. If the consequent is true in the actual world (John left early), the sentence will trivially come out as true. If the consequent is false (John didn’t leave early), the sentence will come out as undefined, because of the definiteness of the MIN operator.1 Thus sentences constructed with this accessibility relation will either come out as true or as undefined, which is not what our intuitions tell us (cf. Appendix for details).

Other analyses (e.g., Heim 2001, von Stechow et al. 2004) will run into similar problems, because they all assume that TECs are at base modalized, and thus they cannot derive implicative readings either (cf. Appendix).

3 Proposal

Previous analyses cannot capture the interaction of aspect with actuality entailment because they all assume that (i) TECs are always implicitly modalized; and (ii) TECs are comparatives. I propose instead that (i) the base meaning of TECs is non-modal; and (ii) TECs are not comparatives per se: they assert the complement clause and implicate (via a presupposition) a bidirectional relation between the degree of the adjective and the complement clause. The basic non-modal meaning emerges with perfective morphology and asserts that the complement took place (7). The modal reading emerges once the basic meaning combines with a covert genericity operator.

(7) a. Jean a été assez rapide pour s’enfuir
   Jean was-pfv. quick enough to escape
   "ASSERTION: Jean escaped"
   "PRESUPPOSITION: there is a sufficient and necessary degree of quickness which guarantees Jean’s escape."

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1 $\text{MIN}(E) = \{e \in E \land \forall e' \in E \Rightarrow e' \geq e\}$
4 Basic meaning of *enough* constructions

The basic meaning of *enough* (and *too*) constructions involves an assertion and a presupposition.

4.1 The assertion

Karttunen (1971) shows that implicative predicates share two characterizing properties: (i) when negated, they entail the negation of their complement clauses, and (ii) their complement clauses carry the ‘illocutionary force’ of the sentence. Karttunen takes these two properties to derive from the fact that the proposition that implicative constructions assert consists only of their complement clause (augmented by the matrix modifiers). I will first illustrate these two properties with the implicative *manage*, and then show that perfective TECs share these characteristics. I will conclude that the proposition that perfective TECs assert consists only of their complement clause (augmented by the matrix modifiers).

1. Implicatives seem to entail the actuality of their complement. When negated, they entail the actuality of the *negation* of their complement (contrast with factives):

   (8) a. John managed to solve the problem
       \[\rightarrow\] John solved the problem
   b. John didn’t manage to solve the problem
       \[\rightarrow\] John didn’t solve the problem

2. The complement clause carries the ‘illocutionary force’ of the sentence. With imperatives and questions, one really commands or questions the embedded complement: if one already knows the answer to (9b), one would not ask (9a) (contrast with the non implicative predicate *hope* in ‘John hoped to solve the problem’).

   (9) a. Did he manage to solve the problem?
       b. Did he solve the problem?

These facts are captured in Karttunen’s analysis where implicative constructions have two dimensions: (i) a proposition (what is being asserted: the complement clause, augmented by the tense and other modifiers of the matrix); (ii) a presupposition of some necessary and sufficient condition which alone determines whether the event described in the complement took place:

(10) Yesterday, Jean managed to kiss Mary

    ASSERTION: Yesterday, Jean kissed Mary
    PRESUPPOSITION: Jean’s success in kissing Mary depended only on his ingenuity

Perfective TECs share the same characteristics:
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1. Negated (perfective) TECs assert the negated complement clause, rather than the negation of the comparison. (11) comes out as a contradiction (note that with imperfective aspect, the sentence would be fine, which is why the English gloss is OK).

(11) #Jean n’a pas été assez âgé pour monter à cheval, mais il était si grand qu’ils l’ont quand même laissé monter.
Jean was-pfv not old enough to ride a horse, but he was-imp so tall that they still let him

2. In (perfective) TECs, the complement clause carries the ‘illocutionary force’ of the sentence:

(12) a. Speaker A :  Il y a eu un incendie sur le campus hier. Heureusement, Jean a réussi à s’enfuir.
There was a fire on campus yesterday. Luckily, Jean managed to escape.

b. Speaker B :  #Jean a-t-il été assez rapide pour s’enfuir ?
Jean was-pfv. enough fast to escape

Speaker B cannot ask (12b) if he already knows that Jean escaped.

Thus when one negates/questions a (perfective) TEC, one really negates/questions its complement clause. I take these facts to indicate that the base meaning of TECs: (i) is implicative and only asserts the complement clause (augmented by the matrix tense and modifiers); and (ii) is non modal. We can thus straightforwardly obtain the implicative meaning of TECs without having to find a stipulative way to unmodalize the sentence.

4.2 The presupposition

In the above section, I argued that the assertion consists only of the complement clause. To capture the full meaning of TECs, I derive the relation between the subject’s degree of adjectiveness and the complement clause through the presupposition in (13):

(13) PRESUPPOSITION: ∃d s.t. (∀w∈Acc(α).[[CP]]w ↔ [[Adj]](w)(d)([[DP]]))

The presupposition is modalized using Lewis’ (1986) maximal similarity, in order to prevent alien spaceships to intervene in Jean’s escape. The accessible worlds are those worlds that are as close to ours as possible, as far as the relevant properties (of escaping in (7)) are concerned (whether there is a desire/need to escape, what the conditions of entrapment are, etc...). This is very similar to the accessibility relation involved in counterfactuals (modulo the implicature of a false antecedent). In the counterfactual “If kangaroos had no tail, they would topple over”, we are not accessing worlds where kangaroos have crutches, but worlds as similar as ours, as far as the relevant properties
of kangaroos are concerned (cf. Lewis 1973, Iatridou 2001, a.o.)\(^2\). This accessibility relation is realistic (i.e., includes the actual world).

The sentence in (7) (repeated as (14)) has the following assertion and presupposition:

(14) Jean a été assez rapide pour s’enfuir  
Jean was-pfv. quick enough to escape  
**ASSERTION:** Jean escaped  
**PRESUPPOSITION:** There is a degree of quickness s.t., in all acc. worlds,  
Jean escaped iff Jean was (at least) that quick\(^3\):  
- If Jean was (at least) d-quick, he escaped  
- If Jean escaped, he was (at least) d-quick

One infers that Jean had the necessary level of quickness to escape as follows:

(15) \(P_1:\) In all acc. worlds (including \(@\)), if Jean escaped then Jean was d-quick  
\(P_2:\) Jean escaped in \(@\)  
\(\therefore\) Jean was d-quick in \(@\)  
(by Modus Ponens)

When the sentence is negated, the sentence has the following assertion and presupposition:

(16) Jean n’a pas été assez rapide pour s’enfuir  
Jean was-pfv. not quick enough to escape  
**ASSERTION:** Jean didn’t escape  
**PRESUPPOSITION:** There is a degree of quickness s.t., in all acc. worlds,  
- If Jean was (at least) d-quick, he escaped  
- If Jean escaped, he was (at least) d-quick

In this case, one infers that Jean didn’t have the necessary level of quickness to escape:

(17) \(P_1:\) In all acc. worlds (including \(@\)), if Jean was d-quick then Jean escaped  
\(P_2:\) Jean didn’t escape in \(@\)  
\(\therefore\) Jean wasn’t d-quick in \(@\)  
(by Modus Tollens)

Thus one can see that the comparative ‘flavor’ of TECs is logically derived.

\(^2\) We can reformulate the presupposition in order to truly reflect the counterfactuality:

\(i\) \(\exists d^*, \text{s.t., if Jean hadn’}t \text{ been } d^*-\text{quick he wouldn’}t \text{ have escaped and if he hadn’}t \text{ escaped he wouldn’}t \text{ have been } d^*-\text{quick.}\)

\(^3\) I take degrees to be lower bound: to be d-tall means to be at least d-tall.
5 The non implicative reading of enough constructions

We have seen so far that the base meaning of TECs is implicative: the assertion consists only of the unmodalized complement clause. We found that there is some level of modality in the presupposition domain, but the accessibility relation is very restricted and is always realistic. To derive the non implicative meaning of TECs, I argue that the construction combines with a covert genericity operator that doesn’t need to include the actual world. This move is inspired by Bhatt (1999) who argues that a similar interaction of aspect and implication for the ability modal derives from the presence or absence of a covert genericity operator, reflected by imperfective morphology.

5.1 An analogy: Bhatt’s (1999) analysis of able

When able has imperfective aspect (in languages that have the morphological contrast, such as French or Modern Greek in the example below), the complement clause doesn’t need to hold in the actual world, as one should expect from a modal auxiliary (18a). However, when able has perfective aspect, the complement does need to hold in the actual world (18b):

(18) a. Borusa na sikoso afto to trapeze ala ðen to sikosa
   CAN.impf.1s NA lift.non-pst-pfv.1s this the table but NEG it lift.impf
   (In those days), I could lift this table, but I didn’t lift it

b. Boresa na tu miliso (#ala ðen tu milisa)
   CAN.pst-pfv.1s NA him talk.non-pst-pfv.1s but NEG him talk.pst-pfv
   I was able to talk to him (#but I did not talk to him)

In Bhatt’s analysis, able has the semantics of an implicative predicate (manage): what is asserted is the complement clause. A conventional implicature (cf. Karttunen and Peters 1979) states that some effort went into the realization of the complement clause. This yields the implicative reading associated with perfective morphology (18b). The modal reading (18a) is obtained through a covert genericity operator which doesn’t require verifying instances, and is reflected by imperfective morphology.

Following Bhatt, I propose for TECs, that the imperfective morphology on the matrix is a reflection of a genericity operator which doesn’t require verifying instances.

5.2 Semantics of the genericity operator

The genericity operator (Gen) is generally assumed to be universal, as it universally quantifies over individuals (x) (in cases that involve individual variables—e.g., bare plurals) and situations (s), with the relevant situations involving individuals being provided by the context (C). Gen is also assumed to be modalized, in order to derive the “law-like” flavor of generic statements: the universal statement is not an “accident” of the actual world, but rather holds of a set of worlds. Gen thus also universally quantifies over possible worlds (w), restricted by an accessibility relation (cf. Dahl 1975, Chierchia 1995, Krifka 1995, a.o.). The following example illustrates (from Greenberg 2002):
(19) Grizzly bears snore very loudly.
∀w′[w′ ∈ Acc(w)]→[∀x,s [G. bear (x,w') ^ C(s,x,w')]] → [snore loudly (s,x,w')]
“In all worlds w’ accessible from w, every grizzly bear, in any contextually relevant situation (e.g., every sleeping situation) is snoring very loudly”.

This accessibility relation can be epistemic (as in the above example, in which the accessible worlds are those compatible with the speaker’s knowledge), or it can be deontic, as in the example below, where the accessible worlds are those in which the law is obeyed:

(20) Dogs owners pay tax on them.

5.3 Non implicative readings of TECs

I use a genericity operator to derive the non implicative reading of TECs:

(21) a. Jean est assez rapide pour s’enfuir
Jean is-impf quick enough to escape
b. ASSERTION: GEN(Jean escapes)
c. ∀w′[w′ ∈ Acc(w)]→[∀s C(s,w')] → [jean escapes (s,w’)]
d. “In all accessible worlds, and in any relevant situation of escaping, Jean escapes”.

Here, the genericity operator combines with the proposition (complement clause augmented by the matrix tense and modifiers), and quantifies over worlds epistemically accessible, and situations provided by the context, namely, situations of ESCAPING. At this point two questions come to mind: the first one has to do with the meaning of the paraphrase in (21d), which seems stronger than what (21a) says. The second is a formal one: what happens to the presupposition associated with TECs?

The answer to the second question will in turn answer the first one. Following Schubert and Pelletier (1989), I take it that presuppositions get accommodated in the restriction of the genericity operator, such that, when one evaluates a generic statement, one restricts oneself to a set of situations which are determined by the presupposition. Consider the following example:

(22) Cats land on their feet

The predicate “land on one’s feet” presupposes that the subject drops to the ground. This presupposition is accommodated in (22) by a restriction that can be stated as ‘whenever they drop to the ground’. Thus, (22) can be paraphrased as ‘in all situations where they drop to the ground, cats land on their feet’.

Similarly, in our TEC example, the presupposition gets accommodated into the restriction of Gen. This restricts the set of situations to those which depend only on Jean’s quickness. We can thus refine the meaning of (21a), with the following paraphrase:
‘In all accessible worlds, and in any situation of escaping which depend only on Jean’s quickness, Jean escapes’.

One can easily see that the reality might not be such that situations of escaping depend only on one’s quickness. Other factors can intervene: for one, Jean might not have the desire to escape. Thus the proposition expressed by the complement clause (‘Jean escapes’) doesn’t need to be actualized, yielding the non implicative reading of this enough construction.

6 The dual relation between too and enough

Following the same arguments as for enough constructions, I propose that too constructions: (i) assert the negation of the complement clause; (ii) have the following presupposition:

\[
\text{PRESUPPOSITION: } \exists d, \text{ s.t. } [\forall w \in \text{Acc}(\@). [\text{CP}]^w = 0 \leftrightarrow \text{[ADJ]}(w)(d)([\text{DP}])]
\]

Thus, the sentence in (25) has the following assertion and presupposition:

(25) a. Jean a été trop lent pour s’enfuir
   Jean was-pfv too slow to escape
b. ASSERTION: Jean didn’t escape
c. PRESUPPOSITION: There is a degree d of slowness s.t., in all acc. worlds, Jean didn’t escape iff Jean was d-slow.

One of the most appealing advantages of previous proposals was the duality of too and enough. This current proposal can also account for the dual nature of too and enough. The following sentences are supposed to be truth-conditionally equivalent:

(26) a. Jean was fast enough to escape
b. Jean was not too slow to escape

In order to see that the two are equivalent, one must first take into account the complementary of antonym gradable adjectives. Gradable adjectives (quick, slow) are relations between objects and intervals on a scale of degrees (cf. von Stechow 1984). Positive gradable adjectives and their negative counterparts use the same scale:

\[
\begin{align*}
\text{Neg extent (e.g., Jean’s slowness) } &< n, \infty > \\
\text{Pos extent (Jean’s quickness) } &< 0, n >
\end{align*}
\]

Positive adjectives (such as quick) relate positive extents (<0,n>) and objects; negative adjectives (e.g., slow) relate negative extents (<n,\infty>) and objects. The slower one is,
the closer to 0; the quicker one is, the closer to $\infty$. (I make the further assumption that $n$ belongs to only one extent.) The polarity of adjectives allows the following equivalences:

(27) a. quick = not-slow  
b. slow = not-quick

Given these equivalences, the presupposition in (25) is equivalent to the presupposition in the enough construction containing the antonym adjective, illustrated in (28):

(28) a. Jean a été assez rapide pour s’enfuir  
Jean was quick enough to escape  
b. ASSERTION: Jean escaped  
c. PRESUPPOSITION: There is a degree d of quickness s.t., in all acc. worlds, Jean escaped iff Jean was d-quick.

Because of the polarity of gradable adjectives, and because of the if and only if relation in the presupposition, too and enough have equivalent presuppositions. The following proof illustrates:

(29) $\exists d, \text{s.t. } [\forall w \in \text{Acc(@)}.[[\text{Jean escaped}]]^w = 0 \leftrightarrow [[\text{slow}]](w)(d)([[\text{Jean}}])$  
(replacing with negation of antonym adjective)  
= $\exists d, \text{s.t. } [\forall w \in \text{Acc(@)}.[[\text{Jean escaped}]]^w = 0 \leftrightarrow \neg([[[\text{quick}]]](w)(d)([[\text{Jean}}])$  
(by logical equivalence: $\neg P \leftrightarrow \neg Q = P \leftrightarrow Q$)  
= $\exists d, \text{s.t. } [\forall w \in \text{Acc(@)}.[[\text{Jean escaped}]]^w = 1 \leftrightarrow [[\text{quick}]](w)(d)([[\text{Jean}}])$

One can easily see then that (28) is equivalent to the negation of (25), given in (30):

(30) a. Jean n’a pas été trop lent pour s’enfuir  
Jean was-pfv not too slow to escape  
b. ASSERTION: It’s not the case that Jean didn’t escape = Jean escaped  
c. PRESUPPOSITION: There is a degree d of quickness s.t., in all acc. worlds, Jean escaped iff Jean was d-quick.

Thus, too and enough have equivalent presuppositions, and differ only in that one asserts the negation of the complement clause, while the other asserts its realization.

7 Aspect and Implication

One point needs to be clarified: Aspect itself is not responsible for whether a TEC is implicative or not. Rather, it reflects the presence of operators, which themselves determine the implication.
7.1 Perfective morphology

So far, we have seen that the basic implicative meaning appeared with perfective morphology. Could there be non-implicative readings with perfective morphology? Consider the following example:

(29) Jean a toujours été assez sobre pour conduire.
Mais sa femme ne l’a jamais laissé, parce qu’elle ne lui fait pas confiance.
Jean was-pfv. always sober enough to drive.
But his wife never let him because she doesn’t trust him.

In (29) the continuation implies that the complement clause didn’t take place. Contrast with (30):

(30) Hier, Jean a été assez sobre pour conduire.
#Mais sa femme ne l’a pas laissé, parce qu’elle ne lui fait pas confiance.
Yesterday, Jean was-pfv. sober enough to drive.
#But his wife didn’t let him because she doesn’t trust him.

The crucial difference between the two examples is that the former involves universal quantification, whereas the latter involves existential quantification anchored by the adverbial ‘yesterday’. The passé composé (perfective) in French is ambiguous between a preterit reading (which involves existential closure) and the Perfect (which involves universal quantification) (cf. Smith 1992). The example in (29) seems to involve a Perfect of a generic (which could be argued to involve both a Perfect and a Genericity operator). The morphological realization of such a Perfect requires the passé composé in French:

(31) J’ai toujours mangé des oeufs au petit déjeuner.
I’ve always eaten eggs for breakfast

Thus, the presence of perfective morphology doesn’t necessarily entail the absence of a genericity operator: two operators can be present but only one can be expressed. The genericity operator gives (29) its non-implicativeness, even though its presence goes undetected in the morphology.

7.2 Imperfective morphology

I would like to address two potential objections to the Genericity operator analysis. The first one concerns the nature of the imparfait (imperfective), which, in French, isn’t necessarily associated with the presence of a genericity operator. The second objection would be that, even if we are dealing with a covert genericity operator in the cases discussed, why doesn’t it need instantiations (like habituals do, for example)?

Imperfective reflects universal quantification, over an interval, which is continuous (for the progressive) or non-continuous (for habituals). If we follow Chierchia (1995), both statives and habituals involve a genericity operator (more precisely, they contain a
feature that triggers the presence of a genericity operator). So we should look at cases in which the imperfective could be the reflection of a progressive (that is, we need to look at eventives).

In this paper I have been focusing on adjectival constructions. Adjectives are states and thus cannot combine with the progressive. But the same analysis should be extendable to verbal constructions, in which a progressive reading is possible:

(32) Quand Marie est entrée, Jean dormait assez profondément pour ne rien entendre. When Marie came in, Jean was sleeping deep enough to hear nothing.

It seems that there is an actuality entailment in (32), although more field work is needed. What this would imply is that examples like (32) are cases in which imperfective morphology is not a reflection of the genericity operator, and in which the complement clause needs to be actualized. I leave it for future research how exactly the analysis will be extended to verbal constructions, and whether the progressive operator could license non implicative readings.

The second objection arises when contrasting the examples at hand with habituals such as ‘Mary smokes’, which is an odd statement if Mary never smoked in her life (i.e., if there are no verifying instances). I take the lack of instantiation requirement in TECs to result from the accommodation of the presupposition, which allows us to look at extremely idealized situations (situations that only depend on one factor).

8 Connection with the ability modal and other modal constructions

We have seen two cases where a seemingly modal construction shows an interaction of aspect with actuality entailment, namely TECs and the ability modal (cf. Bhatt 1999). This interaction is actually more pervasive and also seems to hold of other modals (e.g., French devoir, pouvoir, falloir and their Spanish, Catalan and Greek equivalents, a.o., cf. Hacquard, 2004). Thus one could argue that this is part of a greater phenomenon, and that the same analysis cannot hold for all modal constructions, and thus should ultimately be abandoned for the cases at hand.

However, I would like to show in this section that these different modal constructions are not randomly connected, but rather that they are related in a fundamental way. The hope is that the way these constructions are connected will provide the first clue to how the other constructions should be analyzed.

The ability modal and TECs are closely connected in that in both cases, the realization of the complement clause is contingent on a certain property of the subject (the adjective in the case of TECs and some (unspecified) inherent properties in the case of the ability modal). Thus the difference between the two constructions could hopefully be handled by the kind of presuppositions that are generated. The remaining modals that fit this generalization are also connected to properties of the subject. Indeed, the only modals that are sensitive to this aspectual interaction are root modals (deontics and dynamics). These modals refer to events rather than propositions (as is the case for epistemics), and their accessibility relation has been argued to be restricted to (internal or external) properties of the subject (cf. Brennan 1993).
While a full account of these other constructions is well beyond the scope of this paper, a first clue seems to be that there is a crucial connection between the properties linked to the subject (and restricting the modal base) and the complement clause of these root modals, and that various operators, as reflected by the morphology, can play with this connection.

9 Conclusion

TECs have been analyzed as comparatives with covert modal quantification. Based on the relationship between matrix aspect and actuality entailments, I have proposed a new account where TECs are not at base modalized, as they only assert their complement clause. The modal (or non implicative) readings of these constructions originate from a covert genericity operator (reflected by imperfective morphology), similar to the one involved in dispositional/ability statements. The comparative flavor of TECs results from an inference drawn from the combination of the assertion and the presupposition associated with TECs.

10 Appendix: Problems with previous analyses

Meier (2002)’s LF for (A1a) is in (A1b):

\[(A1) \begin{align*}
\text{a. } & \text{John is clever enough to leave early} \\
\text{b. } & \left[ \text{enough}(\@)(\lambda w. \text{can}^R(w)(h)(\lambda w. \text{PROj leave early in } w)) \right] = 1 \\
& \text{iff } \text{MAX}(\lambda d. \text{John is } d\text{-clever in } \@) \geq \text{MIN}(\lambda d^* \cap (g(h)(\@) \cup \{w | \text{John leaves early in } w\}) \cap \{w | \text{John is } d^*\text{-clever in } w\} \neq \emptyset)
\end{align*}\]

The maximal degree to which J. is d-clever is greater or equal to the minimal d* such that, if J. is d*-clever, he can leave early.

(h is the accessibility relation and g the assignment function)

A fatalistic conversational background doesn’t give the right meaning, as the sentence amounts to a tautology. Let’s focus on the degree to the right of the ≥ relation:

\[(A2) \text{MIN}(\lambda d^* \cap (g(h)(\@) \cup \{w | \text{J. leave early in } w\}) \cap \{w | \text{J. is } d^*\text{-clever in } w\} \neq \emptyset)\]

If the proposition q (q=that John leaves early) is false, (A1a) should come out as false. However, if q is false, then the MIN operator will quantify over the empty set. Because MIN is a definite description, the MIN set of degrees will be undefined. When q is true, the comparison comes out as a tautology: the maximal degree of John’s cleverness in the actual world is greater or equal to the minimal degree of John’s cleverness in the actual world. So the sentence will either come out as true or as undefined.

Heim (2000)/Von Stechow et al. (2004):

\[(A3) \max \{d: \text{M. is } d\text{-old} \} \geq \max \{d^*: \forall w \in \text{Acc}(\@): \text{M. drives in } w \rightarrow \text{M. is } d^*\text{-old in } w\}\]

Mary is at least as old as the age one must have if one drives.
(A4) \( \max \{d: \text{food is } d\text{-good}\} > \max \{d: \exists w \in \text{Acc}(\@): \text{one throws away the food in } w \text{ & the food is } d'\text{-good in } w\} \)

The food is better than the degree at which one can throw it away.

Heim/von Stechow’s analyses cannot get aspect to interact with the implication of the sentential complement nor get any implicative reading at all. A fatalistic accessibility relation cannot help. To see why, suppose that \( \text{Acc}(w) \) is a singleton set containing the actual world, then the truth conditions will come out as follows:

\[
\begin{align*}
\llbracket \text{CP} \rrbracket_{\@} & = 1 & \llbracket \text{CP} \rrbracket_{\@} & = 0 \\
\text{Too:} & \quad \text{false} & \text{Enough:} & \quad \text{true (tautology)}
\end{align*}
\]

If \( \llbracket \text{CP} \rrbracket_{\@} \) is false, the set the second MAX operator ranges over will be the empty set for too (since the first conjunct is false) and have no upper bound for enough (since the false antecedent makes the conditional vacuously true for any degree). If \( \llbracket \text{CP} \rrbracket_{\@} \) is true, the result of the second MAX will be well-defined. However, the comparison will give a contradiction in the case of too (\( \text{MAX}(S) > \text{MAX}(S) \) will be false for any \( S \)) and a tautology for enough (i.e., \( \text{MAX}(S) \geq \text{MAX}(S) \)).

References


SALIENCE, INFERENCE AND PLURAL ANAPHORA *

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Abstract

In this paper, I argue that the DRT Construction Rules for plural antecedents are redundant, because they are subsumed by an inference mechanism that must be made generally available for anaphora resolution. While Kamp and Reyle originally argued against a general inference mechanism for plural anaphora, I argue that the facts of compset anaphora require inference. Furthermore, I observe that compset anaphora is blocked by refset anaphora. I consider an alternative DRT account, in which inference coexists with Construction Rules. I argue that the Construction Rules are not necessary to capture the blocking generalization; rather, I argue that refset descriptions are semantically primed, thus deriving the blocking generalization in terms of general inference, together with an independently required mechanism of semantic priming. I argue that this alternative is to be preferred on grounds of theoretical parsimony. Furthermore, I present an argument that the general inference account correctly captures the fact that plural descriptions can be interpreted at the position of the plural pronoun, while the DRT account incorrectly requires that they be interpreted at the position of the antecedent.

1 Introduction

Occam’s razor provides a general motivation for simplifying linguistic theories: whenever possible, redundancies are to be eliminated in the theory. In the Minimalist Program this general impulse is given a particular slant: “Conditions on representations... hold only at the interface, and are motivated by properties of the interface” (Chomsky 1995)[p 170-171]. In this paper, I argue that the structural conditions on plural anaphora in DRT (Kamp and Reyle 1993) can be eliminated in terms of general properties of the semantic, or Conceptual-Intentional interface: namely Inference and Salience.

In what follows, I first describe the DRT account, in which two Construction Rules define the antecedents for plural pronouns. Next, I examine the phenomenon of compset anaphora, which goes beyond the limitations imposed by the DRT account. I argue that compset anaphora is indeed possible, but is subject to a blocking constraint. I then consider an alternative DRT account, in which Construction Rules coexist with inference. Next, I turn to my proposal, which eliminates the Construction Rules. According to this proposal, any inferable antecedent is available for a plural pronoun, subject to preferences that result from priming effects. In addition to being more parsimonious than the DRT accounts, I argue that my proposal has an empirical advantage: it correctly permits plural

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descriptions to be interpreted at the position of the plural pronoun, while the DRT account does not permit this.

2 The DRT Account: Plural Construction Rules

According to the DRT account of plural anaphora (Kamp and Reyle 1993), two explicit Construction Rules support plural anaphora. These rules are Summation and Abstraction. (Kamp and Reyle 1993) illustrate Summation with the following example:

(1) **John** took **Mary** to Aculpulco. **They** had a lousy time.

Here, Summation constructs the set \{John, Mary\}, which is the desired antecedent for They. In general, Summation allows plural reference to any subset of currently accessible discourse referents.

(Kamp and Reyle 1993) illustrate Abstraction with the following example:

(2) Susan has found **every book** which Bill needs. **They** are on his desk.

Here, Abstraction constructs the set of books which Susan has found and Bill needs. This is the desired referent for They. In general, Abstraction can apply to a sentence S containing a quantified NP (QNP). It constructs a property \(P\) from S by abstracting over the position of the QNP. Then it constructs a set consisting of all individuals that satisfy \(P\). So, in (2), the property is \(\lambda x. [\text{book } x \text{ and } \text{Susan has found } x \text{ and } \text{Bill needs } x]\).

As Kamp and Reyle point out, the Construction Rules deal with sets “...whose existence is entailed by the antecedent text but is not denoted by any one NP ...”. (Kamp and Reyle 1993) illustrate the following limitation on plural anaphora: “subtracting one set from another is not a permissible operation for the formation of pronominal antecedents.” [p. 307] For example, note that in (2), they cannot mean “the books x, such that it is not the case that Susan has found x and Bill needs x”.

Kamp and Reyle argue against defining a general inference rule for plural pronouns. Their intention is to construct some, but not all, of the inferable antecedents for plurals, because, in their view, not all inferable antecedents are available as potential antecedents. In particular, they point to the following limitation on plural anaphora: “subtracting one set from another is not a permissible operation for the formation of pronominal antecedents.” [p. 307] For example, note that in (2), they cannot mean “the books x, such that it is not the case that Susan has found x and Bill needs x”.

This reading could be thought of as the complement of the set constructed by Abstraction, and this sort of anaphora is normally called compset anaphora. The reading where they refers to the set constructed by Abstraction is called refset anaphora.

In this example, only the refset reading is possible; the compset reading is ruled out. Furthermore, Kamp and Reyle present the following example in arguing against compset readings:

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1 We set aside some problematic cases, in which Abstraction incorrectly introduces sets which may be empty; see Nouwen 2003 for discussion.
Eight of the ten balls are in the bag. They are under the sofa.

Clearly, the existence of the compset, ie., the remaining two balls, is entailed by the discourse. But, Kamp and Reyle argue, reference to this set is not possible here. This supports their proposal for Construction Rules: inferred antecedents should not be generally made available, since compsets are inferable but not possible antecedents.

However, it should noted that (3) is perhaps not as infelicitous as Kamp and Reyle suggest; many theorists (see (Neale 1990)) have argued that examples like (3) are acceptable in the right context: in a context where both speaker and hearer are focused on the task of collecting all ten balls – the hearer pauses to think, and then says “I bet they’re under the sofa!”.

In fact, it is widely accepted that compset anaphora is possible under certain conditions. The next section concerns itself with some of the main claims put forward concerning compset anaphora.

3 Compset Anaphora and Blocking

In this section, I will argue that compset anaphora is indeed possible under certain conditions. The main condition is what I will call the Blocking Generalization: compset anaphora is blocked by refset anaphora.

Consider the following example:

(4) Few MP's attended the meeting. They stayed home instead. (Nouwen 2003, p44)

Here, they refers to the MP’s who didn’t attend the meeting. This is the complement of the set associated with the quantified NP, few MP’s.

Note that the quantified NP few MP’s is non-increasing: there is a limit, albeit a somewhat fuzzy one, on the proportion of MP’s that could be denoted by few MP’s. It has been widely noted\(^2\) that such non-increasing NP’s facilitate compset anaphora. This is because a non-increasing NP entails the existence of a non-empty complement set. If one replaces few with a determiner that lacks this property, such as many, some, or most, the compset reading is no longer possible.

In general, a plural pronoun can refer to a compset whose existence is entailed. Of course, this is a consequence of the General Inference view, and conflicts with the view put forward by Kamp and Reyle.

However, despite the existence of examples like (4), several authors have claimed that compset anaphora does not really exist. Instead, apparent cases of compset anaphora in fact involve a kind of sloppy reference to the entire set. So, in (4), “They stayed home instead” might be interpreted to mean “(pretty much) All the MP’s stayed home instead”.

This seems to have been Kamp and Reyle’s view, and similar claims have been discussed by (Corbin 1996) and (Geurts 1997). This is not an entirely implausible position, since there is undoubtedly some looseness or sloppiness in the way sets are referred to. For

\(^2\)See (Nouwen 2003) for discussion and references.
example, (Nouwen 2003), citing (Geurts 1997), mentions the phenomenon of collective reference, as in the following:

(5) The soldiers withstood the attack.

As Nouwen remarks, a speaker might well utter (5) without verifying that all the soldiers were in fact able to cope with the attack. It may well be that some apparent cases of compset anaphora involve such sloppy reference to the entire set. However, I don’t see how one could explain away the entire phenomenon of compset anaphora in this way. There is in fact quite a bit of variety in the acceptability of compset anaphora. It’s hard to see how the sloppy reference view could account for this variety.

Consider the following example:

(6) - How are things going with your class?
(7) - Really good. Almost none of my students skipped the review session. And they all came prepared with interesting questions, too.

Here, the pronoun They denotes the students who didn’t skip the review session. The refset reading the students who skipped the review session is blocked because it is inconsistent – students can’t both skip the review session and come prepared with questions. Note also that the modifier all commits the speaker to a claim concerning every element of the compset, that is every student who didn’t skip the session. This is difficult to reconcile with a sloppy reference view.

I will therefore conclude that compset anaphora is indeed possible, under the right conditions. One condition, discussed above, is that the existence of the compset must be inferable. This is why increasing quantifiers like many do not support compset anaphora. A second condition is what I am calling the Blocking Generalization: refset anaphora blocks compset anaphora. What this means is that compset anaphora is possible only when the refset reading is ruled out for some reason. This captures the fact that the compset reading is not present in (2), since the refset reading is perfectly felicitous. On the other hand, for (7), the compset reading is felicitous, because the refset reading is inconsistent: if "they" means the students that skipped the review session, it is inconsistent to assert that they came to the session with interesting questions.

4 The DRT Alternative: Construction Rules and Inference

Based on our examination of compset anaphora, one could modify the DRT account by allowing inference in addition to the Construction Rules. This is essentially the proposal in (Nouwen 2003), where it is argued that refset readings have accessible antecedents, described by explicit rules, while compset readings require inference.\(^3\)

I will call this the DRT Alternative Account: refset anaphora involves an accessible antecedent, as defined by a DRT Construction Rule (Summation and Abstraction), while

\(^3\)Nouwen develops his explicit account of refset readings in terms of dynamic semantics rather than DRT. I will ignore that difference for the purposes of this paper.
compset anaphora requires a special inference to produce the antecedent (Nouwen 2003) [page 71]. Together with a stipulation that compset inference is more difficult than the Summation/Abstraction mechanisms, this accounts for the basic facts of compset anaphora, including the Blocking Generalization. On this view, the difference between compset and refset anaphora reflects a difference in underlying mechanisms: Construction Rules for refset anaphora, and inference for compset anaphora.

Note that this alternative is quite different from Kamp and Reyle’s original argument for the Construction Rule account: Kamp and Reyle argued for explicit construction rules instead of appealing to inference, because inferable antecedents such as complement sets were not possible antecedents for plural pronouns. According to the DRT Alternative account, inferable antecedents such as complement sets must be made available, subject to a variety of pragmatic and processing constraints. Since the refset antecedents produced by Construction Rules could also be produced by inference, it is clear that there is redundancy associated with the DRT Alternative. In what follows, I will remove that redundancy, arguing that all plural antecedents are produced by general inference, with preferences regulated by a general priming mechanism.

5 An Alternative: Inference and Salience/Priming

The simplest possible alternative to the DRT account is this: all inferable antecedents are available for plural pronouns, subject to a general preference for the most salient antecedent. My goal is to show that uncontroversial aspects of salience preferences are sufficient to derive the Blocking Generalization for compset anaphora.

Now, it is widely acknowledged that explicit antecedents are more salient than implicit antecedents. For example, in Centering theory (Grosz, Joshi and Weinstein 1995), implicit antecedents are permitted for singular pronouns, but are ranked lower than all explicit antecedents. Now, it seems reasonable to claim that refsets are explicit antecedents, while compsets are implicit. Given this, the Blocking Generalization could be seen as a special case of the fact that explicit antecedents are more salient.

However, this assumes a characterization of the refsets explicitly made available in discourse. Of course, one way to do this is in terms of the DRT Construction Rules. But in this case, the Salience preference requires for its very formulation the Construction Rules that we are attempting to eliminate. Thus our question remains: can the Blocking Generalization be captured without Abstraction/Summation or equivalent mechanisms?

6 Salience as Description Priming

To retain our maximally simple account of plural anaphora, I propose a general mechanism of semantic priming, according to which reference to a set raises its salience, because its description is primed.

Let us assume that a plural pronoun is represented as they (P), where P is any description. Now the Salience preference is this: they (P) is preferred over they (Q) if P has been primed more recently than Q. How do descriptions get primed?

4(Grosz et al. 1995) use the terms indirectly realized and directly realized.
We can use the Abstraction Rule as a basis for the priming of descriptions. Thus, a sentence of the form “Q students skipped the review session” primes the description $\lambda x. x$ skipped the review session. In general, for a sentence $S$ containing a QP, the description $\lambda x. S[QP/x]$ is primed. In other words, explicit reference to a set raises its salience, because its description is primed.

This derives the Blocking Generalization concerning refset and compset anaphora: the refset reading is preferred, because its description was primed, as desired. Again, the question must be raised, is this in fact simpler than the DRT account? After all, one might claim that some Abstraction-like mechanism is required to support the contention that the refset description is primed, while the compset description is not.

I cannot definitively refute this claim here, but my intention is that the priming of descriptions results from whatever mechanism underlies semantic priming in general. An Abstraction-like mechanism might well find a place in the underlying mechanism for semantic priming, although undoubtedly with a much different role than that conceived of in DRT.

Rather than further speculate on this issue, I would like to turn to one concrete empirical issue that distinguishes the current proposal from the DRT view. This concerns the question of where the plural description is evaluated.

7 An Empirical Issue: Where is Plural Description Interpreted?

According to the DRT account of Abstraction, the plural description is evaluated in the context of the quantified antecedent, and the elements of the refset are determined at that point. According to the General Inference account, this is not the case. No set is constructed at the position of the quantified antecedent. Rather, a salient description is produced at the position of the plural pronoun, at which point the description is evaluated to determined the members of the set.

Of course, in many cases there is no observable difference. But, by carefully constructing examples, one can force the description to correspond to different sets at the two positions. This is shown by (Evans 1977) with singular pronouns. The following is a variant of one of Evans’ examples:

(8) I have a meeting with the Mayor of Boston.

(9) a. He used to be a Democrat.
   b. The Mayor of Boston used to be a Democrat.

Consider the two continuations, (9)a and (9)b. In (9)a, he is the same individual, who has switched party affiliation, while (9)b concerns a different individual, who was the Mayor in the past. Based on such observations, Evans concludes that, for singular pronouns, the relevant description is not evaluated at position of pronoun.

Inspired by Evans’ argumentation, we can develop similar examples for plural pronouns, like (10).

(10) Many members of Congress have some control over tax policy. They used to be Democrats (but now most of them are Republicans).
The quantified antecedent for the plural pronoun *they* is *Many members of Congress*, and the description associated with the antecedent is *members of Congress who at present have some control over tax policy*. Here, it is natural to interpret *They as individuals who in the past were members of Congress with some control over tax policy*.

Let us look at this reading in more detail. Assume (contrary to fact) that the members of Congress with control over tax policy are the Dennis Hastert (Speaker of the House), and Jim Nussell and Rob Portman, leaders of the House Budget Committee. They are all Republicans. Under the previous administration these positions were held by Democrats. This scenario makes (10) true, under the reading paraphrasable as follows:

(11) In the past, the members of Congress with control over tax policy were Democrats.

To see why this reading is not permitted by the DRT account, look at the following DRS. (Note that I deploy a PAST operator for simplicity, instead of a more elaborate system involving event variables and temporal relations, as advocated by Kamp and Reyle.)

Here, the extension of the set X is determined with reference to the present time, in accordance with the Abstraction operation. But the desired reading requires X’s extension to be determined under the scope of the PAST operator. Under the proposed approach the desired reading is made possible, since the relevant description is evaluated at the position of the pronoun. This is represented by the following DRS:

Here, the set X is determined under the scope of PAST, since the description appears at the position of the plural pronoun *they*. One apparent failing of the above DRS is that it does
not capture exhaustiveness: it simply asserts the existence of a set of Congressmen that controlled tax policy and were Democrats. The natural reading is that all such Congressmen were Democrats. This is an issue that arises in general for the proper interpretation of definite descriptions, and I assume that plural pronouns with implicit descriptions are treated as definite descriptions. So whatever solution to exhaustiveness one proposes for definite descriptions, would also apply to plural pronouns as in the above example.

In my view, (10) is ambiguous, and the reading given by Abstraction is a perfectly acceptable one. This is to be expected under the current proposal, since the PAST operator can its scope restricted to the verb phrase, or have scope over the entire sentence, as shown below:

(14) They (members of Congress with control over tax policy) PAST be Democrats.
(15) PAST They (members of Congress with control over tax policy) be Democrats.

What example (10) shows is that the Construction Rules of the DRT account are not only redundant, they also lead to the wrong reading in certain cases.

8 Conclusions

The general argument of this paper is that DRT construction rules for plural antecedents are redundant, because a general inference mechanism must be made available for plural anaphora. Kamp and Reyle proposed Construction Rules instead of inference, because they did not want to provide for compset readings. However, the subsequent literature on compset anaphora strongly suggests that Kamp and Reyle’s view must be modified in some way – at least in some cases, compset readings are possible or even preferred. I consider an Alternative DRT view, in which a general inference mechanism coexists with Construction Rules, to capture the fact that refset readings generally block compset readings. I argue that the Construction Rules are not necessary to capture the Blocking Generalization; rather, I argue that refset descriptions are semantically primed, thus deriving the Blocking Generalization in terms of General Inference, together with an independently required, general mechanism of semantic priming. I argue that this alternative is to be preferred on grounds of theoretical parsimony. Furthermore, I present an argument that the General Inference account correctly captures the fact that plural descriptions can be interpreted at the position of the plural pronoun, while the DRT account incorrectly requires that they be interpreted at the position of the antecedent.

References


Abstract

In this paper I evaluate two recent analyses of anankastic conditionals, the designated goal analysis by von Fintel and Iatridou (2004) and the modal base restriction account of Penka, Krasikowa and von Stechow (2004). I will show that both theories make the wrong predictions in scenarios with multiple non-conflicting goals. To solve the problem, I propose that ordering sources select salient goals from the context of utterance. For anankastic conditionals the ordering source selects the goal described in the if-clause. At the end of this paper I present some arguments against the recent analysis of anankastic conditionals as counterfactuals by von Stechow, Krasikowa and Penka (2004).

1 Introduction

Anankastic propositions state that something is a necessary condition of something else. In natural language, anankastic propositions are often expressed in the form of a conditional (von Wright 1963, 9-10). In such conditionals, the complement of the modal in the consequent is a necessary condition for achieving the goal introduced in the antecedent. Examples of anankastic conditionals are given in (1). Sentence (1b) for instance, states that unless you first empty yourself, you do not learn anything.

(1) a. If you want to be a star, you must dress like one.
   b. You must first empty yourself, if you are to learn anything.
   c. If we want to be on time, we have to leave now.

The main challenge for an analysis of anankastic conditionals is to give a compositional account of the meaning of such sentences. The problem is the contribution made by ‘want to’ or ‘be to’ in the antecedent. On the one hand, these expressions do not seem to play any role in the anankastic interpretation. Note that (1c) states that leaving now is a necessary condition for us to be on time, not for us to want to be on time. On the other hand, the occurrence of ‘want’ in (1c) is not redundant. If we omit ‘want’, the sentence does not have the necessary condition interpretation anymore:

(2) If we are on time, we have to leave now.

The expression of intention in the antecedent is thus an essential ingredient of anankastic conditionals.

1From the Greek ονήματι which means ‘necessity’
Not every conditional of the form ‘if want p, then must q’ states that something is a necessary condition for something else. The following pair by Hare (1971, 45) clearly shows this point:

(3) a. If you want sugar in your soup, you should ask the waiter.
   b. If you want sugar in your soup, you should get tested for diabetes.

Whereas (3a) expresses that asking the waiter is a means of having sugar in your soup, (3b) does not mean that getting tested for diabetes is a means of having sugar in your soup. Rather it means something like ‘in view of your health, if you want sugar in your soup, you should get tested for diabetes’.

The paper is structured as follows. First I give some background on Kratzer’s framework for modals and conditionals. In section 3 I discuss the existing accounts of anankastic conditionals and in section 4 I present my own analysis. At the end of the paper I discuss the objections against my analysis put forward by von Stechow et al. (2004), and I compare my approach to their analysis of anankastic conditionals as counterfactuals.

2 Background: Kratzer’s Semantics

Most existing accounts of anankastic conditionals take Kratzer’s integrated theory of modals and conditionals (Kratzer 1981) as their point of departure. However, as it stands, Kratzer’s doubly relative semantics doesn’t offer a straightforward account of these sentences.

In Kratzer’s doubly relative semantics the interpretation of modals is dependent on two conversational backgrounds: the modal base and the ordering source (Kratzer 1981). The modal base and ordering source parameters are modelled as functions from worlds to sets of propositions. The modal base $f$ assigns to the world of evaluation $w$ a set of propositions $f(w)$ that describes the domain of possible worlds that the modal quantifies over. The ordering source $g$ provides a further restriction on the domain. It assigns a set of propositions to $w$ that serves to order the modal base worlds with respect to how close they are to the ideals expressed by $g(w)$. The ordering induced by a set of propositions $g(w)$ is defined the following way:

\[ w' \leq_{g(w)} w'' \text{ iff } \{ p : p \in g(w) \text{ and } w'' \in p \} \subseteq \{ p : p \in g(w) \text{ and } w' \in p \} \]

Thus a world $w'$ is at least as close to the ideal $g(w)$ as a world $w''$ iff all the propositions of $g(w)$ that are true in $w''$ are also true in $w'$.

Modals quantify over those modal base worlds that are best by the ordering source.

(5)  

Kratzer’s Semantics for Modality$^2$

(i) ‘must $p$’ is true in $w$ iff for all $w' \in \bigcap f(w)$ such that $\neg \exists w'' \leq_{g(w)} w'$ it holds

$^2$I give a simplified version of the definitions under the assumption that there always exist closest worlds (the so-called Limit Assumption, see Lewis (1973, 19-21). I’ll make this assumption throughout the paper.
that $p$ is true in $w'$

(ii) ‘can $p$’ is true in $w$ iff there is a $w' \in \cap f(w)$ such that $\exists w'' \leq g(w) w'$ and $p$ is true in $w'$

The modal base and ordering source of a given expression are determined in part by its lexical meaning and by its conversational background. Typically, the modal base is factual, containing facts, but the ordering source need not be realistic. In general, the ordering source contains ideals. Consider example (6c):

(6) a. According to the school’s tradition, the champions and their partners open the ball.
   b. Harry is a champion.
   c. Harry has to dance.

For ‘has to’ in (6c), $f$ is circumstantial, picking out the relevant circumstances in $w$, that Harry is a champion, and $g$ is deontic, containing the school’s tradition. Sentence (6c) is true in $w$ relative to $f$ and $g$ iff in all worlds $w'$ in which Harry is a champion and that correspond most to the tradition, Harry dances in $w'$.

With respect to conditionals, Kratzer assumes that $if$-clauses restrict the modal base of the (possibly covert) modal in the consequent. The material in the $if$-clause is thus treated as a hypothetical fact.

(7) Kratzer’s Semantics for Conditionals
   (i) ‘if $p$, then must $q$’ is true in $w$, iff
       for all $w' \in \cap f^+(w)$ such that $\exists w'' \leq g(w) w'$, $q$ is true in $w'$
       and $f^+(w) = f(w) \cup \{p\}$
   (ii) ‘if $p$, then can $q$’ is true in $w$, iff
       there is a $w' \in \cap f^+(w)$ such that $\exists w'' \leq g(w) w'$ and $q$ is true in $w'$
       and $f^+(w) = f(w) \cup \{p\}$

To see how this works, consider sentence (8). The $if$-clause restricts the modal base of ‘has to’ in the consequent to worlds in which Harry’s scar hurts again. The conditional is then true in $w$ iff Harry goes straight to Dumbledore in all those worlds $w'$ such that Harry’s scar hurts again and that correspond most to his godfather’s command.

(8) If Harry’s scar hurts again, he has to go straight to Dumbledore (as commanded by his godfather).

As said above, the Kratzerian analysis fails for anankastic conditionals. To see why, consider the following scenario. In the actual world, you want to become an actor. You do not want to hunt tigers. But I do not know that. To become an actor, you must go to Hollywood. To hunt tigers, you have to go to the jungle. In this scenario, it seems that I can felicitously utter (9) and that my utterance is true.

(9) If you want to hunt tigers, you must go to the jungle.

But Kratzer predicts that it is false, because the ordering source $g(w)$ selects what you
want in the actual world. That is, (9) is true in w iff you go to the jungle in all those worlds \( w' \) such that you want to hunt tigers in \( w' \) and as much as possible of what you want in the actual world, i.e. to be an actor, is true in \( w' \). Clearly, (9) comes out false, because in the worlds that are best by \( g(w) \), you will go to Hollywood. You will not go to the jungle in all of those worlds.

3 Previous Analyses

3.1 Sæbø’s Analysis

The first attempt to mend Kratzer’s framework in order to account for anankastic conditionals was made by Sæbø (2001).\(^3\) He takes over Kratzer’s insight that if-clauses are devices for restricting the domain of the modal operator in the consequent. However, whereas Kratzer maintains that if-clauses always restrict the modal base, Sæbø proposes that in sentences such as (10) the if-clause adds a proposition to the ordering source. He thus treats the if-clause as a hypothetical ideal, instead of a hypothetical fact.

(10) If you want to go to Harlem, you must take the A train.

For (10) the initial modal base is circumstantial, specifying all the relevant circumstances about the railroads, geography etc. The ordering source is teleological, containing your goals. To this ordering source, the proposition that you go to Harlem is added. This is, in Sæbø’s terminology, the internal antecedent of the conditional, i.e. the complement of ‘want’. Note that the external antecedent, i.e. the proposition that you want to go to Harlem is not added to the ordering source, since this would have the effect that you want what you want. Sæbø interprets ‘want’ only as a signal as to which kind of modality is invoked by the modal in the consequent. Sæbø assigns the following truth conditions to (10):

(11) (10) is true in \( w \) iff in all \( w' \in \bigcap f(w) \) such that \( \exists w'' \leq g^+(w) \) \( w' \), you take the A train in \( w' \), and \( g^+(w) = g(w) \cup \{\text{you go to Harlem}\} \)

It follows from this analysis that if-clauses may fulfill either one of two possible roles. In ordinary conditionals, such as Hare’s diabetes-example (3b), the if-clause restricts the modal base, but in anankastic conditionals such as Hare’s waiter-sentence (3a), the internal antecedent restricts the ordering source. Thus Sæbø’s theory of conditionals is as follows:

(12) Sæbø’s Analysis of Conditionals\(^4\)

‘if \( \phi \), then modal \( \psi \)’ is interpreted relative to:

(i) \( f^+(w) \) and \( g(w) \), where \( f^+(w) = f(w) \cup \{\phi\} \), or

(ii) \( f(w) \) and \( g^+(w) \), where \( g^+(w) = g(w) \cup G_\phi \), where \( G_\phi \) is the ordering source expressed in \( \phi \)

\(^3\) (Sæbø 2001) draws on a much earlier manuscript (Sæbø 1986).

\(^4\) The rule I give is a simplification which, in my opinion, captures the essence of Sæbø’s theory of conditionals.
We can now give an explanation of why ‘want to’ or ‘be to’ has to be present in the antecedent of a conditional for it to express the anankastic meaning. Propositions that do not contain any expression of intention do not express an ordering source. Consequently, such antecedents cannot restrict the ordering source. The if-clause of sentences as (2) can only restrict the modal base.

The main problem with Sæbø’s analysis is that it makes the wrong predictions. Independently of one another, both von Fintel and Iatridou (2004) and Penka et al. (2004) have argued that his account runs into problems in scenarios in which you have inconsistent goals. Von Fintel & Iatridou (2004) have come up with the Hoboken scenario. Suppose that in \( w \) you want to go to Hoboken. But I do not know that. The only way to Hoboken is the PATH train. The only way to Harlem is the A train. I say correctly:

(13) If you want to go to Harlem, you must take the A train.

Under Sæbø’s analysis of (13), your goal of going to Harlem is added to the initial ordering source, which contains what you want in the actual world: going to Hoboken. Sentence (13) is true iff in all modal base worlds \( w' \) that correspond most to what you want, you take the A train in \( w' \). The problem is that going to Harlem and going to Hoboken are inconsistent goals, so that you can only realize one of your goals. It follows that modal base worlds in which you go to Hoboken are just as ideal as modal base worlds in which you go to Harlem. Consequently, it won’t be true that you take the A train in all those ideal worlds, since in some of them, you’ll take the PATH train. Thus, under Sæbø’s analysis, (13) is predicted to be false in the Hoboken scenario.

Penka et al. (2004) on the other hand, argued that Sæbø can’t handle the so called mayor scenario. I want to become the mayor in \( w \), but I don’t want to go to the pub regularly in \( w \). And in \( w \) one becomes the mayor only if one goes to the pub regularly. Thus \( g(w) \) contains two propositions: that I become the mayor, that I do not go to the pub, and the modal base contains the fact that I cannot achieve both these goals at the same time. The following conditional is true in this scenario:

(14) If you want to become the mayor, you must go to the pub regularly.

Under Sæbø’s analysis however, (14) is false. According to his analysis, (14) is true in \( w \) relative to \( f(w) \) and \( g^+(w) \), where \( g^+(w) = g(w) \cup \{ \text{you become the mayor} \} \), iff in all modal base worlds \( w' \) that are ideal according to \( g^+(w) \) you go to the pub regularly. But according to \( g^+(w) \) worlds in which I become mayor (and go to the pub) are just as ideal as the worlds in which I do not go to the pub. Thus (14) is false.

3.2 Von Fintel & Iatridou’s Analysis

Von Fintel & Iatridou (2004) discuss three possible analyses for anankastic conditionals. In the end, they decide to go with the so-called designated goal analysis. This analysis postulates that in anankastic conditionals the hypothetical goal overrides any conflicting goals that you actually have (von Fintel and Iatridou 2004, 5). The goal expressed in the if-clause then functions as the designated goal: the only relevant goal in evaluating the...
conditional. The main idea is that the ordering source that is obtained by intersecting
the hypothetical goal $p$ with the initial ordering source $g(w)$ is further revised to make it
consistent. Von Fintel & Iatridou (2004) do not provide a definition of this revised $g^+(w)$.
They probably have in mind that an anankastic conditional ‘if want $p$, then must $q$’ is
interpreted relative to a circumstantial $f$ and a teleological $g^+$, where $g^+(w)$ is the set of
all maximally consistent subsets of $g(w) \cup \{p\}$.

The analysis of von Fintel & Iatridou makes the right predictions in the Hoboken sce-
nario, where you have two inconsistent goals, going to Hoboken and going to Harlem.
Sentence (13) comes out true, since we do not take your goal of going to Hoboken into
consideration. The modal base worlds are only ranked with respect to your ideal of going
to Harlem which is the designated goal. The ideal modal base worlds are thus worlds in
which you go to Harlem. In all those worlds you will take the A train. Therefore, (13) is
ture under the Hoboken scenario.

However, whereas von Fintel & Iatridou’s designated goal analysis works fine for scenar-
ios with inconsistent goals, it fails in intuitively simpler scenarios: scenarios in which you
have multiple non-conflicting goals. The following scenario is a case in point. There are
two trains going to Harlem in $w$, the A train and the B train. At the station I ask about
ways to get to Harlem, and the man behind the counter answers by uttering (15). His
utterance is false, since taking the A train is not the only way to get to Harlem.

(15) If you want to go to Harlem, you must take the A train.

But now suppose that in the actual world, I have more goals than just going to Harlem.
Suppose that I want to meet my idol, Ruud van Nistelrooy and that Ruud happens to be
on the A train. Intuitively, the utterance in (15) is still false. But von Fintel & Iatridou
predict that it is true.

According to von Fintel & Iatridou (15) is interpreted relative to an ordering source $g^+(w)$
that contains both my goal of going to Harlem and my goal of meeting my idol. Since
these two goals are not inconsistent, the hypothetical goal does not override my goal of
meeting Ruud. The sentence is true iff I take the A train in all circumstantially accessible
worlds $w'$ in which I get most of what I want. According to $g^+(w)$ the best worlds are
those in which I get to go to Harlem and get to meet Ruud van Nistelrooy. And in those
worlds I will take the A train. Hence, (15) comes out true.

The problem is that under von Fintel & Iatridou’s analysis the modal doesn’t quantify over
all worlds in which I go to Harlem, but only over a subset thereof, i.e. worlds in which
I go to Harlem and meet Ruud van Nistelrooy. Consequently, the anankastic reading is
not obtained. Taking the A train is a necessary condition for going to Harlem if I take the
A train in all worlds in which I go to Harlem. And so the modal has to quantify over all
those worlds. But if the initial ordering source $g(w)$ is non-empty, this doesn’t happen.
In other words, the hypothetical goal does not only have to override any conflicting goals
you actually have, but it has to override all other goals you actually have.

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6Ruud van Nistelrooy is the star of the Dutch soccer team.
3.3 Penka, Krasikowa and von Stechow’s analysis

Penka et al. (2004) propose an alternative solution to the problem of which Sæbø’s theory suffers, i.e. the problem of scenarios with inconsistent goals. They claim that in case of anankastic conditionals the internal antecedent proposition restricts the modal base of the modal in the consequent.

(16) Modal Base Restriction

An anankastic conditional ‘if want \( p \), then must \( q \)’ is interpreted relative to a circumstantial \( f^+ \) and a teleological \( g \), where \( f^+ = f(w) \cup \{ p \} \).

This solves the mayor problem in the following way. According to Penka et al. (14) is true iff you go to the pub regularly in all modal base worlds, i.e. worlds in which you become mayor, that are best by the ordering source. The ordering source contains the goals that you actually have: becoming mayor and not going to the pub regularly. These goals are inconsistent and thus you cannot achieve both. But since the ordering source orders the modal base worlds, and the modal base is already restricted to worlds in which you become mayor, there is no modal base world in which your goal of not going to the pub regularly is achieved, and so that goal doesn’t play a role in deciding which modal base worlds are best.

As remarked by Penka et al. (2004), this modal base restriction analysis is essentially the same as von Fintel & Iatridou’s designated goal approach. If you let the designated goal in the if-clause override any conflicting goals, you are actually treating it as a hypothetical fact. Remember that if the ordering source contains propositions that are inconsistent with the modal base, the latter has priority. A proposition is a necessity iff it is true in all worlds in which all of the modal base propositions are true, and as much of the ordering source propositions as possible. Von Fintel & Iatridou claim that the designated goal has the same sort of priority as the propositions in the modal base.

Since the analysis of Penka et al. is not different from the designated goal analysis, it is subject to the same problem. Penka et al. fail to predict that (15) is false in the Ruud van Nistelroyo scenario. Even if the modal base is restricted to worlds in which I go to Harlem, the worlds from the ordering source in which I meet Ruud van Nistelroyo are still accessible. The best worlds will still be worlds in which I go to Harlem and meet Ruud. In those worlds I’ll take the A train, and so Penka et al. predict that (15) is true.

From this I conclude that the analysis of Penka et al. may do the job for which it was designed, that is, handling scenarios with conflicting goals. But it cannot handle what at face value seems to be a more simpler scenario: where you just have several goals that are not in conflict with one another.

4 An Alternative Analysis

4.1 Contextually Salient Goals

As said above, the Ruud van Nistelroyo scenario shows that in evaluating anankastic conditionals, the modal is not interpreted relative to an ordering source that contains all goals.

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7Their analysis draws on (von Stechow 2004).
your goals, but rather relative to the goal that is described in the antecedent. Consider the scenario again. I want to meet Ruud van Nistelrooy in \( w \). And in \( w \) there are two trains going to Harlem, the A train and the B train. Ruud van Nistelrooy happens to be on the A train. Sentence (17) is false according to this scenario.

(17) If I want to go to Harlem, I must take the A train.

The modal in the consequent is relative to a circumstantial modal base, and a teleological ordering source. If this ordering source only contains the proposition that I go to Harlem, (17) indeed comes out false. Following the truth conditions in (18), the conditional is true iff I take the A train in all circumstantially accessible worlds in which I achieve my goal, i.e. go to Harlem. But given that there are two trains going to Harlem, I will not take the A train in all those worlds.

(18) Anankastic Conditionals

’if want \( p \), then must \( q \)’ is true in \( w \), iff

for all \( w' \in \bigcap f(w) \) such that \( \neg \exists w'' \leq_{g+(w)} w ' \), \( q \) is true in \( w' \)

where \( g(w) = \{ p \} \)

Note that the analysis in (18) makes not only the right predictions for the Ruud van Nistelrooy scenario, but also handles scenarios in which you have conflicting goals, such as the Hoboken scenario or the mayor scenario. If we only take the hypothetical goal into consideration, it does not matter anymore that in the actual world you want something that conflicts with that goal. But what is the rationale behind this analysis? Can we make the claim that the ordering source is constituted by the internal antecedent plausible? We can under a reinterpretation of Kratzer’s doubly relative semantics.

There are two different views on ordering sources in the literature. First, Kratzer (1981) assumes that a teleological ordering source assigns to \( w \) all propositions that are your goals, independent of the linguistic context. Just as a juridical ordering source assigns all propositions that the law provides, and a deontic ordering source consists of all propositions that are considered to be good. This line of thinking is followed by von Fintel and Iatridou (2004) and Penka et al. (2004).

But there is another way of thinking about ordering sources, common in implementations of Kratzer’s framework in dynamic semantics. There it is assumed that the ordering source just is a contextually salient (set of) proposition(s). In Frank (1997) for instance, the ordering source parameter is treated as an anaphor that needs to link up to a context referent in the previous discourse. In the system of Geurts (1999) the antecedent of the anaphor would be a propositional referent.

The analysis of anankastic conditionals, and in particular the Ruud van Nistelrooy scenario, brings to light that these two ways of construing ordering sources are not equivalent. On the first view, a teleological ordering source assigns all your goals to \( w \), whether it is known that these are your goals or not. It follows that in the Ruud van Nistelrooy scenario the wrong predictions are made for (17). But under the second view, the ordering source only contains those goals that have been explicitly introduced in the conversation. Because of that, we may assume that in the Ruud van Nistelrooy scenario, my goal of meeting my idol is not picked up by the ordering source parameter, and hence will not
influence the interpretation of the modal in (17).

The anankastic reading results from binding the ordering source parameter to the proposition in the antecedent that describes the goal. Introducing a goal in the antecedent of a conditional is a way of making that goal highly salient. It is therefore not surprising that the ordering source would link up to that goal. Support for this claim can be found in Bittner (2001) where it is argued that if-clauses are topical.

To sum up, I argue that it is misleading to think of ordering sources as functions that assigns sets of propositions to the world of evaluation. However, for the modal base parameter this line of thinking seems to be correct. For (17) for instance, the circumstantial modal base contains all the relevant facts, about the railroads, the geography, the train schedules, etc. But all these facts do not have to have been explicitly mentioned in the preceding discourse in order to end up in the modal base. We want them to be part of the modal base, whether we know all the departure schedules by heart or not.

That there are differences between modal bases and ordering sources has previously been noted by Frank (1997). She notes that presuppositions can only be accommodated in modal base contexts, not in ordering source contexts. For instance in (19c), the presupposition that Max owns a car should not be accommodated in the juridical context (19a), since this would mean that the law provides that Max owns a car, but in the factual modal base context (19b).

(19)  

a. Any person who is not handicapped and owns a car, pays taxes for it.  
b. Max is not handicapped.  
c. Max must pay taxes for his car.

The analysis of anankastic conditionals shows that there is another difference between modal bases and ordering sources. Modal bases are functions that assign to the world of evaluation a set of propositions that describe everything that is known (in case of an epistemic modal base), or all the relevant facts (if the modal base is circumstantial). But ordering sources are contextually salient propositions.

4.2 An Objection

Von Stechow et al. (2004) have objected to an earlier version of this analysis that I put forward in Huitink (2004). Their main objection is that my analysis seems to ignore the very reason why Kratzer introduced the ordering source parameter in the first place. Initially, Kratzer (1977) assumed that modals are interpreted relative to just one conversational background, the modal base \( f(w) \). This turned out to be problematic in case \( f(w) \) is inconsistent, since any proposition is a necessity relative to an inconsistent modal base, and no proposition is a possibility. To solve the problem, Kratzer (1981) proposed that modals are interpreted relative to two conversational backgrounds, the modal base and the ordering source. The modal base contains propositions that describe facts, and the ordering source describes ideals. It may be that the ordering source is inconsistent with the modal base. But if it is, the semantics is so designed that the modal base has priority over the ordering source. A proposition is a necessity if it is true in all the modal base worlds that correspond to the ideals as much as possible.
Now von Stechow et al. (2004, 8) object that in my analysis it is not possible that the ordering source contains something that conflicts the modal base. My answer to this objection is that such a conflict is possible in my system. My analysis does not contain a principle that keeps the ordering source from selecting a set of propositions that is inconsistent with the modal base. The mayor scenario of Penka et al. (2004) is a case in point. In this scenario it is given that you want to become mayor and that you do not want to go to the pub regularly. But unfortunately for you, the world is such that you can only become mayor if you do go to the pub regularly. I predict that for (20), the modal base contains the fact that you cannot realize both your goals, and the ordering source contains both the above mentioned goals. Consequently, (20) is false, since you do not go to the pub in all the worlds that are best according to this ordering source.

(20) You have to go to the pub regularly.

But I also predict that (21) is true, since there the ordering source parameter is bound to the goal described in the if-clause, under the assumption that a goal in an if-clause is highly salient:

(21) If you want to become mayor, you have to go to the pub regularly.

As far as I can see, this counters the main objection of von Stechow et al.

4.3 Relative Necessary Conditions

To conclude my analysis, I’d like to briefly remark on the way necessary condition is expressed in natural language. It seems that very often we express that something is a necessary condition of something else, given certain assumptions. Consider for instance Sæbø’s paradigmatic example of an anankastic conditional again:

(22) If you want to go to Harlem, you must take the A train.

Strictly speaking, if (22) were a true anankastic conditional, it would have to be false, since there are always other ways of going to Harlem than taking the A train. I could for instance go by car, or by foot, or take a taxi, or maybe fly a helicopter. It seems that in our understanding of (22) we already take it for granted that you go by train. As such (22) expresses a relative necessary condition.

The circumstances in view of which something is a necessary condition of something else, may also be explicitly stated:

(23) a. If you want to go to Harlem, you have to take the A train, unless of course you get your car fixed in time.
    b. If you want to go to Harlem, you have to take the A train, assuming that you don’t own a car.

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8I owe this observation to Henriëtte de Swart (p.c.). Independently, von Stechow et al. (2004) have made the same observation.
In the semantics, relative necessary conditions can be accounted for by restricting the modal base further. For (22) the modal base contains all relevant facts with respect to the railroads, and the fact that you are going to travel by train. The ordering source is as before, your goal of going to Harlem. Then (22) expresses that in all circumstantially accessible worlds in which you travel by train and go to Harlem, you take the A train. Similarly, in (23a) the modal base is further restricted by the *unless*-clause, and in (23b) the restricting comes from the complement of *assuming*.

5 Anankastic Conditionals as Counterfactuals?

5.1 The Analysis

Recently, von Stechow et al. (2004) proposed a competing analysis that treats anankastic conditionals as counterfactuals. Whereas their analysis is at first sight very attractive, I think it ultimately fails.

Von Stechow et al. (2004) base their analysis on Sæbø’s observation that that anankastic conditionals can be paraphrased by means of purpose constructions (Sæbø 2001). He presents the following pair of sentences:

(24) a. If I want to be owner of North America, I must find the Golden Helmet.
    b. To be owner of North America, I must find the Golden Helmet.

Although the semantics of purpose constructions had not been widely studied, the theory developed by Bech (1957, 320ff.) clearly points in the direction of a Kratzerian account of modality, where the purpose clause determines the domain of quantification of the modal in the consequent.

The analysis of anankastic conditionals by von Stechow et al. (2004) consists of two parts. First, they take anankastic conditionals to be *elliptical*. That is, (25a) can be paraphrased as (25b), and its LF is something like (25c):

(25) a. If you want to pass the exam, you should study well.
    b. If you want to pass the exam, you should study well, to do that.
    c. If you want to pass the exam, [you should [to pass the exam] study well]

According to von Stechow et al. the complex main clause alone expresses the anankastic reading. The domain over which the modal quantifies is thus restricted by the *to*-clause, and not by the *if*-clause. Von Stechow et al. claim that the *if*-clause in anankastic conditionals is not really ‘conditional’, just as the *if*-clause in (26) only seems to contribute a felicity condition:

(26) If the train is leaving in 2 minutes, why are we standing around here talking?
      (von Stechow et al. 2004, 11)

This means that von Stechow et al. claim that anankastic conditionals are really sentences with the logical form: ‘*to φ, must ψ*’. This brings us to the second part of the analysis, which concerns the semantics of such sentences. Von Stechow et al. first try to treat conditionals as counterfactuals, in the sense of (Lewis 1973). That is, they propose that
(27) is true iff you study well in all the worlds $w'$ such that you pass the exam in $w'$ and $w'$ is most similar to our world.

(27) To pass the exam, you should study well.

The truth conditions for anankastic conditionals then are as follows (von Stechow et al. 2004, 9):

(28) Anankastic Conditionals as Counterfactuals - First Version

\[ 'To \phi, must \psi' \text{ is true in } w \text{ iff } \Sim_w(\phi) \subseteq \psi \]

But, as von Stechow et al. (2004, 9-11) note, the above analysis has some unwanted consequences. First, since it claims that Lewis’ would-counterfactuals have the same truth conditions as anankastic conditionals, it predicts that (29a) and (29b) have the same meaning. But this isn’t borne out:

(29) a. If kangaroos had no tails, they would topple over.
   b. For kangaroos to have no tails, they would topple over.

The anankastic conditional in (29b) makes a stronger statement than (29a): it means that the only way to achieve that kangaroos have no tails is that they topple over, which is clearly false. The counterfactual in (29a) on the other hand is true.

To mend things, von Stechow et al. (2004, 9) suggest that we need a stricter relation between the antecedent and the consequent. They require that for anankastic conditionals the set of most similar worlds where the antecedent is true is a subset of the set of most similar worlds where the consequent holds:

(30) Anankastic Conditionals as Counterfactuals - Final Version

\[ 'To \phi, must \psi' \text{ is true in } w, \text{ iff } \Sim_w(\phi) \subseteq \Sim_w(\psi) \]

This analysis accounts for the falsity of (29b). Probably none of the nearest worlds where kangaroos have no tails belongs to the nearest worlds where kangaroos topple over.

5.2 Why Anankastic Conditionals aren’t Counterfactuals

I have three objections against the analysis of von Stechow et al. (2004). The first is that the restriction on the consequent in their final analysis is too strong. It predicts that (31) is false:

(31) If combustion is to occur, oxygen must be present.

Suppose that in the actual world oxygen is present, but that, for some other reason, combustion does not occur. Since oxygen being present is a necessary condition, but not a sufficient condition for combustion to occur, this is possible, and it might just be the case in the actual world. If it is, the set of worlds where oxygen is present that are most sim-
ilar to the actual world just is the singleton set containing only the actual world. Since combustion does not occur in the actual world, the nearest worlds where combustion occurs are not contained in the nearest worlds where oxygen is present. This is a general problem: whenever the internal antecedent is false in \( w \), but the consequent is true, the analysis of von Stechow et al. predicts that the anankastic conditional is false, whereas such a conditional is intuitively true.

The second problem is that the analysis of von Stechow et al. (2004) cannot explain why the antecedent must contain an expression of intention in order for the conditional to express the anankastic meaning. There is nothing in their theory that excludes an LF for (32a) as in (32b). Hence, von Stechow et al. falsely predict that (32a) has an anankastic interpretation.

(32) a. If you pass the exam, you should study well.
    b. If you pass the exam, [you should [to pass the exam] study well]

Note that my analysis more or less takes over Sæbø’s explanation for the fact that (32a) has no anankastic interpretation. The if-clause in (32a) doesn’t set up a deontic context referent, in the terminology of Frank (1997). It follows that the ordering source parameter cannot pick up material from the if-clause.

My final argument against the analysis of anankastic conditionals as counterfactuals is that under this analysis the teleological meaning aspect gets lost. If the modal in the consequent is not interpreted as teleological, how are we to derive that studying well is a means of passing the exam? Note that it will no do to allow that the modal is relative to two ordering sources, one based on overall similarity and one based on your goals. As argued in Frank (1997, 49) this would lead to a kind of proportion problem. So we really have to choose. Either the ordering source is teleological, or we order world in terms of their similarity to the actual world. I think there are better arguments for the first option than for the second. The fact that anankastic conditionals may be paraphrased in terms of purpose clauses shows that the modal in the consequent is sensitive to some goal. There is nothing that prima facie suggests that anankastic conditionals are counterfactuals.

6 Conclusion

I have discussed four analyses of anankastic conditionals. Three of these, Sæbø (2001), von Fintel and Iatridou (2004) and Penka et al. (2004), make the wrong predictions in the Ruud van Nistelrooy scenario. This problem can be solved by assuming that the ordering source selects a salient goal from the context of utterance, and that in the case of anankastic conditionals, this is the goal described in the antecedent. The fourth analysis by von Stechow et al. (2004) treats anankastic conditionals as counterfactuals. This avoids the Ruud van Nistelrooy problem. But as I have shown, this analysis runs into other problems. To me this indicates that anankastic conditionals just aren’t counterfactuals. Von Stechow et al. (2004) object to my analysis for conceptual reasons. I have argued that their objection isn’t justified. As far as I can see, it is not problematic to reinterpret Kratzer’s notion of ordering source. Ordering sources as anaphors is an idea that has been around for many years already. The analysis of anankastic conditionals shows that this really is a different view on ordering sources than Kratzer’s original formulation. More
importantly, the analysis of anankastic conditionals requires such a notion of ordering source.

References


Abstract

This paper investigates the notion of ‘togetherness’ expressed by adverbials like together in English or ensemble in French. We show that the natural division between the main uses of these adverbials is aspectual: whereas achievements impose no significant restrictions, non-achievements demand that the eventualities that are grouped ‘together’ be causally controlled or coordinated. In particular, contrary to what is frequently assumed in the literature, it is not sufficient that they occupy the same spatio-temporal location. This leads us to propose a new picture of togetherness, which accounts for the intuitions of ‘grouping’ (Lasersohn) or ‘integration’ (Moltmann) but puts them in a different perspective.

1 Introduction

In this paper, we offer a preliminary study of what we call ‘togetherness’, that is, an association between events or objects often expressed by an adverbial or a preposition, such as the following ones, encountered in well-studied Indo-European languages: together and with in English, samen and met in Dutch, zusammen and mit in German, insieme and con in Italian, juntos and con in Spanish, ensemble and avec in French. We will focus on the English and French adverbials together and ensemble. Roughly speaking, these adverbials have essentially three values. They can express summation (1), spatio-temporal colocalization (2) and eventuality coordination (3).

(1) a. The three directors together earn 1.000.000 euros
    b. Les trois directeurs (ensemble) gagnent (ensemble) 1.000.000 euros

(2) a. John and Mary are sitting together
    b. Jean et Marie sont assis ensemble

(3) a. John and Mary are walking together
    b. Jean et Marie marchent ensemble

It might sound strange to propose a ‘preliminary’ study on together in view of the existence of at least three substantial contributions (Lasersohn 1998, Moltmann 1997, Moltmann 2004). However, we argue that the algebraic analysis of events that these two approaches adopt is insufficient to do justice to the ‘intensional’ character of together. Specifically, the paper defends two claims.
1. From an empirical point of view, the difference between achievement and non-achievements has been overlooked. We show that togetherness is not aspectually uniform: states and processes (i.e. activities or accomplishments) impose stronger requirements than achievements.
2. The role of causation and coordination has not been recognized, although it is crucial for telling apart togetherness from simple colocalization. We first describe intuitively the difference between achievements (section 2) and non-achievements (section 3), showing that together can be licensed by simple spatio-temporal colocalization in the case of achievements, whereas non-achievements impose more stringent requirements, for which we propose a formal representation in section 4.

2 Achievements

With achievements, together and ensemble are licensed by spatio-temporal colocalization. In (4a,b), the two trekkers might climb independently and reach the summit at the same moment by pure chance. Nothing more, in particular no intentional control, is required (4c-h).

(4) a. The two trekkers reached the summit together
   b. Les deux trekkers ont atteint le sommet ensemble
   c. John and Mary sneezed together
   d. Jean et Marie ont éternué ensemble
   e. John and Mary jumped together
   f. Jean et Mary ont sursauté ensemble
   g. The two bombs exploded together
   h. Les deux bombes ont éclaté ensemble

However, English and French do not completely coincide because French tends to avoid simple simultaneity.¹

(5) a. All these events happened together [≠ at the same place]
   b. Tous ces événements se sont produits ensemble / en même temps
   c. Then Susan began to laugh, and then she began to sneeze, and then she laughed and sneezed together [Google: http://www.gutenberg.net/dirs/1/0/3/2/10329/10329.txt]
   d. Alors Suzanne s’est mise à rire, et puis elle s’est mise à éternuer, et puis elle a ri et éternué ensemble / tout ensemble / en même temps

Predicates compatible with a summation interpretation (1) are in general not achievements, but there is no radical impossibility. E.g. (6) can refer to two simultaneous very short events of scoring.

(6) John and Mary together scored 50 points

3 Non achievements. Intuitive description

The main intuitive idea is expressed in (7).

¹Note also the difference: He has been smoking for years together vs. Il a fumé pendant des années ensemble / de suite.
With states and processes, for *together* and *ensemble* to be appropriate, there must be something that keeps the entities under consideration ‘together’ (in the same place or within the bounds of some common evolution or activity).

### 3.1 Why is colocalization not sufficient?

*Prima facie*, many examples seem to be licensed by simple colocalization (8), as in the case of achievements.

(8) a. The glasses and the decanter are together (in the cupboard)
   b. Les verres et la carafe sont ensemble (dans le buffet)
   c. John and Mary are together in the waiting room
   d. Jean et Marie sont ensemble dans la salle d’attente
   e. John and Mary are waiting together
   f. Jean et Marie attendent ensemble

In view of similar examples, Moltmann (2004) proposes that adverbial *together* is licensed whenever it groups events into a global event that has the properties of an *integrated whole* (IW), à la Simons (1987). An *R*-integrated whole $X_R$ is a part structure $(X, \sqsubseteq)$ such that, for any two objects $A$ and $B$, $R(A, B)$ or $R(B, A)$ iff $A, B \sqsubseteq X$. E.g. the books on a shelf make up an IW with respect to the relation of ‘being on the same shelf as’.

For cases like (8), spatio–temporal proximity ‘glues’ the subeventualities corresponding to the spatio-temporal localizations of the two entities, which are close to each other and to nothing else (outside the reference location).

There are several problems with this approach, which stem from the fact that the notion of IW is actually too weak.

1. IWs seem to ‘dissolve’ in certain cases: in (5a), if $t$ if the time point referred to, $X_R = \{e : e$ is at $t\}$, but this means that $X_R$ contains an (de)finite number of simultaneous events to be considered in addition to the events referred to.
2. One might simply weaken the closure condition of IWs, replacing Moltmann’s condition by ‘*Together* is licensed whenever it denotes a *subset* of an IW’. However, this weaker version conflicts with (9). If we assume that the house and the park in (9a,b), and the library and the computer room in (9c,d), are close to each other, they form a subset of any IW that gathers entities located in the same area. Note also that, if there is no other building or noticeable area in the vicinity of the house and the park or the library and the computer room, the two pairs of entities form two IWs, according to the strong version of the definition, but this does not improve the sentences in (9) in any way.

(9) a. ?? The house and the park are together
   b. ?? La maison et le parc sont ensemble
   c. ?? The library and the computer room are together in building B5
   d. ?? La bibliothèque et la salle d’informatique sont ensemble dans le bâtiment B5

3. There are also problems with coordinated actions. E.g. in (3) Mary and John must coordinate their moves. If John and Mary are two passersby who share a common path
by pure chance (3a,b) is weird.

3.2 Towards togetherness

Similar observations hold for *with* and *avec* (Mari 2003). The problems mentioned above affect also Lasersohn’s (1998) analysis. This is not unexpected if one assumes that the mode of association between objects/events indicated by *together* and *with*, and their French counterparts, is stronger than spatio-temporal proximity. The question is: how much stronger?

From the examples reviewed up to this point, we see that there are at least three modes of licensing.

1. The first is causally controlled localization. What makes examples like (9) anomalous is the fact that, even if the house and the park were deliberately created in the same place, their locations cannot change anymore, since they cannot be moved (in contrast to mobile objects like in (8a,b)) or move (in contrast to living beings like in (8c,d)). (8a,b) is compatible with an interpretation in which the glasses and the decanter are intentionally kept in the same place (maybe with other objects) for some time; as long as this intention persists, it brings about the fact that the glasses and the decanter share a location. For (8c,d): the fact that the two persons wait for the same kind of event determines the fact that they share a location.

2. Another possibility is state or process coordination (e.g. ‘being on the problem together’, ‘walking together’).

3. Finally we have summation, as studied by Moltmann (2004).

Cases 1 and 2 can be ‘unified’ to some extent by seeing togetherness in space and time as the external manifestation of certain causal constraints.

3.3 Interaction of togetherness and aspectual status

Where does the difference between achievements and non achievements come from? Togetherness is a mode of association between events or, more generally, entities. This intuition informs approaches such as Lasersohn’s, through the notion of group, and Moltmann’s, through the notion of IW. One can associate entities in several ways, the most obvious being to group them together because they share a common property (see the notion of IW). Suppose that we consider the cluster of people that are currently taller than 8 feet on earth. Why is (10) strange? Because the property of being taller than 8 feet is not a property of the cluster but of the individuals taken separately.

(10) a. ?? These persons are taller than 8 feet together
    b. ?? Ces personnes font plus de deux mètres quarante ensemble

Let us assume, then, that togetherness demands that the predication concern the cluster of entities. This would account for spatio-temporal localization: a cluster of eventualities can be located at a unique spatio-temporal point. However, togetherness cannot be reduced to predication on a complex event because it could not be distinguished from colocalization. It involves the idea that the entities are clustered for some reason and that their spatio-temporal proximity, if any, is the reflection of a certain unity. The idea
that wholes have properties beyond those of their parts has driven research from Gestalt theory to recent work on whole-part structure (Meirav 2003). Whatever the details of the different theories may be, a common conception is that wholes must betray properties that cannot be predicated only of their parts. Although we do not consider here ‘wholes’ in a strong sense, but rather clusters (including simple pairs), it is clear that, in many cases, togetherness exhibits the sort of unity and/or integrity that is appealed to in Gestalt theory. For summation, the sum operation involves the totality of parts. Similarly, coordination cannot be reduced to the sequence of stages of one particular component. Another possibility is that a cluster maintains its structure as time goes along (integrity). Colocalized non-achievements illustrate this case: they get their stability from the existence of causes.

For achievements, there is no noticeable time flow. When the coincidence of the two events is a mere quirk of fate, the unity or integrity requirements cannot be met in a strong (realistic) sense. At this point, there are at least two possibilities. One might conclude that together is in such cases a mere spatio-temporal marker, and that the distinction between together with achievements and with non-achievements is on the verge of homonymy. On the other side, one might note that the coincidence of two very short events of the same type is epistemically striking and propose that the unity of the cluster is then epistemic. More precisely, the probability that two or several achievements of the same type coincide is felt as weak. Their cooccurrence is then perceived as an unexpected pairing, which thereby acquires a sort of epistemic integrity. The existence of a bridge between descriptive (realistic, factual) and epistemic value is frequently mentioned in the study of grammaticalization (see (Traugott and Dasher 2002) for a recent discussion) and is probably present in the distribution of comitative prepositions (Mari 2003). Summarizing, we propose that, with achievements, togetherness correspond to an epistemic grouping, that associates events with markedly weak probability of cooccurrence.

Interestingly, in parallel cases, comitative prepositions are not licensed by mere colocalization or simultaneity. This shows that togetherness and comitativity are distinct, though related, notions.

(11) a. Mary reached the summit with the other trekker \[⇒ they were together before reaching the summit\]
   b. Marie a atteint le sommet avec l’autre trekker [idem]
   c. The Asian cyclone happened ?? with the big storm in the Atlantic ocean [simultaneity intended]
   d. Le cyclone en Asie s’est produit ?? avec la tempête dans l’Atlantique [simultaneity intended]

4 The formal representation of togetherness

4.1 Causal control

Together and ensemble are appropriate to describe situations in which a given state of affairs (in most cases the existence of certain intentions) determines the fact that (at least) two entities share a (not necessarily fixed) location during a certain time. Assuming a

\(^2\)At least, with respect to a relevant temporal scale.
Let \( \prec \) be a similarity linear ordering on worlds. \( w' \) is among the least \( w \)-similar worlds w.r.t. the proposition \( p \) iff \( w' \) satisfies \( p \), \( w' \prec w \) and, for some \( w'' \), every \( w_i \prec w'' \) satisfies \( p \) and every \( w_j \) such that \( w \succ w_j \succ w'' \) satisfies \( \neg p \).

\( p \) causes \( p' \) at \( w \) iff (i) the worlds \( w' \) where \( p \& \neg p' \) holds are the least \( w \)-similar w.r.t. \( p \& \neg p' \) and (ii) the worlds \( w' \) where \( \neg p \& p' \) holds are the least \( w \)-similar w.r.t. \( \neg p \& p' \).

Together and ensemble are appropriate at a time interval \( t \) and a world \( w \) w.r.t. a (complex) stative eventuality \( e \) of localization with participants \( x_1 \ldots x_n \) iff there is a propositional schema \( \phi[x]^3 \) such that, for every \( t' \sqsubset t \), \( \phi[t] \) causes \( \text{loc}(t', e, x_i) = \text{loc}(t', e, x_j) \) for any \( x_i, x_j \).

For sentences like (9), no proposition \( \phi[t] \) comes to mind. If the house and the park were constructed at \( t_0 \), the intention of locating them ‘together’ has causal power only at \( t_0 \). At any \( t' > t_0 \), the house and the park would be ‘together’, no matter whether this intention persists. Let us consider coordinated processes, for instance a situation as in (3), in which two people, say \( a \) and \( b \), walk ‘together’ during a time interval \( t \). If \( \text{loc}(t, e, x) \) denotes the location of \( x \) at \( t \) in \( e \), one can posit

\[
\text{[intends-to-be}(a, t', \text{loc}(t', e, a)) \& \text{intends-to-be}(b, t', \text{loc}(t', e, b)) \text{] CAUSES [loc}(t, e, a) = \text{loc}(t, e, b)\]
\]

In this respect, one might say that each colocalization is caused by the joint intention of being at some place; however this causal relation holds ‘piecewise’, i.e. for each moment of the temporal interval. Condition (13) requires something much stronger, namely that the causal factor span the whole interval. It is very unlikely that such a causal factor exists for two independent walking processes. Even if two individuals intend to follow a given path, there is no necessity that they proceed at the same pace (thus occupying the same positions at the same moments).

One might object that ‘unlikely’ does not mean ‘impossible’. For instance, if \( a \) and \( b \) enjoy a total control on planning, they might be able to have, during \( t \), an intention of the general form \( \text{intends}(x, t, \bigwedge_{i=1}^n \text{loc}(t_i, e, x) = f(t_i, e)) \), where \( f(t_i, e) \) returns a unique location for each moment of the eventuality \( e \). What kind of predicate could suggest such an interpretation? Under the vast majority of circumstances, current motion predicates (move, walk, run, etc.) exclude the possibility of a perfect planning. Should such an interpretation emerge, it would certainly be associated with the kind of causal determination one finds in physical phenomena. E.g. supposing that we have two particles guided by a field, (14a) might mean that their successive positions are controlled by a constant factor (the intensity and orientation of the field). The same would be true for two persons gliding down a narrow bobsleigh track (14b). There is certainly no mental anticipation of every stage of the motion, but the physical properties of the track tend to adjust the otherwise independent motions, so that they are roughly parallel (the persons tend to occupy very close locations at the same moment, at least for some while). One may wonder, however, whether such cases really belong in the causal control or in the eventuality coordination category, described in the next section.

\(^3\phi[x] \) denotes any formula with at most the variable \( x \) free.
(14) a. The two particles moved together for 3 nanoseconds
    b. John and Mary accidentally glided together, down to the stop area

Another question concerns the status of the causal factor mentioned in (13) with respect to the participants in the eventuality. Suppose that (2) refers to the following situation: John and Mary are two patients who are perfect strangers and are sitting in a doctor’s waiting room. \( \phi[t] \) would then be the conjunction \( \text{intends}(\text{John}, t, \text{loc}(t, e, \text{John}) = \ell) \) \& \( \text{intends}(\text{Mary}, t, \text{loc}(t, e, \text{Mary}) = \ell) \), which expresses the intention of John and Mary at \( t \) to stay at \( \ell \) at \( t \). This intention is not the same as the intention of John (and Mary) of being in the same place as Mary (and John) at \( t \), i.e. \( \text{intends}(\text{John}, t, \text{loc}(t, e, \text{John}) = \text{loc}(t, e, \text{Mary})) \) \& \( \text{intends}(\text{Mary}, t, \text{loc}(t, e, \text{Mary}) = \text{loc}(t, e, \text{John})) \). More generally, it is not required that colocalization be caused by an intention of colocalization.

Finally, it is not required either that the cause of the colocalization be of the same kind for each participant. For instance if Mary is deliberately waiting in a room, watching her prisoner, John, who is handcuffed to the wall, we may say that John and Mary are waiting ‘together’ in the room, although there is probably no shared intention to be in the room.

4.2 Coordination

Coordinated processes have been studied in Channel Theory (Barwise and Seligman 1997) and in different varieties of communicating process theory (Milner 1989, Milner 1999, Sangiorgi and Walker 2001, Stirling 2001). In this paper, we adopt channel theory because it seems slightly more general and is more intuitive. A channel is an abstract device that (i) selects parts of complex entities (objects, eventualities) and (ii) combine their respective descriptions. It can be interpreted as a very general form of coordination engine and, in most cases, provides a partial and idealized description of the causal system underlying a set of interconnected processes. Examples of channels are the causal system that relates different events in a computer, or the mixing up of intentional control and physical laws that underlies complex coordinated behaviors (e.g. communication and cooperation). See (Restall 1996) for an accessible introduction.

The ingredients of channels are three in number.

Classifications describe entities; the standard notation is \( x \models \sigma \), meaning ‘\( x \) satisfies the description \( \sigma \), \( x \) has the type \( \sigma \).’ \( \models \) is the classification. Types can be complex expressions (Boolean formulas, in general).

Morphisms fulfill two roles. (i) They select parts or aspects that are to be classified. A typical case is that of a function returning a part of a complex entity. E.g. printer \( f \rightarrow \text{button} \) selects the main button of a printer. (ii) They link the types of an entity to those of its parts or aspects.

Infomorphisms connect classifications. They associate pairs of morphisms \((f, g)\) so that the part or aspect of an object \( o \) selected by \( f \) is of type \( \sigma \) if and only if \( o \) is of type \( g(\sigma) \). Figure I,A shows the general form and I,B a computer-printer example. the \( f \) morphism selects the button of the printer. The coordination guaranteed by the infomorphism amounts to saying that the button can be described as \textit{PUSHED iff} the printer can be described as being in an internal state (\textit{INTERNAL-PUSHED}) corresponding to the description \textit{PUSHED} for the button. In this example, the types \textit{PUSHED} and \textit{INTERNAL-PUSHED} are mere labels (informational black boxes). They could be decomposed into pieces of
information. For instance, INTERNAL-PUSHED could be analyzed in terms of electronic circuitry.

\[
\begin{align*}
\text{Types}_2 & \xrightarrow{g} \text{Types}_1 \\
\text{Objects}_2 & \xleftarrow{f} \text{Objects}_1
\end{align*}
\]

\[f(o) \models_2 \sigma \text{ ssi } o \models_1 g(\sigma)\]

Finally, channels connect infomorphisms through constraints. A constraint has the form \(\Sigma \vdash \Sigma'\), meaning ‘every entity that satisfies all the types in \(\Sigma\) satisfies at least one of the types in \(\Sigma'\).’ Constraint systems have different granularities, from symbolic black boxes to real-time systems. Note that, in simple cases, no constraints are necessary. In the summation example below, the infomorphisms take the coordination in charge.

\[
\begin{align*}
PUSHED & \xrightarrow{g} \text{INTERNAL-PUSHED} \\
\text{button} & \xleftarrow{f} \text{printer}
\end{align*}
\]

\[f(\text{printer}) \models_2 \text{PUSHED iff } \text{printer} \models_1 g(\text{PUSHED})\]

\[\text{and } g(\text{PUSHED}) = \text{INTERNAL-PUSHED}\]

For instance, in figure II, the two infomorphisms share the core comprised of the printer and its internal states. The internal state corresponding to the description PUSHED for the button entails the internal state corresponding to the description ON for the light. Externally, this means that whenever the button is pushed the light is on.

Although the construction of channels can be very complex in principle, there is a simple rule of thumb: the actions/states of the participants may be in general put outside the core and the coordination engine inside. Moreover, the most frequent types of coordination engine are causation, communication (intentionally coordinated processes) and mathematical and physical regularities.

---

This is the meaning of \(\vdash\) in Gentzen systems for classical logic.
Let us consider now a few examples.

1. A coarse analysis for *John and Mary walk together*.
   The objects are the complex eventuality of John and Mary walking, \( e \), and the subeventualities of John (Mary) walking, \( f_J(e) (f_M(e)) \). The types are: \( \text{move}(x, \ell_i, \ell_j) \), going from \( \ell_i \) to \( \ell_j \), \( \text{control-move}(x, \ell_i, \ell_j) \), controlling the move from \( \ell_i \) to \( \ell_j \). The morphism \( g \) is defined by:
   \[
   g(\text{move}(x, \ell_i, \ell_j)) = \text{control-move}(x, \ell_i, \ell_j).
   \]
   The constraint is: \( f(x) \models \text{move}(x, \ell_i, \ell_j) \iff x \models g(\text{move}(x, \ell_i, \ell_j)) \).
   So, the channel says simply that John and Mary adjust mutually their moves (by simultaneous control).

2. A less trivial example: *John and Mary work together*.
   The objects are: \( e \), the eventuality of John and Mary working, \( f_{IA}(e) (f_{IM}(e)) \) the eventuality of John (Mary) working during \( t \); the morphism \( g_1 \) is defined by:
   \[
   g_1(\text{work}(x, s_i, s_j, t)) = (\text{send}(x, y, s_j, t') \land t' > t) \lor (\text{receive}(y, x, s_i, t') \land t' < t).
   \]
   The constraint is: \( f_2 \models \text{work}(x, s_i, s_j, t) \iff \text{send}(x, y, s_j, t') \land t' > t \lor \text{receive}(y, x, s_i, t') \land t' < t \).
   Here, the analysis is slightly more complex. Subevents are temporally situated. An agent may work and communicate information about her work, or receive information and work, starting from the information state she received.

3. Summation: *John and Mary together earn n euros*.
   As evidenced by (Moltmann 2004), the summation case is complicated because it may involve measurements in a covert way, that is, through an association between a property and a measure function. For simplicity, we assume that measurement functions can be as-
associated with certain VPs (outnumber those of John, have seen four students, are heavier than John, etc.).\(^5\) E.g. are heavier than John has an associated measure function \(\mu_{\text{weight}}\) that returns the weight of John. For earning \(n\) euros, the measure function \(\mu_{\text{earn}}\) returns simply \(\langle n, \text{euro} \rangle\), i.e. a couple measure + measure unit.

The central object is a sum of individuals John \(\square\) Mary, whose type is the relation \(\mu_{\text{earn}}(\text{John} \square \text{Mary}) = m\).

The subobjects given by the \(f\)-morphism are John and Mary, typed by \(\mu_{\text{earn}}(\text{John}) = m_j\) and \(\mu_{\text{earn}}(\text{Mary}) = m_m\).

To ensure that a summation-based coordination takes place, we do not need any constraint; it suffices to posit an infomorphism of the general form:

\[
f_{\lambda_1}(\bigcup^n_{i=1} x_i) \models \mu_{\text{dim}}(x_i) = m_i \text{ iff } \bigcup^n_{i=1} x_i \models \mu_{\text{dim}}(\bigcup^n_{i=1} x_i) = \sum^n_{i=1} \mu_{\text{dim}}(x_i).
\]

Note that it would be possible to construct an eventuality-based version of this channel. Let us consider a sentence like John and Mary together are heavier than Paul. the central eventuality is the state \(e\) corresponding to the sentence. The substates \(f_{\lambda_1}(e)\) represent the eventualities of John (Mary) having a certain weight. They are typed by \(e_{\lambda_1} \models \mu_{\text{dim}}(e_{\lambda_1}) = m_i\). The \(g\) morphism returns a condition \(R(m_i + \sum_{j=1}^n m_j, m)\), where \(R\) is the quantitative relation (here superiority) and \(m\) the second term of \(R\) (here the measure of Paul’s weight).

The channel-oriented approach calls for two comments. First, it applies to the summation case, which provides a certain unification of seemingly different uses of together and ensemble. Second, it leads one to reconsider in a new perspective Lasersohn’s (1998) contribution. Lasersohn mentions the social accompaniment reading exemplified by (16).

He uses a new primitive (function) \(\pi\) defined in (17).

\[(16) \text{ John and Mary went to the movies together}\]
\[(17) \text{ Let } g \text{ be a group and } e \text{ an event, } \pi(e) \text{ returns the set of groups (‘parties’) that participate collectively in the event.}\]

For instance, in (16), the two subevents of Mary going to the movies and John going to the movies share a party, which is the group \(\ll j, m \gg\). Lasersohn proposes a similar solution for coordination. If John and Mary work together, the group \(\ll j, m \gg\) will be a ‘team’ of the event of John working and that of Mary working. One might object that this proposal uses opaque primitives. However, Lasersohn argues that the notions we have been considering in this section are not amenable to any logical representation: “Social accompaniment is a non–logical notion which is not amenable to a formal definition in model–theoretic terms”, (Lasersohn 1998:289).

We agree that social relations are essentially non-logical, in that they are not driven by standard logical inferences and pertain to the general field of action. However, it does not follow that formal techniques are irrelevant. To clarify the contribution of channels, or similar tools, two comments are in order. First, as in many other domains, idealization plays a central role. Systems of actions and causes are notoriously complex and multidimensional. In our present state of knowledge, nobody is really able to do justice to their detailed structure. The general strategy one adopts is to partialize the domain under study.

\(^5\)The simplification here comes from the fact that we do not distinguish the contribution of the verb and of the complement(s) or adjunct(s).
This may be done by selecting a particular layer or area of phenomena and focusing on it (domain restriction) or by assuming that one has a very abstract model that could, in principle, be developed to provide a detailed rendering of all the relevant observations (underspecification). The fact that a formal study is subject to domain restriction and/or underspecification does not entail that it is useless. In a sense, most models used in cognitive science and theoretical computer science present such limitations. Yet, they are not considered as gratuitous or insignificant. More specifically, process coordination has given rise to many notions (bisimulations, channels, process communication, etc.) that help us to construct an abstract image of coordination. This might not be enough, but it is certainly better than nothing, if only because it dissipates the impression that coordination is a totally vague concept.

A second aspect relevant to Lasersohn’s view is compositionality. There is probably no way to generate a channel-theoretic representation (or any other similar representation) from the lexicon in a compositional way. This is a lethal objection only for those who believe that semantics can simply ignore encyclopedic knowledge. Considering an example like (3), the ways in which co-walkers can coordinate their motions is certainly not coded in the lexicon. However, this does not entail that it is not visible from the lexicon. Mastering the verb walk supposes being able to use it appropriately, that is, to describe real or imaginary circumstances that satisfy the constraints associated with the verb. To take Lasersohn’s slightly more complex example of ‘social accompaniment’, consider (18). It is not necessary that John and Mary have each bought shoes for (18) to be true. What is necessary, is that the activity of buying shoes leads John and Mary to coordinate some of their actions: e.g. they could discuss the different offers, share the expense, or just stay together while one of them buys the shoes. Certain versions of coordination may be felt too light to motivate a sentence like (18), but, in any case, the absence of coordination would make the sentence misleading.

(18) John and Mary have bought shoes together

Clearly, the action scripts that motivate the use of together cannot be read off the sentence form, no more than we can enumerate all the plans that would allow one to reach a certain goal expressed by a simple sentence. This does not make the notions of script or plan void, at least if we assume a relatively traditional division of labor between semantics and world knowledge. For instance, to take into account the fact that coordination is not necessarily total, we might impose the following condition for the definition of coordinated eventualities.

(19) An eventuality $e$ with participants $x_1 \ldots x_n$ is totally coordinated if there exists a channel that coordinates the subeventualities $e_{x_i}$ for $i = 1 \ldots n$. It is partially coordinated if some part of it is totally coordinated.

---

6We suspect that (possibly unconscious) considerations of compositionality explain the leading role of algebraic semantics in the study of togetherness.
4.3 Causal control and coordination compared

Should we view the two cases described in the last two sections as two variants of the same basic configuration? Causal control is clearly weaker than coordination since it does not involve any communication. However, in both cases, we find a certain dependency between the descriptions of the entity which are ‘together’. With spatio-temporal proximity, the dependency is (quasi) identity: the two entities have approximately the same location. With channel-based coordination, the dependency is given by the constraints of the channel. The channel, qua system of constraints, acts as a ‘cause’ of the dependency.

This suggests that causal control and coordination could be unified by seeing togetherness in such cases as the consequence of certain causal factors over a time interval. Thus, we would have a definition parallel to (13). (20) says that there is a causal factor that brings about a dependency relation between the descriptions of the simultaneous $x_i$-subeventualities.

\[(20) \quad \Delta\left(t, e, x_i\right)\text{ denote the description of the subeventuality } e_{x_i} \text{ at } t. \text{ Together and ensemble are appropriate at a time interval } t \text{ and a world } w \text{ w.r.t. a (complex) eventuality } e \text{ of with participants } x_1 \ldots x_n \text{ iff there is a propositional schema } \phi[x] \text{ and a function, } f \text{ such that, for every } t' \subseteq t, \phi[t] \text{ causes } \Delta(t', e, x_i) = f(\Delta(t', e, x_j)) \text{ and } \Delta(t', e, x_j) = f(\Delta(t', e, x_i)) \text{ for any } x_i, x_j.\]

Three points prevent us from proposing (20) or its variants as a unifying definition. First, the properties of the function $f$ remain to be studied. Additional constraints are perhaps necessary in order to narrow the field of reasonable dependencies. Second, a genuine unification would allow us to merge adnominal and adverbial together. In view of the many subtle points involved in the semantics of adnominal together (Moltmann 2004), it is not clear whether a general definition like (13) is sufficient.\(^7\) Third, unification, whatever the details might be, would not spare us taking into account the distinction between achievements and non-achievements.

4.4 Syntax-semantics interface

In this section, we provide an elementary syntax-semantics interface for together and ensemble. There are different models of interface available; since the goal of this paper is not to defend any particular affiliation to one of them, we have chosen recent categorial grammar (Kruijff 2001, Steedman 2000) because it is extremely flexible and does not commit one to much more than assuming a small set of generally accepted categories for constituency. For similar reasons, we use Landman’s (2000) ontology. The account is simplified in at least two respects. (i) We focus on the main cases and do not provide a complete coverage of the distribution; for instance, we ignore the contribution to small clauses (I saw John and Mary together). (ii) We also ignore fine-grained variations for

\(^7\)Moltmann herself claims that she unifies the two constructions but she has to resort to the notion of integrated whole, criticized in section 3.1. Also, it is difficult to reconcile what she says in her definitions (30) and (31) with her final claim (p. 312) that adnominal together can only have access to the predicate (vs. the verb and its arguments).
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...scope possibilities and address only the cases that are accepted by all speakers. For the summation case we will consider only the scope on subject NPs, for together and ensemble, and of scope on V for ensemble. For the causal and coordination cases, we will consider the cases of scope on V and VP.

Ontologically, we distinguish: individual atoms (of type AT), sums of atoms i.e. objects of the form \( x_1 \sqcup \ldots \sqcup x_n \), and group atoms. If \( \sigma \) is a sum \( d_1 \sqcup \ldots \sqcup d_n \), \( \uparrow(\sigma) \) denotes \( \sigma \) as a group and \( \uparrow(a) = a = \sqcup a \) if AT(a).

The basic idea of categorial grammar is that a category comes with its combinatorial potential, an index and the semantic features that describe the event structure. For example, see is analyzed as \( \langle(S : e \setminus NP : x) / NP : y, agent(e) = x & theme(e) = y \rangle \). We must add semantic constraints in order to connect the syntactic structure, the basic predicate-argument(s)/modifier(s) semantic structure and the specific restrictions that constitute the contribution of together. Accordingly, we define constraints for causation and channel types.

1. Scope on subject NP

- Syntax: NP : x \setminus NP : x\text{\_log}
- Semantics: the semantics takes advantage of the structure of sentence descriptions. A sentence description has a form \( \bigwedge^n_r r_i(e) = a_i \), where the \( r_i \)'s are thematic roles. We can then put a constraint on any sentence description that contains \( x\text{\_log} \). This constraint has the general following form, where \( r \) is an appropriate role:

\[
\forall e (r(e) = x\text{\_log} \Rightarrow \phi)
\]

\( \phi \) is a complex condition that we can decompose in two parts:

1. \( x \) must be a sum or a group,
2. for any \( e' \) such that the description of \( e' \), \( \Delta(e') \), is identical to that of \( e \) except that \( x \) replaces \( x\text{\_log} \), \( \Delta(e') \) entails the existence of a certain dimension \( \dim \), a certain comparison relation \( R \) and a certain entity \( y \) such that the measure of \( x \) entertains collectively or distributively the relation \( R \) to the measure of \( y \). E.g., in John and Mary are heavier than Paul, we may have the distributive interpretation (‘John is heavier than Paul and Mary is heavier than Paul’) or the collective one (‘John and Mary as a group are heavier than Paul’). This information is not determined by together and is, accordingly, declared as an implication of the description of \( e' \), the alternative of \( e \).
3. The specific contribution of together is the last underlined part of the formula and consists in asserting that the additive measure of \( x \) entertains the relation \( R \) to the measure of \( y \).

\[\text{(21) Constraints on the summation use of together}
\]
\[
\forall e ([x\text{\_log} = agent(e) \lor x\text{\_log} = theme(e) \lor x\text{\_log} = experiencer \lor x\text{\_log} = \ldots] \Rightarrow
\exists X \[
\exists i \exists y, R (R \in \{<, >, =, ≤, ≥\} & (\forall e' (\Delta(e') = \Delta(e)[x\text{\_log} \leftarrow x]) \Rightarrow (e' \models (x \in \text{AT} \& R(\mu_{\dim}(x), \mu_{\dim}(y))) \lor \forall x_i \in X (R(\mu_{\dim}(x_i), \mu_{\dim}(y)))) & e \models R(\sum_{x_i \in X} \mu_{\dim}(x_i), \mu_{\dim}(y))))]
\]

\[\text{8This might leave out, in particular, variations that reflect the differences between written and spoken usage.}\]
Note that a more complete treatment would have to put constraints on the measure dimension $dim$. However, the nature of these constraints is unclear at this stage; for instance, salary is a possible candidate (John and Mary together earn more than Sally) whereas speed is not (John and Mary together run faster than Sally).  

2. Scope on V

In French, ensemble can follow immediately the V in its three main uses (see (1b) for summation).

a. Summation: $((S : e \setminus NP : x_{tag}) / \alpha) \setminus ((S : e \setminus NP : x) / \alpha)$

b. Causal control: $((S : e \setminus NP : x_{causcont}) / \alpha) \setminus ((S : e \setminus NP : x) / \alpha)$

b. Channel-based control: $((S : e \setminus NP : x_{channel}) / \alpha) \setminus ((S : e \setminus NP : x) / \alpha)$

The semantics is defined in (22) and (23) and is driven by the subject, in a way quite similar to (21).

(22) **Constraints on the causal control use of together**

For every $e$ such that $r(e) = x_{causcont}$ for some $r$, $x$ must be a sum or group end $e$ a causally controlled eventuality with respect to the members of $x$.

(23) **Constraints on the channel-based use of together**

For every $e$ such that $r(e) = x_{channel}$ for some $r$, $x$ must be a sum or group end $e$ a channel-based eventuality with respect to the members of $e_x$.

3. Scope on VP

- Syntax: $(S : e \setminus NP : x_{causcont}) \setminus (S : e \setminus NP : x)$ or $(S : e \setminus NP : x_{channel}) \setminus (S : e \setminus NP : x)$.

- Semantics: as above.

5 Conclusion

In this paper we have shown that together and ensemble have different licensing conditions depending on the aspectual type of the eventuality referred to. We have also introduced a causal and channel-based analysis to deal with cases of spatio-temporal proximity and coordination. Although sum operations ($\sqcup$) familiar from algebraic semantics are necessary, we have cast serious doubt on the idea that they could suffice to capture notions that are rooted in our categorization of causality and, more generally, dependency between processes. We leave the comparison with other similar lexical items (with and avec) and with alternatives techniques of representation (communicating processes) to further work.

References


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9 Before assuming hastily that there must be some trivial difference (but which one, exactly?) between earn and run, the reader might want to keep in mind less ‘trivial’ pairs, like ?? John and Mary together shouted more strongly than Sally and John and Mary together produced more decibels than Sally in the shouting competition.


A SEMANTIC ANALYSIS OF THE KOREAN PLURAL MARKER *TUL*

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Abstract

I argue that Extrinsic Plural Marker *tul* in Korean has two semantic components, distributivity and maximality, that operate on the predicate that *tul* attaches to. In this paper, the universal quantificational force associated with the semantic effects of EPM-*tul* will be accounted for, relying on a distributivity operator and a focus-sensitive operator. The good-fitting requirement on the *Cover* variable of the distributivity operator explains the maximizing effect of the predicate marked with *tul* while the focus-sensitive operator captures the fact that different positions of EPM-*tul* generate different distributive relations.

1 Introduction

The plural marker *tul* in Korean has been argued to have two functions: one is enumerative and the other is distributive. The former has been termed “intrinsic” plurality as opposed to the latter, described as “extrinsic” plurality. Of particular interest in this paper is the *tul* with the distributivity function. In this paper, the two different *tul*’s will be termed Extrinsic Plural Marker (EPM-*tul*, henceforth) and Intrinsic Plural Marker (IPM-*tul*, henceforth), in accordance with Song (1997). EPM-*tul* will refer to the *tul* that introduces full distributivity while IPM-*tul* will be used for the *tul* that induces the inherent plurality interpretation.

The distinction has often been made based on the part of speech of the element that the *tul* is suffixed to. That is, it was assumed that the *tul* attached to count nouns necessarily enumerates the entities denoted by the noun while the *tul* that attaches to unorthodox categories with respect to plurality (non-nominals) does not introduce the genuine function of plurality but derives distributivity. Yet, as Chung (2003) and Song (1997) correctly describe, the extrinsic plural marker can be attached not only to categories that are inherently incompatible with nominal plurality such as adverbials and postpositional phrases but also to count nouns. That is, the function of the *tul* is determined not by the syntactic categories of the elements that host the *tul* but by the syntactic environments where it occurs.

The primary goal of this paper is to propose a semantic analysis of EPM-*tul*. Before jumping to the main discussion, relevant data and properties of EPM-*tul* will be examined in section 2. In section 3, previous studies on the semantics of EPM-*tul*, Yim (2002; 2003) and Kim (2004), will be reviewed. In section 4, I will show that the
semantic contribution of EPM-tul is two-fold: distributivity and maximality. Finally, I
will define the semantics of Korean EPM-tul with a distributivity operator and a focus-
sensitive operator.

2 Data and Properties of Extrinsic Plural Marker Tul

In Korean, bare nouns with or without a plural marking are ambiguous in number. For
instance, namu ‘tree’ and namu-tul ‘trees’ can be either plural or singular. The
ambiguity disappears when the nouns are combined with determiners or demonstratives
such as i ‘this’ and ku ‘that/the’ or with numerals and classifiers. Thus, ku namu
‘that/the tree’ is only interpreted as singular whereas ku namu-tul ‘those/the trees’ and
twu kuru-euy namu(tul) ‘two CL tree(s)’ are necessarily understood to be plural. That is,
the plural marker tul added to the noun that has higher projections above a noun phrase
is always intrinsic. On the other hand, the plurality of bare nouns without overt plural
marking is dependent on the context.

The plurality of bare nouns with an explicit plural marking is ambiguous in a more
constrained way. Overt plural marking on the subject is always inherently associated
with the plurality of the entity, whereas the plural marking on the non-subject bare
count noun can be either intrinsic (enumerative) or extrinsic (distributive). The tul
marking in (1.a) is an example of Intrinsic Plural Marker tul that indicates that there is
more than one book. The tul markings in (1.b) and (1.c) are examples of Extrinsic Plural
Marker tul. The semantic contribution of EPM-tul in (1.b) and (1.c) can be spelled out
as follows: ‘the students drank and what each of them drank was water, with no
exceptions’ for (1.b) and ‘the students left and each of them who left did so loudly, with
no exceptions’ for (1.c).

(1) a. Chayk-tul-i chaeksang wi-e iss-ta.
Book-IPM-Nom desk on-Loc be-Dec
‘The books are on the desk.’
Student-IPM-Nom water-EPM-Add drink-Pst-Dec
‘The students drank water.’
Student-IPM-Nom loudly-EPM leave-Pst-Dec
‘The students left loudly.’

Chung (2003: 75-76) argues that the EPM-tul is licensed only when there is a local
plural subject. The Local Plural Subject condition (LPS condition, henceforth) can be
broken down into the following three parts:

Student-IPM-Nom early-EPM leave-Pst-Dec
‘Students left early.’
John-Nom early-EPM leave-Pst-Dec
‘John left early.’

(3) a. Tom-kwa Mary-ka swukcey-lul ilccik-tul ceychwulha-ess-ta.
    Tom-and Mary-Nom assignment-Acc early-EPM submit-Pst-Dec
    ‘Tom and Mary submitted their assignment early.’

    Tom-Nom Mary-Com Sue-Acc early-EPM send-Pst-Dec
    ‘Tom sent Mary and Sue early.’

    John and Mary-Nom early-EPM leave-Pst-Dec
    ‘John and Mary left early.’

    John and Mary-Top Tom-Nom early-EPM leave-Pst-C think-Prs-Dec
    ‘John and Mary think that Tom left early.’

The plural marker *tul* in the non-subject position can be understood as extrinsic only under the conditions above. As shown in (1), plural nouns must c-command the EPM-*tul*. Yet, the subject nominal does not have to be explicitly marked for plurality when plural quantifiers, numerals, conjoined NPs, and lexical items inherently encoding plurality render plural marking redundant. In addition, the plural noun must be in the subject position of the same clause.

In general, it seems to be true that the LPS condition accounts for the core properties of EPM-*tul*. Yet, it must be noted that the local plural subject is neither a sufficient nor a necessary licensing condition for EPM-*tul*. There have been several counterexamples to the LPS condition. Kim (2004) claims that plural objects can license EPM-*tul* as in (5) and (6), even though there are various judgments on the grammaticality of the sentences.

(5) Na-nun ku ai-tul-ul sacin-eyse-tul poassta.
    I-Top that child-IPM-Acc picture-Loc-EPM see-Pst-Dec
    ‘I saw them in the picture.’

    That police officer-Nom child-IPM-Acc house-Loc-EPM hit-Pst-Dec
    ‘That police officer beat the children at their houses.’

Furthermore, passive sentences show us that plurality of the grammatical subject is not sufficient to license EPM-*tul*, and that the theoretical importance must be placed on the logical subject. Contrary to the LPS condition, we observe that EPM-*tul* is licensed even when the local subject is singular if a plural oblique agent precedes it, as shown in (7).

    Cake-Nom student-IPM-by quickly-EPM eat-put-away-Pst-Dec
    ‘The cake was eaten by the students quickly.’

    Cake-Nom quickly-EPM student-IPM-by eat-put-away-Pst-Dec
    ‘The cake was all quickly eaten by the students.’

    Cake-Nom quickly-EPM eat-put-away-Pst-Dec
‘The cake was eaten quickly.’

There is a high degree of variation in the grammaticality judgments of the sentences with EPM-tul, so it is difficult to propose a definite set of strict conditions on the occurrence of EPM-tul. However, the dialectal and idiolectal variations reveal an interesting aspect of EPM-tul. It seems that, for some speakers, the occurrence of EPM-tul strictly requires a local plural subject. For others, the licensing condition can be more lenient, so that plural nominal antecedents in the local domain – such as plural oblique agents or plural direct objects – can license EPM-tul.

3 Previous Studies

3.1 Yim (2003)

Yim (2002; 2003) provides a semantic account for EPM-tul. He argues that EPM-tul introduces a collectivity-internal distributivity. He suggests that the sentence with EPM-tul is collective and distributive at the same time in the sense that EPM-tul adds distributivity down to each individual in collectively-read sentences. He accounts for the semantic effect of EPM-tul, relying on Schwarzschild (1996)’s Partition-Cover theory, which has the advantage of accounting for the distinction between collectivity and various types of distributivity. The sentences in (8) reveal a minimal pair with respect to EPM-tul. According to Yim (2003), the sentence in (8.a) without EPM-tul has two salient readings: i.e. a collective reading and a distributive reading. The sentence in (8.b), which is the same as (8.a) except the fact that it is attached with EPM-tul, has the collectivity-internal distributive reading,

   The student-IPM-Nom park-at went
   ‘The students went to a park/parks.’

   The student-IPM-Nom park-at-EPM went
   ‘The students went to a park/parks.’

He portrays the semantic difference between the sentence (8.a) and the sentence (8.b) by assigning different values to Cover. The formulas in (9) and (10) are the denotations of the sentences (8.a) and (8.b), respectively. Under the universe of discourse described in (11), the formula in (9) generates the collective reading, when it selects K in (12) as the value of Cover. However, it elicits the nominal distributive reading when the value of Cover is I. The collectivity-internal distributive reading for (8.b) is claimed to be derived when both I and K are simultaneously selected for the value of Cover in (10).

(9) \( \forall x [(x \in [\text{Cov}]) \& x \subseteq [\text{the.students'}]) \rightarrow x \in [\text{go.to.a.park'}]) \]
(10) \( \forall x \exists X \exists Y [(x \in \text{Cov} \& x \subseteq X[X \text{ is a set of students}] \& \exists y \in Y[Y \text{ is a set of park}] \rightarrow \exists e \exists e' [\text{GO}(e') \& \text{Agent}(e',x) \& \text{TO}(e',Y) \& e' \subseteq e]] \)
His analysis is highly significant in the respect that it is the first semantic work that seriously deals with the core semantic property of EPM-tul. Yet, there are some limitations. First of all, it is hard to imagine exactly what interpretation can be derived when the value of Cover is both I (\{\{a\}, \{b\}, \{c\}, \{d\}\}) and K (\{\{a,b,c,d\}\}) at the same time. It seems that the meaning extracted by selecting the two values simultaneously for the same Cover would be neither collective nor distributive, since the intended meanings of the two different values are incompatible.

Furthermore, according to the analysis above, what EPM-tul does is ensure that there is a distributive relation between the plural subject and the “whole” VP predicate. The inadequacy of his analysis crucially lies in the fact that it makes no semantic difference where EPM-tul actually occurs within the VP. Regardless of which element EPM-tul is attached to, the entire predicate is distributed to each individual of the set denoted by the plural subject.

The same fact that Yim (2003) analyses EPM-tul relying on the distributivity operator at the VP level brings about another problem. The maximizing effect introduced by Korean EPM-tul differs from the maximizing effect at the VP level. EPM-tul does not function to make sure that all the first-year students who are contextually-relevant built a raft. Instead, in the following example (13.b), EPM-tul guarantees that each student who actually participated in the building of a raft did so loudly.

```
    The first-year student-IPM-Nom loudly raft-Acc build-Pst-Dec
     ‘The first-year students built a raft loudly.’
    
    The first-year student-IPM-Nom loudly-EPM raft-Acc build-Pst-Dec
     ‘The first-year students built a raft loudly.’
```

The last point I would like to make with regard to Yim (2003)’s proposal on the semantics of EPM-tul is that the distributivity introduced by Korean EPM-tul is not confined to collectivity. That is, the distributivity caused by EPM-tul does not become vacuous with inherently distributive predicates. The EPM-tul in sentence (14.b) functions as an overt indicator that makes sure that the manner described by the adverbial distributes over each agent of the sentence. Even though the sentence (14.a) has the distributive reading, the semantic contribution of EPM-tul in (14.b) is as salient as it is in collective sentences. The sentence in (14.b) with EPM-tul can only be used in a situation where each first-year student who left did so early, whereas the sentence in (14.a) without EPM-tul can encode a situation where five first-year students left early but one first-year student left late.
Kim (2004) claims that the contribution of EPM-tul is weaker than truth conditional. He proposes that Korean EPM-tul imposes the presupposition that its plural antecedent and the category it attaches to are in a distributive relation, defining the denotation of EPM-tul as follows:

\[
[[\text{tul}]] = \lambda x[\lambda y: \exists R \forall z. z \leq x \rightarrow R(y)(z). [y]]
\]

According to his analysis, the following sentence (16) presupposes the distributive relation expressed in (17.a). In this way, he allows the sentence in (16) to be used in a situation where there is only one snowman as well as in a situation where there are 10 snowmen.

(16) \[
\text{Yelmyeng-uy ai-tul-i nwunsalam-tul-ul mantul-ess-ta.}
\]

Ten-Poss child-IPM-Nom snowman-EPM-Acc make-Pst-Dec

‘Ten children made snowmen.’

(17) a. Presupposition: \(\exists R \forall x [x \leq \text{ten students} \rightarrow R(\text{a snowman})(x)]\)
b. Assertion: \(\exists y[\text{snowman}(y) \& \text{made }(y)(\text{ten students})] \text{ or } \forall x[x \leq \text{ten students} \rightarrow \text{made }(\text{a snowman})(x)]\)

The denotation of EPM-tul defined in (15) allows us to derive the semantics of the sentence (18) as (19). As shown in (19), EPM-tul does not contribute to the truth conditions of the sentence where it appears, but imposes the presupposed distributive relation between its plural antecedent, \(\text{ku ai-tul} \text{ ‘those children,’} \) and the adverbial, \(\text{ppali} \text{ ‘fast,’} \) that the tul is suffixed to.

(18) \[
\text{Ku ai-tul-i ppali-tul taly-ess-ta.}
\]

That child-IPM-Top fast-EPM run-Pst-Dec

‘Those children ran all fast.’

(19) 1. \([\text{pro1 tul}] = \lambda e: \exists R \forall z \leq g(1) \rightarrow R(z)(e).[e]\]
2. \([\text{fast}] = \lambda e. \text{fast}(e)\]
3. \(\lambda Q \lambda P: P(\exists e Q(e)).P\]
4. \([\lambda Q \lambda P: P(\exists e Q(e)).[P]] (\lambda e: \exists R \forall z \leq g(1) \rightarrow R(z)(e).[e])\]
\(= \lambda P: P(\exists e \exists R \forall z \leq g(1) \rightarrow R(z)(e).[e]) [P]\)
A SEMANTIC ANALYSIS OF THE KOREAN PLURAL MARKER 'TUL'

5. \( \lambda P: P(\exists e \forall z \leq g(1) \rightarrow R(z)(e)) \) [P] (\( \lambda e. \) fast(e))

6. \([\text{ran}] = \lambda x \lambda e[\text{agent}(x)(e) \& \text{fast}(e)]\)

7. \( \lambda x \lambda e[\text{agent}(x)(e) \& \text{ran}(e) \& \text{fast}(e)]\)

8. \( \exists e[\text{agent}(x)(e) \& \text{ran}(e) \& \text{fast}(e)]\)

Overcoming the limitation of Yim (2003), Kim (2004) correctly captures the fact that EPM-tul does not induce semantic effects over the whole VP predicate, but just over the predicate marked with EPM-tul. However, the critical drawback of his analysis is that the distributive relation is actually asserted rather than presupposed. The evidence comes from the fact that the distributive relation does not remain when the sentence containing it is negated. That is, the distributive presupposition does not survive under negation. The following sentence (20) can felicitously be used in the context where some first-year students who built a raft did so loudly while other first-year students who built a raft were not loud in the building event.

    ‘The first-year students did not build a raft all loudly.’

4 A New Analysis

In this section, I will provide an alternative analysis for the semantics of EPM-tul that overcomes the limitations found in previous approaches. In contrast to Yim (2003) and Kim (2004), I will introduce a distributivity operator and a focus-sensitive operator to account for the universal quantification associated with EPM-tul.

4.1 Two Semantic Components of EMP-tul

An adequate analysis must account for the following semantic properties of EPM-tul. All the examples below share the common propositional core. However, as Song (1997) and Kim (2004) point out, each sentence in (21) yields a different distributive relation. That is, the different position of EPM-tul must induce a different meaning.

    ‘The students built a raft in the park loudly.’

    ‘The students built a raft in the park loudly.’

    ‘The students built a raft in the park loudly.’

What is also crucial in the analysis of EPM-tul is that it consists of two semantic components that are described in (22). Kim (2004) describes the semantics of EPM-tul
only as distributivity. Yim (2003) discusses a maximizing and a distributivity effect but incorrectly describes that the two semantic effects apply at the VP level. The accurate semantics of EPM-tul is as follows:

(22) a. Distributivity: EPM-tul distributes the predicate it attaches to over the denotation of the agent nominal.
   b. Maximali ty: EPM-tul indicates that, in this distribution, each individual denoted by the agent nominal must be exhausted.

The two semantic components of EPM-tul explain why there are salient differences in meaning not only between (23) and (24) but also between (25) and (26). EPM-tul in (24) alters the possible collective and non-maximal readings induced by sikkurupkke ‘loudly’ in (23) into the necessary distributive and maximal readings as in (24).

(23) Ilhaknyen haksaeng-tul-i sikkurupkke ttamok-ul ciessta..
‘First-year students built a raft loudly.’
◊ collective building event
◊ non-maximality of the plural agent noun
◊ collectivity in the being loud event
◊ non-maximality of the plural agent noun in the being loud event

(24) Ilhaknyen haksaeng-tul-i sikkurupkke-tul ttamok-ul ciessta.
First-year student-IPM-Nom loudly-EPM raft-Acc build-Pst-Dec.
‘First-year students built a raft in the park all loudly.’
◊ collective building event
◊ non-maximality of the plural agent noun
☐ distributivity in the being loud event
☐ maximality of the plural agent noun in the being loud event

The two semantic components also naturally account for why the semantic contribution of EPM-tul is not entirely nullified even when the main predicate is inherently distributive. EPM-tul occurring with inherently distributive main predicates still yields a maximizing effect, even though it does not introduce distributivity. That is, EPM-tul in (26) alters the possible non-maximal reading of the plural agent into a necessary maximal reading with respect to the plural agent involved with the being early event.

First-year student-PL-Nom early leave-Pst-Dec
‘First-year students left early.’
☐ distributive leaving event
☐ non-maximality of the plural agent noun
☐ distributivity in the being early event
◊ non-maximality of the plural agent noun in the being early event
4.2 A Semantic Account of EPM-tul

In explaining the two semantic effects of EPM-tul, I will introduce a distributivity operator accompanying a contextual variable and a focus-sensitive operator. The good-fitting requirement on the Cover variable of the distributivity operator accounts for the maximizing effect of the predicate marked with tul, while the focus-sensitive operator captures the fact that different positions of EPM-tul generate different distributive relations.

EPM-tul as a focus-sensitive operator is primarily based on the observations made in Song (1997). He describes that EPM-tul marks “a focus of emphasis in terms of distribution.” First, he observes that topic-marked nominals cannot be suffixed with EPM-tul as in (27) due to the functional clash.

The child-Dat (-EPM)-TOP(-EPM) person-IPM-Nom money-Acc give-Pst-Dec.
‘People gave the child money.’

The second argument comes from the nonrandom occurrence of EPM-tul in question-answer pairs. As Rooth (1996) also finds, the position of focus in an answer correlates with the questioned position in the corresponding question. The following question-answer examples borrowed from Song (1997) reveal the congruence between question and answer with respect to focus. When the questioned element is attached with EPM-tul, the answer sounds natural. However, as shown in (28.c), it sounds awkward when EPM-tul is attached to non-questioned elements.

(28) a. Mwues-ul ai-tul-i kongwon-eyse culkepkey ha-ess-nya?
   What-Acc Child-IPM-Nom park-Loc cheerfully do-Pst-Q
   ‘What did the children cheerfully do in the park?’

   Child-IPM-Nom park-Loc cheerfully ball game-EPM-Acc do-Pst-Dec
   ‘The children cheerfully played ball in the park.’

   c. # Ai-tul-i kongwon-eyse-tul culkepkey kongnoli-lul ha-ess-ta.
   Child-IPM-Nom park-Loc-EPM cheerfully ball game-Acc do-Pst-Dec
   ‘The children cheerfully played ball in the park.’

What has to be further taken into account in the argument above is the case where the question itself contains EPM-tul. When a question includes EPM-tul, the corresponding
answer can have EPM-tul in the corresponding position, even though it is not necessary. Also, the direct answer to the questioned element can have EPM-tul as shown in (29.b). However, parallel to (28), it sounds very awkward when the unquestioned element has EPM-tul attached as an answer to the question as in (29.c).

(29)  

   ‘What did the children cheerfully do in the park?’

   ‘The children cheerfully played ball in the park.’

   ‘The children cheerfully played ball in the park.’

Based on the evidence discussed above, I would like to claim that EPM-tul is a focus sensitive operator that includes a distributivity operator in its restrictor domain. As a focus operator, EPM-tul serves to re-structure the information of the sentence by placing the focused element in the nuclear scope, which is how Beaver & Clark (2003) and Nakanishi & Romero (2003) define a focus operator. Furthermore, the relevant maximizing and distributive interpretation are arrived at, by imposing the good-fitting restriction on the Cover of the distributivity (Partition) operator encoded in the lexical meaning of EPM-tul. I would like to suggest the truth condition of EPM-tul as in (30).

(30) Truth condition of EPM-tul
NP(x) [VP XP-[tul] ]
   \[ \forall e \forall y [y \in Cov_{\text{good-fitting}} \& y \subseteq x \& Ag(e,y) \rightarrow q(e) ] \],
   where q is XP that hosts EPM-tul.

Now, we are ready to illustrate the semantic contribution of EPM-tul based on the denotation given in (30). The sentences in (31), (33) and (35) commonly express the same proposition. Yet, EPM-tul attached to the oblique nominal as in (33) and EPM-tul suffixed to the adverbial as in (35) further contribute distributive and maximizing senses to the core proposition, as illustrated in (34) and (36). The EPM-tul in (33) maximally distributes certain aspects of the events specified by the oblique nominal over each individual agent involved. EPM-tul attached to an adverb as in (35) fully distributes the manner expressed by the adverbial over the action performed by each of the agents involved. The denotations of the sentences (33) and (34) are described as (34) and (36), respectively.

(31) Ilhaknyen haksaeng-tul-i kongweneyse sikkurupkke ttamok-ul ciessta..
   ‘The first-year students built a raft in the park loudly.’

(32) \[ \exists e \forall x [x \in Cov \& x \subseteq \{ \text{the.first.year.students} \} \rightarrow \exists e'[e' \subseteq e \& Ag(e',x) \& Build (e') \& Theme (e', a raft) \& AT(e', park) \& loudly(e') ]] \]
When one sentence has more than one EPM-tul marking, the multiple elements attached with it shift to the nuclear scope as follows:

When one sentence has more than one EPM-tul marking, the multiple elements attached with it shift to the nuclear scope as follows:

(34) \[ \exists e \forall x [x \in \text{Cov} \land x \subseteq \{ \text{the.first.year.students} \} \rightarrow \exists e' [e' \subseteq e \land \text{Ag}(e',x) \land \text{Build}(e') \land \text{Theme}(e', \text{a raft}) \land \text{loudly}(e') \land \text{AT}(e', \text{park}) \land \forall e'' [e'' \subseteq e' \land \forall y [y \in \text{Cov}_{\text{good-fitting}} \land y \subseteq x \land \text{Ag}(e'',y) \rightarrow \text{AT}(e'', \text{park})]]] \]

(35) Ilhaknyen haksayng-tul-i kongweneuye-tul sikkurupkke ttamok-ul ciessta.
‘First-year students built a raft in the park loudly.’

(36) \[ \exists e \forall x [x \in \text{Cov} \land x \subseteq \{ \text{the.first.year.students} \} \rightarrow \exists e' [e' \subseteq e \land \text{Ag}(e',x) \land \text{Build}(e') \land \text{Theme}(e', \text{a raft}) \land \text{cheerfully}(e') \land \text{AT}(e', \text{park}) \land \forall e'' [e'' \subseteq e' \land \forall y [y \in \text{Cov}_{\text{good-fitting}} \land y \subseteq x \land \text{Ag}(e'',y) \rightarrow \text{loudly}(e'') \land \text{Theme}(e'', \text{raft})]]] \]

In (34), (36) and (38), there appear two Covers. One is induced by the plural subject and the other is elicited by EPM-tul. The possible types of Covers in each case are summarized in (39). The Cover variable introduced by the main predicate can generate both distributive/collective and maximal/non-maximal readings. However, the Cover variable induced by EPM-tul is restricted to be distributive and good-fitting so that it necessarily generates a distributive and a maximal reading.

(39) Four possible cases for Covers

<table>
<thead>
<tr>
<th>Main predicate</th>
<th>Distributive/Collective</th>
<th>Good-fitting/Ill-fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tul-predicate</td>
<td>Distributive</td>
<td>Good-fitting</td>
</tr>
</tbody>
</table>

However, it is the case that the Cover for the tul-predicate has to be good-fitting but is not necessarily distributed down to the atomic level. When the Cover for the main predicate is of a mid-size type, or when EPM-tul attaches to the adverbial hamkkey ‘together,’ as in the examples like (40.a) and (40.b), the distributivity induced by EPM-tul does not necessarily go to the atomic level.

Female students and male students-Nom loudly-EPM leave-Pst-Dec.
‘The female students and the male students left all loudly.’

Student-IPM-Nom together-EPM raft-Acc build-Pst-Dec.
‘The students built a raft all together.’

5 Conclusion

In this paper, I have addressed the semantic properties associated with Extrinsic Plural Marker *tul*. Introducing a focus-sensitive operator, I have explained that the different position of EPM-tul generates a different meaning. The core semantic components of EPM-tul have been accounted for by the distributivity operator with a contextual variable. EPM-tul induces a distributive reading and a maximizing effect on the predicate it attaches to regardless of the readings of the main predicate. I have addressed the fact that the semantic contribution of EPM-tul on its predicate is independent of the semantic characteristics of the main predicate by introducing a separate Cover in the restrictor domain of the focus operator.

In the current analysis of the semantics of EPM-tul, I have employed two operators: a distributivity operator and a focus-sensitive operator. However, it will be highly preferable if a single operator can uniformly account for all the semantic properties of EPM-tul. Furthermore, what has been assumed in the current analysis is that Korean plural marker *tul* has two different functions. As discussed, it can yield a genuine plural meaning and a distributive meaning. Yet, it will be intriguing to see whether there is any correlation between these two functions.

References


A SEMANTIC ANALYSIS OF THE KOREAN PLURAL MARKER 'TUL'


ATTITUDES TOWARD DEGREES *

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Abstract

Degree modifiers of the type exemplified in the sentence “She was frustratingly late” are analyzed. These modifiers, which indicate that a propositional attitude – here frustration – holds with respect to the degree associated with the predicate – here lateness, are shown to have certain monotonicity entailments which are absent from simple adverbial attitude reports such as “Frustratingly, she was 10 minutes late.” These entailments account for an interesting puzzle concerning the semantics of the degree modifiers which arises when standard analyses of attitude predicates are combined with standard accounts of degree modification.

1 Introduction

It has long been known that scalar predicates can be modified by adverbs that indicate the degree to which the predicate holds, as in (1) (Bolinger 1972, Kamp 1975).

(1) a. John is completely in love with Mary.
   b. Maria is somewhat sick.
   c. Peter is very convinced that he is right.

The analysis of these kinds of scalar modifiers was an early domain of formal semantics research (cf. Cresswell (1976), Klein (1980), von Stechow (1984)), and remains an active area today (Kennedy (1999, 2001), Kennedy & McNally (2004)).

My focus here will be directed to a particular kind of such degree modification: degree modifiers that specify the degree to which the predicate holds indirectly by specifying a propositional attitude that is held toward this fact. Examples of this sort of modifier are given in (2).

(2) a. Peter is surprisingly tall.
   b. We were frustratingly close.

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c. The answer was painfully obvious.

In such sentences the degree to which the predicate holds evokes a particular mental attitude. So in (2a) it is Peter’s size that is somehow surprising, in (2b) it is our closeness (to something) that is frustrating and in (2c) it is the degree of obviousness of the answer that is frustrating. There is a parenthetic reading of these modifiers, in which they are interpreted as attitudes toward a simple proposition, that is NOT of interest to us here. On this reading, (2a) is synonymous with (3).

(3)  It is surprising that Peter is tall.

Rather, we are concerned with the reading which Cresswell suggested might be paraphrased as in (4), where the attitude is taken to be directed toward the degree itself.

(4)   a. The degree to which Peter is tall is surprising.
       b. The degree to which we are close is frustrating.
       c. The degree to which the question was obvious was painful.

We will call these modifiers attitude toward degree modifiers. Some of these modifier-predicate constructions, such as painfully obvious in (2c), appear to have acquired an almost idiomatic meaning, with the attitude verb bleached of its content and the resulting collocation having only a hyperbolic meaning (here: overly obvious). This is not generally the case, however, and our goal here is to give an account of attitude toward degree modifiers in their true compositional sense (as suggested by the paraphrases in (4)).

In the course of providing such an account, we will see that an interesting puzzle arises. This puzzle results from combining standard accounts of propositional attitude predicates with standard accounts of degree modification. Put briefly, on standard accounts being tall to a certain degree corresponds to being short to a certain degree – there is a necessary inverse relationship between degrees of tallness and degrees of shortness. Standard accounts of attitude predicates treat them as essentially quantifiers over possible worlds. Now, since the worlds in which John is tall to a particular degree are all worlds in which he is short to a particular degree, (5a) should be true exactly when (5b) is.

(5)   a. John is surprisingly tall.
       b. John is surprisingly short.

Our semantic intuitions tell us, of course, that (5a) and (5b) are not synonymous. Our central goal will be to address the difference in interpretation between them in such a way that we can account for this “polar predicate selection puzzle.”

2  Simple degree modifiers

It will be useful to first sketch an analysis of simple degree modification. In analyses going back to that of Cresswell (1976), degree modifiers have been taken to provide
information about the value (or degree) that an individual has on the scale associated with the modified predicate. In (6a), for example, *six feet* specifies exactly the degree to which Peter is tall. In (6b), on the other hand, the vague modifier *very* specifies this less precisely, telling us something like that Peter’s size is significantly above the average degree of tallness (Klein 1980).

(6)   a. Peter is six feet tall.
     b. Peter is very tall

Formally gradable adjectives can be analyzed as denoting relations between individuals and degrees on a scale appropriate for the predicate (Cresswell 1976, von Stechow 1984, Kennedy 1999, Kennedy & McNally 2004). This is illustrated for *tall* in (7), where the appropriate scale is the *size* scale.

(7) 

\[
[[\text{tall}]] = \lambda d \lambda x \ [\text{size}(x) = d]
\]

A scale such as *size* is an appropriately ordered set of degrees, which, intuitively, can be taken to correspond to a dimension, such as height, width, weight, brightness, loudness, on which entities can be measured. Predicates that are in polar opposition, such as *tall/short* and *full/empty*, take their values from the same scale. This provides a straightforward account of the semantic relationship between such pairs and underlies the fact that (8a) and (8b) are contradictory.

(8)   a. John is tall.
     b. John is short.

To be tall is to be above some standard on the size scale and to be short is to be below some lesser standard on the same scale, and so, given the structure of scales, one individual cannot be both tall and short. Kennedy (2001) has explored this extensively.

As we saw above, degree modifiers either specify the exact degree on the scale that an individual has, as in (9), or shift the relationship of the scale to the standard, as in (10).

(9)   a. John is six feet tall.
     b. \([\text{size}(j) = 6ft]\)

(10)  a. John is very tall.
     b. \(\exists d \ [\text{size}(j) = d \& d \text{ is extreme with respect to } d_{\text{tall}}]\)

Here the constant \(d_{\text{tall}}\) is the contextually specified standard for tallness, and what *very* does is to specify that the actual degree of tallness lies well above this standard. Formally, then, *very* can be interpreted as a predicate of relations, as indicated in (11), which acts to further specify where on the scale the given individuals size is with respect to this standard.

(11)  

\[
[[\text{very}]] = \lambda P \lambda x \exists d \ [P(x)(d) \& d \text{ is extreme with respect to } d_{P}]
\]
In the absence of degree modification, of course, a scalar predicate must be provided with a simple positive meaning. The idea, on this approach, is that to be tall is to have a size \( d \) that is larger than the standard for tallness \( d_{\text{tall}} \).\(^1\) So the simple positive sentence (12a) is given the logical analysis in (12b).

\[
\begin{align*}
\text{(12)} \quad \text{a.} & \quad \text{John is tall.} \\
& \quad \exists d \ [\text{size}(j) = d \land d > d_{\text{tall}}]
\end{align*}
\]

A parallel analysis is given for the polar opposite predicate \textit{short} in (13).

\[
\begin{align*}
\text{(13)} \quad \text{a.} & \quad \text{John is short.} \\
& \quad \exists d \ [\text{size}(j) = d \land d < d_{\text{short}}]
\end{align*}
\]

Note that predicates bring with them not only a scale and a standard of comparison, but also a polarity, which cashes itself out as the direction of comparison. The predicate \textit{tall} indicates that the value on the size scale must be \textit{above} the standard \( d_{\text{tall}} \), while the predicate \textit{short} indicates that it must be \textit{below} the standard \( d_{\text{short}} \).

Since, formally, gradable predicates are taken to be relations between individuals and degrees, we need a type-shifting mechanism to generate the appropriate-type predicate meaning. Stechow (1984) proposed that in simple positive predications, a null morpheme \textit{pos} applies to introduce the standard for the predicate into the logical form (other options, such as existential closure (Kennedy 2001) have been explored). The interpretation of \textit{pos} is given in (14):

\[
[[\text{pos}]] = \lambda P \lambda x \exists d \ [P(x) = d \land d \ R_P d_P]
\]

Note that the \textit{pos} morpheme introduces the direction of comparison into the logical analysis as well. In simple positive uses, then, the meaning of a scalar predicate combines a standard of comparison \( d_p \) with an ordering relation \( R_P \) and it tells us that the degree to which the predicate holds of the subject stands in the \( R_p \) relation to the standard \( d_p \).

It is clear, of course, that the ordering relation must play a role in degree modification as well, as (15a) is not synonymous with (15b).

\[
\begin{align*}
\text{(15)} \quad \text{a.} & \quad \text{John is very tall.} \\
& \quad \text{b.} \quad \text{John is very short.}
\end{align*}
\]

The interpretation of \textit{very} must be sensitive to the direction of comparison associated with the predicate it modifies, to be very short is to be much \textit{lower} on the size scale than what would count for shortness and to be very tall is to be much \textit{higher} on the size scale than what would count for tallness. Revising the analysis of \textit{very} accordingly gives us

---

1 We are adopting a simple point-based account of degrees here. On extent-based accounts, we would be talking about “maximal degrees”.}
the interpretation in (16), where we use the locution “is distant from” to gloss the relevant metric notion.

(16) \[
\text{[[very]]} = \lambda P \lambda x \exists d [P(x)(d) & d R_P d_P & d \text{ is distant from } d_P]
\]

The direction in which the degree is distant from the standard is that given by the ordering relation associated with the predicate—higher for tall, lower for short. This will play an important role in our semantics for attitude toward degree modifiers below.

Kennedy and McNally (2004) note that gradable predicates can be categorized on the basis of the kinds of scales they are associated with. They distinguish two types of scales, in which there is no maximum degree, and the closed scales, in which there is. Predicates such as tall and rich, which are associated with scales which rise without limit, are contrasted with predicates such as dry and flat, in which this is not the case. The open-scale predicates are distinguished grammatically from the closed-scale predicates by their acceptability with the adverbial modifier completely, as illustrated in (17).

(17) a. The paint is completely dry.
    b. *The man is completely tall.

Kennedy and McNally also distinguish predicates on the basis of the kinds of standards that they are associated with. Predicates such as tall have contextually based standards that can be shifted. In a given context of use, different standards for tallness or shortness may be being used. If we are talking about basketball, we might have standards that are radically shifted as compared to a normal context. While John might have a size which we might usually consider tall, it certainly is possible that in a context in which we are talking about basketball or basketball players, we might not consider John tall at all. Other predicate have standards that are not shiftable, however. They are said to have absolute standards. These come in two sorts: minimal standards and maximal standards. So the predicates wet and late have minimal standards, because to be wet is be minimally wet and to be late is to be minimally late, while the predicates dry and full have maximal standards, since to be dry is to be maximally dry and too be full is to be maximally full. It turns out that what kind of standard a predicate has tells us quite a lot about the entailment patterns that it participates in. To be somewhat wet is to be wet, but to be somewhat full is not to be full. Likewise, when used in the comparative, predicates with minimal standards always have entailments to the positive, while predicates with maximal standards do not. (18a) entails that at least the towel is wet, but (18b) doesn’t entail that towel or the shorts are wet.

(18) a. My towel is wetter than my shorts.
    b. My towel is drier than my shorts.

Clearly the notions of scales and standards combine to do much of the semantic work needed for the analysis of scalar predicates and their modifiers.

Let us complete this sketch of degree modification by briefly discussing comparative expressions. In the comparative form, a predicate relates the degrees on a particular
scale that two individuals have, using the direction of comparison associated with the predicate. We illustrate this with taller and shorter below:

(19)  
\[ \begin{align*}  
&\text{a. John is taller than Mary.} \\
&\quad \exists d \ [\text{size}(j) = d \& \exists d' \ [\text{size}(m) = d'] \& d > d'] \\
&\text{b. Mary is shorter than John.} \\
&\quad \exists d \ [\text{size}(m) = d \& \exists d' \ [\text{size}(j) = d'] \& d < d'] 
\end{align*} \]

So the comparative taller in (19a) tells us that the degree to which John is tall is above the degree to which Mary is tall. This doesn’t entail that either degree is above \text{d}_{\text{tall}}, and, of course, (19a) doesn’t entail either that John is tall or that Mary is. Furthermore, the fact that (19a) and (20a) are synonymous follows from the relationships between the scales and the ordering relation associated with the scalar predicate involved. Both sentences tell us that \text{size}(j) is above \text{size}(m).

The comparative morpheme itself can be taken to relate two individuals and a predicate via the scale and ordering relation associated with the predicate, as indicated below:

(21)  
\[ [-\text{er}] = \lambda P \lambda x \lambda y \exists d \exists d' \ [P(y) = d \& P(x) = d' \& d \mathcal{R} d'] \]

The kinds of entailments we discussed in connection with (18a) and (18b) follow from this analysis. Since any comparative sentence predicates that one degree is above another, for gradable predicates with minimal standards, such as wet, this will entail that at least one of the degrees is above the standard, while for gradable predicates with maximal standards, such as dry, it does not entail that either of them are.

Before turning to attitude toward degree modification, let us note that the degrees which play such a central role here, but are entirely implicit in the logical analysis, can be referred to directly by nominal expressions. In examples such as (22a) and (22b) we see that nominalized scalar predicates such as John’s height, which would appear to denote the degree that John has on the size scale, can act as syntactic arguments. The predicates that take these NPs as arguments are exactly those that would be appropriate for degrees, such as being 6ft in (22a) or exceeding Mary’s height in (22b).

(22)  
\[ \begin{align*}  
&\text{a. John’s height is 6ft.} \\
&\quad \text{b. John’s height exceeds Mary’s height.} 
\end{align*} \]

As in the case of underlying events (Davidson 1967; Parsons 1990), this might be taken to be evidence that degrees really are first class individuals in the domain of discourse. This is a point that will be left for another occasion.

We can now return to attitude toward degree modification, and ask, in the context of this scales-and-standards-based theory, what the analysis of the degree modification in such sentences as (2) should be.
3 Attitude toward degree modification

One might expect that, as in the case of standard degree modification, the modifiers in (2), repeated here as (23), would simply provide more information about the degree argument of the scalar predicate they modify.

(23)  a. Svetlana is frustratingly late.
     b. The answer was painfully obvious.
     c. The pool is surprisingly empty.

In fact, paraphrases such as those in (24) and (25) would seem to argue for an analysis on which the attitude predicate applies directly to the degree argument.

(24)  a. The degree to which Svetlana is late is frustrating.
     b. The degree to which the answer was obvious was painful.
     c. The degree to which the pool is empty is surprising.

(25)  a. Svetlana’s lateness is frustrating.
     b. The obviousness of the answer was painful.
     c. The emptiness of the pool was surprising.

Let us try this approach. In an example such as (23c) the gradable predicate empty indicates a degree on the scale from empty to full that the pool has, and this degree might be taken to have the property of being surprising. An overly naive interpretation would be that given in (26), in which the degree itself is taken to be the object of the predicate surprising, but this is clearly incoherent, as degrees, being individuals, are of the wrong semantic type to be the objects a propositional attitude predicate.

(26)  \( \exists d [\text{emptiness(pool)}=d \land \text{surprising}(d)] \)

As Zucchi (1991) has noted, attitude verbs which have apparent entity denoting subjects, as in (27a), typically induce a shift in interpretation in their subjects into propositional meaning. So (27a) will be interpreted as in (27b), although here there is no overt have predicate in (27a).

(27)  a. Her false teeth surprised me.
     b. It surprised me that she had false teeth.

In fact, the range of interpretation for such examples as (27a) is fairly broad. In context, any number of predicates might be taken to be implicitly applied to the teeth, such as their color – where (27a) might mean that it surprised me that the false teeth were white – or their makeup – in which (27a) might mean that it surprised me that the false teeth were wooden.

\[ *\]

2 We will abstract away from the agent of the attitude throughout. Whether this is the speaker or a general PROarb agent will not be of interest here.
In the case of degree nominalization, it is clear that we also have such a shift, with the attitude predicate not being applied to a degree, but the proposition that the subject has this property to the degree that he does on the given scale. We might analyze (23c), then, as indicated in (28), where I have used the Montagovian '$\land$'-notation to indicate abstraction over the (implicit) world argument carried by all predicates (Montague, 1973).

\[(28) \ \exists d \ [\text{emptiness(pool)}=d \ & \ \text{surprising} (\land [\text{emptiness(pool)}=d])]\]

Adopting a traditional analysis of attitude verbs (of the type proposed by Hintikka (1969)), in which they are taken quantifying over possible worlds, we see that what (28) says is that the pool is empty to degree d and all worlds in which the pool is empty to degree d are worlds that are surprising. The interpretation of surprisingly can be then given as that in (29).

\[(29) \ ([\text{surprisingly}]) = \lambda P \ \lambda x \ \exists d \ [P(x) = d \ & \ \text{surprising}(\land [P(x) = d])]\]

Like degree modifiers such as very, surprisingly simply takes a gradable predicate as complement and predicates something additional of the degree to which this predicate holds of the subject and existentially binds the degree variable. The difference is merely that what it predicates is that the proposition that the subject has the property to the given degree is surprising. I will simply assume that the intentional predicate surprising, of type $<<s \ t>\ t>$, is interpreted as in (30).

\[(30) \ \text{surprising}(P) \ \text{is true iff for } \forall w \in W \text{ if } P \text{ is true in } w, \text{ then } w \text{ a surprising world}\]

This is clearly not adequate (as discussed by Heim (1992), Zimmermann (1993), and many others), but will serve our purposes here. It may be clear already that the naive approach to the semantics of degree modifiers outlined above is problematic. Let us expand upon what the problem is.

On the analysis given above (and certainly on any reasonable analysis) predicates which are polar opposites are related in a complementary way. To be absolutely full, for example, is to be not empty at all and to be half full is to be half empty. Whatever degree a given individual has of fullness determines exactly what degree it has of emptiness. This is a good thing, because it allows us to derive the fact that (31a) and (31b) entail each other.

\[(31) \ a. \ \text{The pool is half full.} \]
\[b. \ \text{The pool is half empty.}\]

But this is a problem for the simple treatment of attitude toward degree adverbs we just outlined. Because of the direct relation between the degree to which a given pool is full, and the degree to which it is empty, the simple account predicts that (32a) and (32b) should be equivalent.

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(32)  a. The pool is surprisingly empty.
    b. The pool is surprisingly full.

Any world in which the pool is p% full is one in which the pool is 100-p% empty and so
if being p% full is surprising so should being 100-p% empty (assuming that degrees of
fullness and emptiness are just percentages). In fact using simple degree arithmetic we
can derive the equivalence. Given the above account, (32a) is interpreted as in (33a),
and (32b) as in (33b):

(33)  a. $\exists d \ [\text{emptiness(pool)}=d \ & \ \text{surprising(} \neg \text{emptiness(pool)}=d\text{)\}]$
    b. $\exists d \ [\text{fullness(pool)}=d \ & \ \text{surprising(} \neg \text{fullness(pool)}=d\text{)\}]$

But since $\text{emptiness(pool)} = 100-\text{fullness(pool)}$
we can rewrite (33a) as:

(34) $\exists d \ [\text{fullness(pool)}=100-d \ & \ \text{surprising(} \neg \text{fullness(pool)}=100-d\text{)\}]$

But of course $100-d$ is simply a degree, so (34) is logically equivalent to (33b).

It is fairly clear, however, that (32a) and (32b) or not synonymous. This difference is
brought out quite distinctively when one considers the following scenario. Assume that
we expect that the pool will be 60% full. It is a moderately warm mid-summer day, but
not one crying out for swimming. If we get to the pool and find that it is only 40% full,
then we would be justified in uttering (32a), but not (32b). On the other hand, if we get
to the pool and find it 80% full, then we would be perfectly justified in uttering (32b),
but not (32a). While the fact of the matter – the degree to which the pool is full or
empty – can be described using either polar predicate, the particular polar predicate
used in the attitude toward degree sentence indicates the direction in which the
deviation from expectation lies.

Before we draw the over-hasty conclusion that it is the relationship between the actual
degree and the expected degree that is crucial to determining which polar predicate is
appropriate, we should note that the same problems arise in connection with such
attitude toward degree modifiers as frustratingly and uncomfortably, which don’t have
associated implicit standard. It is clear, for example, that (35a) and (35b) do not have
the same meaning, despite the fact that to be small to a certain degree is just to be large
to an inversely related degree

(35)  a. The apartment is uncomfortably small.
    b. The apartment is uncomfortably large.

We might also come to the erroneous conclusion that entailment to the positive is
crucial. (36a) would seem, after all, to entail that the apartment is small, while (36b)
appears to entail that the apartment is large. It is clear, however, that this cannot be the

---

3 We use the two closed-scale predicates full and empty because they both are naturally used with
degree modifiers, as indicated in (32). For predicate pairs such as tall and short, in which only the
positive pair appears naturally with such modifiers, the semantic point about degrees goes through
nevertheless. To be d-tall is to be d’-short, although we can’t talk that way.
story either, as in the case of (32) we know that there is no entailment to the positive. (32a) doesn’t entail that the pool is full, nor does (32b) entail that it is empty.

4 Accounting for polar predicate selection

We need, then, to account for the fact that in a situation such as that illustrated below, when the pool is d1-full we use (36a), while in a situation in which it is d2-full we use (36b).

Fullness Scale: EMPTY-----------------d1------------dexpected----------d2-----------FULL

(36) a. The pool is surprisingly full.
   b. The pool is surprisingly empty.

My central claim is that this contrast is a consequence of the fact that attitude toward degree modification involves an implicit “at least” entailment. (36a), for example, appears to entails that if the pool were even more full than it is, this would be surprising too, while (36b) appears to entail that if the pool were even emptier than it is, that would be surprising. The attitude in attitude toward degree modifiers, then, isn’t directed toward a particular degree, but rather toward a whole range of degrees – those degrees that are at least as far up (or down) on the scale as the actual degree.

This contrasts distinctly with adjectival attitude predicates or even adverbial attitude predicates that are in sentence initial position. Such attitude predicate can indicate an attitude with respect to a particular degree, and do not appear to have such monotonicity entailments. So, for example, while the discourse in (37) is incoherent, the parallel discourses in (38a) and (38b) are perfectly normal.

(37) (At 60% full) the pool is surprisingly full.
??We thought it’d be either totally full or empty.

(38) a. It is surprising that the pool is 60% full.
   We thought it’d be either totally full or empty.
   b. Surprisingly, the pool is 60% full.
   We thought it’d be either totally full or empty.

The monotonicity, then, is not part of the meaning of the attitude predicate itself, but is part of the semantics of attitude toward degree modifiers, as such. My concrete proposal, then, is simply to build this monotonicity into the semantics of attitude toward degree adverbs by adding universal quantification over degrees to the lexical semantics of these adverbs.

The analysis of the attitude toward degree modifier surprisingly is given in (39), where, again, R_P is the ordering relation associated with the scalar predicate P.

(39) $[[\text{surprisingly}]] = \lambda P \lambda x \exists d [P(x) = d & \forall d' [d' R_P d \rightarrow \text{surprising}(''P(x) = d'')]]$
We can, of course, derive this meaning of the attitude toward degree adverb from the
adjectival attitude predicate *surprising* by giving an appropriate semantics to the
category changing morpheme –*ly*, as indicated in (40).

\[
[-ly] = \lambda Q \lambda P \lambda x \exists d [P(x) = d & \forall d' [d' R_P d \lor d' = d] \rightarrow Q('P(x) = d')]\]

For an attitude toward degree modified sentence to be true, the attitude must be held not
only toward the degree to which the modified predicate holds, but also to all degrees
that are more extreme on the scale associated with the predicate. As in the case of the
comparative, the direction of comparison is provided by the predicate that is modified.

We can now illustrate the semantic differences between (36a) and (36b) by giving their
logical analyses. (36a) is interpreted as in (41a) and (36b) as in (41b):

\[
(41) \begin{align*}
& a. \exists d [\text{fullness(pool)} = d & \forall d' [d' \geq d \rightarrow \text{surprising}('\text{fullness(pool)} = d')]]) \\
& b. \exists d [\text{fullness(pool)} = d & \forall d' [d' \leq d \rightarrow \text{surprising}('\text{fullness(pool)} = d')]])
\end{align*}
\]

For (36a) to be true, all worlds in which the pool is as full or fuller than it is in the
actual world must be surprising worlds, while for (36b) to be true, all worlds in which
the pool is as full or less full then it is in the actual world must be surprising.

It is the fact that the ordering relation is sensitive to which of the polar predicates is
being used that allows us make the crucial semantic distinction between polar pairs such
as *full/*empty. In the situation described above, the reason we can’t say (36b) in a
situation in which the pool is d₂-full is that this would entail that worlds in which it the
pool is d_{expected}-full are surprising (since d_{expected} is below d₂ on the scale and empty
is associated with the less-than ordering), and this contradicts our assumption that worlds
in which the pool is d_{expected}-full are not surprising.

Note that the ordering relation behaves in attitude toward degree modification much as
it does in the comparative. We might restate the crucial fact that allows us to solve our
puzzle as being the fact that, although to be d-full is just to be d’-empty, if something is
fuller than something else, it is not emptier. In some sense, there is an implicit
comparative in the attitude toward degree modifier. A natural paraphrase of (36a) then
is, after all, (42):

\[
(42) \text{It is surprising that the pool is as full as it is and it’d be surprising were it fuller.}
\]

There is some question about whether there is, in fact, a double comparision, that is,
whether (36a) really means that it is surprising that the pool is as full as it is and it’d be
more surprising were it fuller, but it is not clear that this is the case. Other paraphrases,
such as those given in (44) are also revealing

\[
(43) \begin{align*}
& a. \text{It is surprising how full the pool is.} \\
& b. \text{The pool is so full that it is surprising.}
\end{align*}
\]

In both cases, recent analyses have been given in which the relevant degree expressions
– *how full* and *so full* – are implicitly associated with a range of degrees (d’Avis 2001;
Meier 2003). In the case of d’Avis’ analysis of such sentences as (43a), however, this is
part of the meaning of the embedded exclamative, whereas for Meier’s analysis of such sentences as (43b) it is part of the (extent-based) meaning of the scalar predicate combined with minimality and maximality operators associated with so...that.

In attitude toward degree sentences, as in the case of the comparative, whether there is entailment from the modified sentence to the simple positive sentence is determined by the type of standard associated with the predicate modified. If the predicate is associated with minimal trivial standards, then there is clearly entailment to the positive, as in (44a). If however, the predicate is associated with maximal trivial standards there is no entailment, as in (44b).

(44)  a. Svetlana was surprisingly late. \(\rightarrow\) Svetlana was late.  
      b. The backpack is uncomfortably full. \(-/\rightarrow\) The backpack is full.

In cases in which the standards are contextual determined, as for tall, there frequently seems to be entailment, as (45a) seems to entail (45b)

(45)  a. Peter is surprisingly tall.  
      b. Peter is tall.

If we look a little more deeply into the semantics, however, we see that the relation between (45a) and (45b) is not one of entailment, but rather one of conversational implicature. This we see from the fact that the implicature can be cancelled, as in (46).

(46) Although he is quite short, Peter is surprisingly tall, given his background.

What appears to be going on here is that the contextual standard associated with the scalar predicate modified is typically taken to be the standard used to determine what is surprising – something like the value \(d_{\text{expected}}\). In cases in which we are explicit about these two values being distinct, as in (46), we see that there is no entailment.

Finally, we might, note that attitude toward degree modifiers can themselves be modified by degree modifiers, as in (47).

(47)  a. The pool was very surprisingly full.  
      b. Peter was more frustratingly late than Mary.

In fact, it even appears that attitude toward degree modifiers can be used to modify other attitude toward degree modifiers:

(48) The apartment was surprisingly uncomfortably small.

This, of course, is not at all surprising. If the attitude predicates that are contained in the attitude toward degree modifiers themselves have degree arguments, then we would expect that they could be so-modified as well. The analysis of these kinds of constructions will be left for another occasion, however.
5 Conclusion

We have addressed the semantics of attitude toward degree sentences such as “John is surprisingly tall.” Although degree modification itself is now fairly well understood as involving degree scales and standards of comparison and direction of comparison, these sentences bring a slight twist with them. Given a simple account of propositional attitude adverbials, we might have expected that the interpretation of our sentence to be simply that the fact that John is as tall as he is is surprising. It turns out, however, that such an analysis would make polar opposites such as surprisingly tall and surprisingly short synonymous, which they are not. This puzzle was dissolved by noting that attitude toward degree modifiers bring with them a kind of monotonicity entailment. John is surprisingly tall not just if it surprising that he is as tall as he is, but also if it would be surprising were he taller. The reason polar opposite are not synonymous, then, is that the direction of comparison associated with these predicates is distinct and finds its way into the implicit comparative semantics of attitude toward degree modifiers.

There are a number of question which remain open, of course. Alongside the general question of what role in the syntax the degree arguments whose semantics we have discussed might play, we are faced with the more specific question of how to relate the attitude toward degree use of adverbial modifiers such as surprisingly to their simple proposition-modifying uses, as in “Surprisingly, John is tall.” In addition we might like to relate these adverbs to their derivationally related adjectives, particularly in such sentences as “John’s height is surprising” and “It is surprising how tall John is” in which the adjective appears to have the same monontonicity entailments as the adverb. And, of course, the treatment degree nominalizations such as “John’s height” remains open in this context as well. Here, however, it would appear that a straightforward application of the analysis sketched above would yield intuitive results.

It would, of course, be desirable to derive the monotonicity effects noted here from the semantics of the attitude predicate themselves, and this is certainly the central desideratum for future work. As Zimmerman (1993) and Heim (1992) have shown, however, this task is frequently less straightforward than one might hope. The analysis presented here should, however, be taken as a stand-in for a more complete and explanatory account. What is encouraging is that embedded exclamative expressions in sentences such as “It is surprising how tall John is” appear to have essentially the same semantics as that given here for scalar predicates, i.e. they interpreted as properties of degrees. This does suggest that general principles for combining attitude predicates with degree-predicates should be involved in deriving the crucial monotonicity effect. If this is the case, the differences between propositional modifiers and the attitude-toward-degree modifiers would be derivable from simple scope considerations, a result worth shooting for.

References


DE SE REDUCTIONISM TAKES ON MONSTERS

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Abstract

Chierchia (1989) and others have used the contrast between George hopes that he will win and Georges hopes to win in mistaken-self-identity scenarios, to argue for dedicated de se LFs. The argument, further strengthened by evidence of shiftable indexicals, appears applicable against any reductionist account that sees de se as merely a particular subtype of de re. My Acquaintance Resolution framework is an attempt at such a reduction, and this paper seeks to extend that theory with a logical principle of introspection for belief, to account for the data within a unified treatment of de re and de se.

1 Introduction

An arsonist has set fire to Tujiko’s and Noriko’s pants. Just before she feels her own pants burning, Tujiko catches a glimpse of her fiery pants in a mirror and, not recognizing herself, she points and yells: “Oh my god! That girl’s pants are on fire!” Alarmed, Noriko looks down and notices she’s on fire, screaming: “Help! My pants are on fire!”

This is your typical mistaken-self-identity scenario, modeled after an original from Kaplan (1989). It is meant to show the difference between de se and de re beliefs about oneself. On the one hand, the two utterances express a similar belief that is in both cases about the utterer herself, viz. that her pants are on fire. On the other hand the cognitive difference of the two expressed beliefs differs vastly and we may expect two different reactions: Noriko will panic and/or roll on the floor, whereas Tujiko will attempt to help the ‘other’ girl. On most accounts it follows that both girls’ beliefs are de re about themselves, since they are both referring more or less directly to themselves with their utterances of that girl or my. The obvious difference is in the way they manage to refer to themselves. Noriko’s belief is ‘from a first person perspective’, or de se, whereas Tujiko’s use of the third person description shows a third person perspective on the same belief, which is still de re but not de se (i.e. mere de re).

The above tentatively suggests a treatment of de se attitudes as a subclass of de re. In 2 we will make this precise by giving a semantics of de re and de se belief. In 3 we will switch to belief reports, and see what the aforementioned semantics predicts as a semantics of reports. Section 4 presents a problem for the reductionist account of de se reports sketched above. In 5 I present my own reductionist attempt, which will be extended in 6 to cover the problematic constructions of 4.

*This paper and its companion (Maier to appear) provide different extensions to (Maier 2004), each addressing a different set of counterarguments to the de se reductionist proposal. I wish to thank Philippe Schlenker for raising and explaining the problem addressed in this paper.
2 The relational account of de re belief

To carry out the reduction of de se to de re we must be precise about what de re belief is. For this purpose we use a combination of Kaplanian (1969) acquaintance relations and Lewisian (1979) self-ascription. To start with the Kaplanian ingredient, the motivating example was Quine’s (1956) Ortcutt scenario:

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. Also there is a gray-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. Now Ralph does not know it, but the men are one and the same [viz. Ortcutt]. (Quine 1956, 179)

From the first half we conclude that Ralph in fact believes de re of Ortcutt that he is a spy, but from the pillar-of-the-community bit it follows that Ralph believes de re of Ortcutt that he is not a spy. How to account for these two facts, without dismissing Ralph as logically insane?

Kaplan (1969) comes with a simple answer: de re belief is just de dicto belief with descriptive content provided by the way the believer is (perceptually) acquainted with the res. Applied to the Ortcutt example, the res is Ortcutt, and the relevant acquaintance relations have Ralph seeing someone in a brown hat, and seeing some guy with gray hair at the beach. In Kaplan’s terminology: there are two vivid names of Ortcutt for Ralph: the man in the brown hat and the gray-haired man at the beach. The logical forms of the two seemingly contradictory beliefs then come out as Ralph believes that the man in the brown hat is a spy and Ralph believes that the gray-haired man at the beach is not a spy, wherein the belief relation may be explicated simply as relating an individual to a proposition, i.e. a set of worlds.\(^1\)

To capture de se beliefs, however, we need more structure than just propositions as the objects of believe. This was the conclusion of Lewis’s (1979) argumentation, based on examples where people are mistaken about who they are or are referring to. Take Kaplan’s (1989) pants-on-fire scenario discussed above. What does Tujiko learn upon realizing that the girl she sees is herself? The difference is that now she can say ‘My pants are on fire!’, i.e. the de re belief has become de se, but has she learned a new proposition? No, says Lewis, proposition-wise nothing has changed; whether she refers to herself with that girl (pointing at the mirror), or with I, the expressed proposition constituting her belief is that Tujiko’s pants are on fire. Lewis’ solution is that belief is self-ascription of properties: first, Tujiko self-ascribes the property of seeing someone whose pants are on fire, then she realizes her mistake and comes to self-ascribe the property of having one’s pants on fire. In possible worlds semantics, these properties are set-theoretically represented as \{⟨a, w⟩|a sees someone with fiery pants in w\} and \{⟨a, w⟩|a’s pants are on fire in w\}, respectively, and self-ascription is a new primitive notion replacing the modal attitude operator.

We now combine the above two theories into a unified analysis of de re and de se. First, make the Kaplanian definition of de re belief sensitive to properties:

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\(^1\)Although Kaplan himself advocates a sententialist view on propositional attitudes in the cited paper, we simply translate his theory to the more standard analysis of propositions as sets of possible worlds.
(1) \( x \) believes \textit{de re} of \( y \) that it has \( P \) iff there is a two-place relation \( R \) s.t.

(i) \( R \) is a sufficiently vivid acquaintance relation
(ii) \( R \) holds between \( x \) and \( y \) (in the actual world)
(iii) \( x \) self-ascribes the property of bearing \( R \) to something \( P \)

Applied to Tujiko and Noriko we get that both girls believe \textit{de re} about themselves that they are on fire, because for each girl \( x \) there is an \( R \) that holds between \( x \) and \( x \) and satisfies the other two criteria, for Tujiko we can take \( R \) to be \textit{seeing someone in the mirror}, for Noriko we can even just take the relation of equality, since unlike Tujiko, she believes to ‘bear equality to someone whose pants are on fire’ (iii).

Next, define \textit{de se} as \textit{de re} under the acquaintance relation of equality:

(2) \( x \) believes \textit{de se} to be \( P \) iff \( x \) believes \textit{de re} of \( x \) that he is \( P \), with equality as the 2-place acquaintance relation \( R \)

Now, Noriko’s belief is \textit{de se}, but Tujiko’s is merely \textit{de re}. This reduction of \textit{de se} to \textit{de re} can be traced back to Lewis (1979, 156)\(^2\) but Cresswell and von Stechow (1982) were the first to clearly separate belief and belief reports, and extend the above analysis of \textit{de re} belief to a semantics of belief reports, with which the rest of the paper is concerned.

3 Belief reports

Belief reports are sentences typically used to convey that someone has some belief or other. As I said, the remainder of this paper provides a semantics for (a certain subclass of) belief reports, that is, a systematic\(^3\) way of deriving logical forms (representations of truth-conditions in a logical language) from surface structures of the form \( NP \) believes that \( NP \) \( VP \). The obvious starting point being that a sentence of that form is true iff the referent of the first \( NP \) believes \textit{de re} of the referent of the second \( NP \) that that last has the property denoted by the \( VP \), for example:

(3) \[
\begin{align*}
\text{[Ralph believes that Ortcutt is a spy]}_w &= 1 \\
\text{iff } \text{[Ralph]}_w \text{ believes (in } w \text{) } \text{de re of } \text{[Ortcutt]}_w \text{ that it is a spy} \\
\text{iff there is an } R \text{ s.t.} \\
& \quad \text{(i) } R \text{ is a sufficiently vivid acquaintance relation} \\
& \quad \text{(ii) } R([\text{Ralph}]_w, [\text{Ortcutt}]_w) \\
& \quad \text{(iii) } [\text{Ralph}]_w \text{ self-ascribes the property of bearing } R \text{ to a spy}
\end{align*}
\]

We already saw that in Quine’s example this is verified by taking \( R \) to be the relation of seeing someone in a brown hat. An analogous derivation, with \( R(x, y) \) is \( x \) sees \( y \) at the beach, shows the truth of the report Ralph believes that Ortcutt is not a spy.

From now on we restrict attention to reports of beliefs about oneself. As Kaplan (1989) has pointed out, in the mistaken identity scenario where Tujiko doesn’t recognize her own mirror image, the following reports, as uttered by an informed spectator, are both true:

\(^2\)“[\textit{de se} belief] is ascription of properties to oneself under the relation of identity. Certainly identity is a relation of acquaintance par excellence. So belief \textit{de se} falls under belief \textit{de re}.” (Lewis 1979, p.156)

\(^3\)Not necessarily \textit{compositional} in the oldskool Amsterdam sense of the word...
Kaplan concluded that ‘purely indexical distinctions’, such as the difference between Tujiko’s *de re* and Noriko’s *de se* attitudes, can not be conveyed by reports in natural language: there are no *de se* reports, only *de se* attitudes. In the reductionist framework discussed above, this boils down to saying that for a report to be true there has to be some acquaintance relation, and natural language has no way of specifying on the surface, which acquaintance relation. This is exactly what is captured by the straightforward semantics exemplified in (3), which would indeed predict truth for both sentences in (4), in accordance with Kaplan’s (1989) conjecture.

Such reductions of *de se* to *de re*, denying the existence of dedicated *de se* LFs for natural language reports have been proposed and defended by Boër and Lycan (1980), Cresswell and von Stechow (1982), von Stechow (1982), Reinhart (1990), and, reformulated in terms of Kaplan’s two-dimensional character theory, by Kaplan (1989) and Zimmermann (1991). Lately, however, there has been a surge in counterarguments, one of which is the topic for the remainder of the paper.

### 4 Anti-reductionism

There are two groups of counterarguments against the general reductionist setup, one appears in work on monsters and *de se* reports (Chierchia 1989, Schlenker 2003, von Stechow 2002), and the other involves quantified belief reports, most notably embedding under ‘only’ (Percus and Sauerland 2003). This last I discuss elsewhere, for now we’ll focus on the monsters.

First of all, Chierchia (1989) argues for separate *de se* and *de re* LFs on the basis of infinitive constructions like, in (Pseudo-)English:

\[
\begin{align*}
(5) & \quad \text{a. Noriko believes to be on fire} \\
& \quad \text{b. #Tujiko believes to be on fire}
\end{align*}
\]

Unlike with the corresponding 3rd person reports in (4), where the one about Tujiko was perhaps a bit forced (or even misleading) but still true, there is a real semantic contrast here: (5a) is fine, (5b) is plain false.

Given our earlier result that there can be no *de se* reports, the question arises how to account for these data? Chierchia’s own account postulates an ambiguity: there are *de se* and *de re* LFs, and sentences as in (4) are ambiguous, whereas the infinitives in (5) correspond solely with a *de se* LF. On his account, a *de re* belief complement is of a sentential type, with a free variable bound by a *res* from the outside. Such complements become

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\[^{4}\text{In English, this kind believes to be without object is rather rare, if not unacceptable, though Google comes up with e.g. “The author believes to be aware of related intellectual property rights [...]” (www.ietf.org/ietf/IPR/infineon_ietf_ipr.pdf). The similar hopes to be used by Schlenker (2003) and others is fine in English, and the contrast is the same, but the semantics of that attitude verb introduces some independent difficulties. Chierchia’s original examples were in Italian where crede di essere is the standard way of ascribing *de se* beliefs, and I can confirm that in Dutch the analogous constructions denkt *te* and meent *te* + infinitive are ok, as witness the number of Google hits on "denkt * te *"}"

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by fronting them with a $\lambda$ at LF and binding the free variable, thereby type-shifting the propositional complement into a property. The variable binder has no discernible surface realization, so the ambiguity of (4) boils down to the existence or non-existence of this variable binder at LF. The argument then continues with recalling that infinitival complements of (5) have independently been argued to come with such a variable binder of their own. In Chierchia’s theory this is further linked up with Chomsky’s PRO, the invisible subject of such infinitival complements: the surface structures of (5) have an invisible subject NP, called PRO, which is nothing less than the surface realization of the $\lambda$-abstractor.

The next step is Schlenker (2003) who adds cross-linguistic data of ‘monstrous’ behavior of indexicals embedded in beliefs, that is, constructions like (6) where a first person indexical refers, not to the speaker, but to the subject of the reported belief. A literal gloss of a true Amharic belief report into English would for instance look like this (Pseudo-Amharic):

(6) Noriko believes that $I_{Amh}$ am on fire

Somehow, it must be possible to interpret the embedded first person as a first person with respect to the belief. Moreover, on this reading, the truth-conditions are conjectured to be de se (Schlenker 2003, p.38), i.e. it patterns with the English PRO construction in (5). Note that $I_{Amh}$ can be read de re (wide-scope), but then it patterns with English $I$, ascribing Noriko a belief about me, Emar. Schlenker eventually arrives at a theory which assigns 1st person features to $I$, $I_{Amh}$ and PRO, and postulating a typology of 1st person pronouns: $I$ must be evaluated with respect to the actual context, $I_{Amh}$ can take the actual context or the belief context (in which case the belief is de se)$^5$, and PRO can only take the belief context.

The problem for reductionist theories of de relde se can now be singled out to be the fact that they in effect scope the subject of the attitude complement out of the belief operator. This is can be seen in (3): the embedded NP Ortcutt is evaluated in the actual world $w$, and Ralph is supposed to be $R$-related to this Ortcutt in that world $w$ too. In this way we can get the right result for English embedded $I$, but how about $I_{Amh}$? Surely, that is just as much a 1st person, just not always the actual 1st person. Once we accept that, we might as well follow Schlenker in analysing PRO as a first person too, since both are used to express first person thoughts. In the next sections I propose a way to incorporate these observations in a reductionist framework based on acquaintance resolution. The account differs from Schlenker’s in that it uses a form of scoping, and from Von Stechow’s (2001, 2002) in that the embedded subject’s surface features are straightforwardly interpreted (no feature deletion)$^6$.

---

$^5$There’s an obvious correspondence between properties and sets of contexts as complements of a belief: self-ascribing the property of being on fire is the same as ‘believing’ the set of contexts whose agent (or center) is on fire.

$^6$With respect to the third person, Schlenker also needs a morphological agreement mechanism, whereas the proposal developed below requires nothing of the sort.
5 Acquaintance Resolution

My proposal, Acquaintance Resolution, tries to give a formal semantic treatment of de re and de se belief reports by implementing an enhanced version of the relational attitude semantics exemplified in (3), in the framework of DRT with presuppositions. I assume some familiarity with basic DRT (Kamp and Reyle 1993), presupposition-as-anaphora (van der Sandt 1992), and possible worlds semantics. The aims are (i) to be weakly reductionistic in the sense that there be no syntactic ambiguity in the simple belief reports of (4)-(6) (contra (Chierchia 1989)), and (ii) pronouns are interpreted according to their surface features (contra e.g. (von Stechow 2002)). And of course we need to get the right truth-conditions for the reports in (4)-(6) in a systematic way, but that’s just the definition of natural language semantics.

Just representing adequate de re and de se truth-conditions already necessitates some additions to standard DRT. I will here simplify a bit with respect to the formal semantics, focusing more on mapping sentences to representations. In the appendix or (Maier 2004) the interested reader will find the tedious semantic details, i.e. a 2-layered fragment of LDRT to account properly for direct reference and indexicality. For simplicity then, we now proceed with a 1-dimensional toy version, keeping in mind that certain uniqueness and rigidity facts require the machinery of the appendix.

First, add to the DRS language a predicate ‘believe’ with interpretation Bel ∈ ℒ × W → ℘(W):

\[ \textit{believe}(x): \varphi \mapsto \{ w \in W \mid \llbracket \varphi \rrbracket_w \subseteq \textit{Bel}(f(x), w) \}. \]

Now we can represent things like:

\[ \textit{Noriko believes that there’s an arsonist in the house} \]

\[ \llbracket \textit{x Noriko}(x), \textit{believe}(x): \llbracket \textit{y arsonist}(y), \textit{in the house}(y) \rrbracket \rrbracket \]

\[ \llbracket (8b) \rrbracket_w = 1 \iff \text{there is an individual } a, \text{ called } \textit{Noriko}, \text{ in } w, \text{ all of whose belief worlds } w' \in \textit{Bel}(a, w) \text{ feature some arsonist who is in the house (at } w') \]

Next, we need a predicate to represent the first person, i.e. to refer to the current speaker. Since we don’t care about rigidity, we may simply take the predicate ‘speaker’, assuming implicitly that the worlds of evaluation are more like contexts: centered worlds with a unique speaker. However, as the discussion of (Pseudo-)Amharic and PRO shows, a first person pronoun may also refer to the ‘I’ of a thought, the ‘speaker’ of an interior monologue. I propose a predicate ‘center’ to represent the first person in this somewhat generalized sense. With the ‘center’ predicate we can represent first person pronouns, (9a-b), and consequently de se ascriptions, (9c-d):

\[ \textit{y center}(y), \textit{on fire}(y) \]

\[ \llbracket (9a) \rrbracket_w = 1 \iff \text{w has a center (speaker) who is on fire in } \]

\[ ^7\text{This is worked out more precisely in the 2D version, see appendix} \]
c. $\left[ x \mid \text{Noriko}(x), \text{believe}(x); \left[ y \mid \text{center}(y), \text{on}_{\text{fire}}(y) \right] \right]$

d. $\left[(9c)\right]_w^f = 1$ iff a certain Noriko in $w$ has a belief set in which each world has a center (experimenter) who is on fire.

Given the simplifying assumptions discussed above, (9c) correctly represents the de se truth-conditions, but we have not said how to get at such a representation, given a sentence like (4a), (5a) or (6), all of which have the truthconditions of (9d). This process is often described as a two-stage procedure: first the sentence is parsed and compositionally transformed into a preliminary DRS, then (presupposition) resolution merges the preliminary DRS with the context (input) DRS and takes care of context-dependencies by binding or accommodating presuppositions, yielding the final (output) DRS representing the new context. My aim is to give an analysis of belief reports that assigns them all a single uniform preliminary de re DRS and in that sense unifying de re and de se reports. Note that my analysis is thus only weakly reductionistic because although the preliminary sentence representations of say (4a) and (4b) are uniform, after resolution the final representations differ, which is as it should be given the differing truth-conditions for de re and de se (readings of) reports.

To sketch the workings of acquaintance resolution, consider the 3rd person reports about Noriko (4a), and Tujiko (4b), in the mistaken identity context. In our dynamic framework we must first represent this input context, in which it is common ground (among the reporter and her audience, that is, Tujiko of course is clueless) that there are two girls, called Tujiko and Noriko, the first of whom is looking a mirror but not recognizing herself. This is represented as:

(10) $\left[ x \mid \text{Noriko}(x), \text{Tujiko}(y), \text{see}_{\text{in}}_{\text{mirror}}(y,y) \right]$

Now, the preliminary DRS of (4a) is:

$$\left[ \partial \left[ z \mid \text{Noriko}(z) \right] \\
R(z,w) = ? \\
\text{believe}(z); \left[ u \mid \text{center}(u), R(u,v), \text{on}_{\text{fire}}(v) \right] \right]$$

(11)

This represents a sort of LF based on the relational analysis of de re sketched in section 2. The proper name Noriko and the pronoun she have triggered presuppositions, denoted by the $\partial$DRS, but there is also another kind of underspecification in (11), viz. R, a 2nd order free variable (ranging over 2-place relations), which is supposed to hold of z and w in the main DRS (corresponding to the real world). This R further serves as the descriptive content under which Noriko has the de re belief, as represented in the complement DRS which says ‘there is a v that the belief center is R-acquainted with, and that v is on fire’ in accordance with the de re reduction of (1), p.3.

After merging (11) and (10), we resolve the regular presuppositions, binding z and w to x (Noriko), and get:
The resolution algorithm must perform a ‘second order binding’ to determine R, given that must be a two-place relation that holds in the context between x and x. This 2nd order binding is done by means of 2nd order matching, a special case of higher order unification (Dalrymple, Shieber and Pereira 1991): we look for a substitution for R that verifies the equation R(x,x)=\ldots, the \equiv representing \alpha\beta\gamma\delta-interconvertibility of lambda terms, and the dots are to be replaced by a contextually salient relation relating x to x. By default we take x=x, which is not explicitly written in the context DRS, but can be thought of as always implicitly there, since it adds nothing to the truth-conditions. This gets us (13a). Then there are 4 possible unifying substitutions, of which (13b) is the one we want, the non-trivial one that resolves R to the relation of equality. Applying it to the whole gives (13c), which is equivalent to (13d-e):

We have succeeded in assigning a \textit{de se} output DRS, equivalent to our earlier (9c), to an underspecified input. Now, a \textit{de se} output for Tujiko (4b) would be false, contradicting our judgments, so let’s see what happens if we add the same preliminary structure (11), except for the proper name, to the same context (10). After merging and resolving presuppositions, we’re at (14a). If now we were to choose the default resolution, y=y for the question mark position and to consequently bind R to equality, we’d get \textit{de se} which the context falsifies. But we can choose a different route, since now there is a salient contextual relation between y and herself: the looking in the mirror, the derivation of the \textit{de re} reading we get from that is shown in (14). One of the main selling points of this kind of analysis is that we can view the deviation from the default equality acquaintance, and the associated pragmatic backtracking described above, as an explanation of the awkwardness many people feel with (4b)’s way of reporting the situation.
DE SE REDUCTIONISM TAKES ON MONSTERS

(14) a. \[
\begin{bmatrix}
\text{Noriko}(x) , \text{Tujiko}(y) , \text{see}_{-}\text{in}_{-}\text{mirror}(y,y)\\
\text{R}(y,y) = ?\\
\text{believe}(y):[ u \ v \ | \text{center}(u), \text{R}(u,v), \text{on}_{-}\text{fire}(v)]
\end{bmatrix}
\]
b. \[\text{R} \mapsto \lambda s . \lambda t . \text{see}_{-}\text{in}_{-}\text{mirror}(s,t)\]
c. \[
\begin{bmatrix}
\text{Noriko}(x) , \text{Tujiko}(y) , \text{see}_{-}\text{in}_{-}\text{mirror}(y,y)\\
\text{believe}(y):[ u \ v \ | \text{center}(u), \text{see}_{-}\text{in}_{-}\text{mirror}(u,v), \text{on}_{-}\text{fire}(v)]
\end{bmatrix}
\]
d. \[\frac{(14c)}{w} = 1 \iff \text{in } w \ldots [\text{context}] \ldots \text{and all of Noriko’s belief worlds have a center who sees someone in a mirror being on fire}\]

Note in conclusion that the third person feature of the syntactically embedded \textit{she} is straightforwardly interpreted as a semantic condition in the presupposition. This means that in the resolution \textit{she}’s presupposition floats up to the main DRS, reminiscent of the ‘wide-scope property’ of (1) that was shown to cause trouble with PRO and shifted \textit{I}_{Amh}. It remains to be seen if we can do better than the classical reductionist account.

6 Embedded first person and unambiguous \textit{de se}

Now let’s see what happens if we apply our analysis to the unambiguously \textit{de se} (5) and the Pseudo-Amharic (6). But first, consider an English first person report. Picture a different scene, featuring me and my friend Noriko, me uttering (15).

(15) Noriko believes I’m on fire

The preliminary DRS for (15) is the same as (11) except for the pronoun’s features which are now \textit{1.sg} instead of \textit{3.sg}. The context has two individuals, of which I am the speaker (center), so if we merge context and preliminary structure and resolve the proper name presupposition to its obvious antecedent, we’re at:

(16) \[
\begin{bmatrix}
\text{Noriko}(x) , \text{Emar}(y) , \text{friend}(x,y), \text{center}(y)\\
\text{R}(x,w) = ?\\
\text{believe}(x):[ u \ v \ | \text{center}(u), \text{R}(u,v), \text{on}_{-}\text{fire}(v)]\\
\partial [ w \ | \text{1.sg}(w)]
\end{bmatrix}
\]

The remaining presupposition \textit{w} can float up to top-level and be resolved to \textit{y}, since obviously it’s centers that can bind first person presupposition. Resolution then proceeds as follows:

(17) a. \[
\begin{bmatrix}
\text{Noriko}(x) , \text{Emar}(y) , \text{friend}(x,y), \text{center}(y)\\
\text{R}(x,y) = \text{(Emar}(y), \text{friend}(x,y))\\
\text{believe}(x):[ u \ v \ | \text{center}(u), \text{R}(u,v), \text{on}_{-}\text{fire}(v)]
\end{bmatrix}
\]
b. \[\text{R} \mapsto \lambda s . \lambda t . \text{(Emar}(t), \text{friend}(s,t))\]
That is, Noriko believes something of the form “My friend Emar is on fire”: the reading we want. So much for the wide-scope resolution of the 1.sg presupposition, that gave the desired result: a real de re reading of I. But why can’t we bind the presupposition of (16) to the local center? Well, in principle we can, but for English we’d get pathological readings, so we should really stipulate that English I always takes widest scope, a reformulation of (a corollary of) Kaplan’s (1989) Principle 2 which states that indexicals are directly referential.

However, as Schlenker (1999, 2003) shows, I_{Amh} behaves rather differently. As it happens, we can characterize this difference exactly by giving up the wide-scope stipulation for I_{Amh}. To see this, let us see what happens in our old context (11) with the Pseudo-Amharic (6), whose preliminary DRS is the same as for its English counterpart (15), so after merge we get:

\[
\begin{bmatrix}
\text{Noriko(x), Tujiko(y), see in mirror(y,y)} \\
\text{R(x,w) ?} \\
\text{believe(x): [ u v | center(u), R(u,v), on fire(v) ]}
\end{bmatrix}
\]

Schlenker suggests that the English-type wide-scope resolution is possible, which we account for by adding a representation of me as speaker to the context and resolving w to it, proceeding as sketched in (17a). Now, we consider the alternative, narrow scope resolution w\rightarrow u:

\[
\begin{bmatrix}
\text{Noriko(x), Tujiko(y), see in mirror(y,y)} \\
\text{R(x,u) ?} \\
\text{believe(x): [ u v | center(u), R(u,v), on fire(v) ]}
\end{bmatrix}
\]

What can R(x,u) be bound to? At first sight this seems strange since u has become unbound, but that need not be a problem since the main DRS does not claim that R(x,u) is the case, but rather asks for a part of a DRS with some conditions that involve the (free) variables x and u. In the current DRS there is a salient relation between x (Noriko) and u (Noriko’s belief-self): being the person you believe to be, in fact this is explicitly present as the smallest subpart of the DRS containing both x and u:

\[
\begin{bmatrix}
\text{Noriko(x), Tujiko(y), see in mirror(y,y)} \\
\text{R(x,u)=?} \\
\text{believe(x): [ u v | center(u), R(u,v), on fire(v) ]}
\end{bmatrix}
\]

\[
\begin{bmatrix}
\text{R\rightarrow\lambda s.\lambda t.belong(s): [ | center(t) ]}
\end{bmatrix}
\]
And then we’re stuck, since what we want is \textit{de se} truth-conditions, as represented by (13c) \((\approx (9c))\); (20c) seems to attribute to Noriko a belief about a belief, rather than merely a belief about the self being on fire. Is there a way to deduce the \textit{de se} belief from (20c)?

What’s missing is some kind of introspection principle: if you believe to believe \(\phi\), you believe \(\phi\). Such principles have been studied in doxastic modal logic, i.e. modal systems with an operator \(\Box\) interpretable as ‘I believe that’. For example, in a well-known standard system for belief, \textbf{KD45}, as in \textbf{S5}, we have both \textit{positive introspection} \((\Box \phi \rightarrow \Box \Box \phi)\) and \textit{negative introspection} \((\neg \Box \phi \rightarrow \Box \neg \Box \phi)\), semantically corresponding to the frame properties of transitivity and Euclidicity. Without first going into modal logic proofs, note that our semantics differs from these classical logics in that we make heavy use of the fact that our beliefs have centers, which makes the belief objects more like self-attributed context sets, or equivalently Lewisian properties, than classical propositions. I will therefore posit a generalized introspection principle for centered belief, and since our representations are kind of ‘heavy’, I will also give a neat semantic formulation and show how it helps us get what we want.

First, syntactically, what we want is to reduce the double belief embedding to a single one. Classically that would be \(\Box \Box \phi \rightarrow \Box \phi\) (“If I believe that I believe something, then I believe it”), which is indeed a theorem of \textbf{KD45} provable from the axioms of \textit{consistency} \((\neg \Box (\phi \land \neg \phi))\) and negative introspection. The analogon of this theorem for centered belief would state that if \(x\) has a belief in which the center has a belief, then that second belief is actually belief of \(x\)’s. As a sort of axiom it would look roughly like (21), where \(U(\phi)\) denotes the set of discourse referents, the \textit{universe}, of the main DRS of \(\phi\), and \(\text{Con}(\phi)\) the set of conditions in \(\phi\).

\begin{equation}
(21) \quad \begin{array}{c}
\ldots \ldots \text{believe}(x): \left[ u \ldots \text{center}(u), \text{believe}(u): \varphi, \ldots \right] \ldots \\
\Rightarrow \left[ \ldots \ldots \text{believe}(x): \left[ u \ U(\varphi), \ldots \text{center}(u), \text{Con}(\varphi), \ldots \right] \ldots \right]
\end{array}
\end{equation}

If we accept this, on grounds of its roots in classical \textbf{KD45} or its own intuitive appeal as a principle of a logic of belief, we see that (20c) is now equivalent to:

\begin{equation}
(22) \quad \begin{array}{c}
x \ y \quad \text{Noriko}(x), \text{Tujiko}(y), \text{see_in_mirror}(y,y) \\
\text{believe}(x): \left[ u \ v \ \text{center}(u), \text{center}(v), \text{on_fire}(v) \right]
\end{array}
\end{equation}

One additional stipulation is needed to arrive at the \textit{de se} truth-conditions, and it’s one we have more or less assumed all along: there can be but one center per belief alternative. In other words, you cannot believe yourself to be two people at once.\footnote{A very uncontroversial assumption, probably not even falsified by people with severe multiple personality syndrome.} Syntactically:
An application of axiom (23) and consequent unification of u and v finishes the proof: Acquaintance resolution with axioms (21) and (23) predicts two readings for the Pseudo-Amharic (6), one wide-scope, same as for the English I in (15), viz. (17c); the other de se, i.e. same as the de se reading that was preferred for the English third person report (4a), viz. (13e). The same Amharic sentence now with Tujiko as subject is therefore predicted to be false in our scenario, because Tujiko doesn’t recognize herself and so does not belief that the belief-center is on fire. Our prediction with respect to $I_{Amh}$ are thus completely in line with Schlenker’s discussion of the data (Schlenker 2003, p.38,74-76).

How about Chierchia’s (1989) PRO and infinitival reports like the (Pseudo-)English ones in (5)? We simply assume a PRO with 1.sg features, like I and $I_{Amh}$, but adding the stipulation that this type of first person must take narrowest scope. We then predict only the above derivation of de se (using our new axioms), which is as it should be. Note that we have not got rid of Schlenker’s stipulative typology of indexicals (Schlenker 2003, p.38,74-76), we merely replaced it with a reformulation more appropriate to our representational framework, i.e. in terms of scope: PRO must take narrow scope, I must take wide scope, and $I_{Amh}$ can take either.

We have added two axioms, whose working is clear, but whose formulation is a bit hairy. A truly semantic formulation may be cleaner and more insightful or even easier to swallow, so that’s why I offer (24):

(24) a. Every belief-alternative $w$ has exactly one center
b. If $w' \in Bel(a, w)$ and $b$ is the center of $w'$, then $Bel(a, w) = Bel(b, w')$

In other words, well, (24a), the replacement for (23), speaks for itself, and (24b) says that the person you believe yourself to be, has, in the world you believe to inhabit, the same beliefs as you. This last is a bit stronger than (21) (it verifies an axiom of positive introspection as well), but in any case it will not be too hard to see that in all models in which (24) holds, (20c) is equivalent to (9c), i.e. we can derive de se readings for reports with embedded first persons.

Conclusion

In this paper I argued for a reductionist account of de se reports, based on the relational analysis of de re belief, according to which de se belief is de re belief about oneself, under the acquaintance relation of equality (or under the description the person I am, if you will). Reductionist accounts of belief reports typically predict that the type of acquaintance relation is not conveyed by linguistic means, a belief report is de re if the subject has a de re belief under some acquaintance relation. This prediction is borne out in third person reports of the form $x_i$ believes that $she_i$… which are true if the belief in question is de se or merely de re (someone referring to herself without realizing it). However, data involving PRO and shiftable indexicals have cast doubt on the reductionist
endeavor, since it seems that some reports are not in the same way underspecified for (or ambiguous between, depending on your framework) de se and de re, but exclusively de se (on the co-referential reading).

My own framework is reductionist in the sense that it assigns a uniform preliminary structure to all reports of the form NP believes that NP VP, in which definite NPs are all interpreted as presuppositions with their content drawn straight from the surface features, and in which the acquaintance relation is left underspecified. A mechanism is provided by which the presuppositions and acquaintance relation are resolved in context, so it’s really pragmatics that disambiguates between de re and de se, not syntax. As a bonus we get a pragmatic explanation for the fact that non-linguist/philosophers often find it hard to accept a co-referential third person pronoun report in a mistaken self-identity scenario. The basic setup of Acquaintance Resolution is then extended with a logical principle of introspection to overcome difficulties encountered with a narrow-scope resolution of an embedded first person, something that we wouldn’t need for ‘well-behaved’ indexicals like English I, but is the key to our treatment of shifted I\textsubscript{Amh} and PRO. The principle is adapted from standard modal logic treatments of belief, and if we add it, we can make the right predictions, not only for reports with third person, but also with I, I\textsubscript{Amh} and PRO. To capture the difference between these last three, some stipulation could not be avoided, so I simply reformulated Schlenker’s typology of first person pronouns in terms of scope. The differences between my pragmasemantic account on the one hand, and the competing recent accounts of Schlenker and Von Stechow, who heavily rely on morphological agreement, on the other, lie more in the third person realm: I maintained that the ‘ambiguous’ report’s embedded she is interpreted wide scope and as a third person, whereas Schlenker and Von Stechow would need to interpret it as a first person for the de se reading, and as a third person for the de re reading.

References


Schlenker, P.: 1999, Propositional attitudes and indexicality, PhD thesis, MIT.


Appendix: Maier’s (2004) 2-layered fragment of Geurts and Maier’s (ms) LDRT

Syntax: An LDRS is a set of fr(egian) and/or k(ripkean) labeled discourse markers, paired with a set of labeled conditions, e.g. \[ x_k y_k \mid \text{love}_k(x, y) \]

Semantics: Let \( \varphi \) be an LDRS, \( m, l \in \{k, fr\}, \langle D, W, I \rangle \) a model, \( w \in W \), and \( f \) a variable assignment:

a. definedness:
   - \( \llbracket \varphi \rrbracket_{f\cdot l\cdot w} \) is defined iff there is an embedding \( g, \text{Dom}(g) = \text{Dom}(f) \cup \{ x \mid x \in U(\varphi) \} \) and for all \( \psi \in \text{Con}(\varphi) : \llbracket \psi \rrbracket_{f\cdot l\cdot w} \) is defined
   - \( \llbracket P_m(x^1, \ldots, x^n) \rrbracket_{f\cdot l\cdot w} \) is defined iff \( \{ x^1, \ldots, x^n \} \subseteq \text{Dom}(f) \)
   - \( \llbracket \neg m \varphi \rrbracket_{f\cdot l\cdot w} \) is defined iff \( \llbracket \varphi \rrbracket_{f\cdot l\cdot w} \) is defined

b. If defined, the semantic values of conditions and LDRSs are:
   - \( \llbracket \varphi \rrbracket_{f\cdot l\cdot w} = \{ g \mid \text{Dom}(g) = \text{Dom}(f) \cup \{ x \mid x \in U(\varphi) \} \text{ and for all } \psi \in \text{Con}(\varphi) : \llbracket \psi \rrbracket_{f\cdot l\cdot w} = 1 \} \)
   - \( \llbracket P_m(x^1, \ldots, x^n) \rrbracket_{f\cdot l\cdot w} = 1 \) iff \( m \neq l \) or \( \langle f(x^1), \ldots, f(x^n) \rangle \in I(P)(w) \)
   - \( \llbracket \neg m \varphi \rrbracket_{f\cdot l\cdot w} = 1 \) iff \( m \neq l \) or \( \llbracket \varphi \rrbracket_{f\cdot l\cdot w} = \emptyset \)

c. \( \llbracket \varphi \rrbracket_f = \{ w \in W \mid \llbracket \varphi \rrbracket_{f\cdot l\cdot w} \neq \emptyset \} \) if \( \llbracket \varphi \rrbracket_{f\cdot l\cdot w} \) is defined for some \( w \) (otherwise \( \llbracket \varphi \rrbracket_f \) is undefined).

d. Contexts: \( \mathcal{C} = \{ w \in W \mid I(\text{center})(w) \text{ is a singleton} \} \)

e. Truth-conditional content: if \( \llbracket \varphi \rrbracket_{k\cdot c} \) is a singleton, \( \llbracket \varphi \rrbracket_{f\cdot c} = \llbracket \varphi \rrbracket_{g\cdot c} \) where \( g \) is the unique element of \( \llbracket \varphi \rrbracket_{k\cdot c} \). Otherwise undefined.

f. Diagonal proposition: \( \Delta_f(\varphi) = \{ c \in W \mid \llbracket \varphi \rrbracket_{f\cdot c} \text{ is defined and } c \in \llbracket \varphi \rrbracket_{f\cdot c} \} \)

g. Belief set: \( \text{Bel} \in [D \times W \rightarrow \mathcal{P}(\mathcal{C})] \)

h. If \( x \in \text{Dom}(f) \) and \( \llbracket \varphi \rrbracket_{m\cdot w} \) is defined, \( \llbracket \text{believe}_l(x) ; \varphi \rrbracket_{m\cdot w} = 1 \) iff \( m \neq l \) or \( \Delta_f(\varphi) \supseteq \text{Bel}(f(x), w) \)

Example: (18) \( \leadsto x_k y_k \mid \text{Noriko}_k(x), \text{Tujiko}_k(y), \text{see_in_mirror}_g(y, y) \)
\( R(x, w) \uparrow ? \)
\( \llbracket \text{believe}_l(x) ; \varphi \rrbracket_{m\cdot w} = 1 \) iff \( m \neq l \) or \( \Delta_f(\varphi) \supseteq \text{Bel}(f(x), w) \)

\[
\begin{bmatrix}
\text{Noriko}_k(x), \text{Tujiko}_k(y), \text{see_in_mirror}_g(y, y) \\
R(x, w) \uparrow ?
\end{bmatrix}
\]
THE AKTIONSART OF SPANISH REFLEXIVE PSYCHOLOGICAL VERBS

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Abstract

In this paper we argue that reflexive psychological verbs in Spanish (SRPVs), such as aburrirse ‘bore-REFL’ constitute a special subclass of stative predicate which we term BOUNDED STATE PREDICATES. Bounded state predicates entail that the onset of the state they denote falls within the reference time for the predicate. The analysis not only accounts for subtle differences between SRPVs and related estar+participle expressions but also lays the groundwork for explaining the otherwise puzzling fact that SRPVs are translated into English with phrases involving get in some cases and be in others.

1 Introduction

Psychological verbs, which include e.g. English fear, frighten, disturb, worry, have generated interest primarily because of their implications for the theory of argument structure (see among many others Belletti and Rizzi, 1988; Dowty, 1991 and more recently Ackerman and Moore, 2001 and references cited there). In this paper we address a different and equally challenging aspect of these predicates: their Aktionsart.

Although psychological predicates of the fear class are commonly assumed to denote states (Grimshaw, 1990; Pustejovsky, 1991, among others), there is much less consensus about the aspectual value to be assigned to those of the frighten type. Thus, for example, English frighten verbs have been argued to be achievement predicates (Van Voorst, 1992) as well as accomplishments (Tenny, 1994), while Filip (1996) has argued that they are not telic, and both Pylkkänen (2000) and Arad (1998) have argued that at least some interpretations of some members of this class in Finnish (Pylkännen) and English and Romance (Arad) are stative.

When one examines this diversity of analyses –particularly the latter ones mentioned– and the data used to support them, two things become immediately clear. First, there is no guarantee that the Aktionsart of a given verb in one language will be exactly the same as that of its most familiar translation equivalent in another: there is greater cross-linguistic variation than one might naïvely think. Second, the nature of this variation can also be more subtle than the standard Vendlerian characterization of Aktionsarten might lead one to believe. These observations indicate that, in order to arrive at a more adequate theory of Aktionsart –a better understanding of what information about event structure is encoded in natural language and how different languages encode it– more case studies of specific verb classes in specific languages are necessary.
Our goal in this paper is to undertake precisely one such case study: the class of Spanish reflexive psychological verbs (henceforth SRPVs) such as *aburrirse* ‘bore-REFL’ and *sorprenderse* ‘surprise-REFL’, which have a nominative experiencer subject and can be accompanied by an optional prepositional phrase that describes the stimulus that produces the psychological state, as illustrated in (1):

(1) a. Se aburrió (con la película).  
   ‘S/he was bored (by the movie).’

   b. Se sorprendió (por la noticia).  
   ‘S/he was surprised (at the news).’

We will argue that these verbs are stative, much as Arad (1998) argues for one reading of experiencer object verbs in Romance. However, we will show that they denote states with a specific property not previously identified in the literature, namely that their onset is entailed to occur within the Reichenbachian reference time for the verb. For this reason, we will describe SRPVs as BOUNDED STATE PREDICATES.

The paper is organized as follows. In section 2, we present a series of tests that demonstrate that SRPVs are neither telic nor even dynamic but rather stative. We further show that the temporal properties of SRPVs pattern with those of stative stage-level predicates. In section 3, we compare SRPVs with semantically very similar *estar* + participle sentences, in order to argue that they are bounded state predicates. We compare our analysis to that of Arad (1998), in section 4. Finally, section 5 presents our conclusions.

## 2 SRPVs describe states which are not temporally persistent

Our argument that SRPVs denote states which are not temporally persistent proceeds in two steps. We begin by presenting a series of tests to show that they are stative, and particularly to rule out the hypothesis that they fall into the class of achievement predicates. We then present arguments that they behave like stage-level predicates as opposed to individual-level ones with respect to their temporal properties.

### 2.1 Tests for telicity and dinamicity

It is well known that only telic predicates can be modified by adverbials of the type *in* x time. In contrast, *for* x time adverbials combine with both process and stative predicates, but are not compatible with telic predicates except on an iterative reading or on a reading which does not entail that the event described by the predicate has finished. We observe the same behavior in Spanish for *en* (‘in’) and *durante* (‘for’) adverbials:

(2) a. Escribió su tesis *durante/en nueve meses.  
   ‘She wrote her thesis in nine months.’

   b. Paseó durante/*en un cuarto de hora.  
   ‘S/he walked for an hour.’
c. Admiró a su hermano durante/*en un año. [Stative predicate]
   ‘S/he admired his/her brother for a year.’

Crucially, SRPVs combine with *durante* adverbials on a noniterative reading, and they generally resist modification by *en*, both signs of their atelic nature:

(3) Se {aburrió/divirtió} {durante/*en} toda la tarde. [SRPV]
   ‘S/he was bored/amused (continuously) during the whole afternoon.’

A second piece of evidence for the atelicity of SRPVs is their incompatibility with predicates such as *acabar* or *terminar* (‘finish’), which require that their infinitival complement describe an action that can be completed:

(4) *Ha terminado de asustarse/preocuparse. [SRPV]
   ‘S/he has finished being afraid/worried.’

The examples below show that only eventive predicates can be complements of *acabar* or *terminar*; processes and states cannot:

(5) a. Ha acabado de pintar la baranda. [Eventive]
    ‘S/he has finished painting the railing.’
 b. *Ha terminado de acariciar al perro. [Process]
    ‘S/he has finished petting the dog.’
 c. *Ha acabado de preferir las acelgas. [Stative]
    ‘S/he has finished preferring chard.’

We now show that SRPVs fail two of the most reliable tests for dynamicity in Spanish. First, unlike dynamic predicates (whether eventive, (6a), or process-related, (6b)), and like other stative predicates, (6c), SRPVs systematically allow a nonhabitual interpretation in the simple present tense (see (7)):

(6) a. Su padre corta el césped. [Eventive] [habitual]
    ‘Their father cuts the grass.’
 b. Su hermano conduce el camión. [Process] [habitual]
    ‘Their father drives the truck.’
 c. Le gustan los hombres con barba. [Stative] [nonhabitual]
    ‘S/he likes men with beards.’

(7) Se preocupa por el futuro de sus hijos. [SRPV] [nonhabitual]
    ‘S/he worries about the future of his/her children.’
Second, SRPVs also pattern systematically with stative predicates in the way they combine with the aspectual predicates \textit{parar} (‘stop, cease’) and \textit{dejar} (‘stop, give up’). While dynamic predicates –with some minimum duration– can be complements to either \textit{parar} or \textit{dejar}, stative predicates are only acceptable with \textit{dejar}:

\begin{enumerate}
\item a. Ha parado/dejado de pintar la baranda. [Eventive]
   ‘S/he has stopped painting the railing.’
\item b. ¡Para/deja ya de llorar! [Process]
   ‘Stop crying already!’
\item c. Ha *parado/dejado de admirar a su hermano. [Stative]
   ‘S/he has stopped admiring his/her brother.’
\end{enumerate}

\begin{enumerate}[resume]
\item (9) Ha *parado/dejado de preocuparse. [SRPV]
   ‘S/he has stopped worrying.’
\end{enumerate}

Note that the restriction on \textit{parar} does not involve agentivity/control; an agentless predicate such as \textit{llover} (‘to rain’) combines felicitously with it: \textit{Ha parado/dejado de llover} (‘It’s stopped raining’).

From the tests applied in this section, summarized in the following table, we can conclude that SRPVs denote atelic, nondynamic situations; that is to say: states.

<table>
<thead>
<tr>
<th></th>
<th>Eventive</th>
<th>Process</th>
<th>Stative</th>
<th>SRPVs</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{en} (‘in’) x time</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>\textit{acabar}/\textit{terminar} (‘finish’)</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>habitual interpretation in present</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>\textit{parar} (‘stop, cease’)</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

However, they do not describe the same type of states as do verbs such as \textit{temer} (‘fear’) or \textit{odiar} (‘hate’). SRPVs, like stage-level predicates, lack the inference of temporal persistence that \textit{temer} and similar individual-level predicates manifest.

2.2 Tests for temporal persistence

Like predicates which do not entail temporal persistence, SRPVs can restrict temporal quantification, (10), while temporally persistent stative predicates cannot, (11):

\begin{enumerate}[resume]
\item (10) a. \{Cuando/siempre que\} \{se impresiona/obsesiona\} por algo, se deprime. (10)
   ‘When(ever) s/he obsesses about something, s/he gets depressed.’
\end{enumerate}

\textsuperscript{1} See Condoravdi (1992) and McNally (1994) for a characterization of the temporal properties of individual-level predicates in terms of an inference of temporal persistence.

\textsuperscript{2} See the next section for comments on the translation of these examples.
b. Cada vez que se asusta/enfada, empieza a llorar.  
‘Every time s/he gets scared/afraid, s/he starts to cry.’

(11) a. *{Cuando/siempre que} {admira/teme} tus reacciones, se deprime.  
‘When(ever) s/he admires/fears your reactions, s/he gets depressed.’

b. *Cada vez que odia/prefiere las películas de terror, se va del cine.  
‘Every time s/he hates/prefers horror movies, s/he goes to the movies.’

SRPVs are also compatible with temporal modifiers, such as \textit{hace unos días} (‘a few days ago’) or \textit{tan pronto como} (‘as soon as’), which temporally persistent stative predicates normally reject:

(12) a. Hace unos días me aburrí.  
‘A few days ago I was bored.’

b. Tan pronto como/en cuanto se despiste, me lo dices.  
‘As soon as s/he is distracted, let me know.’

c. Después de haberse enfadado, se sintió mejor.  
‘After having been angry, s/he felt better.’

(13) a. *Hace unas semanas temió a su padre.  
‘A few weeks ago s/he feared his/her father.’

b. *Tan pronto como/en cuanto admire a tu hermano, me lo dices.  
‘As soon as s/he admires your brother, let me know.’

c. *Después de haber detestado/preferido las acelgas, se marchó.  
‘After having detested/preferred chard, s/he left.’

We also find clear differences between the two type of state predicates in other grammatical domains. As shown in the following examples, participles based on SRPVs can appear as adjunct predicates and within small clauses introduced by \textit{con} (‘with’), (14), which is not the case for temporally persistent statives, (15):

(14) a. Llegó a su casa asustado/preocupado.  
‘He arrived home frightened/worried.’

b. Con el jefe enamorado/enfadado, no se puede trabajar.  
‘With the boss in love/angry, it’s impossible to work.’

(15) a. *Llegó a su casa admirado/detestado.  
‘He arrived home admired/detested.’

b. *Con el jefe odiado/prefeirido, no se puede trabajar.  
‘With the boss hated/prefered, it’s impossible to work.’

However, perhaps the clearest divergence between SRPVs and temporally persistent stative predicates is attested with \textit{estar} and other Spanish copular verbs. As can be
observed in (16), SRPVs are compatible with *estar*, but not with *ser*, while temporally persistent statives exhibit the opposite behavior:

(16) a. Juan {está/*es} {asustado/enfadado/preocupado}.
    ‘Juan is frightened/angry/worried.’

b. Juan {*esta/es} {admirado/odiado/temido}.
    ‘Juan is admired/hated/feared.’

So-called pseudo-copular verbs, such as *andar* (literally, ‘walk’), *quedar(se)* (‘remain’) or *seguir* (‘continue’) are governed by identical aspectual constraints as those associated with *estar*:

(17) a. Esteban {anda/sigue} {asustado/enfadado/preocupado}.
    ‘Esteban continues to be frightened/angry/worried.’

b. *Esteban {anda/sigue} {admirado/odiado/temido}.
    ‘Esteban continues to be admired/hated/feared.’

We summarize the results of our diagnostics in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Temporarily Persistent Statives</th>
<th>SRPVs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction over temporal quantification</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Temporal modifiers</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Adjunct predicates / con-clauses</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>ESTAR / other copular verbs</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

Thus, it is clear that SRPVs denote states which lack the inference of temporal persistence typical of individual-level predicates and in this sense have more in common with stage-level predicates. However, we will now show that they manifest specific temporal properties that other arguably stage-level predicates do not share, leading us to conclude that they constitute a well-defined proper subclass of stage-level predicate.

3 Evidence for bounded state predicates: SRPVs vs. *estar*+participle

As mentioned in the introduction, the data show that SRPVs are what we will call bounded state predicate. We define ‘bounded state predicate’ in (18):

(18) A bounded state predicate denotes a state whose onset is lexically entailed to coincide with or be posterior to the onset of the reference time for the predicate.
Bounded state predicates contrast with other stative predicates insofar as the event time of the latter is generally assumed to include their reference time or at least to permit this possibility. This contrast becomes evident when we compare the interpretation of SRPVs and counterpart estar+participle sentences, which are generally considered to be stage-level (see e.g. Fernández Leborans, 1999; see also Marín, 2004 for a different characterization which is compatible for present purposes); it provides evidence for the claim that SRPVs are indeed bounded state predicates.

Consider the sentences in (19):

(19)  a.  Los niños se aburren.
     b.  Los niños están aburridos.
     c.  The children are bored.

Both of these sentences can be translated as in (19c), leading to the impression that (19a) and (19b) are synonymous. However, when these expressions are embedded in contexts which make the reference time explicit, interpretive differences emerge. We consider two such contexts here: 1) when the SRPV or estar+participle appears in the main clause in a generic cuándo (‘when’) or siempre que (‘whenever’) sentence, and 2) when an SRPV or estar+participle is modified by a simple temporal modifier.

We begin with generic cuándo/siempre que sentences. The cuándo/siempre que clause not only can be understood as the restriction on generic quantification over events; it also provides a reference time for the situation described by the main clause. We thus have the following prediction: if SRPVs denote bounded states, then the state they describe should be entailed to begin during the time described by the cuándo/siempre que clause. In contrast, if estar+participle denotes an ordinary stage-level state, there should be no entailment that the state begin during or after the time described by the cuándo/siempre que clause; if anything, it should be the other way around. If the event time of stative predicates is generally taken to include the reference time, we should get an implication that the state described by the estar+participle holds prior to the time described by the subordinate clause.

This prediction is very clearly borne out. Note first the oddness of the both the Spanish sentences in (20a) and (21a) and their English counterparts:

(20)  a.  ??Cuando lo molestas, el perro está muy enfadado.
     b.  ??When you bother him, the dog is very angry.

(21)  a.  ??Siempre que tiene un examen, está muy preocupado.
     b.  ??Whenever he has an exam, he is very worried.

All of these sentences are anomalous for the same reason. Such generic sentences establish a quantificational relationship between the situation described in the subordinate clause and that described by the main clause. Since the quantification is universal, the relationship can easily be inferred to be causal. But there is something wrong with the causal relationships in (20) and (21): the situations described by the
main clauses are all inferred to hold prior to the onset of the situations described in the subordinate clauses. And if this is the case, it is difficult to imagine in what sense the latter situations could be said to cause the former. This is exactly what we would expect if the main clauses describe states whose event time is inferred to include their reference time. Interestingly, this anomaly does not occur with SRPVs, as shown in (22a) and (23a).

(22)  
(a)  Cuando lo molestas, el perro se enfada mucho.  
‘When you bother him, the dog is very angry (and the onset of anger coincides with or is after the onset of bothering).’

(b)  When you bother him, the dog gets very angry.

(23)  
(a)  Siempre que tiene un examen, se preocupa mucho.  
‘Whenever s/he has an exam, s/he is very worried (and the onset of worry coincides with or is after having an exam).’

(b)  Whenever s/he has an exam, s/he gets very worried.

The (a) examples entail, as noted, that the onset of the states described by the SRPVs is posterior to the onset of the situations described by the \( \text{cuando/}\text{siempre que} \) clauses. As a result, nothing prevents establishing a causal relationship between the two situations of the kind excluded with \( \text{be} \) and \( \text{estar+participle} \). Crucially, despite the fact that the (a) sentences are most naturally translated into English with nonstative get, as in the corresponding (b) examples, we are not forced to conclude that SRPVs are ambiguous between a stative and nonstative reading, or that they are not stative at all, hypotheses that would be inconsistent with the diagnostics we presented in section 2. Instead, the translation follows directly from the hypothesis that SRPVs denote bounded states together with the fact that English apparently lacks such a class of stative predicates, forcing a translation which preserves the temporal relationship entailed by the original but via the use of an aspectually different predicate which easily permits the inference that the state described in the original obtained.

Similar predictions are made and realized with ordinary temporal modifiers such as \( \text{hace unos días} \) (‘a few days ago’) or \( \text{mañana} \) (‘tomorrow’). The (a) and (b) examples in the following pairs are not synonymous. When the temporal modifier combines with an SRPVs, the state described in the main clause is entailed to begin at some time after the onset of the reference time, be that time in the past or the future. In contrast, when the modifier combines with \( \text{estar+participle} \), there is no such entailment –the state could start or have started either before or after the onset of the reference time.

(24)  
(a)  Hace unos días, me aburrí.  
‘A few days ago I was bored (and that boredom began a few days ago).’

(b)  Hace unos días, estuvo/estaba aburrida.  
‘A few days ago I was bored.’

(25)  
(a)  Esta mañana se ha enfadado durante un buen rato.
‘This morning s/he was angry for a good while (and that anger began this morning).’

b. Esta mañana ha estado enfadado/a durante un buen rato.
‘This morning s/he was angry for a good while.’

(26)  a. Mañana se aburrirá.
‘Tomorrow s/he will be bored (and the anger will begin tomorrow).’

b. Mañana estará aburrido.
‘Tomorrow s/he will be bored.’

(27)  a. Mañana se enfadará.
‘Tomorrow s/he will be angry (and that anger will begin tomorrow).’

b. Mañana estará enfadado.
‘Tomorrow s/he will be angry.’

Once again, these facts are exactly what is predicted if SRPVs are bounded state predicates and estar+participle expressions, simple stage-level stative predicates which are silent as to the temporal properties of the states they describe.

4 Comparison with Arad (1998)

Though we have found no study which specifically addresses the Aktionsart of SRPVs, it will be useful to compare our analysis to that of Arad (1998). As mentioned in the introduction, Arad posits that Romance experiencer-object psychological verbs, which are closely related to SRPVs, can be stative. Though she does not give examples from

3 There do exist various works on the Aktionsart of psychological verbs in Spanish (e.g. Parodi and Luján, 2000 and references cited there), but these, like Arad’s study, systematically address nonreflexive variants (e.g. preoccupar, aburrir). Although one would expect the reflexive and nonreflexive variants of a given verb to share aspectual properties, the existence of an accusative/dative case alternation in the nonreflexive forms complicates matters considerably, and has motivated our decision to limit the present study to the reflexive form. For reasons of space, our discussion of other analyses focuses on Arad’s study, as it is the only one even remotely compatible with the basic data presented in section 2.

4 Arad’s analysis is inspired in Pylkkänen’s analysis of Finnish psychological verbs, first presented in 1997 and then published as Pylkkänen (2000). Pylkkänen divides these verbs into four classes, including causative “stage level” statives (i) and inchoative nonstatives (ii):

(i)  Hyttset inho-tta-vat Mikko-a. (Pylkkänen, 2000, (1b))
mosquitos.NOM findDisgusting-caus-3PL Mikko-PAR
‘Mikko finds mosquitos disgusting.’

(ii)  Mikko viha-stu-i uutisi-sta. (Pylkkänen, 2000, (2a))
vihA.NOM anger-INCHOATIVE-3SG.PAST news-ELA
‘Mikko became angry because of the news.’

It is clear that SRPVs are not directly analogous to verbs exemplified in (i) as they lack a causative component. They seem more to resemble the class exemplified in (ii). Unfortunately, Pylkkänen provides no argumentation that this latter class of verb is nonstative; the only observation she makes concerning the semantics of these putative inchoative nonstative verbs is that the stimulus argument must be eventive, as (iii) shows. This is not true for SRPVs, as illustrated in (iv):
Spanish, our understanding of her analysis is that she would consider it to cover examples such as the following:

(28)  

a.  Tu comportamiento le molesta a Martín.  
   ‘Your behavior bothers Martín.’

b.  Aquel profesor me aburre.  
   ‘That professor bores me.’

Arad associates this reading with three characteristics. First, she claims that such states manifest a general absence of control: “[S]omething inherent to the stimulus, outside its control, […] triggers a particular mental state in the experiencer […] Similarly, the experiencer cannot control the mental state which the stimulus triggers in it.” (Arad, page 4 of the manuscript version). Second, Arad maintains that there is no change of state in the experiencer, stating “[t]he stative reading […] only asserts that the experiencer is at a specific mental state as long as she perceives the stimulus (or has it on her mind) […]” (ibid.). Third, the state is considered to hold only as long as the stimulus is present: “On the stative reading the stimulus is an inherent part of the event of mental state: the existence of the state depends on it […] this state disappears along with the stimulus” (op. cit., pp. 5-6). Thus, setting aside the possible habitual reading, (28a) would be claimed to entail that Martín is bothered as soon as and only as long as he perceives or thinks about the hearer’s behavior. Arad suggests that this stative reading for an example such as the English (29) would be represented logically as in (30) (op. cit., footnote 4; we have cleaned up her formalization slightly and added the last conjunct concerning the temporal coextensiveness of the two events in accord with Arad’s comments in this footnote):

(29)  Blood sausage disgusts Nina.

(30)  \( \exists t[=\text{now}] \wedge \exists e[\text{perception}(e) \wedge \text{perceiver}(e, \text{Nina}) \wedge \text{perceived}(e, \text{blood sausage}) \wedge \text{hold}(e,t) \wedge \exists e'[\text{feel-disgusted}(e') \wedge \text{experiencer}(e', \text{Nina}) \wedge \text{stimulus}(e', \text{blood sausage}) \wedge \text{hold}(e',t) \wedge \text{Cause}(e,e') \wedge \forall t'[\text{hold}(e,t') \leftrightarrow \text{hold}(e',t')] \]}

This set of characteristics is only partially shared by SRPVs. We have argued that SRPVs are not telic and therefore cannot denote a change of state, even though this change is made very salient by the fact that the onset of the state is entailed to occur within the verb’s reference time. Thus, on this point SRPVs conform to Arad’s characterization of object-experiencer verbs.
In contrast, both the generalized absence of control and the temporal coextensiveness of the stimulus and the mental state are stated too strongly to apply to SRPVs. While it is certainly the case that sentences containing SPRVs do not entail deliberate action on the part of the stimulus, nor deliberate control over the mental state on the part of the experiencer, they do not appear to exclude such control, either. For example, it would not make much sense to utter (31), which is felicitous both before and after the hearer has gotten angry, if the speaker did not presume that the hearer (i.e., the experiencer) could exert some control over being in the mental state.

(31) No te enfades.

‘Don’t be angry.’

Similarly, the stimulus can be an individual who acts volitionally to produce the state described by the verb, as (32) shows:

(32) Cuando el hijo de Félix quería que su padre le hiciera más caso, se puso a salir por la noche hasta las tantas, a tomar drogas, y a buscar problemas con todo el mundo hasta que, por fin, Félix se preocupó por él.

‘When Felix’s son wanted his father to pay more attention to him, he began to stay out late at night, take drugs, and get into trouble with everyone until, finally, Felix (began to) worry about him.’

We are therefore inclined to conclude that rather than insisting that lack of control is entailed, perhaps the intuition Arad intends to convey is something that simply follows from the fact that the verbs in question denote states. Since states are not dynamic, the final clause in (32) cannot in and of itself entail that Felix’s son has done anything to cause the mental state, though it is compatible with the son voluntarily being the stimulus for the state. Since volition in and of itself is not dynamic, there is no inherent incompatibility with being a participant in a state voluntarily.

Where Arad’s claims regarding the semantics of psychological verbs most diverge from our observations concerning SPRVs is on the question of the temporal relation between the perception of the stimulus and the existence of the mental state. We see no reason that SPRVs should necessarily carry any temporal restriction beyond that described in the previous section. If it were entailed that the mental state should cease upon the disappearance of the stimulus, utterances like (33) should be contradictory, but they are not:

(33) Esta mañana se ha enfadado por un comentario tonto, y se ha mantenido enfadado durante todo el día.

‘This morning s/he was angry over a silly comment, and s/he’s stayed angry all day.’

Arad explicitly links this temporal coextensiveness condition to the claim that the psychological verbs in question do not describe changes of state:
I take [...] the existence of a state which holds independently to be part of the definition of “change of state.” On the stative reading the stimulus induces a state in the experiencer, but this state disappears along with the stimulus. There is thus triggering of a state, but no change of state. Note also that both the stative reading and the non-stative reading are causatives [...] The type of causation is different in each case: one is an active causation, causing a change of state, the other is stative causation, or triggering a concomitant state. (op. cit., p. 6)

Let us set aside the trivial fact that SPRVs and the verbs Arad discusses describe relations between individuals, and that, strictly speaking, such a relation (here, by hypothesis, a state) cannot hold if the stimulus in the relation ceases to be the object of the mental state. Arad’s claim is intended to imply that, if (35) denotes the sort of state she describes, then the subject’s anger must subside as soon as the silly comment has been made. But both intuition and the felicity of (35) indicate that this is not the case.

Nonetheless, Arad’s claim leads us to ask what makes it possible for a sentence like (35) be true. (35) can only be true if anger is an emotion which we can ascribe to an individual even if the cause of the emotion is not perceptible to him/her or perhaps to anyone. This, in turn, is only possible if we can associate anger with a certain set of internally or externally observable physical and/or psychological properties. The extent to which the different states described by psychological predicates have this characteristic is unclear to us and is a matter which we will have to leave for future investigation. The question we wish to address here is: Is this characteristic linked in any deep way to the Aktionsart of psychological predicates, as Arad’s comments might suggest?

On the surface, the answer would appear to be no. We can find no logical reason why we could not have a verb which denotes an event of a stimulus causing an experiencer to become angry, or one which denotes the anger relation between a stimulus and an experiencer, with or without the entailment that the anger cease to hold once the stimulus disappears. The connection in this case between the nature of the mental state and the Aktionsart of related psychological predicates seems loose at best.

Summarizing, in this section we have examined Arad’s claims concerning the semantics of statively interpreted experiencer-object psychological verbs and have shown that SPRVs do not manifest all of the properties she attributes to such verbs. Given the obvious morphological relation between SPRVs and experiencer-object verbs in Spanish, we might have expected there to be a closer match between the semantics of SPRVs and the properties Arad describes. We conclude that a closer examination of statively-interpreted experiencer-object verbs in Spanish is clearly necessary.

5 Conclusion

In this paper we have demonstrated that reflexive psychological verbs in Spanish (SRPVs) such as aburrirse (‘bore-REFL’) and sorprenderse (‘surprise-REFL’) describe stative situations, contrary to what has generally been claimed in the literature about similar classes of verbs in other languages. Moreover, SRPVs manifest specific
temporal properties (namely, the fact that their onset is entailed to occur within the reference time of the verb) that other arguably stage-level predicates such as \textit{estar}+participle constructions do not share, leading us to conclude that they constitute a well-defined proper class of stage-level predicate, which we have called BOUNDED STATE PREDICATES.

The entailment concerning the onset of bounded state predicates has allowed us to explain the difference in felicity between SPRVs and related \textit{estar}+participle expressions in certain contexts, as well as the fact that SRPVs are translated into English with phrases involving \textit{get} in some cases and \textit{be} in others. In addition, our analysis captures those aspects of Arad’s (1998) characterization of stative psychological predicates that we consider to be empirically justified for SPRVs, without committing us to other aspects which are not applicable.

Our proposal has at least two consequences for the development of a general theory of Aktionsart. First, we have provided a new example of why a more detailed and empirically satisfactory typology of situations is necessary. Second, our case study emphasizes the fact that even relatively closely related languages can manifest significant aspectual differences, underscoring the need for additional studies of the sort we have undertaken here.

References


CALL ME ISHMAEL*

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Abstract

A careful study of naming constructions is essential for the understanding of the syntax and semantics of proper names. Cross-linguistic analysis of verbs of naming shows that they take a small clause complement and therefore argues that a proper name is essentially a nominal predicate, whose contents mentions the name itself. The indexicality of proper names in argument positions can be compositionally derived from their independently motivated internal complexity.

1 Introduction

In this paper I will address the question of the syntax and semantics of proper names. Although there are vast quantities of philosophical literature on proper names, little of it addresses the issue from the syntactic point of view. If we view the standard theories of proper names in this light, we can come up with two major proposals:

(i) Proper names are directly referring rigid designators (Kripke (1980)), or indexicals (Recanati (1997), Pelczar and Rainsbury (1998)). Under this view, they are necessarily syntactically simplex.


I will provide arguments for a proposal fitting the second description based on the behavior of verbs of naming (1). The syntax of naming constructions argues that proper names are essentially predicates, whose contents mention the name itself (thus requiring a quotation theory, cf. Geurts (1997)). In argument positions proper names become rigid
due to their internal complexity, which allows them to combine with an indexical, and definite as a result of combining with a definite article (null in some languages, overt in others).

\[(1)\]  
ad. Arthur was named the king of all England.  
b. The king of all England was named Arthur.

The structure of the argument is as follows. Although the first impression given by verbs of naming is that they the have the ditransitive structure, represented in (2a), I will provide a list of arguments that verbs of naming take a small clause complement, having the structure as in (2b). This means that proper names must enter syntax as predicates.

\[(2)\]

\[\text{ditransitive simplified}\]

\[\text{ECM/raising simplified}\]

I will then turn to proper names in argument positions and show that there they have the internal syntax of definite DPs (cf. Geurts (1997)). The indexicality of the proper names (rigidity, according to Kripke (1980)) can then be compositionally derived from their semantics in naming constructions.

## 2 Naming constructions

The first impression given by constructions such as (3) is that they are ditransitive. This impression is however misleading. In this section we will argue that verbs of naming take a small clause complement.

\[(3)\]  
Call me Ishmael.

The first argument that the second noun phrase (henceforth, xNP₂) in (3) is a predicate comes from the fact that it cannot be passivized. It is a general property of English that to passivize, a DP has to start out as the object of a verb (or of a preposition, in pseudo-passives). GOAL and THEME can both do so:

\[(4)\]

\[\text{GOAL}\]

\[\text{THEME}\]

However, in naming constructions only DP₁ can passivize, which means that xNP₂ does not behave like the THEME object in English (see also Hornstein and Weinberg (1981) for a note on the difference between naming constructions and ditransitives):

\[(5)\]

\[\text{GOAL}\]

\[\text{THEME}\]

Another, relatively minor argument, is the behavior of naming and nomination constructions with animate subjects, where, the interrogative is what rather than who:
(6)  a. What/*who was Caesar nominated?
    b. What/*who did they christen the boy that Mr. Earnshaw found?

Likewise, anaphora of the name can be expressed by the pronominal predicates so and that. No other pronoun (and in particular no anaphor like itself) can appear as xNP₂.

(7)  Latimeria is called latimeria/that/so/*it/*itself after Marjorie Courtney-Latimer.

If the structures involved were ditransitive, these facts would be unexpected, but if xNP₂ is a predicate, we do not expect animacy marking in interrogation and anaphora.

Further evidence comes from comparing naming verbs to verbs of nomination, which Stowell (1989) analyzes as containing a small clause. One interesting property that they show is that they can appear with a bare nominal predicate:

(8)  a. The queen appointed her lover treasurer of the realm.
    b. Anne’s death made George (the) king of England.

As Stowell points out, the omission of the definite article is conditional on there being only one individual satisfying the predicate at every given moment:¹

(9)  We named him public enemy *(number 1)/*enemy of the state.

Strikingly, in languages where names can appear with definite articles (the so-called preproprial articles) in argument positions, they cannot do so in naming constructions, except with modification:

(10)  a. Ich habe den Karl gesehen. 
         Bavarian German (Nina Rothmayr, p.c.)
         I have the-Acc Karl seen.
         I have seen Karl.

    b. Ich habe ihn (*den) Karl genannt
         I have him-Acc the-Acc Karl called
         I called him Karl.

    c. Die Polly wird *(die) neue Mary Poppins genannt
         the Polly was *(the new Mary Poppins called
         Polly was called the new Mary Poppins.

In colloquial Icelandic, Northern Norwegian and Northern Swedish argument proper names are also preceded by a definite article (Delsing (1993), p. 54). Other languages with preproprial articles include the Uto-Aztec language Pima (Marcus Smith, p.c.), Modern Greek (Dimitra Papangeli, p.c.), European Portuguese (Jairo Nunes, p.c.), and certain dialects of German (Gerhard Schaden, Nina Rothmayr, p.c.). If names are used predicatively here, this is an obvious analogue of bare predicate definites in (8) (see also article drop with nominal predicates in French (Kupferman (1979), Pollock (1983), Boone (1987), Longobardi (1994), Chierchia (1998), Roy (2001), Matushansky and Spector (2003), among others), Dutch (de Swart, Winter and Zwarts (2004)).

¹ This may be why superlatives allow article drop relatively easily (as Borthen (1998, 2003) shows for Norwegian).
In Northern Norwegian, the preproprial article takes the form of a 3rd person pronoun (examples by Peter Svenonius, Øystein Alexander Vangsnes, p.c.):

(11) a. ho Marit så han Øystein  
    she Marit saw he Øystein  
    Marit saw Øystein.

   b. han Øystein så ho Marit  
    he Øystein saw she Marit  
    Øystein saw Marit.

In naming constructions (as well as in some others, such as vocatives, play-acting and sometimes possessives) this preproprial article disappears (Delsing (1993))!

(12) a. Dæm døpte barnet (*ho) Marit  
    they baptized child.the (she) Marit  
    They baptized the child Marit.

   b. Han heter (*han) Øystein.  
    he is-called he Øystein  
    He is called Øystein.

Other languages with special preproprial articles include Catalan (Louise McNally, p.c., see Longobardi (1999)), Maori, Tagalog, and Malagasy (Campbell (1991) as cited by Delsing (1993)).

However, our strongest argument for a small clause analysis of verbs of naming and nomination comes from languages with morphological Case-marking. The Case on xNP2 is predicative.

2.1 Predicate case

In Syrian Arabic (Nisrine Al-Zahre, p.c.), in both naming and nomination constructions xNP2 bears Accusative, which is the predicative Case there (as can be seen from the fact that it remains the same in passivization):

(13) a. salma laqqabat  
    salma nickname.Caus-Prf child-Acc-her Ali-Acc  
    Salma nicknamed her child Ali.

   b. walad-u-ha luqqiba  
    child-Nom-her nickname.Pass-Prf Ali-Acc  
    Her child is nicknamed Ali.

(14) a. salma Ńayyanat  
    salma nominate.Caus-Prf child-Acc-her minister-Acc  
    Salma nominated her child as a minister.

   b. walad-u-ha Ńuyyna  
    child-Nom-her nominate.Pass-Prf minister-Acc  
    Her child was nominated as a minister.
Salma considers her child to be a minister.

Likewise, xNP2 in naming and nomination constructions is not marked as in ditransitive constructions in Hungarian, where the predicate Case is Dative (Veronika Hegedüs, p.c.), and in Russian, where predicates are marked with Instrumental (Bailyn and Rubin (1991), Bailyn and Citko (1999), Pereltsvaig (2001), etc.).

2.2 Case-doubling

Case-doubling, i.e. the appearance of the same Case-marking twice in the same clause, is a characteristic property of small clauses (especially in secondary predication, even in languages that don’t have it in primary predication). For example, Modern Greek small clauses exhibit Case-doubling: the Case on xNP2 is the same as that on DP1 (data due to Dimitra Papangeli, p.c.):

(16) a. Theoro to Yani ilithio consider-1sg the-acc Yani-acc idiot-masc-acc Greek ECM
   I consider Yani an idiot.
   b. O Yanis theorite ilithios the-nom Yani-nom considered-3sg(passive) idiot-nom
      Yani is considered an idiot.

Case-doubling can be diagnosed by passivization, which renders DP1 Nominative. In Case-doubling languages this is reflected in the Case of xNP2.

Importantly, Case-doubling also happens with verbs of naming and nomination:

(17) a. Diorisa to Yani diefthindi appointed-1sg the-acc Yani-acc director-acc
    I appointed Yani (the) director.
   b. O Yanis dioristike diefthindis the-nom Yani-nom appointed-3sg(passive) director-nom
      Yani was appointed (the) director.

(18) a. Vaftisa to Yani Petro baptised-1sg the-acc Yani-acc Petro-acc
    I baptized Yani Petro.
   b. O Yanis vaftistike Petros the-nom Yani-nom baptised-3sg(passive) Petros-nom
      Yani was baptized Petro.

There is no accepted theory of Case-doubling, but while “copying” the Case of the subject onto the predicate can be a kind of agreement, no relation is commonly assumed.

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2 Case doubling also occurs in Japanese and Korean with inalienable possession. This might be relevant: Massam (1985) and following her Cho (1998) argue that Korean Case doubling involves ECM. This is suggestive when one recalls that possessives is one of the environments in Northern Norwegian where the preproprial article disappears).
to exist between two internal arguments of a ditransitive verb that would permit to connect their Case-marking. The existence of Case-doubling with verbs of naming and nomination therefore further confirms that they project a SC structure. The same effects obtain in German and Latin (though this is harder to show for the former, since proper names do not decline).³

2.3 Other predicate positions

Proper names can be small clause predicates with ECM/raising verbs (including copula) as well as secondary predicates. The predicative *be* is one obvious example; another is the Dutch raising verb of naming *heten* (Eddy Ruys, p.c.):

(19) I am Sam.

(20) *zij heet Marie*  
  Dutch  
  *she be-named Marie*  
  *She is named Marie.*

One might be tempted to believe that this is an identity statement, but name predicates can be coordinated with regular predicates (examples due to Jim Higginbotham, p.c.):

(21) a. The Pope called himself John-Paul and a devout Christian.  
   b. I am Sam and a Catholic.

As the following example shows, proper names can appear as secondary predicates and as complements of ECM verbs other than verbs of naming:

(22) Born [PRO Charles Lutwidge Dodgson], the man who would become Lewis Carroll was an eccentric and an eclectic.

The fact that proper names may appear in what is known to be predicate positions lends further support to the idea that at least sometimes they might function as predicates. It also argues against treating the use of proper names with verbs of naming as a special instance of *mention*, since such an analysis would not extend to the cases discussed in this section.

However, while some verbs of nomination allow infinitival, indicative or subjunctive complements (though sometimes with a subtle change in meaning), verbs of naming do not.

(23) a. They proclaimed Arthur to be the king of all England.  
   b. The prince declared that the war was inevitable.  
   c. Sir Gawaine chose that Dame Ragnell be a beauty by day and a hag by night.

(24) a. Earnshaw named the foundling Heathcliff.  
   b. *Earnshaw named the foundling to be Heathcliff.  
   c. *Earnshaw named that the foundling is/be Heathcliff.

³ If this is correct, then German does have ECM, albeit restricted.
Among possible explanations that might be envisaged is a syntactic one (naming verbs c-select an xNP complement, as was argued by Stowell (1991) for many ECM verbs), and a semantic one (an embedded verb would introduce an event argument, which would be incompatible with the semantics of naming verbs). We leave this question as a topic for future research.⁴

To summarize, we have adduced a number of arguments that verbs of naming take a SC complement (like verbs of nomination, which are clearly ECM):

- The preproprial definite article on the proper name in an argument position is dropped in naming constructions
- Case-marking of the proper name is that of a predicate and can be realized either as the dedicated predicative Case or Case-doubling
- Proper names can function as both primary and secondary predicates

By Occam’s razor proper names in argument positions have to incorporate the meaning that they have in predicate positions, just like argument DPs incorporate the meaning of corresponding NP predicates. The meaning that we will give for predicate proper names will also allow us to account for modified and complex proper names in a way parallel to modification inside DPs.

3 Analysis

Apart from the idea that proper names are predicates, we will assume that they are not even simplex predicates. Instead they have one more argument slot besides the \(\langle e\rangle\) one, for the naming convention:

\[(25) \{\text{Alice}\} = \lambda x \in D_e. \lambda R . x \text{ is a referent of } [\Theta \lambda I_\sigma] \text{ by virtue of the naming convention } R\]

Clearly, ours is not an approach where an artificial predicate \(\lambda x . x = \text{Alice}\) is created.⁵ For one thing, the contents of the name quote the (phonological form of) the name itself. We believe that this is obligatory, since proper names are not amenable to substitution in naming constructions (Sylvain Bromberger, p.c.). The other important innovation is the additional argument slot for the naming convention, which we will shortly motivate.

3.1 Predicate names

Since proper names can appear as predicates with raising and ECM verbs, as well as function as secondary predicates, the argument slot for the naming convention that we have proposed can be saturated by a free variable, whose value will be discussed in the next sub-section. However, our reason for introducing this argument slot is the behavior of proper names in naming constructions.

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⁴ A proper name cannot appear with verbs like *seem* or *believe* due to a scalarity constraint on their complement (Matushansky (2002)).

⁵ Proper names in naming constructions make the definite description theories where proper names abbreviate an artificial predicate (Aristotle = “the one who *Aristotelizes*”) also rather difficult to maintain.
Consider the interpretation of (26). On the one hand, the inference “Alice is Al” has to hold, but on the other, the fact that this is a result of a nicknaming action also has to be incorporated into the theory:

(26) \[[\text{Alice is nicknamed Al}] \approx \text{Alice is a referent of } [\text{_Options}]] \text{ by virtue of } \text{nicknaming}

Given that verbs of naming are not intensional, they cannot take propositions of the kind “Alice is Al” as their argument. This is why we have to assume the reverse: the naming verb (actually its root) is an argument of the proper name, even if the small clause with the name head is structurally its complement. The agential \(v^0\) introduces the \text{become} component of the meaning, and the structure is topped by a causative \(v^0\) head.\(^6\) This makes verbs of naming rather different from Hale and Keyser (1993) and Harley (2003), especially given that no incorporation is involved:

(27) \[vP \text{ simplified}\]

\[\text{Carroll} \quad \text{vP} \quad \text{v} \quad \text{vP} \quad \text{VP} \quad \text{CAUSE} \quad \text{v} \quad \text{vP} \quad \text{VP} \quad \text{BECOME} \quad \text{v} \quad \text{vP} \quad \text{VP} \quad \text{SC} \quad \text{√} \quad \text{name} \quad \text{DP} \quad \text{DP} \quad \text{his heroine} \quad \text{Alice}\]

An additional argument in favor of having a bi-clausal structure associated with verbs of naming, suggested to me by Danny Fox, is modification by \textit{again} (von Stechow (1996), Beck and Johnson (2004)):

(28) You can’t call her Griselda again.

(16) can be used in a situation where the challenge is to give a doll different names (a) without repeating oneself, which means that \textit{again} can be attached higher than \text{CAUSE}, or (b) without repeating someone else (causing the doll to have the same name), which means that \textit{again} can be attached lower than \text{BECOME}.

To return now to verbs of nomination, the difference between them and verbs of naming is that in the latter case, the verb is an argument of the small clause, while nomination verbs are associated with the more conventional structure where the small clause is an argument of the causative nomination verb.

The fact that the naming small clause can appear with ECM verbs, suggests that the argument slot of a naming relation \(R\) can be saturated by a free variable. What variable is it? To answer this question, we need to consider proper names in argument positions.

\(^6\) The reason why we choose this structure over \textit{[cause [become [his heroine Alice]] by naming]} has to do with the semantics of the construction. In some Arabic cultures, a woman drops her own name when she bears a child and instead becomes \textit{Umm} plus the name of her child, as in \textit{Umm Kulthum} (\textit{umm} means “mother of”). However, you cannot name someone \textit{Umm Kulthum} by naming her son Kulthum, which means that the naming predicate has to be internal to the \text{CAUSE} one.
3.2 Argument proper names

If proper names are predicates in the naming construction, then in argument positions they must be definite descriptions. This is not a new idea, and various arguments have been proposed in favor of this hypothesis, some of which we will list below.

The first reason to believe that proper names are definite description is the fact that the definite article is overt in some languages (see section 2) and with some proper names (which Strawson (1950) calls quasi-names, see Burge (1973), Geurts (1997), Elbourne (2002), and Borer (in press)):

(29)  
(a) the Thames, the Pacific, the Alps…  
(b) the States, the Netherlands, the Sudan…

Secondly, proper names in argument positions have bound variable uses (Geurts (1997)) and E-type uses (Elbourne (2002)), just like definite descriptions:

(30)  
(a) If a child is christened ‘Bambi’, then Disney will sue Bambi’s parents.  
(b) Every woman who has a husband called John and a lover called Gerontius takes only Gerontius to the Rare Names Convention.

Thirdly, proper names can be used generically (Geurts (1997)):

(31)  
The light bulb/Coca Cola was invented by an American.

Though there are many more arguments in favor of the definite description hypothesis (see Geurts (1997) and Elbourne (2002), among others), proper names do not behave exactly as definite descriptions. The main difference between proper names and definite descriptions is that argument proper names are rigid (Kripke (1980)), i.e. they refer to the same individual in various possible worlds. One consequence of that is that they are opaque in intensional contexts, as shown schematically in (32).

(32)  
Mary considers Peter to be a fool.  
(a) $\Rightarrow$ The individual called Peter in $w_0$ is a fool in Mary’s belief-worlds.  
(b) $\Rightarrow\sim/$ The individual called Peter in Mary’s belief-worlds (who might be John in $w_0$) is a fool in Mary’s belief-worlds.

The inference in (32b) is generally considered invalid because proper names have to be interpreted de re (but see Geurts (1997) for counter-examples). To explain why proper names usually do not have a de dicto reading, it has been suggested that they contain an indexical:

(i) Burge (1973) suggests that the meaning of argument proper names contains a demonstrative (that Alice), while Larson and Segal (1995) propose that the null that is present in the syntax (see Elbourne (2002) for arguments against this view).

(ii) Recanati (1997) and Pelczar and Rainsbury (1998) propose the indexical of the naming convention in force between the speaker and the hearer.

(iii) Liu (2004) makes use of the relevant linguistic community.

In all these approaches, including mine, proper names refer to one individual due to the hidden definite article (overt in many languages) or the demonstrative. This also makes
them compatible with there being more than one person with a particular name (as long as we consider only the universe of the discourse).

The facts and analysis presented above not only provide independent evidence for a definite description analysis with a “quotation” predicate but also make it follow from compositionality. To do so, we need a contextual indexical of the naming convention in force between the speaker and the hearer:

$$\text{[Alice]} = \exists x . x \text{ is a referent of } [\Theta \lambda x \sigma] \text{ by virtue of the naming convention in force between the speaker } c \text{ and the hearer } e$$

Saturation by a contextual indexical argument is always available:

(34) a. The airport is close (to here).
    b. She is a close friend (of mine).

Morpho-syntactically, we propose that the ability to omit the article is a morphological property of a particular lexical item or of a class of lexical items, and the same for the choice of a special preproprial article. One of the arguments that can be proposed in favor of this hypothesis is the fact that modified proper names, where no local relation can be established between the proper name and an article, always appear with articles (except when modification is by evaluative adjectives (poor Mary) and possibly some others – see Borer (in press)):

(35) a. the *(French) Mary Poppins restrictive
    b. the *(young) Mozart
    c. the *(incomparable) Callas non-restrictive

In languages with special preproprial articles such as Tagalog (Norvin Richards, p.c.) or Catalan (Louise McNally, p.c.), the article is regularized in modification contexts, thus further confirming that the matter is morphological.

(36) Li diuen *(el/*en) Lord Nelson francés.
    him call-3sg *(the/the-PrePr Lord Nelson French
    They call him the French Lord Nelson.

While unmodified proper names appear with the special preproprial article en, modified proper names must take the usual definite article el.

Another argument in favor of the hypothesis that article omission is morphological comes from the fact that lexical properties of the proper name may play a role. Thus in some dialects of Italian with preproprial definite articles (Longobardi (1994, 1999)) the article may (and must) be omitted only with masculine proper names:

(37) a. *(la) Maria
    *(the Maria

    b. (*il) Gianni
    *(the Gianni

If the gender of the lexical item plays a role in whether the article is present, the issue is not syntactic or semantic.
3.3 Complex and modified proper names

That proper names can now be treated as definite descriptions (cf. Frege (1983), Russell (1911), Searle (1958), Kneale (1962), Burge (1973), Katz (1977, 1990, 1994), Geurts (1997) and Elbourne (2002)) and as indexicals allows us to extend our compositional semantics to complex and modified proper names and derive the entailments associated with them:

(38) a. \[[\text{the Miss Alice Liddell}]\] ≈ \(\iota x . \text{x is a miss AND x is a referent of } [\Theta \lambda I \sigma] \text{ by virtue of the naming convention in force between the speaker and the hearer AND x is a referent of } [\lambda I \Delta \lambda] \text{ by virtue of the naming convention in force between the speaker}_\text{c} \text{ and the hearer}_\text{c}\)

b. \[[\text{the famous detective Sherlock Holmes}]\] ≈ \(\iota x . \text{x is famous AND x is a detective AND x is a referent of } [\Sigma E \bullet \lambda \mu \kappa] \text{ by virtue of the naming convention in force between the speaker and the hearer AND x is a referent of } [\eta \nu \lambda \mu \zeta] \text{ by virtue of the naming convention in force between the speaker}_\text{c} \text{ and the hearer}_\text{c}\)

The fact that in our theory complex proper names are derived by predicate modification allows us to obtain the entailment that Sherlock Holmes is Sherlock and that Sherlock Holmes is Holmes, and deal correctly with titles and descriptions preceding the proper name. The same holds for modification, restrictive or non-restrictive:

(39) a. the older Miss Challoner there are two people named Miss Challoner

b. Richard the Lionhearted there is more than one king named Richard

(40) the charitable Miss Murray

\text{Anne Brontë, } \text{Agnes Grey, p. 165}

A special case is temporal and modal modification of proper names (see Kayne (1994), Gärtner (2004)), which is something that names do and definite descriptions seem not to until we draw a parallel with kinds (cf. Kripke (1980)), which permit both temporal and modal modification:

(41) a. the Paris of my youth/that I knew

b. The human of that era was not yet fully bipedal.

However the interpretation of (41b) is obtained (and there it does seem to be predicate modification), the same strategy will work for (41a).

3.4 Other determiners

Another correct prediction of our syntax and semantics is that proper names should be able to combine with determiners other than (the covert) \text{the}, and to appear in the plural:

(42) There are relatively few Alfreds in Princeton.

\text{Burge (1973)}

\(^7\) I have nothing to say about the ordering in (39b), discussed in Longobardi (1994) et seq.
The meaning of the subject in (42) can be paraphrased as “few people named Alfred”. This reading is fully expected, given our semantics for predicate proper names, and the same happens with genericity:

(43) Some Alfreds are crazy; some are sane. Burge (1973)

Other determiners are also allowed:

(44) a. …but no Catherine could I detect, far or near.
    b. There’s a Mr. Smith to see you, sir.
    c. This Rover of yours has overturned the garbage again!

Finally, the meaning shift when conversion to a common noun takes place e.g. in scalar contexts supports the hypothesis that proper names are interpreted as suggested above:

(45) He is such a (typical) John – he always has to appear as the subject of a sentence!

Here the name is no longer “proper”: John is interpreted as a (typical) representative of the kind defined by being named John. The difference between (42) and (45) is that (45) assumes that there are properties that all people called John share.

4 Summary

If verbs of naming appear with predicate proper names and these predicates contain an argument slot for the naming convention, we can deal with several issues that have accumulated in syntax and semantics of proper names:

- Argument proper names are (usually) definite descriptions (hence the article in many languages)
- The rigidity of argument proper names is due to the contextually supplied indexical of the naming convention between the speaker and the hearer
- Complex and modified proper names are composed just like other DPs and their entailments are accounted for.
- Quantified and indefinite proper names are predicted by the general fact that a predicate NP can combine with any quantifier

Several issues suggest themselves as topics for future research:

- Limits of cross-linguistic variation: many languages (e.g. Georgian) use the benefactive structure for naming constructions (cf. She was given this name in honor of her grandmother). How is this construction related to the small clause one we have examined? What does it say about the meaning of proper names?
- Default and non-default names: as Zimmermann (to appear) notes, a place or a person may have more than one name or change names over a period of time. Can our lexical entry for proper names make reference to the time of naming, in the same way common nouns are specified for a time argument?
- How similar are proper names and kind names (Kripke 1980)?
CALL ME ISHMAEL

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Abstract

We examine the distribution and interpretation of post-copular noun phrases in French when they appear with and without an indefinite article (Marie est (une) physicienne). We propose that the alternation is due to the fact that the indefinite article marks saturation of an NP-internal argument slot, and show that because of this, post-copular indefinite NPs are usually but not always existentially quantified, while bare NPs are predicative. This theory leads to new perspectives both on cross-linguistic marking of post-copular NPs and on the treatment of the indefinite article.

1 Introduction

As observed by Kupferman (1979), Pollock (1983), Boone (1987), Longobardi (1994), Chierchia (1998), and Roy (2001), among others, unmodified post-copular noun phrases in the singular (henceforth, extended NPs or xNPs, without a special distinction between DPs and NPs) in French, as well as Dutch and in German, can appear with or without the indefinite article un(e): 1

(1) a. Cynthia était une espionne.
    Cynthia was a spy
    Cynthia was a spy.

b. Cynthia était espionne.
    Cynthia was spy
    Cynthia was a spy.

Under what conditions do indefinite articles disappear in French post-copular xNPs? To answer this question we will assume that such xNP marking reflects/marks saturation of various argument slots of the nominal predicate. We first show how this saturation is

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1 Everything we will say below has to do with unmodified nouns. Nouns modified by a relative clause trigger automatic article insertion. On nouns modified by an AP or a PP see de Swart, Winter and Zwarts (2004).
reflected in the interpretation of the post-copular xNP and then argue that various
languages treat different nominal argument slots slight differently: while in Dutch (de
Swart, et al. 2004) and in German xNP-marking behaves as in French, Instrumental vs.
Nominative Case-marking on Russian post-copular xNPs is different in an interestingly
predictable way. This leads us to conclude that the indefinite article is not (necessarily)
interpretable.

1.1 Distinctions

The first difference between the structures in (1) is the fact that the presence/absence of
the indefinite article affects in what contexts the copular sentence may appear:

(2)  
\begin{align*}
a. \text{Qui est Cynthia ?} & - *(Une) espionne. \\
& \text{Who is Cynthia a spy.} \\
& \text{Who is Cynthia? – A spy.} \\
\hline
b. Qu’est Cynthia ? & - (Une) espionne. \\
& \text{What is Cynthia a spy.} \\
& \text{What does Cynthia do? – She is a spy.} \\
\end{align*}

Secondly, the time argument slot of a bare post-copular xNP must be bound by that of
the main verb, while this is not necessarily so when the article is present:

(3) Scenario: At a fund-raising event all former or current governors must identify
themselves. What about Bush?
\begin{align*}
a. \# \text{Bush est gouverneur.} & \quad \text{false}
\text{Bush is governor.} \\
b. \text{Bush est un gouverneur.} & \quad \text{true}
\text{Bush is a governor} \\
\end{align*}

Thirdly, the world of evaluation of an indefinite post-copular NP can be independent of
that of the main verb, unlike that of a bare xNP:

(4) Harry Potter est (un) magicien. \\
\text{Harry Potter is a wizard} \\
\text{Harry Potter is a wizard.}

The variant containing a bare NP predicate can be appropriate only if the speaker places
herself in the imaginary world; no such belief is required with an indefinite NP.\footnote{It should be noted that the two readings cannot be readily distinguished by some speakers, because ‘placing oneself in the imaginary world’ is so easy.\footnote{For more distinctions see Coppieters (1975, 1983) and Roy (2001).}}

1.2 Animacy and scalarity

The empirical generalization due to Kupferman (1979), Pollock (1983), Boone (1987),
and Roy (2001), as well as de Swart, et al. (2004), is that only certain semantic types of
nouns allow article omission: professions (médecin, avocat), titles (prince, roi), hobbies
(alpiniste, aventurier), functions (ministre), occupations (étudiant), status (chômeur ‘unemployed’), and some others. Furthermore, only animate nouns allow the variation:

(5) Julie était *(un) génie. ok if genius is understood as an occupation or social function
Julie was a genius
Julie was a genius.

This generalization was restated by Roy (2001) to claim that nouns denoting sub-kinds of humans (femme ‘woman’, enfant ‘child’) or “inherent properties” (héros ‘hero’, terroriste ‘terrorist’) require an article because they introduce an event variable. On the other hand, de Swart, et al. (2004) argue that post-copular xNPs with an optional indefinite article are a subclass of (human) predicates denoting a capacity. Both these proposals face the problem of nationality nouns (which cannot be distinguished from adjectives in French, but can in Dutch and in German): nationality nouns readily allow indefinite article omission (Eddy Ruys, p.c.), as do nouns like Prix Nobel ‘the Nobel Prize winner’ in French.

We propose that the generalization is really about [+ sentient, - scalar] nouns; a scalar NP such as génie in (5) (Bolinger (1972), Matushansky (2002c)) forces the insertion of an indefinite article.

(6) **Generalization**

Only nouns that are [+ sentient, - scalar] allow article omission in French.

The first point that needs to be discussed is that of scalar nouns, motivated by Bolinger (1972), Garcia and Luis Méndez (2000), Matushansky (2002a, c), among many others. Scalar nouns can be diagnosed by their ability to be used as epithets and to appear in the complement of seem, in the *N of an N* construction (Matushansky (2002a, c)), with degree-modifying adjectives such as utter and with the exclamative such. To this list we can add the new fact that scalar nouns cannot function as bare predicates in French. To understand why, we need to recall that scalar nouns have a degree argument slot, while other nouns don’t. We will see that this distinction is essential for predicate marking.

On the subject of [+ sentient] some caution is needed as well. First of all, there are some apparent counterexamples with non-human predicates, as in (7). We believe that either the subject is anthropomorphized in (7) or the generalization is about something more like [+ person].

(7) Fido est (un) chien d’aveugle animate predicate
Fido is (a dog of+blind

\[
\text{Fido is a seeing-eye dog.}
\]

---

4 We need to use the feature [+ sentient] rather than the customary [+ human] to account for the fact that (a) non-humanoid aliens in science-fiction/fantasy and (b) personified animals and objects in fairy-tales can be viewed as belonging to this class.

5 This fact lends clear support to de Swart, et al. (2004), who distinguish capacity (‘professional’) readings from normal predicate readings. They also discuss some inanimate predicates in Dutch – these facts do not hold for French. We will not return to this issue here.
The second issue is that nouns denoting sub-kinds of humans (femme, enfant, homme) cannot be bare in the post-copular position. This suggests that a further elaboration of the $[\pm$ sentient $]$ distinction is needed (see Matushansky and Spector (2003)).

1.3 Dialects

Before we continue, it should be noted that reported judgments on the distribution of indefinite articles demonstrate the existence of at least three French dialects with respect to $[+ \text{ sentient}]$ nouns.

i. Indefinites are allowed as post-copular xNPs for all types of nouns (Pollock (1983)).

ii. Indefinites are allowed in the post-copular position only for scalar nouns (judgments from Kupferman (1979), Boone (1987), and Roy (2001)).

iii. Indefinites cannot appear as post-copular xNPs (some speakers that we have questioned). Post-copular xNP marking in this dialect seems to resemble what happens in Russian.

In this paper, we will be concerned with the dialect (ii).

2 Nominal argument saturation

To understand what happens in copular constructions we need to examine small clauses, which is what predicative copulas are based on. We will see that the features $[\pm \text{ scalar}]$ and $[\pm \text{ sentient}]$ play an important role there as well.

2.1 $[- \text{ sentient}]$ nouns

Non-scalar $[- \text{ sentient}]$ nouns (which disallow article omission in copular constructions) cannot appear in small clauses at all, with or without un, while scalar $[- \text{ sentient}]$ nouns can, as long as the article is present:

(8) a. *Cet animal, je le crois un mammifère
   this animal I it believe a mammal
b. *Cet animal, je le crois mammifère
   this animal I it believe mammal

(9) a. ?Cette maison, je la crois une affaire.
   this house I it believe a bargain
   I believe this house to be a bargain.
b. *Cette maison, je la crois affaire.
   this house I it believe bargain/deal

These data show that we are dealing with two independent generalizations:

i. scalar nouns require an indefinite article
ii. $[+ \text{ sentient}]$ nouns allow article omission
The independence of two generalizations finds empirical support in Norwegian, where article insertion is correlated with scalarity/scalar modification (Delsing (1993)).

2.2 [+ sentient] nouns and the structure of a small clause

We know that a small clause with a bare [+ sentient, - scalar] predicate is interpretable:

(10) Pierre croit Marie physicienne.
    Pierre believes Marie physicist
    *Pierre believes that Marie is a physicist.

The simplest assumption is that a small clause (SC) denotes a proposition and therefore has the semantic type \( \langle s, t \rangle \). Thus its predicate must be of type \( \langle e, \langle s, t \rangle \rangle \) (propositional function), abstracting away from the time argument slot and \( \varphi \)- and [+ sentient] features:

(11) a. \([\text{physicienne}] = \lambda x \in D_e . \lambda w \in D_s . x \text{ is a physicist in } w\]
    b. \([\text{croire}] = \lambda f \in D_{\langle s, t \rangle} . \lambda x \in D_e . \lambda w \in D_s . \text{ in every world } w' \text{ compatible with what } x \text{ believes in } w, f(w')(x) = 1\]

With the semantics in (11), the interpretation of (10) is straightforward:

(12) \([\text{Pierre croit Marie physicienne}] = 1 \text{ iff in every world } w \text{ compatible with Pierre’s beliefs in the actual world } w_0, \text{ Marie is a physicist in } w.\]

The question is then, what does the indefinite article do that leads to the fact that a non-scalar predicate of a small clause cannot bear an indefinite article?

(13)*Pierre croit Marie une physicienne.
    Pierre believes Marie a physicist

The most natural assumption is that the presence of the article triggers a type mismatch: \textit{une physicienne} is not of the type \( \langle e, \langle s, t \rangle \rangle \) and cannot combine with the subject. We can now formulate a generalization on bare post-copular xNPs:

(14) French predicate marking
    
    The indefinite article in the post-copular position in French signals the saturation of one of the argument slots of an unmodified [+ sentient] noun.

(14) entails that the indefinite article contributes no meaning (i.e. \textit{un(e)} is vacuous), but is only a reflex of a syntactic operation. To understand how this allows us to explain

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6 The meaning that we give to intensional verbs firmly commits us to the idea that nouns denote functions from individuals to propositions (type \( \langle e, \langle s, t \rangle \rangle \), a.k.a. \textit{propositional functions}) rather than functions from worlds to extensions (type \( \langle s, \langle e, t \rangle \rangle \), a.k.a. \textit{intensions}). We will see that this assumption is essential to our theory; see also Matushansky and Spector (2003) for some of its desirable consequences.
post-copular xNP-marking in French and to unify it with similar xNP-marking in other languages, we must start with the full lexical entry for believe/croire:

\[ \text{croire} = \lambda f \in D_f \times \lambda x \in D_x \times \lambda t_1 \in D_t \times \lambda w_1 \in D_w \text{ in all possible worlds } w \text{ compatible with what } x \text{ believes in } w_1 \text{ at the time } t_1, f(w)(t_1) = 1 \]

The syntax of a small clause with a bare predicate, as in (10), is quite straightforward:

\[ \text{VP} \rightarrow \text{V0} \rightarrow \text{SC} \rightarrow \text{subject} \rightarrow \text{predicate} \]

Suppose now that we were to insert an indefinite article in the SC predicate, i.e. saturate one of its argument slots with a variable.

### 2.3 A welcome prediction: type \( \langle d \rangle \) xNP-internal saturation

Let us assume the following semantics for genius (abstracting away from the [+sentient] feature):

\[ \text{genius} = \lambda d \in D_d \times \lambda x \in D_x \times \lambda t \in D_t \times \lambda w \in D_w : x \text{ is a genius to the degree } d \text{ in the world } w \text{ at the time } t \]

To combine this \( \langle d, \langle e, t \rangle \rangle \) noun with a subject (type \( \langle e \rangle \)), we need to saturate the degree argument slot, and thus to introduce an xNP-internal degree variable, with a value set to the relevant standard of comparison for the context of the utterance (see Lewis (1979), Klein (1980), Heim (1985), etc.). However, by our proposal, saturation of a nominal argument slot triggers indefinite article insertion! Therefore, to be able to interpret a SC with a scalar noun, we need to insert the indefinite article, which yields the observation that scalar nouns cannot be bare.

It is easy to see that the compositional semantics of the small clause comes out right:

\[ \text{VP} \rightarrow \text{V0} \rightarrow \text{SC} \rightarrow \text{subject} \rightarrow \text{predicate} \]

We now predict correctly that a [- sentient] indefinite xNP can appear as a small clause predicate or with the predicative be if it is [+ scalar] (be the subject [+ sentient] or not):

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7 Independent evidence for syntactic representation of time and world variables can be found in Farkas (1993) and Percus (2000). Such xNP-internal variables can be bound (via being coindexed with a bound variable), or remain free (and get their referent from an assignment function determined by the context).

8 Once believe/croire is combined with its subject, we obtain the semantic type \( \langle i, \langle s, t \rangle \rangle \). To obtain a truth value in the matrix clause, the time and world variables slots are filled with UT and \( w_0 \), respectively.

9 We still don’t know why [- sentient] xNPs cannot be bare, but see section 6 for some speculations.
(19) a. Marie croit ce meuble *(une) table/*(une) affaire
Marie believes this piece of furniture a table/ a bargain

b. (?) Un génie, Mozart l’était depuis l’enfance
a genius Mozart it+was since the+childhood
Mozart has been a genius since childhood.

To summarize, an indefinite article is obligatory with scalar nouns, both in small clauses and in copular sentences (and as long as no other determiner is present).\(^{10}\)

2.4 Type 〈e〉 xNP-internal saturation

We can now explain why non-scalar indefinite xNPs are not allowed in small clauses: if the individual argument slot of the predicate is saturated, we get a type-clash internal to the small clause:

(20) 

The same result would obtain if the position occupied by x\(_{(e)}\) in (20) were occupied by an existential operator over individuals (type \(\langle(e, t), (e, t, t)\rangle\)). This is why an identity interpretation of the second xNP is impossible inside a small clause.

2.5 Type 〈i〉 or type 〈s〉 xNP-internal saturation

For the sake of consistency, we continue with the same argument ordering for the xNP:

(21) 

If the time argument slot of the predicate is saturated by an xNP-internal variable, the SC node (now of the type (s, t)) cannot combine with a propositional attitude verb. The same thing will happen if the world argument slot of the predicate is saturated.\(^{11}\)

To summarize, under the assumption that an article appears in French [+ sentient] xNPs if at least one of their argument slots is saturated by an internal variable, we can explain

\(^{10}\) The condition on indefinite article insertion proposed in (14) is open with respect to which argument slots trigger predicate marking, which makes it possible for languages to (not) distinguish between them. We will argue that this is in fact what some languages do.

\(^{11}\) Along with other theories arguing that small clauses are propositions, we now wrongly predict that they can function as matrix clauses. To evade this issue, we stipulate that IP and CP layers are obligatory in matrix clauses.
i. why scalar nouns require an article: unless the degree argument slot of a scalar noun is saturated, the noun cannot combine with its subject

ii. why indefinite articles are disallowed with [- scalar] xNPs in small clauses: saturation of an individual argument slot results in a type clash inside the small clause; if a time or a world argument slot is saturated, the resulting small clause cannot be combined with a propositional attitude verb due to a type clash

However, if this is true, why on Earth do we get indefinite xNPs after the copula, where they do not have to be scalar?

3 Two be and why two be

It is well-known that apart from the predicative be, there exists an identity be, which asserts that its two arguments denote the same object. We suggest that the article-variant is an instance of the equative use of the copula. Both clearly equative copulas and the copulas with an indefinite post-copular xNP (the article-variant) can be used to answer an identity question and their subject cannot be a third person pronoun in non-embedded contexts (see Coppieters (1975, 1983)):

(22) Qui est Cicéron?
Who is Cicero?
   a. Cicéron (c’) est Marcus Tullius
      Cicero THIS+ is Marcus Tullius
   b. * Cicéron, il est Marcus Tullius
      Cicero, he is Marcus Tullius
   c. Cicéron (c’) est un orateur
      Cicero THIS+ is a orator
   d. * Cicéron, il est un orateur
      Cicero, he is un orator

Also, both the article-variant and identity copulas disallow predicate pronominalization, except when the noun is scalar, as predicted by our approach:

(23) a. Célèbre, Cicéron l’est depuis longtemps
       famous, Cicero it+ is since long+ ago
      Cicero has been famous for a long time.
   b. (* Un) orateur, Cicéron l’est depuis longtemps
      An orator, Cicero it+ is since long+ ago
      Cicero has been an orator for a long time.
   c. * Marcus Tullius, Cicéron l’est
      Marcus Tullius, Cicero it+ is
(24) *( Un) génie, Cicéron l’était depuis l’enfance.
     An genius, Cicero it+ was since childhood
     Cicero had been a genius since childhood.

Roy (2001) argues against an existential analysis of indefinite post-copular xNPs on the basis of the fact that unlike other existentially quantified xNPs, they do not:
(1) undergo inversion,
(2) scopally interact with negation,
(3) or allow anaphora in discourse:

(25) Marion est un prof. Elle/ne peut pas voir les copies. Marion is a professor. She cannot see the copies

The property (1) is simply due to the fact that identity sentences require the subject to be less salient than the post-copular xNP. The property (2) can be argued not to hold because the post-copular xNP can always be interpreted as a specific indefinite. Finally, the property (3) is in fact attested with identity statements, once we remove the issue of discourse salience from the picture:

(26) Charles d’Eon was Lia de Beaumont. She/he became famous.

(26) is weird because for most people neither of these two differently gendered names has sufficient discourse salience to warrant the use of the pronoun of the corresponding gender. On the other hand, (25) requires the feminine pronoun because in this context, Marion is more salient than un professeur. The same manipulation can be done with an identity statement:

(27) Dana International used to be Yaron Cohen. Even then she/he dreamed of a music career.

Granted, human language is not suited to sex change, but gender conflict has nothing to do with identity copulas. We conclude that indefinite post-copular xNPs can be treated as involving the identity be.

4 Temporal and modal (in)dependence

Under the standard assumption that be can be a raising verb with a small clause complement, we readily explain why the bare xNPs in (3) and (4), repeated below, must have time- and world-dependent readings. Likewise, we can explain why the indefinite xNPs in these examples can be time- and world-independent.

(3) Scenario: At a fund-raising event all former or current governors must identify themselves. What about Bush?
   a. #Bush est gouverneur. Bush is governor.
   b. Bush est un gouverneur. Bush is a governor.

(4) Harry Potter est (un) magicien. Harry Potter is a wizard

4.1 The article-variant

With the identity be, both xNPs are arguments of the verb. Since in argument xNPs, the time and world of evaluation can be independent of those of the verb (Farkas (1993),
Percus (2000), the time- and world-independent readings of indefinite xNPs in (3) and (4) follow. In our system this is handled as follows.

The presence of the article indicates saturation of an xNP-internal argument slot. Once an \( i \) or an \( s \) xNP-internal argument slot is saturated (which is required for time- and world-independent readings), we obtain a type-clash inside the small clause (see section 2.5) and therefore only the identity \( \text{be} \) can be used:

\[
\text{(21) TYPE CLASH}
\]

\[
\begin{array}{c}
\text{V}_0^{(i, (s, t)), (e, (i, (s, t)))} \\
\text{croire} \\
t_1 \\
\text{SC}_{(s, t)} \\
\text{subject}_{(e)} \\
\text{SC'}_{(i, (s, t))} \\
\text{predicate}_{(e, (i, (s, t)))}
\end{array}
\]

To be compatible with the identity \( \text{be} \), the post-copular xNP has to be existentially quantified (cf. Pereltsvaig (2001) for Russian) and then to scope out.

\[
\text{(28) } [\text{Bush est un gouverneur}] = \text{at } t_0, \exists x [x \text{ is a governor at } t_1 \text{ and Bush } = x]
\]

\[
\text{(29) } [\text{Harry Potter est un magicien}] = \text{in } w_0, \exists x [x \text{ is a magician in } w_1 \text{ and HP } = x]
\]

The free time and world variables receive their values from the contextual assignment function. The most salient readings are \( t_1 = t_0 \) (i.e. utterance time) and \( w_1 = w_@ \) (i.e. the real world), but other times and worlds are also possible:

\[
\text{(30) Victor Hugo est un poète.}
\]

\[
\text{Victor Hugo is a poet}
\]

\[
\text{Victor Hugo is a poet}
\]

In (30), \( t_1 \) is the lifetime of Victor Hugo.

\[
\text{4.2 The bare variant}
\]

Since the world and the time argument slots of the xNP are not saturated (or \( \text{un(e)} \) would have been inserted), the predicate will necessarily be evaluated with respect to the worlds and times introduced by the attitude verb, i.e. necessarily receive a dependent interpretation:

\[
\text{(31)}
\]

\[
\begin{array}{c}
\text{V}_0^{(i, (s, t)), (i, (s, t)))} \\
\text{être} \\
\text{subject}_{(e)} \\
\text{SC}_{(i, (s, t))} \\
\text{SC'}_{(i, (s, t))} \\
\text{predicate}_{(e, (i, (s, t)))}
\end{array}
\]

\[
\text{(32) } [\text{être}_\text{PRED}] = \lambda p \in D_{(i, (s, t))} \cdot p
\]

The copula here is vacuous, as usually assumed for the predicative \( \text{be} \).
4.3 Embedding

Under an intensional verb, three scopal options are theoretically available for the post-copular xNP. The entire DP may be interpreted *de re* or *de dicto*, or the NP alone may be interpreted *de re*:

(33) W. believes that Roman Polanski was a Roman emperor.
   a. DP *de re*: W. saw a portrait and erroneously believed that it represented Nero. In fact it was Roman Polanski.
   b. NP *de re*: W. saw a group of portraits and erroneously believed that one of them was Roman Polanski. In fact these portraits represent Roman emperors.
   c. *de dicto*: W. believes that Roman Polanski lived in ancient Rome, wore a toga, etc.

(33a) is an identity reading: there was a Roman emperor such that W. identified Roman Polanski with him. The post-copular xNP is then not a predicate.

(33b), where the NP restrictor should be read *de re*, is marginally possible, in a scenario where we don’t know whether W. identifies the portraits as those of Roman emperors. Both it and the previous reading (33a) are readily available for argument DPs (Farkas (1993), Percus (2000)).

(33c) represents the most expected reading of the predicate, and this is the only reading that a bare post-copular xNP can have in French.

(34) a. W. croit que Roman Polanski était un empereur. ✓(33a, b, c)
    b. W. croit que Roman Polanski était empereur. *(33a, b), ✓(33c)

A total *de re* reading is unavailable in (34b) because predicates simply can’t have *de re* readings. Consider once again the lexical entry for *believe/croire*:

(15) \[ [\text{croire}] = \lambda f \in D_{\{\langle s, t \rangle \}, \lambda x \in D_x : \lambda t_1 \in D_t : \lambda w_1 \in D_w : \text{for all possible worlds compatible with what } x \text{ believes in } w_1 \text{ at the time } t_1, f(w)(t_1) = 1 \]

A *de re* reading of the predicate is possible iff its world argument slot is saturated by an xNP-internal variable of the type \( \langle s \rangle \) that takes its reference from a higher clause:

(35) In all worlds w compatible with what W. believes in w\(_0\) at UT, emperor (Roman Polanski) (w\(_0\)) = 1 at t\(_1\) < UT

To obtain the reading above, the world argument slot of *empereur* must be filled by an xNP-internal world variable, which can take as its reference the actual world w\(_0\). But we have argued that when such a variable is inserted, an article must be inserted as well! Therefore, *de re* readings are impossible with bare post-copular xNPs.\(^{12}\)

\(^{12}\) The post-copular bare xNP cannot have the partial *de re* reading (33b) either. The reason is that if we raise the NP restrictor (i.e. the whole xNP), its trace would have the same type as the raised predicate,
5   Summary

We have argued that post-copular xNP-marking in French (presence vs. absence of the indefinite article) reflects the saturation of an xNP-internal argument of the post-copular [+ sentient] xNP.

A. when the xNP is scalar, the article is obligatory
B. when the xNP is not scalar, the indefinite article results in ungrammaticality unless…
C. …the identity be is used with indefinite xNPs

As a result, we can now formally deal with the indefinite/bare alternation in unmodified post-copular xNPs in French.

6   Towards an explanation

Our analysis correctly captures the fact that bare predicates and indefinite xNPs do not have the same distribution (small clauses) and are interpreted differently with respect to time and world dependence. But it doesn’t explain why some meanings (“capacity”, “social function”) occur with bare predicates while others (“important characteristic”, “defining property”, “identification”) require an indefinite xNP. It also has nothing to say about the more “temporary” perception of Instrumental-marked Russian predicates (which we take to largely correspond to bare xNPs in French) vs. Nominative-marked xNPs (see Jakobson (1936/1971), Wierzbicka (1980), Bailyn and Rubin (1991), Geist (1998, 1999), Pereltsvaig (2001), Matushansky and Spector (2003), etc.), or about coercion in (5):

\[
(5') \quad \text{Julie'était génie.} \quad \text{ok if} \quad \text{genius} \quad \text{is understood as an occupation or social function}
\]

\[
\begin{align*}
\text{Julie was genius} \\
\text{Julie was a genius.}
\end{align*}
\]

We believe that the answer lies in the fact that “capacity” readings are more temporary. Informally speaking, properties can be viewed as accidental (stage-level) or substantive (defining, individual-level). Intuitively, the latter are achieved with xNPs as a result of temporal independence of the xNP (whose precise semantics is still to be determined). Such temporal independence, technically realized as saturation of the (i) argument slot, causes a type clash inside the small clause (section 2.5), and therefore, the only way of expressing individual-level readings is via the identity copula.

6.1  [± sentient]?

We can now offer a deeper insight into the contrast between [+ sentient] and [- sentient] nouns. If the latter may not have stage-level readings for pragmatic reasons (after all, inanimate objects rarely possess accidental properties), we will never find them as bare

which would ensure a “reconstructed” interpretation. On the other hand, if we were to saturate the world argument slot of the NP restrictor in situ by a world pronoun coindexed with some higher possible world variable, the predicate would be unable to combine with the predicative be due to a type clash of the familiar nature.
nominal predicates. The problem with such a simplistic view is that of course adjectival predicates denoting accidental properties are allowed with inanimate subjects.

On the other hand, the lack of bare variants with (sub-)kind predicates such as *child* or *cat* can be linked to the same general issue. Intuitively, such nouns must always be individual-level and therefore must pattern with [-sentient] predicates.

6.2 Coercion of the indefinite predicate in small clauses

An indefinite xNP is allowed in small clauses on the condition of receiving a particular interpretation (Kupferman (1979), p. 141, as cited by Boone (1987)):

(36) Après avoir effectué cette opération, Max est devenu un médecin. Boone (1987)

This interpretation is that of “a typical doctor”, “a real doctor” – a meaning shift typical of scalarity coercion (P → “having properties stereotypically associated with being P”), which takes place when a non-scalar predicate appears in a scalar context (Matushansky (2002b)).

13 This coercion is probably responsible for what we called the dialect (i) on p. 4 (Pollock (1983)), allowing indefinite predicates in small clauses for all nouns.

(37) a. My cook is more French than Napoleon.
   b. You are such a linguist!

What’s important here is that the predicate is shifted towards a meaning in which it has a degree argument slot, whose saturation is obligatory for interpretability. The indefinite article then must be inserted by hypothesis (14).

7 Questions for future research

We believe that the distribution of Nominative/Instrumental predicate case marking in Russian is governed by the same principle as indefinite article insertion in French and may in fact be the same as in the dialect (iii) discussed on p. 4. The difference between French dialect (ii) examined here and Russian lies in the status of the [degree] argument slot: in Russian, the saturation of this argument slot is not marked and therefore scalar xNPs behave like non-scalar ones (see Matushansky and Spector (2003) for an extended discussion).

One question to ask here is whether the [degree] opposition the only one. Can there be languages that only mark saturation of the world argument slot and if yes, can such cases be distinguished from marking the time argument saturation?

7.1 Adjectives vs. nouns

Under the assumption that argument slots of a predicate can be saturated by an internal variable of the appropriate type, why does this never happen with adjectives? This issue is actually composed of two separate facts: (1) Why does article insertion never happen...
with adjectives? (2) Why aren’t adjectival predicates ever temporally or referentially independent?

The answer to these questions should also account for the fact that French [± sentient] (sub-kind) nouns can have an interpretation with which they can appear bare in small clauses and with degree modifiers (e.g. très femme ‘very womanly’).

7.2 Contribution of modification

The role of modification in predicate marking (de Swart, et al. (2004)) is still obscure to us. We hope to be able to use the proposal made by McNally and Boleda Torrent (2004) with respect to the kind argument position in nouns to argue that argument saturation is at play here as well.

References


ON RESULT NOMINALIZATION IN GERMAN

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Abstract

It is well known that certain deverbal nouns like invention, forgery and disappointment allow a result interpretation while others like explosion and search do not. Result interpretation can mean two things: reference to a result object (forgery) or reference to a result state (disappointment). The present paper, whose focus is on deverbal nouns in German, investigates the semantical conditions the base verb must fulfill in order to allow a result object or a result state nominalization. In particular, we critically examine the criteria proposed by Ehrich and Rapp (2000).

1 Introduction

The most prominent use of deverbal nouns is to refer to the situation expressed by the respective base verb. Examples from German (and English) are Explosion (explosion), Prüfung (examination), and Suche (search). Deverbal nouns can of course pick out participants and other aspects of a situation as well. They can refer to the agent or the patient of an action, like Prüfer (examiner) and Prüfling (examinee), or to the instrument or the place, like Feile (file) and Bäckerei (bakery).

The focus of the present paper is on deverbal nouns in German that can be interpreted as referring to the result of an action or event. More specifically, there are two sorts of results to be considered: result objects and result states. Examples of deverbal nouns with result object interpretation are Fälschung (forgery), Bohrung (bore), and Verletzung (injury), whereas a result state interpretation is possible for Inhaftierung (imprisonment) and Verblüffung (amazement), for instance. Notice that there are also examples, like Blockierung (obstruction), that allow both types of interpretation.

1.1 Deverbal Result Nouns

By a deverbal result noun associated with a given verb we mean a noun that is derived from this verb by some regular single-step morphological process and that refers to the result state or the result object of the event denoted by the verb. In particular, we exclude past participle nominalizations because they are not deverbal but deadjectival. Hence, past participle conversions like das Fertiggestellte (the completed), although referring to the result object of the underlying verb, are not counted as deverbal result nouns. The same argument excludes state nominalizations derived from past participles by heit-suffixation as, e.g., Aufgeräumtheit, or by analytic formations as in das Aufgeräumt-Sein (the being-cleared-up).
Deverbal nouns that allow a result interpretation often allow an event interpretation too. In order to separate the different meanings of a deverbal noun, one usually employs distributional tests. If we assume result objects to be concrete entities then result object nouns should be usable in complement positions of verbs which require concrete objects:

(1) a. Die Fälschung wurde der Polizei übergeben.
   ‘The forgery was handed over to the police.’
 b. Er berührte versehentlich seine Verletzung.
   ‘He inadvertently touched his injury.’
 c. Er verbarg seine neuste Erfindung im Keller.
   ‘He hid his newest invention in the basement.’
 d. Die Beurteilung wurde ihm gestern zugesandt.
   ‘The assessment was sent to him yesterdy.’

Passing the foregoing test is of course not sufficient for being a result noun since agent and instrument nominalizations, for instance, behave the same way in that respect. It seems thus reasonable to require deverbal result nouns to refer to entities that come into existence during the event denoted by the base verb. But notice that this condition apparently excludes nouns like *Eroberung* (conquest) and *Erwerbung* (acquisition) because the object to be conquered exists before the act of conquering (although it is not a conquest at that time). We come back to this problem in Section 5 below.

Deverbal nouns under result state interpretation should be compatible with attributive adjectives expressing duration:

(2) a. Die mehrstündige Versperrung der Ausfahrt
   ‘The several hours’ obstruction of the driveway’
 b. Die mehrminütige Verblüffung des Professors
   ‘The several minutes’ amazement of the professor’

In addition to such durative attributes, Ehrich and Rapp (2000, pp. 252f) suggest to employ the attributive adjectives *bestehend* (existing, persisting) and *vorgefunden* (found (being there)) which are intended to express “stationariness”. However, it appears to me that these adjectives are unsuitable as indicators for state nouns because they are compatible with nouns denoting concrete objects as well, witness *die bestehende/vorgefundene Alarmanlage*.

### 1.2 Traditional Categories

It is instructive to review the traditional onomasiological classification of deverbal nouns in German under the perspective of result nominalizations. The more or less “classical” categories found in the literature are *nomina actionis*, *nomina agentis*, *nomina patientis*, *nomina instrumenti*, *nomina loci*, and *nomina acti*.\(^1\) *Nomina actionis* correspond to event nouns whereas *nomina agentis*, *patientis*, *instrumenti*, and *loci* are characterized by the roles of the objects they refer to.\(^2\) The only class having a “resultative” connotation

\(^1\) Cf. e.g. Fleischer and Barz (1995).
\(^2\) See also Osswald and Helbig (2005).
seems to be the nomen acti class. Indeed, the respective entry in (Bussmann 1996) says that nomen acti is a term for “deverbal nouns that denote the result of the action denoted by the verb.” This view seems to be compatible with that of Fleischer and Barz (1995), where we find a definition of nomina acti as denoting the result state of an action (p. 86), but, somewhat inconsistently, also result object nouns like Fälschung (forgery) and Bekanntmachung (announcement) and even such cases as Erwerbung (acquisition) as examples of nomina acti (pp. 174f). There is, moreover, a totally different conception of nomina acti in the literature, which is held, for instance, by Eisenberg (1998, p. 265), according to whom nomina acti are deverbal nouns formed by er-suffixation which mostly describe the result of actions that are movements or sound utterances:

(3) Dreher (turn), Huster (cough), Hopser (leap), Schluchzer (sob), Stupser (nudge)

Fleischer and Barz (1995, p. 154) mistakenly speak of “process descriptions” in this case, although a punctual, or semelfactive, reinterpretation is clearly prevalent.

Another problem concerning the classification of result nouns is the proper use of the nomen patientis category. Engel (1996, p. 505), for instance, restricts this category to persons affected by an action, like Prüfling (examinee). One of his examples, however, is Aufkleber (sticker), and his characterization of nomina patientis as deverbal nouns taking subject position under passivation allows a much broader range of objects than just persons:

(4) a. Ein Prüfling ist jemand, der gepüft wird.
   ‘An examinee is somebody who is examined.’

b. Eine Erwerbung ist etwas, das erworben wird.
   ‘An acquisition is something which is acquired.’

c. Eine Spende ist etwas, das gespendet wird.
   ‘A donation is something which is donated.’

Motsch (1999, p. 343), on the other hand, does not mention the nomen patientis category at all in his semantic classification of deverbal nouns but introduces a single semantic class for “themes” which also covers result object nouns, his nomina acti. Here, a theme is meant to be the patient of an action (or event), an affected or effected object, or a passive undergoer (ibid, pp. 36f). However, since Motsch also employs the above passivation test for this class of nouns, he cannot account for result nouns like Beurteilung (assessment), to which the passivation test does not apply:

(5) * Eine Beurteilung ist etwas, das beurteilt wird.
   * ‘An assessment is something which is assessed.’

In fact, result nouns that refer to implicit result objects are totally missing in the semantic classification proposed by Motsch.

To sum up, there is no appropriate coverage of result nouns by traditional onomasiological categories, and implicit results are even missing in more recent approaches like that of Motsch.

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2 Events, States, and Results

Let us now look a bit more closely at the semantics of the verbs that give rise to result nominalizations. Clearly, it must be part of the meaning of such verbs to bring about a result. By a result we roughly mean some sort of condition whose manifestation characterizes the culmination of the described event.³ Hence only terminative, or telic verbs can give rise to deverbal result nouns. Telicity, however, is not sufficient as examples like entleeren (empty), erreichen (reach), and fertigstellen (complete) show: the deverbal nouns Entleerung, Erreichung, and Fertigstellung formed by ung-suffixation only allow an event interpretation, and other candidates for deverbal result nominalizations are not available in these cases.

The rest of this section is mainly concerned with the question of how to characterize telic verbs that semantically imply an “independent” result state, since this is a necessary requirement for result state nominalization. In addition, we discuss the impact of result objects on the existence of result states.

2.1 Resultant States vs. Target States

In his semantic analysis of the perfect in English, Parsons (1990, Chap. 12) draws a distinction between resultant states and target states for events that culminate. Parsons (ibid, p. 234) assumes that for every culminating event e “there is a corresponding state that holds forever after.” He calls this state the resultant state of e and refers to it as “the state of e’s having culminated.” The resultant state must not be identified with the target state, which is an “independently identifiable state” that the object of a verb is in after the verb is true of it (ibid, p. 252). Apparently, only telic verbs defining target states are candidates for deverbal result state nominalizations.

Kratzer (2000) observes that the distinction between target states and resultant states is reflected by the behavior of the stative passive (‘Zustandspassiv’) with respect to adverbial modification by immer noch:⁴

(6) a. Die Ausfahrt ist immer noch versperrt. (target state passive)
   The driveway is still obstructed.
b. Der Aschenbecher ist (*immer noch) geleert. (resultant state passive)
   The ashtray is (*still) emptied.

However, there are many verbs like aufräumen (clear up) and abschrauben (screw off) that allow target state passives but not result state nominalizations. So, having a target state is obviously not sufficient for a verb to give rise to a result state noun.

It is moreover worth mentioning, and also noted by Kratzer, that there are many verbs with “independently identifiable” result states that nevertheless do not allow target state passives. Examples are deadjectival causatives like leeren (empty), trocknen (dry), and säubern (clean) and resultatives like sauberfegen (make-clean-by-sweeping) and weich-

---

³A much more general notion of ‘result’ for aspectual classification can be found in Naumann (2001) and Naumann and Osswald (2002).

⁴Kratzer attributes this observation to Nedjalkov and Jaxontov (1988), who refer to target state passives as resultatives and to resultant state passives as perfects; cf. also Löbner (2002).
klopfen (make-soft-by-beating). The “independently identifiable” result states seem to be fully specified by the respective adjectives in this case. Notice that none of these verbs allows a result state nominalization.

Durative adverbials, especially für-PPs (for-PPs), are another result state indicator studied in the literature. Kratzer (2000) claims that “the class of verbs that can form target state passives in German coincides with the class of verbs that allow modification by für-PPs.” However, there are counterexamples:

(7) a. Das Fenster ist (*immer noch) auf+gemacht.
The window is (*still) open+made

b. Der Lehrer hat das Fenster für einige Minuten auf+gemacht.
The teacher has the window for several minutes open+made.

Kratzer observes that all causatives derived with the help of machen never permit target state passives. This class of verbs, that have target states without allowing target state passives, is closely related to the class of deadjectival causatives mentioned above.

At the level of semantic representation, Kratzer (2000), and similarly Piñón (1999), assume a Davidsonian result state argument in addition to an event argument for verbs that allow target state passive and modification by für-PPs.

2.2 Result States vs. Result Object States

Result objects are objects resulting from an action or event. Examples of verbs denoting such actions are erfinden (invent), destillieren (distill), umhüllen (wrap), etc. It is tempting to argue that every result object is trivially accompanied by a result state, which is given by the very existence of the result object. This “state”, however, must not be taken as the result state of the action or event in question. Consider the verb absperren (close off), for example, which comes along with a result state as well as a result object, both referable in German by the deverbal noun Absperrung. Now notice that the result state is primarily a state of the object that is closed off and not a state of the barrier created for that purpose. This is quite obvious if we take into account that result states are typically expressed by target state passives.

The situation is of course different for verbs of creation with overt result arguments like bake, build, and dig because the resulting state holds precisely of the created objects in this case. But for these verbs, the assumption of a target state is nevertheless rather questionable.

That the coming into existence of a result object does not necessarily establish a result state is also clearly seen for accomplishment verbs like zusammenfassen (summarize) and übersetzen (translate), which do not allow adverbial modification by durative adverbials, although they give rise to result object nominalizations: Zusammenfassung (summary), Übersetzung (translation).

(8) Der Student hat den Artikel *[für mehrere Minuten] zusammengefasst.
The student has the article *[for several minutes] summerized.

5See e.g. Dölling (1998) and Piñón (1999).
‘The Student summarized the article *[for several minutes].’

We can conclude, there are not only telic verbs without result states, as observed in the previous section, but also verbs with result objects the lack a result state.

2.3 Digression: The Status of States

The ontological status of states notoriously calls for reflection. Proponents of a Davidsonian event analysis hold different positions concerning the status of states. There are those who simply consider states as a special type of eventuality, on a par with events. Others claim that one can dispense with states altogether in favor of reference to the temporal domain. Again others draw a distinction between states that are located in space (expressed by verbs like sit and sleep) and those which are not (expressed by verbs like know and own and most copula constructions). An approach of the latter type is proposed by Maienborn (To appear), who draws a distinction between Davidsonian states and so-called Kimian states; the latter are meant to be exemplifications of properties by objects at a time and are represented by a logical form that differs from a Davidsonian analysis.

Suppose we accept the view that states expressed by copula constructions are property exemplifications. Then we still need to distinguish between resultant states and target states. More concretely, the question is whether resultant state passives should be interpreted as property exemplifications at all. This comes down to deciding whether being built, being translated etc should count as properties (exemplified by Kimian states). Maybe Kimian states could be employed to explain the deviant behavior of deadjectival verbs with respect to target state passives mentioned in Section 2.1, but this issue needs further research.

3 The Approach of Ehrich and Rapp

In their article on ungb-nominalizations in German, Ehrich and Rapp (2000) aim at two things: First, they propose a theory of lexical semantics and linking in order to explain how the syntactic realization of the arguments of a lexical entry is determined by its semantic representation and category specific linking rules. In particular, they assume ungb-nominalizations and their base verbs to have identical lexical semantic representations but different argument structures. Second, they postulate specific constraints on the semantic representation of telic verbs that are correlated with possible interpretations of the ungb-nominalization as a result object or result state, respectively. In the context of the present paper, we are primarily interested in this second aspect of Ehrich and Rapp’s approach.

3.1 Lexical Semantic Structure

Ehrich and Rapp employ a decompositional approach to lexical semantics. They stipulate the following set of basic predicates: DO, BE, POSS, and APPL. The predicate DO,
which characterizes actions, can take one or two arguments – the agent and an optional
affected theme (or patient). BE represents one-place states; the two-place predicates
POSS and APPL stand for static relations, where POSS indicates the relation of posses-
sion, both material (e.g. own) and psychological (e.g. admire), and APPL is intended as
generalized local relatedness.
For example, transitive activity verbs like schlagen (hit) are represented by the two-place
process predicate DO, while transitive verbs of possession are represented by POSS:

\[
\begin{align*}
\text{DO } ((x) r) & \quad \text{rennen (run)} \\
\text{DO } ((x, y) r) & \quad \text{schlagen (hit), unterstützen (support)} \\
\text{POSS } ((x, y) s) & \quad \text{besitzen (own), kennen (know), bewundern (admire)} \\
\text{APPL } ((x, y) s) & \quad \text{umgeben (surround)}
\end{align*}
\]

The symbols representing the Davidsonian arguments in the semantic structure are subject
to the following convention: \( r \) stands for processes, \( s \) for states, and \( e \) for (telic) events.
In Ehrich and Rapp’s formalism, the telic aspect of a verb is represented by means of a
change of state predicate BECOME (or BEC) that takes state predicates as arguments.
Telic verbs are represented by applying BECOME to the respective result state term:

\[
\begin{align*}
\text{BEC } ((\text{BE } ((x) s)) e) & \quad \text{einschlafen (fall asleep), sterben (die)} \\
\text{BEC } ((\text{POSS } ((x, y) s)) e) & \quad \text{erkennen (recognize), finden (find)} \\
\text{BEC } ((\text{APPL } ((x, y) s)) e) & \quad \text{erreichen (reach)}
\end{align*}
\]

If it is part of the meaning of a telic verb that the change of state is the result of the action
of one of the participants, then the semantic representation contains a DO term in addition
to the BECOME term. The semantic template then has the form:

\[
\text{DO } ((...) r) & \quad \& \quad \text{BECOME } ((\text{State-Predicate})((...) s)) e)
\]

Here, the conjunction of DO and BECOME is meant to express an implicit causation
relation between the respective action (or process) and the change of state event, where
the event argument \( e \) occurring in the BECOME term is taken as identical to the event
argument of the whole causative construction.\(^8\)

Our discussion of result state and result object nouns will be mainly concerned with the
four types of causative verbs listed from (12) to (15), with examples taken form Ehrich
and Rapp:

\[
\begin{align*}
\text{(12) \quad Availability verbs} \\
\text{DO } ((x) r) & \quad \& \quad \text{BECOME } ((\text{BE } ((y) s)) e) \\
\text{entdecken (discover), erfinden (invent), ausgraben (dig up)}
\end{align*}
\]

\[
\begin{align*}
\text{(13) \quad Change of state by affection} \\
\text{DO } ((x, y) r) & \quad \& \quad \text{BECOME } ((\text{BE } ((y) s)) e) \\
\text{renovieren (renovate), verletzen (injure), fertigstellen (complete)}
\end{align*}
\]

\[
\begin{align*}
\text{(14) \quad Locative treatment verbs}
\]

\(^8\text{Cf. Ehrich and Rapp (2000, p. 258).}\)
\[ \text{DO} \left( (x, y) \, r \right) \& \text{BECOME} \left( (\text{APPL} \left( (z, y) \right)) \, e \right) \]

bemalen (paint), beschmieren (smear), absperren (close off)

(15) Treatment verbs with effected theme
\[ \text{DO} \left( (x, y) \, r \right) \& \text{BECOME} \left( ((\text{BE} \left( z \right) \& \text{APPL} \left( z, y \right)) \, s) \, e \right) \]

zusammenfassen (summarize), beurteilen (judge)

Template (14) says something like this: \( x \) is acting upon \( y \) to the effect that \( z \) is attached to \( y \) (locally or otherwise). Notice that (12) and (13) differ with respect to the arity of DO: The semantic structure of verbs expressing a change of state by affection involves the two-place DO predicate, whereas the semantic structure of availability verbs contains the one-place version of DO. In the first case, the agent is thought to directly affect the theme, or undergoer, in order to give rise to the result state, whereas in the second case there is no such direct continual influence of the agent on the object.

Referring to agents and themes hints at an inventory of semantic roles. In the approach of Ehrich and Rapp, each (non-situational) argument of a primitive predicate is associated with a specific thematic role:

(16) \[ \begin{align*}
\text{DO} \left( (x) \, r \right) \quad & x = \text{AGENT} \\
\text{DO} \left( (x, y) \, r \right) \quad & x = \text{AGENT}, \ y = \text{THEMAFF} \\
\text{BE} \left( (x) \, s \right) \quad & x = \text{THEME} \\
\text{POSS} \left( (x, y) \, s \right) \quad & x = \text{EXPERIENCER}, \ y = \text{POSSESSUM} \\
\text{APPL} \left( (x, y) \, s \right) \quad & x = \text{APPLICATUM}, \ y = \text{RELATUM}
\end{align*} \]

The second argument of DO is called the affected theme or patient. Arguments within the scope of BECOME are referred to as effected arguments. Since an argument can occur in more than one primitive predicate of a decomposition, it may carry multiple thematic roles. In template (13), for instance, the affected theme is identical with the effected theme.

3.2 Criteria for Result Interpretations

Ehrich and Rapp assume that all possible interpretations of an unng-nominalization have the same lexical semantic structure which is identical with that of the base verb; different interpretations just pick out different referential arguments from that structure. Since telicity is a necessary condition for a verb to allow a result nominalization, the semantic structure of such a verb must contain a BECOME term.

The criteria Ehrich and Rapp propose for result interpretations make use of the rank of an argument, which is determined with respect to its position in the primitive predicates, where the first argument of a two-place predicate has higher rank than the second. Ehrich and Rapp postulate that the unng-nominalization of a telic verb has a result object interpretation if and only if the argument with highest rank under the BECOME operator is not an affected theme, in which case this argument is the referential argument of the result noun. It follows that verbs subsumed by (12), (14), and (15) should give rise to result object nominalizations whereas those subsumed by (13) should not, because in the latter case, the effected argument with highest rank \( y \) is an affected theme.
As for result state interpretations, the constraint proposed by Ehrich and Rapp is that that
the argument with lowest rank under BECOME is an affected theme, which is then the
referential argument of the result state noun; furthermore, they require none of the effected
themes be created or destroyed. Result state interpretations should thus exist only for (14)
and for verbs of modification subsumed by (13).

3.3 Critical Analysis

A closer look reveals that Ehrich and Rapp’s predictions are untenable in several respects.
Consider the class (14) of locative treatment verbs. Whereas for verbs like absperren
(close off) and abdecken (cover) a result state interpretation of the ung-nominalization is
unproblematic, such an interpretation seems much more difficult to accept in the case of
verbs like bemalen (paint) and beschmieren (smear):

(17) a. Die mehrtägige Absperrung des Geländes
    The several days closing off of the area
b. ??Die mehrtägige Beschmierung der Hauswand
    The several days smearing of the wall

Many verbs of modification falling under (13) behave no better with respect to result state
nominalization, contrary to what Ehrich and Rapp predict:

(18) *Die mehrjährige Renovierung des Hauses
    The several years renovation of the house

Let us turn to result object interpretations. Ehrich and Rapp predict that ung-nominali-
zations of modification verbs subsumed by (13) allow result state interpretations but not
result object interpretations. Verbs like verletzen (injure) and beschädigen (damage),
however, show exactly the opposite behavior. Injuries and damages are objects on a par
with stains and holes – dependent on the object they are attached to, but surely not states
of that object. The corresponding state is rather to have an injury or hole. One could
argue that this seeming defect of Ehrich and Rapp’s theory is only due to a mistaken
classification of the chosen example verbs verletzen and beschädigen. Indeed, it might
be more appropriate to subsume them under template (15). In any case, the modification
template (13) is too unspecific for the given examples in that it does not represent the fact
that something is implicitly “created” by these events, viz an injury or a damage. Another
problematic aspect of template (13) is that it subsumes, both, verbs of creation and of
modification. On the other hand, Ehrich and Rapp argue that this distinction makes a dif-
fERENCE with respect to the existence of result object nominalizations. The given semantic
representation is thus not fine grained enough to allow a correct prediction in this case.

The semantic structure of template (14) shows a further deficiency, namely the identifi-
cation of the “locatum” argument z with the referential argument of the postulated result
object noun. This is inadequate since the result objects of smearing, wrapping, or closing
off events do not coincide with the material used for smearing, wrapping, or closing off,
but are things produced from that material. Put differently, the APPLICATUM should not
be identified with the result object since the latter is typically a newly created object that
materially consists of the APPLICATUM (which is often a substance). So, again, like in the case of verletzen (injure) and beschädigen (damage), implicitly created objects are not appropriately represented by the proposed lexical semantic structure. We can conclude that an adequate lexical semantic representation of implicit creation verbs should reflect the resulting object as well as the relations of that object to other participants of the event, be it the material used for creating the object or the *patiens* it is attached to; cf. Section 5.

4 Result State Nominalization and Stative Readings

This brief section addresses a straightforward criterion for the existence of result nominalizations. Observe that verbs like absperren (close off) and abdecken (cover), in contrast to bemalen (paint) and beschmieren (smear), allow an argument alternation known as *locatum-subject alternation* (Levin 1993). In this case, there is a stative reading of the verb that refers to the target state of the action reading:

(19) a. (Eine Barriere aus) Stacheldraht sperre das Gelände ab.
    (A barrier of) barbed wire closed the area off
b. *(Eine Schicht aus) Farbe beschmiere die Wand.
    *(A coat of) paint smeared the wall

A result state reading of the base verb is surely a sufficient criterion for the existence of a deverbal result state nominalization. We may ask whether this condition is necessary too. Psychological verbs like erstaunen (astonish) and verblüffen (amaze), which are paradigmatic for giving rise to result state nominalizations, seem to be in accordance with the thesis in question, for they allow an appropriate stative reading:

(20) Ihr gestriges Verhalten erstaunt/verblüfft ihn immer noch.
    Her yesterday behavior astonished/surprised him still

Potential counterexamples are verbs like evakuieren (evacuate), which have no stative reading, although a result state interpretation seems possible:

(21) Die mehrwöchige Evakuierung des Küstengebiets
    The several weeks evacuation of the coastal area

Of course, *evacuate* has a target state passive but we have already seen in Section 2.1 that target state passives are not reliable for predicting result state nominalizations.

5 Implicit Creation Verbs and Result Nominalization

5.1 Resultative Adverbs and Result Objects

In his study of so-called “oriented” adverbs, Geuder (2000, Chap. 3) reports on a close connection between result objects and the interpretation of the type of adverbal modification exemplified in (22).
He points out that these *resultative adverbs*, in contrast to resultative adjectives, do not predicate of an overtly expressed object but of an *implicitly created object*. In (22a), it is the decoration that is beautiful, whereas in (22b), it is the load that is heavy. Notice that we just referred to the implicitly created objects by deverbal nouns, viz *decoration* and *load*, respectively. Geuder takes this as a general fact: Verbs that allow resultative adverb constructions should in principle also allow result object nominalizations (*ibd*, pp. 82f). The converse does not hold, as Geuder observes, because overt result objects usually block resultative adverbs, as in *bake a cake sweetly*.

Geuder regards (23a) as an example where the result nominalization is blocked despite of a possible modification by result adverbials.

For this seeming exception to the above rule, he offers the tentative explanation that the verb *brush* is denominal. There are two objections to this argument: Firstly, a result interpretation of *brushing* seems to be not totally unacceptable. Secondly, and more importantly, as far as results are at issue, one should focus on the resultative alternative (23b) instead of (23a). In German, the telic variant of the locative alternation is morphologically marked by *be*-prefixation, witness the German translation of (23) given in (24).

Whereas *Pinselfung* is acceptable as an event nominalization at most, one could accept *Bepinselfung*, like *Besprühung* and *Beschmierung*, as referring to result objects as well. Although somewhat unusual in colloquial German, these interpretations seem to be quite common in German officialese, of which (25) is an instructive example.

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Notice that the *with*-variant allows a telic and an atelic interpretation (ib), whereas the locative variant only has an atelic interpretation (ia).

(a) He sprayed paint onto the wall for an hour/*in an hour.
   b. He sprayed the wall with paint for an hour/*in an hour.

Notice also that there are German verbs with atelic *be*-variants, which nevertheless show the locative alternation pattern; examples are *werfen/bewerfen* (*throw*) and *schießen/beschießen* (*shoot*).

(ii) a. Er warf Schnee auf seine Freunde. (He threw snow at his friends.)
   b. Er bewarf seine Freunde mit Schnee. (He pelted his friends with snow.)

Notice that *Pinselfei* and *Gepinsel* allow a result interpretation too, although they are derived from *pinseln* and not from *bepinseln*:

(i) Betrachtet nur die Pinselfei/das Gepinsel an der Decke!

(The primary effect of *(e)rei*-suffixation or so-called combinatorial derivation by *Ge-(e)* is to generate iterative event reinterpretations; e.g. *Gehüpfe, Häuferei*.)
The pair Ladung/Beladung (load) obviously does not behave as expected. Without attempting a full explanation of this effect, let us note that, first, there is a telic reading of laden as in die Pistole laden, where Ladung indeed refers to the result object, and, second, although uncommon, there seems to be a result object interpretation of Beladung too. Other locative treatment verbs like abdecken (cover) and verpacken (wrap), which are prefix verbs but not be-verbs, also allow a result object modification by resultative adverbials:

(26) a. Sie haben den Innenhof mit Planen regendicht abgedeckt. They have the inner courtyard with planes rainproof covered  

b. Sie haben die Messinstrumente mit Ölpapier wasserdicht verpackt. They have the gauges with oil paper waterproof wrapped

(27) a. die regendichte Abdeckung des Innenhofs the rainproof cover of the inner courtyard  

b. die wasserdichte Verpackung der Messinstrumente the waterproof wrapping of the gauges

Our discussion has shown that the locative verbs are promising candidates for implicit creation verbs that give rise to result object interpretations. But notice that the class of locative verbs is not exhaustive in this respect. Implicit creation verbs like verletzen (injure) and beschädigen (damage) clearly belong to another semantic class. The result object is not created from other objects or some substance in this case. Nevertheless, these verbs apparently allow resultative adverbs to predicate of result objects:

(28) a. Der Dieb hat Peter lebensbedrohlich verletzt. The thief has Peter life-threateningly injured  

b. Peters lebensbedrohliche Verletzung wurde rechtzeitig behandelt. Peter’s life-threatening injury was in time treated

5.2 Implicit vs. Overt Creation Verbs

Concerning result nominalizations of overt verbs of creation, Bierwisch (1989, pp. 61f) observes the following “rather subtle, even elusive” distinction. Bierwisch argues that there are deverbal nouns like Produktion (production) whose referential argument can but need not be identified with the argument expressed by the grammatical object of the base verb. He claims that Produktion can show the referential pattern of Komposition (composition) as well as that of Vertonung (setting to music) “depending on factual aspects of the event in question.” Moreover, Bierwisch recognizes a similar switch of perspectives in the case of Eroberung (conquest) “depending on whether an occupied

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object is construed as different from the unoccupied one.” In order to take care of this variation he postulates an additional result argument in the lexical semantic form of the result noun, which, depending on conditions of “conceptual context”, can be identified with the “affected” object.

By the foregoing argument, however, the same can be said of the winner of a tournament, for instance, who could be construed as different from the one he was before he won. I take this view as untenable and therefore Bierwisch’s distinction as elusive indeed. A suitable semantic representation of result properties like being-occupied or having-won, i.e., being-the-winner is surely an issue. As remarked at the end of Section 2.3, maybe Kimian states are of use for this purpose. But introducing an additional result argument, as Bierwisch suggests, seems to be inadequate for that purpose. To give a final example of the phenomenon in question:

(29) a. Er hat tausend Euro gespendet.
    He has thousand Euro donated
b. Mit der Spende /dem gespendeten Geld kann vielen geholfen werden.
    With the donation /the donated money can many helped will be

Within discourse analysis, the anaphorical reference to thousand Euro by the donation in (29) is known as role bridging.12

6 Conclusion

Result nominalizations provide both, an interesting linguistic phenomenon on its own right and a touchstone for verbal semantics. The main purpose of the present paper was to analyze the phenomena and to critically examine approaches given in the literature. The next step is to develop a formal semantic framework that takes these insights into account.

References


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12Cf. e.g. Clark (1977).


Pragmatic Control of Specificity and Scope: Evidence from Dutch L1A*

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Abstract

In this paper I argue, on the basis of intuitional and psycholinguistic evidence, that a grammatical constraint on scope ambiguity found in Dutch and some other languages, but not in English, is a rule of pragmatic competence. After showing that this constraint cannot be derived from the obligatory specificity of indefinites in certain contexts, nor from core syntactic properties of Dutch that distinguish it from English, I present experimental evidence that the Dutch scope constraint is not fully acquired by Dutch monolingual speakers until after the age of 12. Given standard assumptions about L1A, this can only be the case if this constraint does not derive purely from UG. I propose a construction-based account of it and suggest that this is generated by the same general cognitive processes that are primarily responsible for adult L2A.

1 The Scope Constraint

In English, when a sentence is composed of an indefinite subject, a transitive verb, and a direct object QP headed by each or every, it is generally SCOPALLY AMBIGUOUS.1 For example, the sentence type illustrated in (1a) has both the SURFACE SCOPE (SS) reading paraphrased in (1b) and the INVERSE SCOPE (IS) reading roughly represented in (1c).

(1) a. A bird has eaten each/every blueberry. (ambiguous)
   b. ‘There is a bird who ate all the blueberries’ (SS reading)
   c. ‘Each blueberry was eaten by a bird’ (IS reading)

In Dutch, in contrast, sentences analogous to (1a) using elke or iedere as the universal quantifier generally do not allow the IS reading.2 For example, most adult native

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1 This term is intended here as a theory-neutral description of the logical ambiguity that is observed in sentences like (1a) and that can be described as the availability of two distinct sets of truth-conditions (“readings”), as represented by (1b) and (1c) in the case of (1a).

2 Although differing subtly in connotation, elke and iedere have the same primary truth-functional meaning, which seems to be closer to that of each than to that of every. Unlike each and every, elke and...
speakers of Dutch would find the sentences in (2) to be false if each blueberry were eaten by a different bird.³

(2) Een vogel heeft elke/iedere bosbes opgegeten. 
A bird has each blueberry up-eaten

These empirical claims about English and Dutch are based not only on native speaker intuitions but also on psycholinguistic evidence (for English, Kurtzman and MacDonald 1993; for Dutch, Regeling 1995). The descriptive generalization seems to be that Dutch has a general constraint on scopal ambiguity that English lacks. Moreover, Dutch is not unique in this regard. Rather, there appears to be a natural class of otherwise seemingly quite different and historically unrelated languages which all have the same, or a very similar, SCOPE CONSTRAINT. For example, two other languages known to be members of this family are Chinese (Huang 1982) and Japanese (Hoji 1985).

There are three basic ways in which the presence or absence of the scope constraint in a given language can receive a principled explanation consistent with the Innateness Hypothesis.⁴ One approach is to try to derive it from some more general interpretive constraint that can in turn be derived from Universal Grammar (UG). Alternatively, one might attempt to attribute the scope constraint directly to UG. Finally, we might try to derive the presence or absence of the scope constraint in a given language from an interaction between UG and UNIVERSAL COGNITION (UC). Here, the term “UC” refers to a hypothetical set of innately specified cognitive principles that are domain-neutral, i.e. that can in principle apply to language processing and language acquisition but that are not genetically pre-programmed to do so.⁵ In other terms, under this third approach

iedere can be used when the domain of quantification has been “widened” in the sense of Kadmon and Landman 1993), i.e. in contexts in which use of free-choice any would be obligatory in English (Philip 2002). Both elke and iedere can occur either as adverbs (“floated quantifiers”) or as determiners. In the default case, determiner elke and iedere can only form a constituent with a [+count] NP, just like each and every. However, when expressing the free choice meaning, they can compose with a [−count] NP. Finally, as determiners, but not as adverbs, elke and iedere must agree in noun-class with the NP they compose with: for example, [elk meisje]/*[elke meisje] but [elk jongen]/*[elk jongen] (Booij 2002).

³ Some native speakers find sentences like (2) slightly marginal when taken out of context. However, those that report this intuition do not find anything odd about sentences like Jan heeft elke/iedere bosbes opgegeten ‘John ate each blueberry’, which differ from (2) only in that the subject is definite rather than indefinite.

⁴ I take the Innateness Hypothesis simply to be the thesis that certain cognitive phenomena are genetically predetermined rather than learned. The validity of this general hypothesis does not entail the existence of UG. That is, one could be a nativist and yet, with perfect consistency, deny that the theory of UG is an accurate model of the acquisition of grammatical knowledge. Two independent cases of this are the L1A theories of Elman, Bates, Johnson, Karmiloff-Smith, Parisi and K. Plunkett (1996) and Tomasello (2004).

⁵ By the term “UG” I mean that hypothetical set of innately specified cognitive mechanisms and principles that apply only within the language faculty, i.e. that are specific to language processing and language acquisition. Note that this view—which is the Modularity Thesis—is not always adopted by theoretical linguists. For example, according to Chomsky (2004:104), certain elements of the language faculty “might be recruited from, or used for, other functions” (my underlining). As I use the terms, if an element of the language faculty is “recruited from” some other cognitive domain, then this element derives from UC rather than from UG. Moreover, if all the elements of the language faculty have some prior nonlinguistic cognitive function, then UG simply does not exist at all.
the scope constraint is attributed to PRAGMATIC COMPETENCE rather than to syntactic or semantic competence.

Let us first consider the approach which takes the scope principle to be an effect of some other, more general, UG-derived interpretive principle. Noting that all of the languages that have thus far been reported to have the scope constraint also have a SPECIFICITY CONSTRAINT, it might be hypothesized that the unavailability of the IS reading in sentences like (2) follows simply from the circumstance that an indefinite subject must be specific. The specificity constraint forces the subject to have an interpretation that is inconsistent with its being construed as having narrower scope than the universally quantified direct object. As for exactly how the specificity constraint should be derived from UG, there are a number of proposals in the literature (e.g. Reuland 1988, Enç1991, de Hoop 1992, Diesing 1992, Neeleman and Reinhart 1998, Van Geenhoven 1998, Portner and Yabushita 2001).

At first blush, the specificity-based account of the scope constraint looks promising. However, it faces at least four different major empirical problems. First, as is well-known, it is not really true that a specific indefinite must always have widest scope; in certain contexts it may alternatively have “intermediate scope”(e.g. Ruys 1992). Thus, to attain minimum descriptive adequacy, we must add the qualification that the Dutch specificity constraint holds in such a way that in a root clause a specific indefinite subject cannot take scope under any other scope-taking expression. But now the problem is that as long as this qualification itself receives no principled explanation, the entire analysis reduces to a construction-based account of the scope constraint. If we must stipulate that the sentence type in (2) triggers the specificity constraint, and this in turn gives rise to the scope constraint, then it seems we might as well simply stipulate that (2) directly triggers the scope constraint. Other things being equal, Occam’s Razor demands this simplification.

The second problem is that the scope constraint actually does seem to apply in English with sentences like (3a), and does not seem to apply in Dutch with sentences like (3b).

(3) a. *Santa Claus gave a child each toy.* (unambiguous/only SS)
    b. *Een koning ging op elke/iedere schildpad zitten.* (ambiguous)
       ‘A king sat on every turtle.”

Despite the strong pragmatic bias in favor of an IS reading, (3a) has only an SS reading; it is false if each toy was given to a different child. On the other hand, Dutch (3b) is just as scopally ambiguous as English (1a). It is not the case that for (3b) to be true the king in question must be someone like the turtle king in the Doctor Suess story *Yertle the Turtle*. Rather, this sentence can also be true if a different king sat on each turtle.

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6 Note in this regard that an English sentence like *A certain boy must sing each song*, which has a subject that must be specific in some sense, is nonetheless scopally ambiguous. I do not perceive any intuitional difference between this case of a specific indefinite DP being in the scope of a QP headed by *each* and cases such as *Every author in this room despises every publisher who would not publish a book that was deemed pornographic* (where a book can be taken as narrower in scope than *every author*).
The third and most problematic empirical difficulty for a specificity-based account of the scope constraint is that there is considerable individual variation across native speakers of Dutch as to whether or not a sentence-initial indefinite subject can have a nonspecific reading. For many it is always in principle possible for a high indefinite subject to be nonspecific as long as the verb is transitive (e.g. Reuland 1988). For these Dutch speakers, for example, (4a) can have a meaning comparable to (4b); it does not have to mean (4c).

(4) a. Een vogel moet die bosbes opgegeten hebben.
   a bird must that blueberry up-eaten have
   b. ‘It is very likely that that blueberry was eaten by some bird or other.’
   c. ‘There is a certain bird in have in mind who very likely ate that blueberry.’

If the hypothesized specificity constraint need not apply in the case of (4a), it is hard to see why it should have to apply in the case of (3). Of course, we could add the qualification that the specificity constraint only applies to sentences that have both a sentence-initial indefinite subject and a universal quantified object. However, now our analysis simply reduces, once again, to a description of a construction. There is no need to make reference to specificity; it does no work for us.

Finally, the fourth empirical problem for any specificity-based account of the Dutch scope constraint is that at an age when monolingual Dutch children have fully acquired adult-like performance with specific indefinite subjects in sentence initial position they seem to have very little knowledge of the scope constraint (Philip and Termeer 2003, cf. Krämer 2000). That is, they readily assign an English-like IS reading to sentences like (2) under certain experimental conditions. In this regard, incidentally, they behave exactly like monolingual Chinese children of approximately the same age (Lee 1986, Chien 1994).

The second general approach to the scope constraint attempts to derive it directly from properties of UG, i.e. from the interaction of certain UG principles with the specific settings of certain UG parameters. As a representative of this approach, let us consider the syntactic proposal of Aoun and Li (1993), which offers an account of why a Chinese sentence like (5a) lacks the IS reading while its English analog in (5b) is scopally ambiguous.7

(5) a. Y zh zh shu~ l me tiāo chuán.  (unambiguous/only SS)
   a/one Cl pig paint Asp each Cl boat
   b. A piglet painted each boat.  (ambiguous)

7 Actually, Aoun and Li (1993) offer three distinct syntactic proposals and, although I have generously interpreted their theory to be about the absence of scopal ambiguity in sentences like (5a), in fact they discuss this sentence type only twice in the entire monograph. Most of the time they exemplify the Chinese scope constraint with native speaker intuitions about Chinese sentences analogous to Every pig painted a boat. This is extremely curious since it is impossible to observe scopal ambiguity with such sentences. Given that most of their Chinese examples contained the adverb dou ‘each’, which seems to be a distributivity operator (Lin 1998), it may be that Aoun and Li were systematically confusing obligatory distributivity with an obligatory SS reading. Since distributivity cannot possibly be reduced to scope relations (e.g. Roberts 1989), the value of their theory lies in its ability to explain the cross-linguistic contrast in (5).
There are three severe empirical problems for this proposal, two of which come from Dutch. Although in principle each of these problems could be dealt with by means of an additional stipulation (or an alternative set of basic syntactic assumptions), collectively they cast considerable doubt on the entire approach.

The first problem is that Dutch sentences like (2) are falsely predicted to be just as scopally ambiguous as English sentences like (1a). This is because according to Aoun and Li the crucial syntactic factor determining the Chinese/English contrast in (5) is whether or not the subject may be spelled out in a VP-internal position. In English, the subject must be removed from the VP and this is why English has scopal ambiguity. In Chinese, the subject may remain VP-internal in the surface form and this is why Chinese lacks scopal ambiguity. Obviously, this analysis cannot possibly extend to Dutch, since the subject in Dutch surface forms like (2) must be just as VP-external as the subject in English surface forms like (1a).

The second empirical problem arises from English minimal pairs like (6). While (6a) is scopally ambiguous, (6b) is just as unambiguous as a Chinese sentence like (5a) or a Dutch sentence like (2) above.

(6) a. A bird has eaten each blueberry. (ambiguous)
   b. A bird has eaten all the blueberries. (unambiguous/only SS)

This suggests that the presence/absence of scopal ambiguity is dependent on some internal syntactic or semantic property of the direct object QP. Either it is a lexical property of all or a semantic or syntactic property of all the blueberries that directly triggers the scope constraint in (6b), or perhaps it is a lexical property that each and every have and the all lacks which licenses scopal ambiguity in (6a). Whatever the correct analysis may be, Aoun and Li’s proposal cannot explain minimal pairs like (6) without some additional stipulation.

The third empirical problem for Aoun and Li’s proposal, which is also problematic for a specificity-based approach, is the observation that not all sentences of the type illustrated in (2) lack scopal ambiguity. As van de Wijngaerd (1992) has noted, there also are sentences like (7) which are just as scopally ambiguous as their English analog.

(7) a. I have eaten each blueberry. (ambiguous)
   b. I have eaten all the blueberries. (unambiguous/only SS)

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8 In addition, it offers no account of the scopal ambiguity observed with Dutch sentences like (3b), though it does explain why the scope constraint applies to English sentences like (3a).

9 Below I suggest that it is a lexical feature present in each and every and absent from all that is crucial for licensing the IS reading. Note, however, that the basic cross-linguistic contrast represented by (1a) and (2) cannot simply be reduced to the presence/absence of some lexical feature. This is because Dutch elke and iedere also must have this feature, given that scopal ambiguity is observed in (3b) above and (7) below.

10 It is hard to see the ambiguity here because it is hard to imagine how the SS reading could ever be true. As we will see, this is precisely why the IS reading is licensed. However, (7) could in principle be true under an SS reading. Imagine a different world in which some very important religious figure was martyred on a weathervane, thereby transforming it into a holy relic, and, after years of bloody religious wars for possession of the “Holy Cock”, it was finally agreement that the different churches of the land would take turns having possession of it for limited periods of time.
A Pragmatic Account of the Scope Constraint

In the previous section we examined two purely UG-based theories of the scope constraint and found them both to have severe empirical problems. Of course, this does not show that no UG-based theory can possibly work. However, I hope I have at least persuaded the reader that it is worth considering whether there might be some alternative way to go that would offer us a slightly less bumpy ride. In this section I will attempt to outline such an alternative.

The starting point of my proposal is the idea that the scope constraint is actually nothing more than what it seems to be, namely a construction-based interpretive rule. Precisely because it is construction-based, it cannot possibly derive entirely from UG. Rather, it is hypothesized that this rule arises in the grammatical competence of native speakers of languages like Dutch and Chinese as the result of an interaction of UG with a general pragmatic principle that derives (ultimately) from UC. UG contributes the linguistic primitives used to define the construction in question, and presumably establishes the syntactic prerequisites for the existence of such a construction. (Perhaps the existence in Dutch of both a “high” and a “low” subject position is such a prerequisite.) However, it is a general pragmatic principle that creates the actual interpretive rule that is triggered by this construction. In the remainder of this section I will focus exclusively on an account of the Dutch scope constraint, leaving to future research an extension of the proposal to constraints on scopal ambiguity observed in Chinese, Japanese, in English with sentences like (3a), or in any other languages.

Note that the background assumption here is that UC is capable of getting involved in the business of processing and acquiring language but that, when it tries to do this, it performs in a very clumsy and inefficient manner, i.e. it posits constructions (cf. Tomasello 2004). The idea the UC can mimic the work of UG in this fashion is not at all new. On the contrary, there is a well-established school of thought in L2A theory which maintains that (i) the Critical Period Hypothesis is valid and that therefore (ii) most of adult L2A must be driven by UC rather than UG (e.g. Clahsen & Muysken 1989, Bley-Vromann 1990, Neeleman & Weerman 1997).

What I propose for Dutch, then, is that there is a construction-based interpretive rule whose structural condition is represented in (8a) and whose semantic condition and function is represented by the conditional in (8b).

(8) a. \[DP[+TOPIC]...[QP[+TOPIC] V]VP...]\]CP

b. If a sentence instantiating the construction in (8a) has scalar truth conditions because of the logically possible scopal interaction of DP and QP, then assign it the strongest possible reading consistent with the context of use

Note that I am not adopting Tomasello’s view that all of adult grammatical knowledge consists in nothing more than a set of constructions. This is a good description of the kind of linguistic knowledge that the adult L2 learner typically acquires, but precisely for this reason it is a poor description of the kind of grammatical knowledge that the child L1 learner acquires.
In addition, I assume that UG supplies the substantive universal described in (9a), the Dutch-specific interpretive rule described in (9b), and the universal interpretive principle described in (9c).

(9) a. *Elke* and *iedere* carry a lexical feature that causes the phrases they head to be obligatorily lexically marked [+TOPIC].
b. In Dutch, a sentence-initial DP is obligatorily syntactically marked [+TOPIC]
c. If a DP is lexically, morphologically, or syntactically marked [+TOPIC], then, (i) it can denote a subset of the objects that make up the “discourse topic” or “protagonist set” and (ii) it can take scope over any clause-mate scope-taking expressions.

For concreteness, I am treating the feature [+TOPIC] as a primitive. Note also that the construction in (8a) includes information as to the internal constituency of the VP (abstracting away from the hypothetical VP-internal trace of the subject). The extension of this construction is the set of all transitive sentences whose direct object is a QP headed by *elke* or *iedere* and whose subject occupies Spec CP position.

To see how the proposal captures the Dutch facts, consider again the sentences in (2). For convenience, one of these is repeated in (10a), with its SS and IS readings represented in (10b) and (10c), respectively.

(10)a. *Een vogel heeft elke bosbes opgegeten.*

b. ‘There is a bird who ate all the blueberries’ (SS reading)
c. ‘Each blueberry was eaten by a bird’ (IS reading)

The kind of situations which would make (10a) true under the SS reading in (10b) may be represented roughly by the schema in (11a), where each BB stands for a different blueberry and the lines represent eating (and where 3 stands in for more than 1). On the other hand, the set of situations that would make (10a) true under the IS reading in (10c) is the union of situations of the type represented by (11b) with situations of the type represented by (11a).

(11) a.  

   bird  

   BB₁ BB₂ BB₃

b.  

   bird₁ bird₂ bird₃

   BB₁ BB₂ BB₃

Clearly, the truth conditions of (10a) are scalar. The IS reading defines a weaker meaning that includes the meaning of the SS reading and that therefore is easier to verify. The SS reading defines a stronger meaning that is easier to falsify. Since (10a) satisfies the structural description in (8a) and verifies the antecedent of the conditional in (8b), the consequence in (8b) follows, i.e. the IS reading is suppressed. This is how the proposal captures the basic observation that Dutch sentences like (10a) are generally not scopally ambiguous. As for the cross-linguistic contrast with English, sentences like (1a) are scopally ambiguous simply because (i) English has no construction-based interpretive rule like (8a-b) but (ii) *each* and *every* have the [+TOPIC] feature so the UG principle described in (9c) applies.
As for cases like (7) where the IS reading is available, here the proposal once again makes a correct prediction because the SS reading is not consistent with the discourse context. There does not seem to be any possible situation consistent with the actual world that would verify it (but see footnote 10). Thus, since it is the only reading available, the IS reading is selected by (8b) as the strongest reading.

The proposal also straightforwardly captures the observation that Dutch sentences like (3b) are just as scopally ambiguous as (1a). This is correctly predicted simply because such sentences do not instantiate the construction described in (8a). Consequently, the interpretive rule in (8b) cannot apply and instead the UG-derived principle in (9c) applies. Here an additional assumption is that, if a sentence has two DPs marked [+TOPIC] either one can have scope over the other (and, of course, both can be subsets of the set of objects that the discourse is about).

3 Implications for Language Acquisition

As mentioned above, an integral part of the proposal is the claim that the scope constraint does not derive purely from UG but rather from an interaction between UG and UC. More specifically, it is hypothesized that this construction-based interpretive rule is engendered by a general pragmatic principle which, following Levinson (1983:145-6), we might call the PRINCIPLE OF INFORMEDNESS. This principle maximizes the informativeness of sentences by maximizing their falsifiability. Another instance of it, I suggest, is the principle described by the Strongest Meaning Hypothesis of Dalrymple, Kanazawa, Mchombo and Peters (1995). These authors show how the scalar truth conditions of reciprocal sentences are regulated by a principle that always assigns the strongest meaning that is not necessarily false, given the restrictions of the context. This is very similar to what (8b) does.

Now, given that my pragmatic proposal makes the claim that the scope constraint does not derive from UG, the L1 acquisition of this constraint can shed some light on the validity of this proposal. If it were found that children acquiring Dutch as a native language did not attain adult-like mastery of the scope constraint until a very late age, this would constitute evidence in support of any pragmatic account simply because it would cast doubt on all purely UG-based accounts. Recall that the reason why the existence of UG was posited in the first place—and the reason why evolutionary forces would have produced it, it seem to me—is that it is supposed to function as a LAD for the child. Not only does this make L1A possible, it makes L1A incredibly fast and early, and moreover guarantees virtually universal success (about 97%) at acquiring an L1. Nowadays most acquisitionists agree that by the age of 4, if not much much earlier, all of the major syntactic, morphological, and phonological parameters are set to the right value for the adult grammar and UG has essentially finished its work as an LAD for the L1.

In the experiment reported in the next section, we will indirectly test the pragmatic account of the Dutch scope constraint that I am proposing by directly testing a basic prediction of all UG-based counter-proposals. Assuming the validity of the Strong Continuity Hypothesis, this all UG-based counter-proposals predict that the Dutch scope

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12 This is the widely accepted hypothesis that all of UG is available to the child learner from the onset of L1A, i.e. from birth or earlier.
constraint will be fully acquired very early, like everything else that derives from UG. To be extra conservative, let us say that we will only consider this prediction falsified if the scope constraint is not mastered by the age of 8 years. This is the age that is often taken as the upper bound of the Critical Period (e.g. Long 1990).

4 Experimental Evidence from Dutch L1 Acquisition

The experiment used a standard truth-value judgment paradigm with a puppet making statements about a picture story and had a between-subjects design in which chronological age was the independent variable. The five levels of this factor were: six-year-olds, seven-year-olds, nine-year-olds, twelve-year-olds, and adults. Each participant was presented the test sentence only once. This occurred at the end of the story shown in Figures 1, 2 and 3 in the appendix. This story was presented after instructions and a warm-up story. The test sentence, which was the Dutch sentence shown in (2) above, was presented after two control sentences, labeled PD and PA, which occurred right after the 5th scene (see Figure 2). The PD and PA control sentences were designed to control for problems with attention or mastery of the experimental task (e.g. the yes-response bias). In addition, they satisfied the so-called felicity conditions of “plausible dissent” (PD) and “plausible assent” (PA) of Crain, Thornton, Boster, Conway, Lillo-Martin, and Woodams (1996). Elements of the 7th and 8th scenes provided additional conformity to these allegedly important methodological principles. Note that the PD control sentence was identical to the test sentence. This could have introduced a slight bias in favor of an adult-grammatical judgement of falsity.

The procedure for the six-and seven-year-old children involved two experimenters. One (the story-teller) sat at a table with the child and told the story, showing the child the pictures as she did so. The other experimenter (the puppet) sat opposite the child and the story-teller and purportedly tried to listen carefully to the story. Throughout the entire experiment the puppet was never allowed to see the pictures. The child was told that the puppet, whose name was “Drakkie”, would sometimes have to say something that was true about the story. When this happened, the child was told, it was her job to judge the accuracy of the puppet’s statement, indicating her judgement by saying “That’s right” or “That’s wrong”. (No reward/punishment procedure was used.) The experiment was carried out in a quiet area of the school that the child was attending. The two experimenters were Dutch native speakers trained in L1A research methodology. The child’s responses were recorded by hand on an answer sheet by the experimenter manipulating the puppet. Normal prosody was used at all times, with special care taken never to stress the indefinite article of the subject. The story was read only one time and the puppet repeated his statements only once if the child failed to respond immediately (which virtually never happen). For the older children and the adults, a similar procedure was used except that only one experimenter conducted the experiment, presenting the control and test sentences as yes/no comprehension questions about the story (i.e. felicitous as quiz questions).

142 monolingual Dutch children between the ages of 5;7 and 14;11 participated in the study, as well as 40 adults between the ages of 18 and 79. The numbers and mean ages of each age group are shown in Table 1 in the appendix, together with the results.
5 Conclusion

As can be gleaned from Table 1 below, the principal experimental finding is that, for all age groups, a great many of the child participants did not obey the Dutch scope constraint. Even with the oldest children, performance was very poor; the group performance of the twelve-year-olds did not differ significantly from that of the six-year-olds but did differ significantly from that of the adults (p ≠ 0.0518). Could these experimental findings be an artifact of the notorious yes-response bias? That seems highly unlikely in view of the fact that most of the participants had no difficulty whatsoever correctly judging the PD control sentence to be false. Moreover, the nine-year-olds and twelve-year-olds seem much too old for a yes-response bias to affect their performance significantly. They also seem much too old for their poor performance to be attributed to some hypothetical cognitive limitation. In particular, given the simplicity of the story and the ages of the older children, it is hard to see how the general lack of success in acquiring the scope constraint could be blamed on “poor discourse integration skills” (Kramer 2000). Thus, we seem to be driven to the conclusion that complete acquisition of the Dutch scope constraint is incredibly delayed and gradual. In this regard it is interesting to note that complete L1A of the strongest meaning principle of Dalrymple et al. (1995) is also extremely delayed (Philip 2000).

A second noteworthy finding of the study is that as many as 15% of the adult native speaker participants failed to obey the scope constraint. This suggests either that there is significant dialectal or ideolectal variation as to the existence of the scope constraint in a Dutch native speaker’s grammatical competence, or that it is more of a preference than a rule. In either case, this is not what one would expect of an operation or principle that derives from UG. Rather, it is what one would expect of a rule of pragmatic competence (cf. conversational implicatures).

In conclusion, both experimental findings strongly suggest that the Dutch scope constraint does not derive purely from UG but rather is a part of pragmatic competence. This piece of native speaker grammatical knowledge seems to be acquired by the same inefficient language learning mechanisms that are typically employed by adults in their struggle to acquire an L2. This would explain why not all Dutch native speakers succeed in acquiring the scope constraint. Finally, given that its acquisition not guaranteed, it would not be surprising to find that there is dialectal or ideolectal variation within Dutch as to existence of the scope constraint.

References


Appendix

This story is about 3 birds who were friends. One was big and fat because he always ate too much. One was thin because he never ate enough. And the last was small, because he was young.

One day the 3 birds were sitting on a fence enjoying the sun when all of a sudden the small one pointed to the ground and said, "Hey Look! Strawberries and blueberries!"

Immediately the big bird flew down and gobbled up both of the strawberries.

Figure 1. 1st through 3rd scenes.
Then he also ate up one of the blueberries. "Not fair!" cried the small bird. "Don't eat up all the blueberries too. Leave some for us."

The small bird flew down and the big fat bird said, "Sorry. I thought nobody wanted them." Okay Drakie, tell us something that happened.

(Puppet) *Een vogel heeft elke bosbes opgegeten.* (PD control sentence)
'A bird has eaten each blueberry.'

(Puppet) *Een vogel heeft elke aardbei opgegeten.* (PA control sentence)
'A bird has eaten each strawberry.'

Then the small bird ate up one of the blueberries and he called to the thin bird "Hey. This last one is for you."

Figure 2. 4th through 6th scenes, including the PD and PA control sentences.
"No thanks," said the thin bird. "You have it." [more PD satisfaction] But the small bird said, "No. It's for you. It's really delicious. Come on. Try it."

"Well, all right," said the thin bird and he flew down from the fence and ate the last blueberry. [more PA satisfaction] Okay Drakie, tell us something that happened.

(Drakie)  *Een vogel heeft elke bosbes opgegeten.*  (Test)

'A bird has eaten each blueberry'

Figure 3. 7th and 8th scenes. Test sentence presented only one time per subject.

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FORMAL HERMENEUTICS BASED ON FREGE DUALITY

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Abstract

We outline a sheaf-theoretical framework for the discourse interpretation theory called formal hermeneutics in our previous works (1997, 2001, 2002, 2003, 2004). This approach will provide a common categorical paradigm to generalize the classic Frege’s compositionality and contextuality principles at each semantic level (text, sentence, word). So revised, these principles are reconciled in a natural dual equivalence between two key categories, called Frege duality, that gives rise to some important functional representations of fragmentary meanings. As its application, we develop an inductive meaning theory formalizing the creative process of text understanding. Based on Frege duality, our formal hermeneutics intends to reveal the mathematical structures that underlie the natural language understanding process.

1 Introduction

In recent years, the discourse interpretation has become a field of intensive investigations in logic, linguistics and the philosophy of language. Despite the great progress in this area, the central problem about the key theoretical structures the discourse interpretation theory should be based upon remains still unsettled. The object of this work is to give an outline of some theory of discourse interpretation named as formal hermeneutics and intended to reveal the existence of sheaf-theoretical structures that underlie the process of discourse or text understanding. So the term formal hermeneutics does not mean hermeneutics of any formal system but concerns with the application of formal mathematical methods to analysis of natural language understanding.

We consider some unspecified Indo-European language as a means of communication. This article is mainly concerned with a written type of linguistic communication and so its basic units are texts. All the texts are supposed to be written with good grace and intended for a human understanding; we call them admissible.

The classic approaches to semantics of natural language are based on the implicit premise that any language is nothing more than the set of all its correct sentences (and yet only of all its propositions, i. e. the sentences having truth-value). These approaches are very restrictive and yet inadequate to everyday human practice of language communication. When a person wants to express his thoughts to somebody, he needs to utter some discourse or to write some text, and to understand this data is quite another thing than to understand the set of all sentences it was made up. This is why the semantics of natural language should be defined as a discipline studying the discourse and text understanding. Since antiquity, there exists a concept of discourse interpretation that goes back to Greek mythology. Derived from the Greek verb hermeneuein, the term hermeneutics was firstly used in the 17th century to mean scriptural exegesis. The Protestant Reformation had a
need in the interpretation of Scripture based on the self-sufficiency of the holy text. With the plurality of possible interpretation, it results in a requirement to establish the principles of correct interpretation. As the theory of textual interpretation, hermeneutics began as biblical exegesis and was closely related to philology. The domain of hermeneutics was widely extended in the works of Protestant theologian Friedrich Schleiermacher who created a general hermeneutics as a theory of interpretation applicable not only to religious texts but also to a great variety of secular ones. Schleiermacher stressed the importance of the hermeneutic circle principle according to which the part is understood in terms of the whole and the whole is understood in terms of its constitutive parts. Following Schleiermacher, this part-whole structure is principal in matter of texts interpretation. It is a kind of compositionality that is meant implicitly to hold at the level of text. So, the theoretical principle of hermeneutic circle is a precursor to these of compositionality and contextuality formulated later in 19th century.

In any way, the usual semantics at the level of sentence is based on the implicit use of compositionality principle according to which the meaning of the whole sentence is a function of the meanings of its constitutive parts. So the hermeneutics may be defined as semantics at the level of text which covers a usual semantics at the level of sentence. It is a reason to call formal hermeneutics the sheaf-theoretical discourse interpretation theory which provides a mathematical account of the text understanding process while rejecting the attempt to codify interpretative practice as a kind of calculus.

2 Basic Concepts

This chapter will describe the basic concept and the basic constructions which are relevant to the mathematical structures that underlie the natural language understanding process. First of all, we need to define rigorously what is a text in our formalism. Clearly any text is not just a set of its sentences as the sentence is not a set of its words. Important is the order they ought to be read. In addition, the same words may occur in several places of one sentence and the same sentences may occur in several places of one and the same text. So from a mathematical point of view, we ought to consider a given sentence as a sequence of its words and a given text as a sequence of its sentences. Likewise any part of a considered text is simply a subsequence of a given sequence. Any mathematical structure at a given semantic level (text, sentence, word) is to be defined on the functional graph of the corresponding sequence. Henceforth, we shall simply identify a given text with the graph of its corresponding sequence.

2.1 Sense, Meaning and Reference

We distinguish the semantic notions of sense, meaning and reference considered to be the basic ones and instead of analysis of these notions in terms of more basic concepts, we seek for key mathematical structures that underlie the process of text understanding. This triad of concepts formalize a certain distinction that seems to appear in various forms all over the history of language studies. To avoid the possible misunderstanding from the very beginning, we would like to precise our acceptance of these key terms and to point out that our distinction sense/meaning differs from a classic Frege’s Sinn/Bedeutung dis-
tinction, whereas we accept *reference* to be an English translation of Frege’s *Bedeutung*. Our aim is not to propose some competitive alternative to Frege’s *Sinn*/*Bedeutung* distinction but to find some adequate semantic concepts pertinent as instruments for rigorous formal analysis of text interpretation process. However, one can find our distinction *sense*/*meaning* in the different usage of the word *Sinn* in early Frege’s writings before he had formalized *Sinn*/*Bedeutung* distinction in his classic work of 1892.

We consider the meaning as being composed in the interpretative process, where the understanding of a text is not postponed until the end of a text but is present at all semantic levels during the reading process. So the text should have the meaningful parts and the meanings of these parts should determine the meaning of the whole text as it’s claimed by the principle of *hermeneutic circle*. We accept the term *fragmentary meaning* of some fragment of a given text to be the content grasped when the reader has understood this fragment in some particular situation of reading, which depends on personality of reader, situation of reading, presuppositions and prejudices summed up in the reader’s attitude, that we call by the term *sense* (or *mode of reading*); this *sense* is a kind of semantic orientation in the interpretative process that relates to the totality of text or its fragment, sentence or its syntagma, and involves the reader’s subjective premises that what is to be understood constitutes a meaningful whole. At the level of text, it may be historical, moral, allegorical, psychoanalytical, etc. At the level of sentence, it may be literal or metaphoric. At the level of word, it may be literal or figurative. So our acceptance of the term *sense* as a mode of reading is near to that posed in the exegetic concept of the four senses of Sacred Scripture.

2.2 Semantic Topology

For the understanding is not postponed until the final word of the final sentence of a given text, the meaning is not at the end of a story but traverses it. So the text should have the meaningful parts and the meanings of these parts determine the meaning of the whole as it is postulated by the principle of *hermeneutic circle*. Any semantic theory tries to explain how these local understandings of the constitutive meaningful parts produce the global understanding of the whole text. The philological investigations are abound in examples of the meaningful fragments cited from the studied texts. It is clear that not all the subsets of a given text are meaningful. Contrary, any meaningful fragment became understood in the process of reading. But the reading of text as well as the utterance of discourse is always a process that develops in time, and so it inherits in some way its order structure. From a linguistic point of view, this order structure is known as a notion of *linearity* or that of *words order*. In fact, it is a natural linear order ≤ of sentences the text bears on. It is well-known that any order structure carries several standard topological structures as for example classical *interval topology* generalizing *Euclidean topology* on the real line or other topologies like *upper topologies*, the *Scott topology* or the *Alexandroff topology* (Erné 1991). But it’s not a question to graft some topology onto a given text but to observe that any admissible text has an underlying topological structure which arises quite naturally. It seems to be in agreement with our linguistic intuition that

1. *an arbitrary union of meaningful parts of an admissible text is meaningful*;
2. *non-empty intersection of two meaningful parts of an admissible text is meaningful*. 

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For an admissible text is supposed to be meaningful by definition, it remains only to define the meaning of the empty part of a given text in order to provide it with a topology, where the open sets are all the meaningful parts. Given an admissible text \( X \), let the meaning of its empty part \( \emptyset \) to be a one-element set \( \text{pt} \) (e.g. the meaning of the title of \( X \) if there is). It shows that this kind of semantic topology may be defined so on an arbitrary admissible text (Proxorov 2004, sec. 1.2). A text can be treated as a written speech and so their distinctive feature is a temporality, implicit for the former and explicit for the latter. The natural temporality of phonetic phenomena is a reason to call this semantic topology phonocentric.

In (Proxorov 2002, chap. 3), we have defined a phonocentric topology at the level of text by specifying in a constructive manner the basis of topology at each sentence \( x \in X \) to be the class of intervals \( \{ l : e \leq l \leq x \} \), where \( e \) is the first sentence of the paragraph that contains \( x \) or the first one in any paragraph which precedes that containing \( x \). In this approach, the opens of a topological base are defined by means of explicit semantic markers the text is endowed with. This definition allows to take into consideration the anaphora and theme/rheme semantic relations. As any constructive definition, it has some advantage of being concrete, but not all semantic relations can be formally recovered by means of explicit text division into paragraph, section, chapter, etc. However this definition covers the majority of examples of meaningful fragments cited in the philological investigation. An uttered discourse has many other expressive means such as stress patterns, intonation patterns, rhythm and pause, which disappear in a written text. Moreover, that constructive definition disregards the influence of the author’s vocabulary choice produced on the reader’s understanding process. So that definition may be considered as a first approximation to a more fine topological structure the arbitrary admissible text should bears on. Here we will follow our approach of (Proxorov 2004) to define a phonocentric topology in a general axiomatic setting.

Recall that a topological space \( X \) is an \( A \)-space (or Alexandroff space) if the set \( \mathcal{O}(X) \) of all its open sets is closed under arbitrary intersections. For admissible text being finite, it defines a finite space and thus it is an \( A \)-space. As we have mentioned above, not all the subsets of an admissible text are meaningful, and hence the semantic topology is not discrete. On the other hand, there are certainly the proper meaningful parts in an admissible text, hence the semantic topology is not coarse. Moreover, a natural style of text writing should respect good order and arrangement, as each part ought to fall into its right place; the natural process of reading (from right to left and from top to bottom) supposes that understanding of any sentence \( x \) of the text \( X \) should be achieved on the base of its part already read, because the interpretation cannot be postponed, although it may be made more precise and corrected in further reading and rereading. This is a fundamental feature of a competent reader’s linguistic behavior. Following F. Rastier

\[
\text{Alors que le régime herméneutique des langages formels est celui du suspens, car leur interprétation peut se déployer après le calcul, les textes ne connaissent jamais le suspens de l’interprétation. Elle est compulsive et incoercible. Par exemple, les mots inconnus, les noms propres, voire les non-mots sont interprétés, validement ou non, peu importe. (Rastier 1995, pp. 165-166)}
\]

Thus for every pair of distinct sentences \( x, y \) of an admissible text \( X \), there exists an open (i.e. meaningful) part of \( X \) that contains one of them (to be read first) and does
not contain the other. Hence the admissible text endowed with the phonocentric topology should satisfy the separation axiom $T_0$ of Kolmogoroff and so it is a $T_0$-space.

Let $X$ be an admissible text. For a sentence $x \in X$, we define $U_x$ to be the intersection of all the meaningful parts that contain $x$. In other words, for a given sentence $x$, the part $U_x$ is a minimal open neighborhood of $x$.

It is clear that $x \in U_y$ if and only if $y \in \text{cl}(\{x\})$, where $\text{cl}(\{x\})$ denotes the closure of the one-element set $\{x\}$. This relation “$x$ is contained in all open sets that contain $y$” is usually called a specialization, and some authors denote it as $x \leq y$ or $y \leq x$ (e.g. Ernè 1991, p. 59) contrary to others who denote it as $x \leq y$ or $y \leq x$ (e.g. May 2003, p. 2). As for the notation choice, we follow rather May to define a relation $\preceq$ on the text $X$ by setting $x \preceq y$ if and only if $x \in U_y$ or, equivalently, $U_x \subseteq U_y$. Note that in this notation, for all $x, y \in X$, $x \preceq y$ implies that $x \leq y$, where $\leq$ define the usual order of sentences reading.

The following properties of phonocentric topology and its close relation with partial order structure are the simple translation to linguistic situation of the well-known results for the finite topological spaces.

**Lemma 1.** The set of all open sets of the kind $U_x$ is a basis of phonocentric topology for $X$. Moreover, it is the unique minimal basis of phonocentric topology for $X$.

**Proof.** Clearly, for each $x \in U \in \mathcal{O}(X)$, indeed $x \in U_x \subset U$. If $B$ is another basis, then there is a $B \in B$ such that $x \in B \subset U_x$. Hence $B = U_x$, so that $U_x \in B$ for all $x \in X$.

**Lemma 2.** The relation $\preceq$ is a partial order on $X$.

**Proof.** The relation $\preceq$ is clearly reflexive and transitive. It is also antisymmetric, because $x \preceq y$ and $y \preceq x$ means $U_x = U_y$; for $X$ being $T_0$-space, it implies that $x = y$.

**Proposition.** For an admissible text $X$, the phonocentric topology on it defines a partial order structure $\preceq$ on it; the topology can be reconstructed from this partial order in a unique way.

This is a linguistic variant of a well-known general theorem concerning the relationships between topological and order-theoretical structures on a finite set (Ernè 1991, May 2003). Given a partial order $\preceq$ on a finite set $X$, one defines where a $T_0$-topology by means of the basis constituted of all sets $\{l : l \preceq x\}$. The given order structure is reconstructed from this topology by means of specialization.

All these considerations might be repeated with a slight modifications in order to define a phonocentric topology at each semantic level of a given admissible text. At each level (text, sentence, word), we distinguish its primitive elements which are the points of corresponding topological space considered to be the whole at this level. The passage from one semantic level to another immediately superior consists in gluing of the whole space into a point of the higher level space. In the following, we consider mainly a phonocentric topology at the level of text. The open sets of a phonocentric topology on $X$ will be further referred to as fragments of $X$.

As soon as we have defined a phonocentric topology, we may seek to interpret some linguistic notion in the topological terms and then to study it by the topological means.
Take for example a well-known property of a literary work to be the communicative unity of meaning. So for any two novels \( X \) and \( Y \) yet of the same kind, say historical, detective or biographical, their concatenation \( Z \) under one and the same cover does not constitute a new one. What does it mean, topologically speaking? We see that for any \( x \in X \) there exists an open neighborhood \( U \) of \( x \) that does not meet \( Y \), and for any \( y \in Y \) there exists an open neighborhood \( V \) of \( y \) that does not meet \( X \). Thus \( Z = X \sqcup Y \), that is \( Z \) a disjoint union of two non-empty open subsets \( X \) and \( Y \). Recall that a space \( X \) is said to be connected if it is not the disjoint union of two non-empty open subsets. It is clear that each minimal basic open set \( U_x \) is connected.

3 Compositionality

Understanding of some fragment carries no claim of correspondence to reality but is grounded in the conviction that its meaning may be discussed with anybody in some dialogue where it may be finally shared or may be compared with any other one of the same fragment. Following Gadamer, the understanding is based not only on the shared language but principally on the shared experience as a common life-world. This understanding as a presumed agreement on 'what this fragment wants to say' (that is on its communicative content) becomes for the reader its meaning. So the reading process involves the historicity of reader and the historicity of text, whence the multiplicity of meanings for any meaningful fragment.

Let \( X \) be an admissible text, and let \( \mathcal{F} \) be an adopted sense or mode of reading. From a mathematical point of view, we consider that \( \mathcal{F} \) assigns to each open (called further fragment) \( U \) the set \( \mathcal{F}(U) \) of its fragmentary meanings and, following the precept of hermeneutic circle "to understand any part of text in accordance with the understanding of the whole text" taken in a wide sense, that \( \mathcal{F} \) assigns to each inclusion \( U \subset V \) a map \( \text{res}^V_U : \mathcal{F}(V) \to \mathcal{F}(U) \), such that \( \text{res}^V_U = \text{id}_{\mathcal{F}(V)} \) and \( \text{res}^V_U \circ \text{res}^W_V = \text{res}^W_U \) for all nested fragments \( U \subset V \subset W \). Mathematically, the data \((\mathcal{F}(U), \text{res}^U_V)\) defines a presheaf of fragmentary meanings over \( X \) endowed with the phonocentric topology.

It may happen that some fragment of a given text needs many resumption of reading process. So we have to consider the reading process for any fragment \( U \) as its covering by some family of subfragments \((U_j)_{j \in J}\) already read. Such a covering of \( U \) is said to be open if \( U = \bigcup_{j \in J} U_j \) and each \( U_j \) is open in \( X \).

Following Quine, there is no entity without identity; so we need some notion of identity between fragmentary meanings accepted technically as the content grasped during the reading process. Otherwise, it was impossible to consider the fragmentary meanings to be well-defined objects susceptible to set theoretic operations and quantifications with them. The explicit criterion of equality between fragmentary meanings that seems to be quite adequate to our linguistic intuition is defined by the following:

Claim S (Separability). Let \( X \) be an admissible text, and let \( U \) be a fragment of \( X \). Suppose that \( s, t \in \mathcal{F}(U) \) are two fragmentary meanings of \( U \) and there is an open covering \( U = \bigcup_{j \in J} U_j \) such that \( \text{res}^U_{U_j}(s) = \text{res}^U_{U_j}(t) \) for all fragments \( U_j \). Then \( s = t \).

In other words, two fragmentary meanings of the same fragment are considered to be identical globally if and only if they are identical locally. This definition determines an
effective procedure to decide whether two given fragmentary meanings \( s, t \) of one and the same \( U \subset X \) are equal. Following a standard sheaf-theoretical terminology (Tennison 1975, p. 14), a presheaf satisfying the claim (S) is called separated. Thus any sense (mode of reading) \( F \) defines some separated presheaf of fragmentary meanings over an admissible text \( X \).

The precept of hermeneutic circle “to understand the whole text by means of understandings of its parts” is a kind of compositionality principle at the level of text that generalizes the classic Frege’s one; so the fragmentary meanings should satisfy the following

**Claim C (Compositionality).** Let \( X \) be an admissible text, and let \( U \) be a fragment of \( X \). Suppose that \( U = \bigcup_{j \in J} U_j \) is an open covering of \( U \); suppose we are given a family \( (s_j)_{j \in J} \) of fragmentary meanings, \( s_j \in F(U_j) \) for all fragments \( U_j \), such that \( \text{res}^{U_j \cap U_i}_{U_j}(s_i) = \text{res}^{U_j \cap U_i}_{U_j}(s_j) \). Then there exists some meaning \( s \) of the whole fragment \( U \) such that \( \text{res}^{U_j \cap U_i}_{U_j}(s) = s_j \) for all fragments \( U_j \).

In other words, the locally compatible fragmentary meanings of an admissible text are composable in some global one. Note that we are specifically excluding arbitrary word sequences in our discourse interpretation theory for their lack of this property. This agrees with our intuitive idea of a text written with good grace and intended for a human understanding, which we call admissible.

This claim (C) may be considered as a generalization in the narrow sense to the level of text for the classic Frege’s principle of compositionality of meaning stated at the level of sentence.

In mathematics, a separated presheaf satisfying the claim (C) of compositionality is called a sheaf. Note that for any sheaf, the presence of (S) guarantees the meaning \( s \), whose existence is claimed by (C), to be unique as such. So we have motivated the following sheaf theoretic

**Definition (Generalized Frege’s Compositionality Principle).** A separated presheaf of fragmentary meanings naturally attached to any sense (mode of reading) of an admissible text is really a sheaf; its sections over any fragment of the text are the fragmentary meanings; its global sections are the meanings of the whole text.

We have not yet defined morphisms for these sheaves. To illustrate this notion by means of example, consider e. g. the historical sense \( F \) and the moral sense \( G \) of some biographical text \( X \). Let \( U \subset V \) be any two fragments of the text \( X \). It seems to be very natural that any meaning \( s \) of fragment \( V \) understood in the historical sense \( F \) gives a certain well-defined meaning \( \phi(V)(s) \) of the same fragment \( V \) understood in the moral sense \( G \). Hence, for each \( V \subset X \), we are given a map \( \phi(V) : F(V) \to G(V) \). To transfer from the meaning \( s \) of \( V \) in the historical sense to its meaning in the moral sense and then to restrict the latter to a subfragment \( U \subset V \), following the precept of hermeneutic circle, is the same operation as to make first the restriction from \( V \) to \( U \) of the meaning \( s \) in the historical sense, and then to transfer from the understanding in the historical sense to the understanding in the moral one. This property of a family \( (\phi(V))_{V \in \mathcal{O}(X)} \) may be
expressed simply by claiming that the following diagram

\[
\begin{array}{ccc}
\mathcal{F}(V) & \xrightarrow{\phi(V)} & \mathcal{G}(V) \\
\downarrow \text{res}^V_U & & \downarrow \text{res}^V_U \\
\mathcal{F}(U) & \xrightarrow{\phi(U)} & \mathcal{G}(U)
\end{array}
\]

commutes for all fragments \( U \subset V \) of \( X \) (that is \( \phi(U) \circ \text{res}^V_U = \text{res}^V_U \circ \phi(V) \) for all fragments \( U \subset V \)). This kind of transfer from the understanding in one sense \( \mathcal{F} \) to the understanding in some another sense \( \mathcal{F}' \) is a usual matter of linguistic communication. Hence, such a family of maps \( (\phi(V))_{V \in \mathcal{O}(X)} \) defines a natural transformation of senses \( \phi: \mathcal{F} \Rightarrow \mathcal{G} \) considered as functors and hence defines their morphism as sheaves.

Thus, given an admissible text \( X \), the data of all sheaves \( \mathcal{F} \) of fragmentary meanings together with all its morphisms constitutes some category in a strict mathematical sense of the term. Called category of Schleiermacher and denoted by \( \text{Schl}(X) \), this category supplies a mathematical framework for the part-whole structure in the text understanding formulated by Schleiermacher as the theoretical principle of hermeneutic circle. The category of Schleiermacher \( \text{Schl}(X) \) describes the exegesis of a given particular text \( X \) as, for example, Sacred Scripture.

At the level of sentence, the same considerations generalize the classic Frege’s compositionality principle but with words as primitive elements and syntagmas as meaningful fragments (see Prostorov 2002, chap. 4, p. 35).

4 Contextuality

So far, we have defined only a notion of fragmentary meaning. To consider (at each semantic level) not only the meanings of fragments but also the meanings of its primitive elements (points of a corresponding topological space), we define a notion of contextual meaning. Let \( U, V \) be two neighborhoods of \( x \) and let \( \mathcal{F} \) be an adopted sense. Two fragmentary meanings \( s \in \mathcal{F}(U) \) and \( t \in \mathcal{F}(V) \) are said to induce the same contextual meaning at \( x \) if there exists some smaller open neighborhood \( W \) of \( x \), such that \( W \subset U \cap V \) and \( \text{res}^V_W(s) = \text{res}^V_W(t) \in \mathcal{F}(W) \). This relation “induce the same contextual meaning at \( x \)” is an equivalence relation, and any equivalence class of fragmentary meanings agreeing in some neighborhood of \( x \) is called a contextual meaning of \( x \). The set of all equivalence classes is called a stalk of \( \mathcal{F} \) at \( x \) and denoted by \( \mathcal{F}_x \). The equivalence class of a fragmentary meaning \( s \in \mathcal{F}(U) \) in \( \mathcal{F}_x \) is called the germ of \( s \) at \( x \) and denoted by \( \text{germ}_x s \).

Recalling classic Frege’s contextuality principle, we give the following

Definition (Generalized Frege’s Contextuality Principle). A sentence \( x \) within a fragment \( U \) of an admissible text \( X \) has a contextual meaning defined as the germ at \( x \) of some fragmentary meaning \( s \in \mathcal{F}(U) \), where the sheaf \( \mathcal{F} \) is the adopted sense (mode of reading); the set \( \mathcal{F}_x \) of all contextual meanings of a sentence \( x \in X \) is defined as the stalk of \( \mathcal{F} \) at \( x \), i.e. as the inductive limit \( \mathcal{F}_x = \lim_{\longrightarrow}(\mathcal{F}(U), \text{res}^V_U)_{U, V \in \mathcal{V}(x)} \).

In other words, if we have grasped some fragmentary meaning of a given fragment then, for any its sentence, we obtain a corresponding contextual meaning in a canonical way.
According to a well-known inductive limit characterizing theorem (see e.g. Tennison 1975, Th. 3.8, p. 5), this contextuality principle, stated at the level of text, is equivalent to the conjunction \((E)&(Ct)\) of the following two claims \((E)\) and \((Ct)\) (see Prosorov 2003, chap. 2).

**Claim E (Equality).** Let \(U, V\) be two open neighborhoods of a sentence \(x\) and let \(s \in F(U), \ t \in F(V)\) be two fragmentary meanings for a given sense (mode of reading) \(F\). Then the equality germ \(s = t\) in \(F_x\) between induced contextual meanings of the sentence \(x\) holds if and only if there exists an open neighborhood \(W\) of \(x\) such that \(W \subset U, W \subset V\) and \(\text{Res}^U_W(s) = \text{Res}^V_W(t)\).

The claim \((E)\) is an explicit criterion of equality between contextual meanings of a given sentence in the context of a given text.

**Claim Ct (Contextuality).** Let \(F\) be a sense (mode of reading) adopted for a given text \(X\), then for any contextual meaning \(f \in F_x\) of a sentence \(x\), there exist a neighborhood \(U\) of \(x\) and a fragmentary meaning \(s \in F(U)\) such that \(f = \text{germ}_x s\).

Stated at the level of text, the claim \((Ct)\) is a generalization in the narrow sense of the classic Frege’s contextuality principle; it may be paraphrased as “ask for the meaning of a sentence only in the context of some fragment of a given text”.

Our next aim is to describe a bundle-theoretical frame for the generalized Frege’s contextuality principle.

For the coproduct \(F = \bigsqcup_{x \in X} F_x\), a map \(p: \ F \rightarrow X\) defined as \(p(\text{germ}_x s) = x\) will be referred to as projection.

Every fragmentary meaning \(s \in F(U)\) determines a function \(\dot{s}: x \mapsto \text{germ}_x s\) to be well-defined on \(U\); for each \(x \in U\), its value \(\dot{s}(x)\) is taken in \(F_x\). This gives rise to the functional representation \(\eta(U): s \mapsto \dot{s}\) for all fragmentary meanings \(s \in F(U)\).

We define the topology on \(F\) by taking as a basis of open sets all the image sets \(\dot{s}(U) \subset F\). Given a fragment \(U \subset X\), a continuous function \(t: U \rightarrow F\) such that \(t(x) \in p^{-1}(x)\) for all \(x \in U\) is called a cross-section. For any cross-section \(t: U \rightarrow F\), the projection \(p\) has the obvious property \(p(t(x)) = x\) for all \(x \in U\). The topology defined on \(F\) makes \(p\) and every cross-section of the kind \(\dot{s}\) continuous. So we have defined two topological spaces \(F, X\) and a continuous map \(p: F \rightarrow X\). In topology, this data \((F, p)\) is called a bundle over the base space \(X\). A morphism of bundles from \(p: F \rightarrow X\) to \(q: G \rightarrow X\) is a continuous map \(h: F \rightarrow G\) such that the following diagram

\[
\begin{array}{ccc}
F & \xrightarrow{h} & G \\
\downarrow{p} & \searrow{q} & \\
X & \underset{k}{\rightarrow} & X
\end{array}
\]

commutes. We have so defined a category of bundles over \(X\). A bundle \((F, p)\) over \(X\) is called étale if \(p: F \rightarrow X\) is a local homeomorphism. The étale bundles constitute a full subcategory in the category of bundles over \(X\). It is immediately seen that a bundle of contextual meanings \((\bigsqcup_{x \in X} F_x, p)\) constructed as above from a given sheaf \(F\) of fragmentary meanings is étale.
Thus, the explicit notion of contextual meaning allows, for any admissible text \( X \), to define the category \( \text{Context}(X) \) of \( \acute{e} \)tale bundles of contextual meanings over \( X \) as a framework for the generalized contextuality principle at the level of text.

5 Frege Duality

Our aims now is to relate the two key categories underlying the text understanding process.

We define firstly a germ-functor \( \Lambda: \text{Schl}(X) \rightarrow \text{Context}(X) \). For each sheaf \( F \), it assigns a bundle \( \Lambda(F) = (F, p) \), where \( F = \bigsqcup_{x \in X} F_x \) and \( p \) is projection defined as above; for each morphism of sheaves \( \phi: F \rightarrow G \), the induced map of stalks \( F_x \rightarrow G_x \) gives rise to the morphism of bundles \( \Lambda(\phi)_x: \bigsqcup_{x \in X} F_x \rightarrow \bigsqcup_{x \in X} G_x \).

Secondly, we define a section-functor \( \Gamma: \text{Context}(X) \rightarrow \text{Schl}(X) \). We denote a bundle \( (F, p) \) over \( X \) simply by \( F \). For a bundle \( F \), we denote the set of all its cross-sections over \( U \) by \( \Gamma(U, F) \). If \( U \subset V \) are open, one has a restriction operation \( \text{res}^U_V: \Gamma(V, F) \rightarrow \Gamma(U, F) \). It’s clear that \( \text{res}^U_V = \text{id}_{\Gamma(U,F)} \) for any open \( U \), and that the transitivity \( \text{res}^V_W \circ \text{res}^U_V = \text{res}^W_U \) holds for all nested opens \( U \subset V \subset W \). So we have constructed obviously a sheaf \( (\Gamma(V,F), \text{res}^V_U) \). For any given morphism of bundles \( h: E \rightarrow F \), we have at once a map \( \phi(U): \Gamma(U,F) \rightarrow \Gamma(U,E) \) defined for \( U \subset X \) as \( \phi(U): s \mapsto h \circ s \), which is obviously a morphism of sheaves.

The fundamental theorem of topology states that the section-functor \( \Gamma \) and the germ-functor \( \Lambda \) establish a dual adjunction between the category of presheaves and the category of bundles (over the same topological space) which restricts to a dual equivalence (or duality) between corresponding full subcategories of sheaves and of \( \acute{e} \)tale bundles (see e.g. Lambek and Scott 1986, Mac Lane and Moerdijk 1992). In the linguistic situation, this result yields at the level of text the following

**Theorem (Frege Duality).** The generalized compositionality and contextuality principles are formulated in terms of categories being in natural duality

\[
\text{Schl}(X) \xrightarrow{\Lambda} \text{Context}(X) \xleftarrow{\Gamma}
\]

established by the section-functor \( \Gamma \) and the germ-functor \( \Lambda \), which are the pair of adjoint functors.

As many of well-known classic dualities arising from dual adjunctions, Frege duality may be proven as an equivalence between full subcategories of sheaves and \( \acute{e} \)tale bundles arising from a dual adjunction between the category of presheaves and the category of bundles. However, a formal translating of such a proof into our linguistic situation compels us to give a semantic interpretation for the latter too vast categories. In a work (Properorov 2004, p.36), the interested reader will find a sketched proof of Frege duality which restrains within the framework of the categories of sheaves and \( \acute{e} \)tale bundles. One of the key point of this proof is the functional representation \( \eta(U): s \mapsto s^\prime \) for all fragmentary meanings \( s \in F(U) \) defined above in chapter 4. This representation \( \eta(U) \) is really a bijective correspondence between all the fragmentary meanings \( s \) of \( U \) and all...
the genuine functions on $U$ (see Prosorov 2004, p. 36) of the type $x \mapsto \text{germ}_x(s)$, which matches with the restriction operations $s \mapsto \text{res}_U^V(s)$ and $\hat{s} \mapsto \hat{s} |_U$.

This will answer the fundamental question about the nature of fragmentary meanings: namely, each fragmentary meaning $s$ of $U$ is represented as a sequence $(\hat{s}(x))_{x \in U}$ of the contextual meanings of its sentences $x \in U$ grasped during a particular reading process, and vice versa.

5.1 Inductive Theory of Meaning

The similar Frege duality may be formulated also at the semantic level of sentence and even of word, that gives rise to some functional representation of fragmentary meanings at each semantic level; it allows to develop an inductive theory of meaning (see Prosorov 2003, chap. 4) describing how runs the process of text understanding. We outline here our exposition of (Prosorov 2003, Prosorov 2004) with a slight modifications.

Consider an admissible text $X$ of arbitrary length interpreted in some adopted mode of reading $\mathcal{F}$. The reading process consists in the open covering of $X$ by some family $(U_j)_{j \in J}$ of fragments, each having been read during a single action. So one starts the $(i + 1)$th resumption of the reading process by keeping in mind some fragmentary meaning $s \in \mathcal{F}(U_{j_1} \cup U_{j_2} \cup \cdots \cup U_{j_i})$, where $U_{j_1}$ is a fragment read firstly, and so on, and finally $U_{j_i}$ is a fragment read lastly. This fragmentary meaning $s$ were composed as an intermediate result of interpretation process according to sheaf-theoretical formulation of compositionality principle, and one starts to read the $(i + 1)$th fragment $U_{j_{i+1}}$ in the context of having grasped $s$. So we need to describe the process of understanding of the fragment $U_{j_{i+1}}$. Recall that following our terminological convention, the open $U_{j_{i+1}}$ is a union of the minimal basic opens of the kind $U_x$. So the problem is reduced to explain how the reader grasps some fragmentary meaning of a minimal basic open of the kind $U_x$.

Usually one reads a given text in the normal order $\leq$ it bears on. It may occur to begin a reading from the passage already read. If this is the case, one arrives quickly to a coherent understandings for the part already read and continues the usual reading process. So we may suppose that $U_x \subset U_{j_{i+1}} \cap I(x)$, where $I(x) = \{l : l \leq x\}$.

Suppose that we have explained how the reader has grasped some fragmentary meaning $s'$ of $U_x \cap I(x')$, where $x'$ is the sentence immediately preceding $x$ in the natural sentence order $\leq$. Following the functional representation of fragmentary meanings, this $s'$ is represented by some sequence of contextual meanings of the sentences containing in $U_x \cap I(x')$. So we need to explain how the reader grasps some contextual meaning of $x$ with the purpose to extend the sequence of grasped contextual meanings on the whole $U_x$. But during the process of reading of the sentence $x$ at the level of sentence, where the corresponding Frege compositionality principle holds, the reader grasps some its global meaning at the level of sentence, which is apparently one of its literal meaning. This literal meaning of the sentence $x$ together with the fragmentary meaning $s'$ of $U_x \cap I(x')$ allows to grasp some fragmentary meaning of the whole $U_x$, and whence the contextual meaning of $x$. So the reader has extended the sequence of grasped contextual meanings to the whole $U_x$.

This was the inductive step. As for the basis of induction, note that all the minimal elements of $U_x$ (in the sense of the order $\preceq$) are open singletons; for any such open singleton
\{y\}$, the set of all its contextual meanings at the level of text is in the bijective correspondence to the set of all its fragmentary meanings at the level of text, which is evidently the set of all global meanings of the sentence $y$ at the level of sentence. This is a recursive step to the inferior semantic level, where the corresponding Frege compositionality principle holds to explain how the reader grasps one of its literary meaning. For $\{y\}$ being open, that is meaningful at the level of text, its literal meaning grasped at the level of sentence is apparently its fragmentary (and equally contextual) meaning at the level of text. Note that the first sentence of a novel is always supposed to be understood in his own context, that is supposed to be open in the phonocentric topology.

5.2 Compositionality versus Contextuality

Recall that for any presheaf the property of being sheaf is equivalent to the conjunction $(S)\&(C)$; similarly, the conjunction $(E)\&(Ct)$ implies the property of being étale for the corresponding bundle. We have noticed above that the claim $(Ct)$ is a generalization in the narrow sense of the classic Frege’s contextuality principle and the claim $(C)$ is a generalization in the narrow sense of the classic Frege’s compositionality principle. Separately, they seem to be in rather difficult relations, but augmented with the corresponding notions of equality $(E)$ and $(S)$, they give rise to equivalent categories being in adjunction. It’s exactly in this sense that we consider compositionality and contextuality as adjoint principles.

At the level of sentence, the same considerations generalize the classic Frege’s compositionality and contextuality principles but with words as primitive elements and syntagmas as meaningful fragments.

6 The Realm of Language

Thus the true object of study in the natural language semantics should be a pair $(X, F)$, i.e. a text with a sheaf of its fragmentary meanings; any such a couple is called textual space. But this representation is possible only in the realm of a language following the famous slogan of Wittgenstein “to understand a text is to understand a language”. Rigorously, this claim may be formulated in the frame of category theory. Likewise our formal hermeneutics describes semantics of a natural language in the category of textual spaces Logos. The objects of this category are couples $(X, F)$, where $X$ is a topological space attached naturally to an admissible text and $F$ is a sheaf of fragmentary meanings defined on $X$; the morphisms are couples $(f, \theta): (X, F) \to (Y, G)$ made of a continuous map $f: X \to Y$ and an $f$-morphism $\theta$ which respects the given sheaves, i.e. $\theta: G \to f_*F$, where $f_*$ is a well-known direct image functor (see e.g. Mac Lane and Moerdijk 1992).

For an admissible text $X$ considered as fixed forever, it yields naturally a full subcategory $\text{Schl}(X)$ in the category Logos. This category of Schleiermacher $\text{Schl}(X)$ describes the exegesis of this particular text $X$ as, for example, Sacred Scripture.

Any particular literary genre of texts (discourses) defines some finite set of model spaces in the category of textual spaces. Any particular text (discourse) of a given genre is considered as the ‘global variety’ (called formal discourse scheme) obtained by pasting these model spaces in a certain way. We define an arbitrary formal discourse scheme of
a particular genre to be textual space which locally is isomorphic to one of the model
textual space of this genre (see Prosorov 2002, chap. 8). Thus any literary genre defines a
 corresponding full subcategory (of formal discourse schemes of this genre) in the category
Logos of all textual spaces. This definition follows that one usually given to variety of
some type in geometry and formalizes in some way the celebrated semantic studies of
V. Propp.

The aforesaid inductive theory of meaning based on Frege duality and the different cat-
ergories and functors related to discourse and text interpretation process are the principal
objects of study in the formal hermeneutics as we understand it.

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CONTEXT AND FOCUS PROJECTION.
A COMPOSITIONAL, INTONATION-BASED ACCOUNT OF FOCUS INTERPRETATION*

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Abstract

Theories of focus semantics can be divided into compositional, interpretation-oriented approaches (Rooth 1985, Rooth 1992, Krifka 1992) and production-oriented approaches (Schwarzschild 1999). The current paper attempts to bring these different perspectives together and profit from their respective strengths. A compositional algorithm will be developed which starts out from intonation instead of abstract focus; in other words, the algorithm integrates a compositional, givenness-based version of focus projection. Some explications to the notion \textit{GIVEN} will be presented. Givenness and contrast are shown as two independent modules determining discourse congruence. Finally, the algorithm will be spelled out in Bottom-Up DRT (Kamp, van Genabith and Reyle 2004).

1 Introduction

There are two ways of tackling problems related to the meaning of stress. The first is to formulate the task as “On which word must one place an accent in order for an utterance to sound natural?” Different resources have been employed to resolve this question: phonological (Ladd 1980), syntactic (Chomsky 1971, Cinque 1993) and semantic ones (Schwarzschild 1999).

The task can also be conceived from a second perspective “How does a given accent contribute to the meaning of an utterance?” Taking the latter question seriously requires the integration of focus semantics into an existing theory of meaning as Rooth (1985) or Krifka (1992), based on work by von Stechow (1991).

Both questions have led to aspects that have had a substantial impact on the current theory of information structure. Nevertheless, there are some possible connections between them which have not been addressed so far.

It has become clear that a theory of information structure is incomplete without \textit{some} reference to discourse. This criticism applies to all theories that predict accent placement purely in terms of syntactic configurations or rhythmic categories (meter). But even a theory like Schwarzschild (1999), which takes discourse context into account by virtue of its \textit{givenness} criterion, must be further tested regarding its explanatory adequacy and its fulfillment of the compositionality principle. Without these it will not be possible

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to bridge the gap between this theory and interpretational approaches like Rooth’s and Krifka’s. In other words, “What is going to happen if we turn Schwarzschild (1999) on its head and take an interpretation (perception) instead of a production perspective?”

The approaches by Rooth and Krifka show a different type of weakness. Although compositional with respect to a once identified focus, neither Alternative Semantics nor Structured Meaning Theory tell us much about how focus – i.e. its width – is actually determined. Without mentioning it explicitly, we have, thus, sketched the problem of integrating focus projection into a compositional process of interpreting a focus accent.

In this paper, I want to sketch a theory that combines compositional focus semantics and Schwarzschild’s context-oriented theory of accent placement. I will come up with an algorithm of compositional focus projection, which involves a discussion and redefinition of the property GIVEN. Later on, I will compare the notion of givenness with the notion of contrast and sketch how either of them can be responsible for the infelicity of sentences in different situations. In an appendix, I will give a formulation of the algorithm in a recent version of bottom-up DRT.

2 Complications for theories of focus semantics

Before we come to the main discussion, I would like to first point out some caveats which will not be covered later on but which remind us of the actual complexity of focus semantics and its interactions with lexical semantics.

2.1 Adverbial quantifiers and other operators

Several operators in language alter their meaning at the same time as changes in prosody occur. This, however, does not mean that all processes of so-called association between these operators and focus are of the same kind. It was suggested in Rooth (1985) by use of examples like (1) that always and only are both directly focus sensitive, meaning that the domain of the quantifier is constituted by the background of the sentence while the focus forms the operator’s nuclear scope.

(1) a. In Saint Petersburg, officers always escorted BALLERINAS.
   b. In Saint Petersburg, officers only escorted BALLERINAS.
   c. In Saint Petersburg, whenever an officer escorted somebody she was a ballerina.

There are, however, counterexamples which suggest that the alleged focus sensitivity of always is an illusion related to a not yet fully understood process which has to do with the fact that the source for the quantifier’s domain might not be the background but perhaps the sentence’s presupposition, which sometimes parallels its non-focus information, (2) or even something completely different (3).

(2) Kim always beats Sandy at PING-PONG. (Beaver and Clark 2003)
   a. Whenever Kim and Sandy play ping-pong, Kim beats Sandy.
   b. *Whenever Kim beats Sandy at something it’s pong-pong.
Because of problems like these, the implications of the following algorithm on focus sensitivity should also be investigated separately in the light of every single operator.

2.2 Second occurrence focus:

Another problem which has received considerable attention is second occurrence focus, as exemplified in the following examples.

(4)  a. People only eat RICE\textsubscript{F}.
    
    b. People who GROW\textsubscript{F} rice generally only EAT\textsubscript{contrast.F} [rice]\textsubscript{2OF}. (Rooth 1992)

(5) Mary only STEAMS\textsubscript{F} vegetables and even JOHN\textsubscript{contrast.F} only [steams]\textsubscript{2OF} vegetables. (Krifka 1997)

(6) Who does only like ICE CREAM\textsubscript{F}?
    
    FRED\textsubscript{answer.F} only likes [ice cream]\textsubscript{2OF}?

The constituents marked as 2\textsubscript{OF} in these examples adhere to all semantic intuitions about focus and are very much akin to their corresponding predecessors. Yet, crucially, they lack (much of) their intonational marking and, thus, provide quite an obstacle to any theory that attempts to generate meaning from the prosodic parts of a linguistic input signal. Although there have been attempts to show that there is actually some kind of phonetic marking on the alleged focus constituents (Rooth 1996, Beaver, Clark, Flemming and Wolters 2002), I still have the strong intuitions that the “de-accenting” is so evident that we should not attempt to build our theory on these weak prosodic remains. What we need instead is a heuristics to which the reoccurrence of the “de-accented” item is central. Such a heuristics, however, will not be part of the current paper.

3 Givenness in a bottom-up framework

I will now come to the main part of this article and begin with a description of a focus interpretation algorithm. Let’s first take a look at the following simple sentence (7).

(7) 

\begin{center}
\begin{tikzpicture}
  \node (s) {S};
  \node (np) [below left of=s] {NP};
  \node (vp) [below right of=s] {VP};
  \node (m) [below of=np, xshift=-2cm] {Mary};
  \node (v) [below of=vp, xshift=0cm] {V};
  \node (np2) [below of=v, xshift=2cm] {NP};
  \node (l) [below of=np2, xshift=0cm] {likes};
  \node (o) [below of=np2, xshift=-2cm] {Otto};

  \draw (s) -- (np);
  \draw (s) -- (vp);
  \draw (np) -- (m);
  \draw (vp) -- (v);
  \draw (v) -- (np2);
  \draw (np2) -- (l);
  \draw (np2) -- (o);
\end{tikzpicture}
\end{center}
We assume any ordinary compositional semantic system like the one from Krifka (1992) or Bottom-Up DRT (Kamp et al. 2004, Kamp 2004) and add to it a number of semantic-syntactic constraints. The most important ones are taken from Schwarzschild (1999) where they function as restrictions on output candidates for the most appropriate accent distribution. I have adapted them slightly to make them fit into our changed perspective of meaning generation. Moreover, all of the following constraints are supposed to be of an absolute nature and may not be violated.

**Rule 1 (GIVENness)**

*A constituent must be GIVEN or F-marked or both.*

**Rule 2 (AVOIDF)** *Only spread an F-mark if some other rule demands it.*

We think of any constituent as having two features F and GIVEN. The precise purpose of these will become clear very soon. The goal of our system is to assign to an accented sentence a distribution of F-labels which the hearer is able to interpret. While doing this, as can be directly inferred from GIVENness, the system has to avoid a constellation of the following kind:

**Definition 1 (GIVENness violation)** 

\[ \begin{array}{c}
F \\
\times \text{ GIVEN} \\
\end{array} \]

As in a game of chess, sometimes there are ways to escape this undesired constellation; in other situations, however, no further move is possible. For the hearer an unavoidable GIVENness violation means that a perceived sentence will sound infelicitous in the present context.

Among the “moves” that our system allows or prescribes are the well-known rules of prosodic-syntactic focus projection (Selkirk 1984, Selkirk 1996, Rochemont 1986). I am using the term “focus projection” in its most general sense: any predictable mechanism that accounts for the relation between accents and semantic representations of focus, like Structured Meanings. Syntax need not play a role here *a priori*. For computational reasons, however, it seems clearly desirable and necessary to have certain syntactic restrictions which might be language specific and are ultimately a matter of empirical research.\(^1\)

A theory without such constraints would be a very weak one, that also allows for sentences that, intuitively, should get ruled out.

**Rule 3 (GENF)** *If a word is accented it gets F-marked.*

**Rule 4 (ARGHEAD)** *An F-mark on an internal argument of a head licenses the F-marking of the head.*

**Rule 5 (HEADPHRASE)** *An F-mark on a head of a phrase licenses the F-marking of the phrase.*

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\(^1\)As for English, it might turn out that the rules given in Selkirk (1996) fall out as a special case of more general syntactic processes, cf. (Johnson 2002).
Finally, I want to add another, purely technically motivated rule to our system.

**Rule 6 (FILLPHRASE)** F-mark a constituent if all of its sub-constituents are F-marked.

After having listed these constraints, let me now demonstrate how the new focus interpretation algorithm works.

### 3.1 Accent on object NP

Assume an accent pattern like in (8).

(8) Mary likes OTTO.

We take this simple example and start processing bottom-up. The first thing to do is to apply GENF, which in (8) assigns +F to the accented object OTTO. At the same time we assign *all terminal elements in the tree an entry */-GIVEN where GIVEN means availability of the referent of the lexical item in the context provided by recent discourse.*

We will come to a detailed discussion of how exactly GIVEN should be defined, in section 3.2 below. Assume, for now, that we are in a situation in which the context consists of just the question

(9) {So, what about Mary?}

and the lexical entry for *likes* is, thus, *not GIVEN*. The same is the case for OTTO.

(10) $\begin{array}{c}
\text{VP}^{F} \\
[ \text{F} \\
\text{GIVEN}^{\text{\text{-}}} ] \\
\text{V}^{\text{\text{?}}} \\
\text{likes} \\
\text{NP}^{\text{\text{?}}} \\
\text{OTTO} \\
\end{array}$

On combining the verb with the object, ARGHEAD permits – but doesn’t require – us to project an F-feature onto the verb *likes* – a typical case of a projection ambiguity. But now, thanks to our extended set of rules, we can determine exactly what to do. Not projecting will lead to a GIVENNESS violation on *likes*. The only remaining option is to assign *likes* a +F. Finally, FILLPHRASE requires another +F for the VP node. The result is

(11) $\begin{array}{c}
\text{VP}^{F} \\
[ \text{F} \\
\text{GIVEN}^{\text{\text{-}}} ] \\
\text{V}^{\text{\text{+}}} \\
\text{likes} \\
\text{NP}^{\text{\text{+}}} \\
\text{OTTO} \\
\end{array}$

As other people have observed, words (gorilla) also license their hyperonyms (monkey) as GIVEN. We also take it for granted that high frequency words (conjunctions, prepositions, articles,…) are GIVEN due to their special importance in language.

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2As other people have observed, words (gorilla) also license their hyperonyms (monkey) as GIVEN. We also take it for granted that high frequency words (conjunctions, prepositions, articles,…) are GIVEN due to their special importance in language.
The reasoning is different if the context consists of the question

(12)  \{Whom does Mary like?\}

Now, the GIVEN value for likes in (8) is positive, i.e. there is no danger of a GIVENness violation at V. In that case AVOIDF instructs us not to assign likes a +F; subsequently VP can’t get +F-marked either.

(13)  

\[
\begin{array}{c}
\text{VP} \\
\text{V} \\
\text{NP} \\
\end{array}
\]

\[
\begin{array}{c}
\text{F} \\
\text{GIVEN} \\
\text{ likes} \\
\end{array}
\]

\[
\begin{array}{c}
\text{F} \\
\text{GIVEN} \\
\text{I} \\
\end{array}
\]

\[
\begin{array}{c}
\text{F} \\
\text{GIVEN} \\
\text{Otto} \\
\end{array}
\]

3.2 Accent on V

Now, compare the previous problems with the case of an accented verb.

(14)  Mary LIKES Otto.

There are several things that we can note immediately.

(15)  

\[
\begin{array}{c}
\text{VP} \\
\text{V} \\
\text{NP} \\
\end{array}
\]

\[
\begin{array}{c}
\text{F} \\
\text{GIVEN} \\
\text{LIKES} \\
\end{array}
\]

\[
\begin{array}{c}
\text{F} \\
\text{GIVEN} \\
\text{Otto} \\
\end{array}
\]

First, it is crucial that the object NP is GIVEN. It has been observed quite some time ago (Jacobs 1988) that so-called “de-accenting” phenomena like (16) are possible only in contexts in which the respective NP (Gerd) has been mentioned previously.
a. Was tat Petra, nachdem sie den Raum betreten hatte, in dem Gerd auf sie wartete?
   ‘What did Petra do after she had entered the room in which Gerd was waiting for her?’

b. Sie BEGRÜSSTE Gerd.
   ‘She GREETED Gerd.’

In (14) the impossibility of ‘de-accenting’ in certain contexts is explained by the fact that Otto cannot receive an F-mark from anywhere other than accenting – which it lacks. (There is no projection from a head to its argument.) So in case Otto is not GIVEN, the sentence will get ruled out by a GIVENness violation.

The next question concerns the possibility to project the F from V to VP, which is licensed by HEADPHRASE. For the moment, we do not know whether such a move is required by GIVENness because we have no idea, yet, what it means for a complex constituent to be GIVEN. The definition in Schwarzschild (1999) is only for a part helpful.\(^3\)

**Definition 2 (s-GIVEN)**

An utterance \(U\) counts as s-GIVEN iff it has a salient antecedent\(^4\) \(A\) and

a. if \(U\) is type \(e\), then \(A\) and \(U\) co-refer;

b. otherwise: modulo \(\exists\)-type shifting. \(A\) entails the Existential F-Closure of \(U\).

The (b)-part can be rephrased informally as: For an expression \(U\) of an arbitrary complex type \(⟨\alpha, \beta⟩\) it holds that \(U\) is s-GIVEN if and only if there is an entity \(A\) in the context which is exactly like (or stronger than) \(U\), at least concerning \(U\)’s non-F-marked subconstituents.

This definition, however, will lead us into a contradiction in all cases in which new information is stressed, i.e. in all standard cases of information focus (presentational focus). Just assume an accented word \(U\) which has not been uttered before, like OTTO in (17).

(17) a. \{Fred opened the door.\}

b. He saw OTTO\(_F\).

Intuitively, OTTO is not GIVEN. Definition 2, however, tells us that it should be because all it needs is a constituent in context which is like itself, except for its F-marked subparts (\(≡\) itself in its entirety!) Any word of the same type as \(U\) (e.g. Fred) will trivially fulfill this requirement.

To avoid strange problems like that, I suggest to choose a different definition:

\(^3\)I call it ‘s-GIVEN’ for ‘Schwarzschild-GIVEN’ in order to distinguish it from revised versions presented below.

\(^4\)The term “antecedent” is logically not quite in the right place here; only after one of the conditions (a) or (b) is fulfilled it is appropriate to speak of an antecedent.
Definition 3 (i-GIVEN) An utterance $U$ counts as i-GIVEN iff there is a salient constituent $A$ in the context and

i. if $U$ is a terminal element in a tree then $A$ and $U$ are co-referent$^6$ or it holds that $U$ subsumes $A$;

ii. if $U$ is non-terminal and not $F$-marked itself then $A$ is exactly like $U$, at least concerning $U$’s non-$F$-marked sub-constituents.

The object of (17), now, will not come out as GIVEN anymore because its denotation is not in the context. This is in line with our intuitions.

As for (3ii), this part of the definition tells us how to deal with constituents which are higher up in the tree. Whether we think of i-GIVEN in terms of semantic entailment like in Schwarzschild (1999), as simple pattern matching on syntactic constituents, or spelled out as a presuppositional mechanism on discourse representations (see appendix) is not crucial.

A question that ought to be addressed, however, and to which I shall have no decisive answer is whether an i-GIVEN lookup really needs to involve antecedents with a fixed structure or whether the parts of what we are looking for might as well occur in a different configuration. The problem is revealed by the following examples.

(18) a. {Fred screamed in his sleep.}
    b. Alice SHOOK Fred.

In (18) the expression $\exists R \exists x. R(x, \text{fred})$, corresponding to the VP of (18b), has no salient constituent in context that entails it. It is, therefore, not i-GIVEN. As a consequence, one would predict projection of $F$ from $V$ to VP. Depending on one’s syntactic framework one might then go on and project the $F$ further to the sentence level, again because there is no antecedent for $\exists R. R(\text{alice}, \text{fred})$, the F-closure of the sentence. I have no conclusive argument why we shouldn’t do this; yet, it feels strange to assign $F$ to $S$ and, thus, focus to the entire sentence (18b). A presumably even more severe problem is presented by (19).

(19) a. {Who did John’s mother vote for?}
    b. She voted for HER mother. (Rooth, cited in Kuhn (1997))

As in (18), the second sentence is a felicitous continuation to the first one. And, although the constituents [mother] and [HER mother] have antecedents, there is no match for the VP [voted for X’s mother]. Arbitrary assignment of an $F$ to that VP would not only ignore problems of compositional meaning construction, it would, moreover, ask for syntactic focus projection from possessives, something we normally wouldn’t want, cf. (20).

$^6$We take co-reference of a word to mean equality of denotation. Names and pronouns are co-referent if they denote the same individual. Co-reference between two predicates or two quantifiers means that they denote the same sets.

$^7$Neither is it s-GIVEN, of course.
If we analyze (18) and (19) more closely, it becomes obvious that the core difficulty has to
do with the search for complex antecedents, something which – apart from the empirical
findings – represents a very tricky technical problem.

On the other hand, it looks like an affordable sacrifice not to examine the givenness of
complex phrases but rely instead on a search for parts of those phrases. For example, one
would not check in (18) whether there is an constituent of the form [X-ed Fred] in the
context but simply whether the non-F-marked subpart Fred

Bigger phrases would call GIVEN recursively. [S Alice [VP SHOOK Fred]] would count
as GIVEN if its parts, Alice and [VP SHOOK Fred] are GIVEN. The latter, again, is GIVEN
if Fred is GIVEN, while SHOOK is F-marked and doesn’t count.

This brings us to our last revision of the GIVEN-definition; “pi-GIVEN” now stands for
“partially, intuitively GIVEN”.

**Definition 4 (pi-GIVEN)** An utterance \( U \) counts as pi-GIVEN iff there is a salient con-
stituent \( A \) in the context and

i. if \( U \) is a terminal element then \( A \) and \( U \) are co-referent or it holds that
\( U \) subsumes \( A \);

ii. if \( U \) is non-terminal and not F-marked itself then at least its non-F-marked sub-
parts are pi-GIVEN.

With this final revision, we can account for (18) and (19). As remarked just above,
[SHOOK Fred] is now pi-GIVEN, which makes F-projection unnecessary. The same holds
for [voted for HER mother] in (19).

Finally, we are now able to return to example (15), which was the starting point of our
long discussion. If we interpret GIVEN now as pi-GIVEN, what we get is +GIVEN for the
VP constituent, and, by virtue of AVOIDF, no F-projection.

(21) \[
\begin{array}{c}
\text{LIKES} \\
\text{Otto}
\end{array}
\]

At this point, let me briefly mention an issue that has to do with wh-elements and foci.
(22) below seems to be an easier case than (19).
(22)  a. John drove Mary’s red convertible.  
    What did he drive before that?  
    b. He drove her BLUE convertible. (Schwarzschild 1999)

No further F-mark than the one on BLUE is necessary, as all higher constituents find an appropriate antecedent. This holds independently from whether we apply i-GIVEN or pi-GIVEN. The focus would, thus, be just on the adjective. Yet, it has often been argued that one definition for focus – that we haven’t used in this paper – is “the constituent matching the wh-element of a preceding question”. For (22) this would mean focus on [BLUE convertible]. As we see, that view clashes both with Schwarzschild’s F-assignment and with projection-oriented approaches like mine, which – similar to the possessive case (19) – would not allow for projection from adjectives in modifier position. As far as I can see, this question has not so far been settled.

If we compare (22), (19) and (18) with findings from section 2 on second occurrence focus we actually can’t fail to notice the parallels. In both cases conceptual uncertainty is caused by alleged focus assignment to unaccented words that reoccur. If we transfer the usual assumptions about second occurrence focus to (22b), we would presumably get (23).

(23)  ... He drove her BLUE_{contrast,F} ^{2OF} [convertible].

The two adjacent foci can then be seen as behaving as one large entity; an option which may have the potential to reconcile ideas about wh-related focus and constraints from focus projection. I am pointing this out carefully, as more work still needs to be done on second occurrence focus.

If we do not want to go as far as that, there is still a decision to be made between using i-GIVEN (Schwarzschild’s view of antecedents) or pi-GIVEN (non-F-marked subparts of a constituent must be contextually available). Because of the arguments concerning the examples (18) and (19) I favor the latter.

4  Givenness vs. Contrast: The different layers of infelicity

Compare the following two examples, (24) and (25):^8

(24)  What did Fred do?  
    a. Fred saw JOHN.  
    b. *Fred SAW John.

(25)  John saw Fred, then . . .  
    a. Fred saw JOHN.  
    b. *Fred SAW John.

Examples (24b) and (25b) look exactly the same. Moreover, both are infelicitous. However, the explanations why each of them is bad run into totally different directions. Based on the mechanism I have presented we would say that (24b) is infelicitous (or even “con-

^8brought up by Roger Schwarzschild, p.c.
(25b) on the other hand has no trouble from John, which is already in the context, like all other word constituents. For this reason, the VP also counts as pi-GIVEN and so does the sentence. So, why is it bad, then? I argue that this has to do with a filtering process different from GIVENness checking, namely focus interpretation in line with Rooth (1992), a process that I would like to call contrast checking respectively.

Now we are back at our original motivation, which was to spot the connections between approaches of accent placement and of compositional focus semantics. My criticism was that the former isn’t compositional and the latter has no means to determine the focus range on-line, i.e. during sentence processing. By spelling out Schwarzschild’s accent placement theory in a bottom-up framework I have made it a bit more commensurable to e.g. Rooth’s Alternative Semantics. I argue, that the two “traditions” don’t contradict each other, but rather are different modules building on each other. The givenness module examines non-F-marked constituents and either drives focus projection or rules out utterances that violate GIVENness, as described in section 3. The contrast module, represented by Rooth’s ~-operator (“squiggle”), on the contrary, operates on focus constituents and, in general, after the focus range has been determined by the givenness module. What contrast checking does is formulated in the Focus Interpretation Principle (Rooth 1992), which, roughly, says the following:

**Rule 7 (FIP)** *When interpreting a ~-operator (which must have a focus in its scope), find a set in the discourse context which contains the ordinary semantic value of the focus and at least one contrasting alternative of the same type.*

Consider example (26), which shows the interaction of the focus-sensitive operator only with a focus in its scope, mediated by the ~.

(26) a. {What about Mary?}
   b. 

   ![Diagram]

According to Rooth (1992) the semantics of [only VP] is (27).

(27) \( \lambda x. \forall P((P \in C \land P(x)) \rightarrow P = [VP]) \)

The variable \( C \) is resolved or accommodated by the ~-operator to a set of contextual alternatives to the ordinary semantic value like {goes skiing, hates cooking, likes Otto,
In order to do this, the ~ makes use of the focus, which has been determined beforehand by my givenness algorithm. I argue that in the bad example (25b) we are faced with the constellation (28).

(28) a. \{John saw Fred, then . . .\}  
   b. S  
      \_C  
      S  
      NP  
      VP  
      Fred  
      V\_Focus  
      NP  
      SAW  
      John

I suggest that the badness of this example must have something to do with a contrast failure. In the given context, the “squiggle” can’t find any appropriate contrastive element to the transitive verb. Or, in other words, the assertion that a contrasting alternative to SAW is under discussion is judged to be false. This is different from (24b), where a givenness failure on John caused the infelicity of the sentence.

5 Summary

The semantics of focal accents can be made fully compositional – in particular for the purpose of determining the information structure of a sentence. For this purpose, I have translated the notion of givenness from Schwarzschild (1999) and some other ingredients into a bottom-up algorithm of context-oriented focus projection which made it necessary to apply some changes to the definition of given. In the previous section, I compared the effects of givenness checking (of non F-marked constituents) with the different process of contrast checking (of focus-constituents) (Rooth 1992) and sketched how both of them may sometimes be responsible for the infelicity of sentences in certain contexts.

In what follows, the algorithm will be spelled out – leaving out many details – in a recent version of Bottom-up DRT (Kamp et al. 2004). This will enable us to get an impression of a more formal version of the contextual interactions, which are checking for the givenness of a constituent and checking for the existence of a contrasting set.

Appendix: A Formulation in Bottom-Up DRT

I will deviate from recent work by Kamp (2004) on information structure in DRT to the extent that my representations are simpler and still closer to Structured Meanings. The impact of ~ will only become visible at sentence level.

Again we assume our simple sentence (7) from the beginning. First, the NP OTTO will be translated as (29). The two boxes represent what is known in Structured Meaning

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9 Of course, this is a bit speculative. There is still much unclarity about the real processes. In particular, there is a general problem concerning accommodation. Sometimes accommodation seems clearly necessary. On other occasions, however, it will blur a clearcut split between information that is either present in the context or not. FIP needs to have certainty with respect to that question in order to be meaningful at all.
theory as the “background” (or “focus frame”) and the “focus”. Structuring of a semantic representation replaces the F-marking on constituents as in section 3.

(29)  
\begin{align*}
\text{a. } & \text{OTTO}_F \\
\text{b. } & \left\langle \begin{array}{c}
\begin{array}{c}
\text{x}\
\text{Otto(o)}\
\text{x = o}
\end{array}
\text{, } \begin{array}{c}
\text{o}
\end{array}
\end{array} \right\rangle \\
\text{c. } & \text{FF Focus}
\end{align*}

A non-F-marked constituent like (30) is not structured, but carries instead a “givenness requirement”, indicated by the curly brackets, which instructs it to look for something in context which is co-referential with or a hyponym to likes.\footnote{Boldface variables are interpreted as placeholders that get instantiated during semantic composition.}

(30)  
\begin{align*}
\text{a. } & \text{likes} \\
\text{b. } & \left\langle \begin{array}{c}
\begin{array}{c}
R \\
R \subseteq \text{like}
\end{array}
\end{array} \right\rangle \\
\text{c. } & \left\langle \begin{array}{c}
\begin{array}{c}
s \\
\text{s: like(y, z)}
\end{array}
\end{array} \right\rangle
\end{align*}

Depending on whether such an antecedent is found, (29) and (30) combine to either (31) (in case likes is pi-GIVEN) or (32) (otherwise).

(31)  
\begin{align*}
\text{a. } & \text{likes OTTO}_F \\
\text{b. } & \left\langle \begin{array}{c}
\begin{array}{c}
\text{s} \\
\text{s: like(y, x)}
\end{array}
\end{array} \right\rangle \\
\text{c. } & \left\langle \begin{array}{c}
\begin{array}{c}
\text{o} \\
\text{Otto(o)}\
\text{x = o}
\end{array}
\end{array} \right\rangle
\end{align*}

(32)  
\begin{align*}
\text{a. } & \text{[likes OTTO]}_F \\
\text{b. } & \left\langle \begin{array}{c}
\begin{array}{c}
P \text{s} \\
P \text{s: P(y)}
\end{array}
\end{array} \right\rangle \\
\text{c. } & \left\langle \begin{array}{c}
\begin{array}{c}
\text{o} \\
\text{Otto(o)}\
\text{P = \lambda x. like(x, o)}
\end{array}
\end{array} \right\rangle
\end{align*}

The difference between (31) and (32) is represented by the position where the information from the verb ends up. In (31) there was no need to project focus to V (nor, subsequently, to VP) because of the fact that likes was found to be pi-GIVEN. In other words, we do not want the verb to become focused, which is why it ends up in the focus frame on the left. In (32), on the other hand, we do want likes to be protected from a GIVENness violation. So, we have to put it into the focus part (right box).

As for non-F-marked Mary, it also carries a givenness requirement, which I skip here.

The process of its resolution is like in the case of the verb. The representation of the sentence is, thus, (33).
We subsequently assume focus interpretation at sentence level, which is achieved by attaching a ~-operator at S. What we see in (34) is a translation of rule FIP, the contrast requirement, attached to the left of the meaning of the sentence. The representation is a slight variation of what is found in Kamp (2004).

Resolution of the contrast requirement gives us the representation in (35), which may be interpreted as saying that Mary likes Otto, and, among the people she might have liked, at least Mary and Otto are under discussion.

References


The meaning of ‘only’ has always been an exciting and challenging issue. Many surprising observations have been made and many sophisticated accounts proposed. In this paper we will not focus on new extraordinary data and their treatment. Instead, we will show that there is a way to approach the meaning of ‘only’ that is faithful to classical insights and observations but still can deal with the well-known challenges.

When ‘only’ is used in examples as (1),

(1) John only introduced [Mary] to Sue.

the sentence is intuitively interpreted as stating both A that except for Mary, John introduced nobody to Sue, and B that, in fact, he introduced Mary to Sue. In this paper we will argue that contribution A is due to the semantic meaning of (1), while contribution B comes about as a pragmatic conversational implicature.

1 A background-alternatives account of ‘only’

Let us assume that a sentence has a background-focus structure. The fundamental idea behind our approach to the meaning of ‘only’ is that it does not impose restrictions on focus alternatives, but on background alternatives. What ‘only’ does is to say that the background property has an extension that is as small as possible without making the statement in the scope of ‘only’ false. Assume that the background, B, is of type \( \langle f, t \rangle \) (thus, a property of objects of type \( f \)) and the focus, F, either of type \( f \) or type \( \langle \langle f, t \rangle, t \rangle \) – let us assume, without loss of generality, that the second is the case. Then, roughly, we propose the meaning of ‘only’ to be the following function.

\[
[\text{only}]_{vSt}(\langle F, B \rangle) = \{ w \in W | F(w)(B(w)) \land \neg \exists B' \subseteq D_{f,E,W} : F(w)(B') \land B' \subset B(w) \}.
\]

What \([only]_{vSt}\) does, intuitively, is to claim that for each world \( w \), \( B(w) \) is a minimal elements of \([F](w)\). For example (1), for instance, \( F = [\text{Mary}] \) denotes a generalized quantifier of type \( \langle \langle e, t \rangle, t \rangle \) and \( B = [\text{John introduced to Sue}] \) a predicate of type \( \langle e, t \rangle \). The sentence is predicted to be true in \( w \) if \( B(w) \) is the smallest element of \( \{ B' \subseteq D_{e,E,W}| \{ \text{mary} \} \subseteq B' \} \), i.e., if \( B(w) = \{ \text{mary} \} \). Thus, it is predicted for (1) that John introduced Mary to Sue and nobody besides Mary, which is in accordance with intuition. Notice, that there is no restriction imposed on the domain of quantification. Any possible semantic object counts that has the same type as the background predicate.

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*In this version we completely ignore (i) popular proposals of dealing with ‘only’ by quantifying over focus-alternatives, and (ii) ways in which exhaustification can be made more flexible. In the long version of this paper with the same title (though not the same subtitle) we make up for this.
If you take $F$ to be a term answer and $B$ the predicate of a question, then this rule for the interpretation of ‘only’ is what Groenendijk & Stokhof (1984) have proposed to describe the exhaustive interpretation of a term answer with respect to a question with predicate $B$. Already in von Stechow (1991) it has been proposed to adapt their approach to a semantic rule for ‘only’.

In an earlier paper we have proposed a slightly altered description of exhaustive interpretation than what has been proposed by Groenendijk & Stokhof. This was motivated by certain small misprediction of their approach. For instance, by quantifying over all possible extensions for the background, or question-predicate, meaning postulates for these properties cannot be respected. Because these problems arise with ‘only’ as well, we propose as starting point a parallel rule for the interpretation of ‘only’. The formal definition of $[\text{only}]_1(\langle F, B \rangle)$ will make use of the ordering relation ‘$v < w$’ between worlds. We say that $v < w$ iff $v$ is exactly like $w$ except that the extension of $B$ in $v$ is smaller than in $w$: $B(v) \subset B(w)$.

**Definition 1** (The meaning of ‘only’ - the basic case)

Let $\phi$ be a sentence containing ‘only’ with focus $F$ and background $B$. We define the meaning $[\text{only}]_1(\langle F, B \rangle)$ of $\phi$ as the following proposition:

$$[\text{only}]_1(\langle F, B \rangle) = \{ w \in W | F(w)(B(w)) \land \neg \exists v \in W : F(v)(B(v)) \land v < w \}.$$

In contrast with $[\text{only}]_{vS_t}$, the function $[\text{only}]_1$ does not quantify over all possible semantic objects having the same type as $B$, but only over those extensions that are adopted by $B$ in some world. Still, both approaches to the meaning of ‘only’ are closely related. As explained in van Rooij & Schulz (submitted), $[\text{only}]_{vS_t}$ gives rise to exactly the same predictions as $[\text{only}]_1$ if we assume that $W$ is the set of all possible worlds/models.

The next question we can ask is whether $[\text{only}]_1$ is also a correct description of the semantic meaning of this word. Horn (1969, 1996) and others have given convincing evidence that this is not the case. More in particular, certain observations strongly suggest that the claim that John introduced Mary to Sue for example (1) should not be part of the semantic meaning of this sentence. Let us review the critical evidence. First, McCawley’s (1981, p. 50) observation that ‘only’ can best be paraphrased by expressions involving two negatives in combinations such as ‘No $X$ other than $Y$’, does not suggest suggests very strongly that ‘Only $\phi$’ entails $\phi$:

(2) a. John read only the first chapter.
   b. John read nothing other than the first chapter.

The second, and more important argument involves negative polarity items (NPIs). NPIs like *any* are appropriate when they occur in the background of a sentence with ‘only’, as in (3a), but not when they are part of the focus, as in (3b):

(3) a. Only $[\text{John}]_F$ has *any money* left.
   b. *John only has $[\text{any money}]_F$ left.

It is well established that NPIs are licensed in assertions only in case they occur in downward entailing contexts. A Context $X - Y$ is downward entailing (DE) iff from the truth
of $X\alpha Y$ and the fact that $\beta$ entails $\alpha$ we can conclude to the truth of $X\beta Y$. Thus, a context is DE iff an expression occurring in it can be replaced by a semantically stronger expression *salva veritate*. If the semantic meaning of ‘only’ combines both the $A$ and the $B$ contribution discussed above, one cannot account for (3a), because the background is then not predicted to be downward entailing. If only the $A$ contribution is part of the semantic meaning, however, we can.

A third observation provided by Horn in favor of a more restricted semantic analysis of ‘only’ is the fact that the appropriateness of the following sentences clearly indicates that in contrast to the inference that nobody but John smokes, the inference that John smokes is *cancelable*. Parts of the semantic meaning of a sentence, however, should not be cancellable.

(4) a. Only $[\text{John}]_F$ smokes, {if even he does/and maybe even he does not.}
   b. *Only $[\text{John}]_F$ smokes, {if nobody else does/and maybe somebody else does.}

Furthermore, if both contribution $A$ and contribution $B$ together would constitute the semantic meaning of sentences containing ‘only’, we would predict that the negation of such a sentence conveys that either contribution $A$ or contribution $B$ is false. Thus, an example like (5) should have the semantic meaning that either there are other people besides John that smoke, or John does not smoke. Intuitively, however, only the first part of the disjunction is conveyed by (5). Thus, the negation behaves as if only contribution $A$ and not contribution $B$ is part of the semantic meaning of ‘only’.

(5) Not only $[\text{John}]_F$ smokes.

The same arguments holds for denials of assertions with ‘only’, as demonstrated with the following type of examples (due to Horn (1969)):

(6) a. Only $[\text{John}]_F$ smokes.
   b. No, that’s not true. {Mary does as well/ *He does not.}

Finally, Horn (1996) notes that ‘only’ phrases (with an adverbial, PP, or NP object in focus) trigger inversion. In modern English conversion is (apparently) limited to phrases of negative character. If the semantic meaning of ‘only’ would include contribution $B$, however, this this rule would have an important exception.

All five problems suggest that contribution $B$ is not part of the semantic meaning of ‘only’. Therefore, we propose as description of the semantic content the following adapted version of $[\text{only}]_1$.

**Definition 2** *(The semantic meaning of ‘only’)*

Let $\phi$ be a sentence containing ‘only’ with focus $F$ and background $B$. We define the semantic meaning $[\text{only}]_2(\langle F, B \rangle)$ of $\phi$ as the following proposition:

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1Where the notion of entailment is polymorph, applied to multiple types.
\[ [\text{only}]_2 (\langle F, B \rangle) = \{ w \in W : \exists v \in W : F(v)(B(v)) \& \neg \exists u \in W : F(u)(B(u)) \& u <_B v \& w \leq B v \} \]

Thus, if \( \phi \) has background predicate \( B \), according to this rule ‘Only \( \phi \)’ is true in worlds where ‘\( B \)’ has a smallest extension such that \( \phi \) is true or an extension that is a subset of such a minimal element. What this rule implements is the idea that contribution \( A \), but not contribution \( B \), constitutes the semantic meaning of ‘only’. For instance, ‘Only [John] \( F \) smokes’ is predicted to be true in all worlds where the extension of ‘smoke’ is either \{john\} or \emptyset. Similarly, the sentence ‘Only [men] \( F \) smoke’ is true only in case all smokers are men or there are no smokers. Obviously, this rule makes ‘only’ downward entailing w.r.t. the background predicate \( B \), which accounts for the NPI-distribution.

We believe that \( [\text{only}]_2 \) captures many intuitions we have about the meaning of ‘only’. To illustrate the power of this approach let us discuss how it deals with the puzzle of ‘only if’ constructions. We assume here that these constructions should be analyzed compositionally, in terms of the meaning of ‘only’ and the meaning of ‘if’ constructions. It turns out that \( [\text{only}]_2 \) predicts correctly that ‘\( B \) only if [\( A \)’ \( F \)’ is semantically equivalent with ‘\( A \) if \( B \)’, given a material implication analysis of ‘if’. The latter fact can be seen easily given the following truth-table:

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To derive this truth-table, we have assumed that \( n \)-ary predicates have as their extension the set of verifying \( n \)-ary sequences. A sentence like ‘\( B \)’ is taken to be a 0-ary predicate whose extension is \{\} in case \( B \) is true, and \emptyset in case \( B \) is false. Obviously, \emptyset \subseteq \{\} but not \{\} \subseteq \emptyset. Thus, \( v <_B w \) only if \( w \) but not \( v \) makes \( B \) true.

2 The pragmatics of ‘only’

2.1 The pragmatic contribution as a conversational implicature

Of course, we also want to account for the fact that we normally can infer from ‘Only \( \phi \)’ that \( \phi \) is the case. If we cannot do so in semantics, we have to give a pragmatic explanation. The inference from (7) that John smokes is often proposed to be due to the presuppositions an utterance of the form ‘Only \( \phi \)’ comes with.

(7) Only [John] \( F \) smokes.

Horn (1969), for instance, claims that ‘Only \( \phi \)’ presupposes \( \phi \). An important argument in favor of a presuppositional analysis is that we not only from (7), but also from its negation, (8), typically infer that John smokes.
Horn himself, however, argued against this presuppositional analysis. Horn (1996) – followed by Geurts & van der Sandt (2004) – proposes, instead, that (7) gives rise to the weaker existential presupposition that somebody smokes. But he notes that by combining this proposed presupposition of (7) with the semantic meaning, \( \neg \exists x \neq \text{John} : \text{Smoke}(x) \), we still make the desired prediction that John smokes. Adopting an existential presupposition also seems correct to account for sentences like (9).

(9) Only [men] \( F \) smoke.

As observed by McCawley (1981, p. 226) and others, what this sentence seems to ‘imply’ is that at least some men smoke. And this is exactly what we predict on the proposal under consideration.

Whether or not ‘only’ sentences give rise to an existential presupposition,\(^2\) it is easy to see that in general it cannot be the correct analysis to account for the pragmatic inferences of a sentence of the form ‘Only \( \phi \)’. Although the proposed analysis gives rise to pleasing predictions for examples like (7) and (9), for only slightly different examples it fails to make the desired predictions. For instance, for sentences as (10) we would like to predict the inference that John and Peter smoke.

(10) Only [John and Peter] \( F \) smoke.

This will not come out, however, if we assume that (10) only gives rise to the existential presupposition that somebody smokes.

We claim that the inference from (7) ‘Only [John] \( F \) smokes’ that John smokes; from (10) that John and Peter smoke; from (9) that some men smoke, and from ‘B, only if A’ to the truth of ‘If A, then B’ is a conversational implicature (see also McCawley, 1981, and Horn, 1992). This is supported by the observation that these kinds of inferences pass standard tests for conversational implicature such as ‘but’-reinforcement (‘Only John smokes, but he does.’) and (epistemic) cancellation (‘Only John smokes and perhaps even he does not’). In particular, we propose that this kind of inference is one of those conversational implicatures falling under the heading of exhaustive interpretation (cf. van Rooij & Schulz, 2004). As it turns out, by using \([\text{only}]_1\) – or \([\text{exh}]\) as we will call this interpretation rule from now on – the inference from (7) that John smokes can be derived as due to the exhaustive interpretation of (7). To see this, notice that in sentences like (7), (9) and (10) the background-predicate occurs negatively, i.e., is a downward entailing context. As argued by von Stechow and Zimmermann (1984) and van Rooij & Schulz (2004), in these cases we should interpret exhaustively not with respect to background-predicate \( B \), but rather with respect to the complement of \( B \). Thus, we should interpret (7) as \([\text{exh}][[\text{only}]]_2([\text{John smokes}], S, \bar{S})\). In this way, we predict that the background-predicate ‘Smoke’ has at most John in its extension due to the truth-conditional meaning of (7), and at least John because of exhaustive interpretation.\(^3\) By a similar reasoning we can account for the inference from (10) that John and Peter smoke, something that Geurts

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\(^2\)Remember that many people have argued against such a position.

\(^3\)This is based on the fact that in general \([\text{exh}][[\text{only}]]_2([\phi], B) = [\text{exh}](\emptyset, B)\).

2.2 The epistemic force of the implicature

In the previous section we have argued that the inference from ‘Only [John and Peter]₀ smoke’ that John and Peter smoke is due to exhaustive interpretation, and we have claimed that exhaustive interpretation should be thought of as a conversational implicature. We needed the extra inference to be a conversational implicature, because we wanted to account for the fact that the inference is cancelable. However, we have not suggested yet why what follows from the exhaustive interpretation of a sentence can be thought of as a conversational implicature, nor how such an implicature can be canceled. With respect to cancelation, the most challenging aspect of our analysis of the inference from ‘only φ’ to φ is that we must be able to explain Atlas’ (1991, 1993) asymmetry in acceptability between the following sentences:

(11) a. Only [Hillary]₀ trusts Bill, if (even) she does.
    and perhaps even she does not.

b. *Only [Hillary]₀ trusts Bill, and (even) she does not.

Thus, the challenge we are faced with – as indeed is any proposal that seeks to account for the inference from ‘Only φ’ to φ pragmatically – is that, although the inference might be cancellable, it is only cancellable in certain ways. Notice that the important difference between (11a) and (11b) is that while the former only seems to cancel the implicature that the speaker knows that Hillary trusts Bill, the latter even wants to cancel the inference that the speaker takes it to be possible that Hillary trusts Bill. Thus, it seems that a sentence like ‘Only [Hillary]₀ trusts Bill’ gives rise to two kinds of implicatures: an uncancelable one with weak epistemic force saying that the speaker takes it to be possible that Hillary trusts Bill, and a cancelable one with strong epistemic force saying that the speaker knows that Hillary trusts Bill. Notice that only the second one entails the implicature we ended up with in the previous section: that Hillary in fact trusts Bill. So, the task ahead of us is to take into account that implicatures can come with different epistemic force, and to show that an inference due to exhaustive interpretation can be thought of as a conversational implicature in the first place.

In the previous section we have assumed that the conversational implicature relevant for the analysis of ‘only’ is one of exhaustive interpretation. The interpretation rule [exh], however, makes very strong predictions. For (12), for instance, it predicts that no-one (of the relevant persons) other than John actually smokes.

(12) Ann: Who smokes?
    Bob: John.

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4These examples motivated Atlas to adopt for (7) a ‘conjunctive’ analysis according to which both the A and B contributions discussed at the beginning of section 2 are taken to be semantically entailed by the ‘only’-sentence. The examples also convinced Horn (2002) to give up his earlier analyses (Horn, 1969, 1992, 1996) of ‘only’ where the inference from ‘Only Hillary trusts Bill’ that Hillary trusts Bill is taken to be due to a presupposition or conversational implicature.
A complaint often heard against interpretation rules like \([exh]\) has it that all we can conclude by standard Gricean reasoning is that the speaker only knows of John that he smokes, leaving it open that he does not know of anyone other than John whether he or she smokes. The strengthening from not know to know that not is then mostly contributed to the extra assumption that the speaker knows who smokes. We fully agree with this intuition, and we have shown in van Rooij & Schulz (2004) how to make it precise. In this section we give a quick and somewhat informal review of this work.\(^5\)

In order to take the knowledge state of speakers into account, we make use of the tools provided by modal logic. We interpret sentences with respect to states that also represent what the speaker knows (assuming a designated speaker). In order to do so, we first extend the language with one modal operator, \(K\), where \(K\phi\) expresses that the speaker knows that \(\phi\) is the case. The formula of the enriched language are interpreted with respect to pointed models of the form \(\langle M, w \rangle = \langle W_M, R_M, w \rangle\), where \(W\) denotes a set of possible worlds, \(R\) is a reflexive, transitive, and symmetric accessibility relation between those worlds that represents what the speaker knows, and \(w\) is a designated element of \(W\) that represents the actual world. We assume that worlds themselves also serve as interpretation functions from predicates (or atomic propositions) to their denotations. All sentences are interpreted in the standard way with respect to pointed models, where the modal component is only relevant for sentences of the form \(K\phi\). As usual, such a sentence is counted as true in \(\langle M, w \rangle\) if and only if \(\phi\) is true in all worlds in \(W_M\) accessible from \(w\) according to \(R_M\).

The semantic meaning of a sentence consists as always of the set of its verifying states. Having pointed models as verifying states means that the semantic meaning of a sentence consists of a set of such pointed model. Thus, we define for each sentence \(\phi\) its semantic meaning \([\phi]\) as \(\{\langle M, w \rangle : \langle M, w \rangle \models \phi\}\). Now we want to formalize what it means to take the speaker to obey the Gricean maxims of Quantity and the first subclause of the maxim of Quantity.

Formalizing tht the speaker obeys Quality is not that difficult: If our designated speaker utters \(\phi\), we simply assume that the actual pointed model is one that verifies \(K\phi\). Thus, it is one of the following: \(\{\langle M, w \rangle : \langle M, w \rangle \models K\phi\}\). To account for the Gricean first subclause of the maxim of Quantity (and Relevance) which demands speakers to convey all (relevant) information they posses, we are going to define an ordering relation between pointed models defined in terms of sets of alternative propositions the speaker knows. We are selecting pointed models where the speaker knows at least as possible relevant facts besides that her utterance is true. In order to do so we need an order comparing how much the speaker knows. This is provided by definition 3, which makes use of a set of alternatives to \(\phi\), \(Alt(\phi)\), defined in terms of background predicate \(B\).\(^6\)

**Definition 3 (Ordering knowledge states)**

\[
\langle M, w \rangle \prec_{Alt(\phi)} \langle M', w' \rangle \text{ iff } \{\psi \in Alt(\phi) | \langle M, w \rangle \models K\psi\} \subset \{\psi \in Alt(\phi) | \langle M, w \rangle \models K\psi\}.
\]

Now, we can say what it means to take the speaker to obey the Gricean maxims of Quantity and the first subclause of the maxim of Quantity: she has to know \(\phi\) and to be in a

---

\(^5\)The work of Benjamin Spector (2003) is closely related, although not based on the standard nonmonotonic theory of ‘only-knowing’ due to Halpern & Moses (1985) that we make use of.

\(^6\)We will assume that \(Alt(\phi)\) is a set of sentences, thus not a set of propositions. This is not essential, but it simplifies the presentation.
minimal knowledge state such that this is true.

**Definition 4** *(A Gricean Interpretation)*

\[
\text{[Grice]}(\phi, \text{Alt}(\phi)) = \{ (M, w) \in [K\phi] | \neg \exists (M', w') \in [K\phi] : (M', w') <_{\text{Alt}(\phi)} (M, w) \}.
\]

Thus, if the speaker utters ‘[John] \_F smokes’ we conclude that the speaker knows that John smokes, but not that Mary smokes, and if she utters ‘[John or Mary] \_F smoke’ we conclude that the speaker does not know of anybody else that he or she smokes. This is a nice result, but, as suggested in the previous section, in many cases we conclude something stronger: in the first example that Mary, Bill, and all the other relevant individuals *don’t* smoke, and the same for the second example, except that now this is not true anymore for Mary. How do we account for this extra inference in terms of our richer modal-logical setting?

In van Rooij & Schulz (2004) we show that this can be accounted for by assuming that, in addition to the Gricean maxims, speakers are *maximally competent* (as far as this is consistent with \([\text{Grice}]\)). This can be described by selecting among those states where the speaker obeys Grice, i.e., the elements of \([\text{Grice]}(\phi, \text{Alt}(\phi))\), those where the competence of the speaker is maximal. To account for this we need a new order to compare the competence of the speaker. We do this in definition 5.

**Definition 5** *(Ordering by possibility statements)*

\[
(M, w) <_{\text{Alt}(\phi)} (M', w') \text{ if and only if } \{ \psi \in \text{Alt}(\phi) : (M, w) \models P\psi \} \subseteq \{ \psi \in \text{Alt}(\phi) : (M', w') \models P\psi \}.
\]

Note that the minimal models in this ordering are those states where the speaker knows *most* about the alternatives. Now, finally, we define \(\text{Comp}\) by selecting the minimal elements in \([\text{Grice]}(\phi, \text{Alt}(\phi))\) according to the ordering \(<_{\text{Alt}(\phi)}\):

**Definition 6** *(Maximizing competence)*

\[
\text{Comp}([\text{Grice]}(\phi, \text{Alt}(\phi)), \text{Alt}(\phi)) = \{ (M, w) \in [\text{Grice]}(\phi, \text{Alt}(\phi)) | \neg \exists (M', w') \in [\text{Grice]}(\phi, \text{Alt}(\phi)) : (M', w') <_{\text{Alt}(\phi)} (M, w) \}.
\]

The basic technical result of van Rooij & Schulz (2004) is the proof that as far as all non-modal sentences is concerned, \([\text{exh}][\phi, B]\) gives rise to exactly the same inferences as \([\text{Grice}]_C(\phi, \text{Alt}(\phi))\), at least if definitions 3 and 5 would be slightly changed such that knowledge of ‘irrelevant’ items remains the same.\(^7\)

**Fact 1** *(Exhaustivity and Gricean reasoning)*

For all non-modal sentences \(\phi\) and \(\psi : [\text{exh}](\phi, B) \models \psi\) iff \([\text{Grice}]_C(\phi, \text{Alt}(\phi)) \models \psi\).

\(^7\)See van Rooij & Schulz (2004, submitted) for more discussion. In fact, this relation was not proved with respect to the set of alternatives \(\text{Alt}(\phi)\) but a background predicate \(B\). The proof would go very similar, however. There is one important difference, though. To prove the equivalence now, it is crucial to assume that the set of alternatives – or at least the one used in \([\text{Grice}]_C(\cdot, \cdot)\) – is closed under conjunction. If we would not assume that, the exclusive reading of the disjunction in the answer ‘John or Mary smoke’ to the question ‘Who smoke?’ is derived from \([\text{exh}](\cdot, \cdot)\), but not from \([\text{Grice}]_C(\cdot, \cdot)\).
This means that as far as these non-modal sentences is concerned, exhaustive interpretation can be given a natural Gricean justification. Better, perhaps, it means that if we assume that the speaker is maximally competent, we can take interpretation rule \([\text{exh}]\) to be a natural implementation of the Gricean maxims of Quality and Quantity. But what will be important for us now is that by the use of our modal framework (i) we make better predictions concerning implicatures of modal (and interrogative) sentences, and (ii) we actually can say that exhaustive interpretation by itself gives rise only to weak readings (triggered by definition 4 and not definition 7), which can be strengthened only in case we assume the speaker to be competent about the subject matter of the discourse. Now let us consider examples (11a) and (11b) again:

\[(11a) \quad \text{Only} [\text{Hillary}]_F \text{ trusts Bill, if (even) she does.} \]
\[\quad \text{and perhaps even she does.}\]

\[(11b) \quad \ast \text{Only} [\text{Hillary}]_F \text{ trusts Bill, and (even) she does not.}\]

In the beginning of this section we have suggested that the first conjunct of (11a) gives rise to two conversational implicatures: the uncancelable implicature that the speaker takes it to be possible that Hillary trusts Bill, and the cancelable one that the speaker knows that Hillary trusts Bill. In the previous section we have assumed that if a sentence of the form ‘Only φ’ contains background property \(B\), we should interpret the sentence pragmatically as \([\text{exh}][[\text{only}]_2([\phi], B), \overline{B}]\). If we want to interpret exhaustively with respect to a set of alternatives instead of a background-predicate, we should consider the set of alternatives \(\text{Alt}(\phi) \equiv \{\neg \psi | \psi \in \text{Alt}(\phi)\}\). Thus, if we represent the embedded clause of the first conjunct of (11a) by \(\phi\), this first conjunct should be interpreted pragmatically as \([\text{Grice}][[\text{only}]_2(\phi, \text{Alt}(\phi)), \text{Alt}(\phi)]\). This gives rise to the inference that the speaker takes it to be possible that Hillary trusts Bill. If the speaker is taken to be competent on which of the elements of \(\text{Alt}(\phi)\) are true, the first conjunct of (11a) is pragmatically interpreted as \([\text{Grice}_C][[\text{only}]_2(\phi, \text{Alt}(\phi)), \text{Alt}(\phi)]\). This gives rise to the inference that the speaker knows that Hillary trusts Bill. The second conjunct of (11a) cancels the extra inference due to the assumption of competence. This is indeed a quite reasonable ground for canceling a pragmatic inference. What the second conjunct of (11b) wants to do, instead, is to cancel the inference based on the Gricean maxim of Quality and his first submaxim of Quantity. The fact that this gives rise to an inappropriate sentence strongly suggests (to us) that one cannot cancel inferences based on these maxims. In any case, once we make this latter assumption, we can explain Atlas’ (1991, 1993) asymmetry between (11a) and (11b).

### 3 Conclusion

In the first part of this paper we argued to make a systematic distinction between the semantic and the pragmatic contribution of an ‘only’ sentence, and we provided a minimal model analysis of the semantic part, based on Groenendijk & Stokhof’s (1984) rule of exhaustive interpretation. We showed that the resulting analysis makes some appealing predictions. In the last substantial section of this paper we argued that the pragmatic inference from ‘Only φ’ to \(\phi\) should be thought of as a conversational implicature, and
we have given a precise implementation of the Gricean maxims of Quality and Quantity to account for this.

In the last part of this paper we made crucial use of the assumption that what can pragmatically be inferred from Grice’s maxims of Quantity and Quantity, i.e., those inferences due to Grice, cannot be cancelled. This assumption, however, might sound counterintuitive. Is it not the case that all pragmatic inferences can be cancelled? For instance, we, together with many others, propose that the inference from ‘[John]F smokes’ to the fact that the speaker does not know that Mary smokes is due to the above mentioned Gricean maxims. It seems obvious, however, that this is an inference that can be cancelled easily.


We believe, however, that such examples do not really constitute counterexamples to our assumption. We think that (13) is appropriate only in case it is used in a context in which Mary’s smoking is not at issue, for instance because Paula answered the question who of John and Bill smoke. It seems exactly the function of ‘in fact’ – and perhaps also of ‘too’ – to change, or accommodate, the topic of conversation such that Mary’s smoking becomes relevant as well. This argument does not prove that our assumption is correct, although it does suggest that it is not as ‘wild’ as it might seem at first. Whether it makes sense in general, we have to leave to future investigations.

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‘ON-LINE’-INFERENCE IN THE SEMANTICS OF DANN AND THEN *

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Abstract

The paper presents a theory of the semantics and the discourse effects of German temporal dann and English then in their sentence-initial, –internal and –final positions. The theory provides an algorithmic reconstruction of these differences on the basis of a single specification of the semantics of dann/then, which interacts with other semantic elements at sentence and discourse level in ways that vary with its position. The requirement which dann/then imposes is that the time it denotes is separated from the time which the narration had reached by a change in some contextually salient property of a topical discourse referent. What is available as contextually salient property depends on where dann/then occurs in the sentence. Integration of this insight into a general account of semantic processing entails a shift of perspective in current semantic theory. Semantic processing must now be treated as incremental following the left to right order not only sentence by sentence but also word by word.

1 A short characteristics: semantics and position of German dann and English then

It is a well–known phenomenon that sentence-initial and sentence-final then are different; the former is known as updating, the latter as co-temporal then.¹ That German dann also differs as a function of position is a less well known fact. Sentence-initial dann is like sentence-initial then; there is, however, also a sentence-internal position in German in which dann occurs and in which it behaves differently from sentence-initial dann/then on the one hand and from the sentence-final then on the other. Our attention was drawn to this distinction when investigating a corpus of oral narratives.² We frequently find instances like (1a), where the alternative version in (1b) would be unacceptable.

(1) a. man sieht nochmal sein gesicht und dann sieht man einen schwarzen
     you see again his face and then see you a black
     bildschirm
     screen

¹This paper developed from joint work with Christiane von Stutterheim in the project Konzeptionalisierung und Versprachlichung von Ereignissequenzen, funded by the Deutsche Forschungsgemeinschaft. We wish to thank Hans Kamp and Mary Carroll for discussions.
²Shiffrin (1992), Glasbey (1993), Spejewski and Carlson (1993) and others.
³These are corpora for psycho-linguistic studies at the Institute for German as a Foreign Language at the University of Heidelberg.
b. man sieht nochmal sein gesicht/ und # man sieht dann einen schwarzen
you see again his face and # you see then a back
bildschirm
screen

Context (1a) is true if you see a face and no black screen at t and at t’ you see no face
but a black screen. (1b) would mean a black face but no black screen is seen at t and at
t’ the face as well as the black screen is seen. Since you cannot see the face and a black
screen at the same time (1b) would be the wrong thing to say. (The data show that this is
a mistake that people do not make.)

The difference between sentence-initial and sentence-final then is not quite the same as
that between sentence-initial and sentence-internal dann. (2a) is like (1a).

(2) a. you see his face again/ and then you see a black screen
b. you see his face again/ # and you see a black screen then

Context (2b) would like (1b) describe an impossible situation. But in this case the im-
possibility would arise because the second sentence suggests that a black screen is seen
throughout the time denoted by the first sentence (and not just that the two states would
overlap).

These findings already show a tendency: With sentence-initial dann we have non-persistence
of the antecedent state to the right and non-persistence of the consequent to the left.
I.e.(1a) and (2a) speak of two times and two states, which do not overlap. With sentence-
internal dann we have persistence to the right of the antecedent state and non-persistence
to the left of the consequent state. The context speaks of two times, t≺ t’, but the an-
tecedent state also obtains at t’. With sentence-final then we have persistence of the an-
tecedent state to the right and persistence of the consequent state to the left. The context
speaks of a single time at which both states are presented to obtain.

Is there a unique semantics of dann/then on the basis of which the differences can be
calculated compositionally? We claim that there is. Dann (or then) signals a change of
some property of the subject from the antecedent state to a new state where the subject
no longer has that property: In (1a) and (2a) the property ‘see the face’ changes to ‘not
see the face’. In (1b) the change is from ‘not see the black screen’ to ‘see the black
screen’ while the property ‘see the face’ continues to hold. This difference between (1b)
and (1a) is due to the fact that the discourse referent of man in the second sentence of
(1b) is interpreted as keeping its property ‘see the face’ before dann signals that some
change occurs. In the case of sentence-final then in (2b) that signal comes too late to
prevent another inference that would be drawn if then had been absent altogether, viz.
that the second property already held at the time described by the first sentence. Then
in its sentence-final position must be understood as signalling a change from the state of
both seeing the face and seeing the black screen to a state where neither seeing the black
screen nor seeing the face is longer guaranteed to obtain.

Changing the examples so that the antecedent sentence contains an event rather than a
state shows effects which do not arise with stative predications and which have to do with
the causal relation between the events in the first and in the second sentence.
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(3) a. das männchen steht auf/ und man sieht dann dass es aus lehm ist
   the little man stands up and you see then that it from clay is

Context (3a) means that the event of the little man getting up makes you see that he is made out of clay, something you wouldn’t have seen if he hadn’t got up; we infer a causal connection. If we swap positions of dann and er, so that dann is sentence-initial and er is internal, see (4a), the causal relationship is suspended. This also holds for the English version (4b) with sentence-initial then.

(4) a. das männchen steht auf/ und dann sieht man dass es aus lehm ist
   the little man stands up and then you see that it from clay is
   b. the little man stands up and then you see that it is made out of clay

The potential of sentence-initial dann/then to suspend a causal relationship is wellknown from the literature, see e.g. Glasbey (1993), Spejewski and Carlson (1993). The fact that dann in its clause-internal position can trigger a causal connection is not known and is surprising. It has been noted in the literature that sentence-final then does not prevent the interpretation of a causal relation as such (see (5)). However pure background readings are more common. That is also the default interpretation of (5), when having achieved a lifelong ambition is omitted.

(5) Daniel climbed Ben Nevis. He was happy then (having achieved a lifelong ambition).
   Glasbey (1993)

(6) Daniel bestieg den Ben Nevis. Er war dann glücklich.
   ‘Daniel climbed Ben Nevis. As a result he became happy’

A pure background reading is not available with (3a), nor with (6), where dann is also internal.

We will argue for the fact that the power of sentence-initial dann/then to suspend a causal relationship is due to a discontinuity it introduces into the descriptions, whereas sentence-internal dann and sentence-final then describe the eventuality sequence as continuous. We will define these notions in terms of properties ascribed to the topical discourse referent at the times t and t’ described by the two sentences. Our distinction between continuous and discontinuous descriptions reconstructs that of Shiffrin (1992) between ‘continuation of reference time’ (applying to sentence-final then) and ‘shift of reference time’, (applying to sentence-initial then). Other authors have made similar dichotomies: Spejewski and Carlson (1993), speak of ‘temporal subordination’ vs. ‘temporal distinction’ at the discourse level. Glasbey (1993) speaks of “part-whole-relation” vs. “no part-whole-relation” between eventualities. Our account differs from those in that we explain the discourse effects as a result of inferences at the level of verbal predication.
2 **dann/then**: a challenge for dynamic semantics

2.1 state of the art in dynamic semantics and difference in meaning

The difference between (1a) and (1b) is one that current dynamic semantics fails to represent. Following the proposals of semantics construction in current DRT and UDRT, interpretation is a two step process. Representation starts from a syntactic tree representation. As always, the leaves of this tree are decorated with the lexical items of which the sentence is composed. These items are replaced by the semantic representations with which they are paired in the DRT-lexicon. These representations are “preliminary representations” in the technical sense: they consist of (i) a (set of) presupposition(s) and (ii) a non-presuppositional part. (See (8)). In current DRT these lexical representations are then combined, following the structure of the tree, to form a preliminary DRS for the sentence. (See (9)). Resolution of its presuppositions then converts this preliminary DRS into the final sentence representation.

In UDRT the lexical representations are first arranged in the form of a semantically motivated lattice (UDRS). The conversion of this UDRS into the final sentence representation makes it possible to take other factors besides syntactic structure into account and to permit presupposition resolution to guide the resolution of scope and other ambiguities. In the account of representation construction we propose here the lexical components are also kept separate initially, but their integration is allowed to proceed on-line: As the lexical items and their semantic representations become available in a left-to-right processing of the sentence, those representations which correspond to an initial segment of the sentence string can be integrated into a partial sentence representation, which will then be extended as the following lexical items become available. Moreover, certain lexical items require interpretation in relation to the part representation provided by just those lexical items which precede them in the sentence. This is so in particular for **dann** and **then**, and it is that which is responsible for the different effects these words produce when they occur in different sentence positions. Instead of UDRSs we use ‘modular representations’ which keep track of the order in which the lexical representations are introduced by the lexical items of the sentence string. (8).a and (8).b. give the modular representations for the second sentences of (1a) and (1b). The lexical entry for **dann** is (7).  

(7) **dann** \(\sim\) \(<\{t_0 \subseteq s_0\}, t_{dn}\),  \(t_0 \prec t_{dn}\) or \(<\{t_0 \subseteq e_0\}, t_{dn}\),  \(t_0 \prec t_{dn}\) \>  

The entry (7) reflects how **dann** has been dealt with in DRT: **Dann** and **then** are anaphoric. This is made explicit in the lexical entry (7) in terms of a presuppositional binding condition which requires finding an event or state \(e_0\) in the context. The period discourse referent \(t_{dn}\), which **dann or then** introduces follows the location time \(t_0\) of the antecedent eventuality \(e_0\); see condition ‘\(t_0 \prec t_{dn}\)’ in the assertion part of the entry. The entry (7)  

\(^3\)see Genabith, Kamp and Reyle (2004), Kamp (2001a), Reyle and Rossdeutscher (2001), Reyle, Rossdeutscher and Kamp (n.d.)  

\(^4\)In the representation of **dann** in (8) \(e_0\) (eventuality) generalises over \(e_0\) (event) and \(s_0\) (state) as in the lexical entry (7).
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will be refined and revised, see (14), below.

![Diagram](image_url)

According to DRT the preliminary sentence representation which results from both modular representations (8).a for (1a) and (8).b for (1b) is presented in (9).

![Diagram](image_url)

Here the crucial difference between (1a) and (1b) has been lost because all presuppositional contributions are collected into a single set (which is left adjoined to the representation of the assertion) and all assertional contributions are gathered in the assertion part. This applies in particular to the contribution made by dann. That dann makes its contribution at different stages of a left–to–right interpretation of the two sentences process is entirely ignored.

But before going into discussion of the consequences, let’s finish the text representation of (1a) and (1b) to see what we really get. Presupposition justification in the context of man sieht (nochmal) sein gesicht t₀ in the presupposition triggered by dann binds the location time t of the state s, t ⊆ s, of the condition s: X see fc.

The relation between r(eference time) and location time t’ of s’ (see condition r ⊈ t’, where r is t) turns out t ⊈ t’. This relation is due to dann. Thus we obtain an update reading saying that at time t you see the face of the protagonist m and at a later time t’ you see a black screen.

This result is unsatisfactory because it cannot explain why speakers would produce (1a) and not (1b). Moreover, the same truth conditions that are computed for (1a) and (1b) would be computed for (2b) as well and this would be entirely wrong. For we are made to
infer from (2b) contrary to our intuitions that seeing the face and seeing the black screen happen simultaneously. We could avoid this problem by saying that sentence-final *then* is a different *then*. But saying so would go against the principle that we should not postulate ambiguities where they aren’t needed.

What we need is a more finegrained account of incremental semantic processing which enables us to articulate how the representations on which sentence-initial *dann* of (1a) and sentence-internal *dann* of (1b) operate and why the results of these two operations differ in the way our intuitions tell us. The modular representations as in (8) are not a bad starting point for such a theory. But the theory needs refinement in several respects. One of them is a bookkeeping device on discourse referents which keep track of the temporary properties the text attributes to the represented individuals during various stages of the discourse.

We will now present basic principles to make the necessary refinement of the semantic construction operative.

3 Basic principles

3.1 the linguistic Principle of Monotonicity (MON)

We cite this principle without further motivation. For motivating examples see e.g. the original discussion in Caenepeel and Sandström (1993), for applications see Reyle and Rossdeutscher (2001), and Roßdeutscher and von Stutterheim (n.d.).

(MON) Linguistic Principle of Monotonicity
Once a text has attributed to an individual x a state s of having property P, that state persists (in the direction of the future or ‘to the right’) until the text provides explicit evidence to the contrary, i.e. there is some state s’, s ≺ s’ where x bears the property ¬P. (Persistence to the left, analogously.)

3.2 introduction of temporary properties of individual discourse referents

Information about temporary properties of individuals enters the discourse by means of verbal predicates. Homogeneous verbs like *love*, *be ill*, *run about*, *watch tv* predicate of their subjects the property of loving somebody, of being ill, running about or watching (tv), etc. Change of state predicates like *become ill*, *switch on the tv*, *go to the bus stop* provide more complex information of two successive states with the first changing into the second. For instance *become ill* ascribes a succession of two states (a) a presupposed state of the subject not being ill and (b) an asserted state of the subject being ill. (The subject has the properties for the duration of the corresponding states.)

3.3 a bookkeeping device for temporary properties of individuals

The bookkeeping of properties that are attributed to an individual discourse referent at various stages of the discourse is captured with the help of an indexing procedure for topical discourse referents. As will be argued in the next section the second sentence of (1b) will at one point in the processing of that sentence have the representation of the
following form (where X represents impersonal third person (= man/you) and sc is the black screen).

\[(10) \quad s': X_s \text{ see sc} \quad t' \subseteq s' \cap s\]

Here the topical discourse referent X is indexed with s, see X_s, where s represents the state introduced in the first sentence, i.e. seeing the face. s is the state that counts as 'current' at the point where (10) is established. Indexing X with s in the representation of the form s': \(\varphi(X_s)\) where t' is location time of s' indicates that during t' the variable X bears the properties attributed in s and the property attributed in s'. s' is the state introduced by the sentence whose representation is under construction. A complex condition of the form ‘s’: \(\varphi(X_s), t \subseteq s'\)’ thus always entails that \(t' \subseteq s' \cap s\). A special situation arises with the first sentence of a discourse, where the 'current' state s is the state which the sentence speaks about, see (11), where fc represents the face.

\[(11) \quad s:X_s \text{ see fc} \quad t \subseteq s\]

**pronouns as anaphora with state properties** Individual discourse referents keep their temporary properties beyond sentence boundaries. Anaphoric expressions ‘inherit’ their temporary properties from their antecedents. Thus the referent of the pronoun she, e.g. continues to have those properties its antecedent has been ascribed in context. This insight gives rise to a slight change in lexical entries for pronouns such as she compared with the lexical entry as given in Genabith et al. (2004).

\[(12) \quad \text{she} \sim \begin{cases} \begin{cases} u & \text{female}(u) \end{cases} \\ \end{cases} \quad \begin{cases} \begin{cases} u_0 & \text{female}(u_0) \end{cases} \\ \end{cases}\]

As in Genabith et al. (2004) she introduces a binding constraint for a discourse referent u presenting a female individual, but here the binding constraint is a double one. This double binding constraint applies in particular for discourse referents for topic NPs: They receive a state index. For instance the contribution of the anaphoric use of man in (1b) and (1a) must now be of the form (13).b rather than of the simpler form (13).a.\(^5\)

\[(13) \quad \text{man} \sim \begin{cases} \begin{cases} X' & \text{impers. 3rd ps.sg.}(X') \end{cases} \\ \end{cases} \quad \begin{cases} \begin{cases} X'_{s_0} & \text{impers. 3rd ps.sg.}(X'_{s_0}) \end{cases} \\ \end{cases}\]

Presupposition justification of the occurrence of man in (1b) — but not in (1a) as will be argued for in the next section — comes to the complex identification \(X'_{s_0} = X_s\), where \(X' = X\) (X is introduced by man in the first sentence of (1b)) and \(s_0 = s\) (where s is the state described in the first sentence which consists in X having the property P).

\(^5\)What the conditions ‘current state’\((s_0,X')\) amounts to will become clear as we proceed.
3.4 Lexical properties of dann/then

Using dann the speaker signals a relevant change in the episode of which the given sentence containing dann is used to describe some part. At the point where dann/then occurs dann makes explicit that a change has occurred and what follows must be interpreted on the basis of that change. We can say thus that dann/then triggers the presupposition of a change. And it is because of that change that dann follows the time t the narration has reached. To be more precise there is a state s_p with appropriate property P of the topical discourse referent x in context, such that the condition s_p:P(x) holds at s_p and a state s^*p, where the negative condition s^*p:¬P(x) obtains, s_p ≺ s^*p (see the two columns in the presuppositional part of (14)). The period t_{dn} is located within s^*p, see condition ' t_{dn} ⊆ s^*p ' in the rightmost presupposition column in (14). This latter condition can be strengthened to dur(t_{dn}) = dur(s^*p). For dann/then are no frame adverbials like tomorrow, after the funeral but signal a change in states of affairs. We have positive evidence only of a left boundary, which is co-temporal with the new state conditions to obtain.

(14) (preliminary)

\[
\begin{array}{c|c|c|c}
\text{ev}_0 & t_0 & t_0 & t_0
\end{array}
\]

The reader might notice that the new entry does not make any commitments concerning a relation between t', i.e. location time of the verbal predication, and the period t_{dn} which is introduced by the adverbial. This lack of commitment is intended. Refraining from giving constraints in this respect seems to involve an offence against the well founded insight that adverbials also restrict location time of the sentence, see e.g. Kamp and Reyle (1993) and others. But different from frame adverbials the semantics of dann/then is based on inference processes involving temporary properties of individuals that involve temporal inferences also. Whether t' ⊆ t_{dn} obtains or not varies both with position and context. (We will see later that ' t' ⊆ t_{dn} ' is valid only for sentence-initial and -internal dann/then.) (Note that the entry (14) is preliminary only and will be further refined later. Still refinements will not affect the general structure of presupposing change.)

4 ‘On-line’–inferencing in s;s’–descriptions

4.1 state;state–descriptions with sentence-internal dann

We will now follow the modular representation (8).b of the second sentence of (1b) with two accommodations: The old entry for dann (7) is replaced by (14). The repeated occurrence of man is represented as in (13).b.

man The first discourse referent that gets introduced into the processing of this sentence is the one expressed by the impersonal pronoun man. This occurrence of man is interpreted as co-referential with the man of the first sentence. This means that the discourse referent X'_{s0} is set equal to the discourse referent X_s introduced by the first occurrence of man. The effect of this is that the state attributed to X a in the first sentence is ‘inher-
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'ited' by X': the predication represented by s and the new predication X' expressed by the second sentence overlap at the new predication time t'. In the case of (1b) this means that the discourse referent of man is seeing the face and a black screen at the same time. For the first inference we gain (10) = (15).

\[ s': X_s \text{ see sc black screen(sc) } t' \subseteq s' \cap s \]

\textbf{dann} According to (14) the interpreter must find states \( s^p \) and \( s^{*p} \) which attribute to the topical discourse referent contradictory properties \( P \) and \( \neg P \). In the case at hand the topical discourse referent must be \( X_s \). So the requirement imposed by \textit{dann} in (1b) takes the form of (16).

\[ s^p: P(X_s), s^{*p}: \neg P(X_s), t_{dn} \subseteq s^{*p} \]

\textbf{VP} Which is the property \( P \) \textit{dann} could signal the change of? At the stage when in the course of interpreting the second sentence of (1b) \textit{dann} has to be accounted for there are only two candidates: the one attributed to \( X \) in the first sentence —that of seeing the face — and the one which is contributed in the second sentence. But it cannot be the first for this would mean that the discourse referent of \textit{man} would bear the properties ‘seeing the face’, ‘seeing the screen’ and ‘not seeing the face’ at the same time. For we have inferred in virtue of (MON) that \( X_s \) continues to have the first property, see (15). But given the signalled change concerns the latter property, we need not give up the inference already taken on board. The property changes from ‘not see a black screen’ at \( t \) to ‘see a black screen’ at \( t' \), \( t' \subseteq t_{dn} \) and we end up with (17).

\[ s: X_s \text{ see fc } s^p: \neg X_s \text{ see sc } s': X_s \text{ see sc } t \subseteq s \cap s^p \]
\[ t' \subseteq s' \cap s \]
\[ t' \prec t'; t' \subseteq t_{dn} \subseteq s' \]

This is why we get the interpretation that at \( t \) you see the face, but do not see the black screen and at \( t' \) you see both the face and a black screen. So (1b) ends up with an inconsistent reading. Sentence pairs of the same form as (1b) can be perfectly coherent provided the predications of the first and the second sentence are compatible. An example is (18).

\[ (Als \ ich \Maria \ besuchte), \ war \ sie \ krank. \ Sie \ war \ dann \ im \ Krankenhaus. \]
\[ (When \ I \ Maria \ visited), \ was \ she \ ill. \ She \ was \ then \ in \ hospital \]
\[ (‘When \ I \ paid \ a \ visit \ to \ Maria) \ she \ was \ ill. \ As \ a \ result \ of \ her \ illness \ she \ came \ to \ hospital.’ \]

We infer from (18) that Maria was ill but not in hospital yet, at \( t \) (i.e. when visited) and she was ill and in hospital at \( t' \subseteq t_{dn}, t' \prec t_{dn} \). These are the truth conditions incremental inferencing predicts and which the sentence actually has. 6 We also infer from (18) that

\[ 6 \text{ The reader may verify easily: Interpreting the pronoun } \textit{sie} \text{ in context yields the condition } u_{s_i} = m_s, \text{ where } m_s \text{ represents } \textit{Maria} \text{ which bears the property of being ill at } s; \ 's': \text{ be ill (m_s), Maria (m_s)'}. \text{ As } \textit{sie} \text{ is the subject of } \textit{im Krankenhaus sein} \text{ this leads to the inference 's': be in hospital (m_s), t' } \subseteq s' \cap s. ' \]
Maria went to hospital because of her illness.

4.2 state–descriptions with sentence-initial *dann*

*dann* Following now the modular representation (8).a for (1a) the first word to be processed in the second sentence of (1a) is *dann*. Again presupposition justification in (14) must be resolved wrt. (11). This yields $ev_0 = s$, $t_0 = t$, $t \subseteq s$. This time only one property is available for fulfilling the requirements of *dann*, viz. that attributed to the topical discourse referent X in the first sentence. The result of using this property as $s^p$ in the justification of *dann* is that the discourse referent stops seeing the face before $tdn$. In other words: The speaker utters *dann* at the beginning of the new predication in order to signal that the previously established properties of X no longer obtain, the state $s$ is terminated: You see the face no longer. Thus we obtain (19) for the first inference.

\[
\begin{align*}
(19) & \quad s: X \text{ see fc} \quad s^p: \neg X_{s^p} \text{ see fc} \\
& \quad t \subseteq s \quad t \prec t_{dn}, \ t_{dn} \subseteq s^p
\end{align*}
\]

*man,VP* Again the variable $X'_{s^0}$ must be resolved in the current context. The individual antecedent of $X'_{s^0}$ is X, but X is no longer conceptualised as bearer of the property of seeing the man’s face in $s$, but instead as bearer of the property of not seeing the face any longer. So resolution now has the form $X'_{s^0} = X_{s^p}$, where $s^p$ is as in (19). The result is (20), because $X'_{s^0} = X_{s^p}$ is the subject of the second sentence.

\[
\begin{align*}
(20) & \quad s: X \text{ see fc} \quad s^p: \neg X_{s^p} \text{ see fc} \\
& \quad t \subseteq s \quad t \prec t_{dn} \\
& \quad s': X_{s^p} \text{ see sc} \\
& \quad t' \subseteq s^p \cap s'; \ t' \subseteq t_{dn}
\end{align*}
\]

Table (20) presents the partial inference that at $t$ you see the man’s face and at $t'$ you do not see the man’s face but a black screen. This time the interpretation rules we have been assuming do not trigger any inference about whether the topical X has the second property – that of seeing a black screen – at the earlier predication time $t$. But of course the interpreter will nevertheless infer that X did not see a black screen at $t$, since that is incompatible with seeing a face. That it is indeed the incompatibility between the two properties which is responsible for the inference that X did not see a black screen at $t$, is shown by (21), where there is no incompatibility between Maria’s being ill and her being in hospital. Indeed, (21) does not strictly exclude that Maria was in hospital already at the earlier time $t$.

\[
\begin{align*}
(21) & \quad \text{(Als ich mit Maria letzten telefonierte), war sie krank. Dann war sie im Krankenhaus.} \\
& \quad \text{‘(When I called Maria recently) she was ill. Then she was in hospital’.}
\end{align*}
\]

Justification of *dann* concerns location properties. $s^p$: $\neg$be in hospital($m_s$); $s'$: be in hospital($m_s$)
Still the hearer of (21) will assume, that the speaker has evidence to the effect that Maria isn’t yet at hospital at t, i.e. he will not only infer non-persistence to the right of the antecedent state but also non-persistence to the left of the consequent state. (21) suspends a causal relationship between Maria being ill and being in hospital which we inevitably infer from (18). (See section 7).

4.3 state;state–descriptions with sentence-final then

The interpretation of (2b) starts like that in (1b) but since then is not sentence-internal as dann in (1b), but final, the then-signal doesn’t fire before all inferences concerning the temporary properties attributed by the verb of the second sentence that would also have been drawn had then been absent are already fully registered.

You The first inference is just like in (1b), we yield (15) = (22)

\[ (22) \quad s': X_s \text{ see sc} \quad \text{black screen(sc)} \quad t' \subseteq s' \cap s \]

VP The contribution of the VP becomes processed in absence of any signal that a change had occurred in the course of the described episode. So the interpreter infers that the state of seeing the face and that of seeing the screen were simultaneous. Not only do they overlap at the new location time t’ but the reference time t is stable, which is represented as t \( \subseteq \) t’ in (23).

\[ (23) \quad s: X_s \text{ see fc} \quad s': X_s \text{ see sc} \quad t \subseteq t' \subseteq s' \cap s \]

Just as (1b) (2b) forces the interpreter to assume an overlap of incompatible states. Once again we get a coherent discourse when the two sentences attribute to the topic properties that are not incompatible.(24) supports the inference that Mary was in hospital at the time she was paid a visit.

\[ (24) \quad \text{(When I paid a visit to Mary) she was ill. She was in hospital then.} \]

Then According to our lexical assumptions then signals a change from \( s^p: \neg P(x) \) to \( s^{*p}: \neg P(x) \), where \( t_{dn} \subseteq s^{*p} \). The properties the topical discourse referent bears in context are both seeing the face and seeing the black screen. For \( s^{*p} \) the continuation of both properties is cancelled. The period \( t_{dn} \) is part of that state \( s^{*p} \). That there is a period \( t_{dn} \) to the right of \( t_0 \) present makes itself felt in the fact that the presence of sentence-final then can drive the sentence into ungrammaticality. Here is an example: (25), e.g. spoken during a telephone call while staying with Maria is ungrammatical:

\[ (25) \quad \text{(I am just paying a visit to Maria). She is ill. * She is in hospital then.} \]

How come that (25) is ungrammatical? To arrive this fact from the analysis of dann/then offered here we need one further assumption. It has been implicit in what has been said
so far, but should now be made explicit. The result state $s^\ast p$ of the change required by *then/dann* stands in a temporal relation to the speech time $n$ that is indicated by the tense information of the sentence containing the word. In the examples so far considered this means that the change invoked by sentence-final *then* is itself located at some time $t_c$ in the past of $n$, and thus is between $n$ and the described episode, thereby producing the impression of ‘remoteness’— the episode was entirely before $t_c$ which itself is situated in the past of $n$.

This explains why with a present tense passage like (25) we get in trouble. Here the present tense of the sentences locate both predications at $n$: $t = t' = n$. An attempt to justify the sentence-final *then* by assuming a change which puts an end to the complex predication that has been established as holding at $t = t' = n$ now fails. At the one hand the result state of the change demanded by *then* should be located at $n$, on the other hand it should follow the predication at $t = t'$.

**Justification of clause-final then** We must be more explicit about our idea of “cancellation of the continuation of properties” signalled by sentence-final *then*. Justification cannot invoke a change from ‘not in hospital’ at $s^p$ to ‘in hospital’ at $s^\ast p$ in (24), as in (18). The signal comes too late for that. But neither does the sentence-final signal indicate a change from ‘in hospital’, or ‘ill’ and ‘in hospital’ into a state $s^\ast p$ where the negations of one or both properties obtain. Indeed, being in hospital may very well claimed to continue. For we can continue (24) as in (26) without being contradictory.

(26) (When I paid a visit to Maria) she was ill. She was in hospital then. In fact she has been in hospital ever since.

The puzzle is solved if we assume that the change which sentence-final *then* signals may be of an epistemic nature: For the *then*-period $t_{dn} \subseteq s^\ast p$ the speaker refrains from committing himself to any specific properties the topical discourse referent may or may not have. This is still a genuine change between a period of time with respect to which the speaker commits himself to certain predications of the topic to a period regarding which he makes no such commitments. Such changes too may be signalled in discourse. However, the signal can be overwritten by a subsequent sentence as we find in (26). We present lack of commitment to specific properties by means of the trivial property, s. (27). The trivial property is a property that does not contradict with any of the properties Mary (or the topical x in general) might bear. We write the trivial property as $\top$. (Compare 5.)

As far as the temporal properties are concerned, sentence-final *then* follows the lexical constraint, see (27). (Note that location time $t'$ is not located within the period denoted by *dann/then*.)

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7 Many of the occurrences of sentence-final *then* we find in the narrative work of Charles Dickens express remoteness. Note the present tense in the immediate left of the sentence with *then*.

(i) He walked me up to my room slowly and gravely — I am certain he had a delight in that formal parade of executing justice — and when we got there, suddenly twisted my head under his arm. It sets my teeth on edge to think of it. He beat me then, as if he would have beaten me to death.
§ s: be ill(m)
s': be in hospital(m) s∗p: ⊤(m∗p)
t ⊆ t' ⊆ s ∩ s' tdn ⊆ s∗p, t ≺ tdn

5 Refinements

Sentence-final then shows that the signal of change, which dann/dann contributes, may involve an epistemic dimension. Sentence-final then signals a change from positive evidence to non-commitment or absence of evidence. Sentence-internal dann in state descriptions signals change from negative to positive evidence. But epistemic modularity may apply for sentence-initial dann/then as well. It may signal change from positive evidence of a property P at s∗p to negative evidence of P at s∗p or to non-commitment to P at s∗p. The latter possibility doesn’t come to mind in (1a) and (2a), because it is possible to understand the change as one from seeing the face to not seeing it, and that interpretation is chosen. But both a non-epistemic and an epistemic interpretation seems possible in (21), where the speaker might either signal that Maria is no longer ill when she comes to hospital or else his non-commitment to the question whether Maria is ill or healthy at that time.

We must incorporate our insight that the change which dann/then signals is change modulo an epistemic operator K (=Know or commit to) into the lexical entry. Instead of (14) we yield (28).

(28) dann/then \sim \{ ev_{t_0} t_0 \\
      s^p: K P(x) \}
      \{ ev_{t_0} t_0 \}

Compared to (14) entry (28) is less restrictive because the condition ‘ ¬K P(x) ’ (i.e. non-commitment to P(x)) in s∗p:¬K P(x) is weaker than ‘ K¬ P(x) ’ (i.e. commitment to ¬P(x)) The latter is equivalent to the condition in (14), where we wrongly assumed full commitment to P and ¬P as if K would have been applied according to its strong mode. Between the two epistemic modes the following axiom obtains.

\[ \models K¬ P(x) \rightarrow ¬K P(x) \]

We refrain from giving a precise semantic of the operator K. For K¬ P(x) will translate ¬P(x) for representation purposes and ¬K P(x) will translate \( \top(x) \).

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8However, there are also examples of sentence-internal dann which must be interpreted as involving an epistemic change. But this occurs only as an interpretation of last resort, i.e. if the predicate blocks interpreting the signal as indicating change from ¬P to P. For instance the second sentence of (i) is interpreted as a re-description of the same state of illness which the first sentence speaks of from a later perspective: Unforeseen at the time the speaker paid a visit to Maria — but known now — her illness had lasted three months. (i) bears the same element of remoteness familiar from sentence-final then.

(i) (Als ich Maria besuchte), war sie krank. Sie war dann drei Monate lang krank.
   (When I Mary visited), was she ill. She was then three months long ill.
6 ‘On-line’-inferencing with descriptions involving events

We compare ‘on-line’ inferencing in the felicitous (29) and the weird (30). Leaving out dann or then, both contexts would express a causal relation in virtue of lexical inferencing.

(29) Einmal wurde Maria schwer krank. Sie war dann drei Monate lang krank.
   Once became Maria seriously ill. She was then three months long ill
   ‘Once Maria fell seriously ill and stayed ill for three months.’

The antecedent sentence in both (29) and (30) introduces a change from the pre-state $s_{\text{pr}}$: $\neg$ ill($m_{s_{\text{pr}}}$) to the result state $s_{\text{res}}$: ill($m_{s_{\text{res}}}$). $s_{\text{res}}$ functions as the state of current properties in both contexts (29) and (30). In (29) sie occurs before dann. The binding condition of the pronoun sie, see (12).b is resolved as $u_{i0} = m_{s_{\text{res}}}$. As $m_{s_{\text{res}}}$ is the subject of the second sentence inferencing yields the conditions ‘$s’: ill($m_{s_{\text{res}}}$) for three months $\land t' \subseteq s' \cap s_{\text{res}}$. Internal dann must be justified as signalling a change from a presupposed state of negative conditions, i.e. ‘not being ill (for three months)’ to the positive condition which is attributed in the second sentence. The interpreter identifies the presupposed state of negative conditions as $s_{\text{pr}}$, contributed by the first sentence. So all presuppositions match the context and (29) is fine.

(30) Einmal wurde Maria schwer krank. # Dann war sie drei Monate lang krank.
   ‘Once Maria fell seriously ill. # Then she was ill for three months.’

In (30) dann or then fires first and introduces a state $s_{\text{p*}}$ to the right of the current state of temporary properties $s^p$ of Maria’s in context. The signal enters discourse with a presupposition of change in properties between $s^p$ and $s_{\text{p*}}$. The current state property of Maria’s is her being ill, thus $s^p$ resolves $s_{\text{res}}$, $s_{\text{res}}$: ill($m_{s_{\text{res}}}$). The binding condition of the pronoun sie is resolved $u_{i0} = m_{s_{\text{p*}}}$. We yield the conditions ‘$s’: ill($m_{s_{\text{res}}}$) for three months $\land t' \subseteq s' \cap s_{\text{p*}}$.’ As for the properties of $m_{s_{\text{p*}}}$ that obtain at $s_{\text{p*}}$ (where $s_{\text{res}} \prec s_{\text{p*}}$) there are two possibilities for a justification available, according to (14). (i) $s_{\text{p*}}$: $K \neg$ ill($m_{s_{\text{p*}}}$), implying that the speaker commits himself to the fact that Maria isn’t ill any longer; or (ii) $s_{\text{p*}}$: $\neg K$ ill($m_{s_{\text{p*}}}$), implying that the speaker doesn’t commit himself to whether Maria is ill or healthy. In both cases the context turns out contradictory: For the speaker does claim positive evidence about the state of illness in the second sentence. This is why (30) is weird.

7 Continuous vs. discontinuous descriptions and the accommodation of the discourse relation ‘cause’

(29) intuitively is a continuous description of a continuous situation, (30) is a discontinuous description of the same continuous situation.

Definitions: Let $t$, $t'$ be the location times of $ev$,$ev'$. Let $s^1 = s$ in case $ev = s$ and $s^1 = s_{\text{res}}$ in case $ev$ is a change of state.
(i) If $s^1 \cap t' \neq \emptyset$, then the description is continuous
(ii) If the description of $ev'$ introduces the conditions $s_{\text{p*}} \neq s^1 \land t' \subseteq s_{\text{p*}}$, then the description is discontinuous.

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The property of Maria being ill functions as a conceptual bridge between t and t’ in (29) and in (31).

(31) Einmal wurde Maria schwer krank. Sie kam dann ins Krankenhaus.
    ‘Once Maria fell seriously ill and, as a result, went to hospital’.

(32) Einmal wurde Maria schwer krank. Dann kam sie ins Krankenhaus.

Using a discontinuous description as (32) the speaker conveys that he conceptualises the eventuality sequence as not being causally connected. For he would have chosen a neutral or a continuous description in that case. For detailed discussion see Roßdeutscher and von Stutterheim (n.d.) and Roßdeutscher and von Stutterheim (n.d.).

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READINGS OF THE GERMAN PRESENT PERFECT

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Abstract

The goal of this paper is to give a monosemous analysis of the meaning of the German present perfect in terms of an Extended Now approach (McCoad (1978). I propose an account for the different present perfect readings in terms of the discourse-based approach to tense first developed by Kamp & Rohrer (1985). Temporal and rhetorical relations between tenses in a given text will be used to account for the different readings of the present perfect.

1 Introduction

In German, the present perfect can often substitute for the preterit (cf. (1) and (2)). Both tenses denote an event time (E) that is before (S). Contrary to the English present perfect, both the German preterit and the present perfect can be combined with adverbials such as gestern (yesterday).

(1) Sigurd ist gestern angekommen und gleich wieder abgefahren.
   Sigurd has yesterday in Tübingen arrived and at-once again left.
(2) Sigurd kam gestern an und fuhr gleich wieder ab.
   Sigurd arrived yesterday and left particle at-once again verb-particle.

If a present perfect can be replaced by a preterit without a significant change in meaning, it has a preterit reading. If the preterit cannot replace a present perfect, this present perfect has a perfective reading (the term perfective is used in opposition to preterit. It does not refer to aspect). With the exception of Musan (2002), no systematic distinction between the two readings of the perfect has been proposed so far.

The goal of this paper is to give a monosemous analysis of the meaning of the German present perfect in terms of an Extended Now theory (McCoad (1978)). I propose a systematic account for the different present perfect readings in terms of Kamp & Reyle (1993)’s discourse-based approach to tense. Temporal and rhetorical relations between tenses in a given text will be used to account for the different readings of the present perfect.

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The chapter is organised as follows. In section 2, I argue for a monosemous approach to the German present perfect in terms of an ExtendedNow approach. Section 3 offers a discourse based account to the different perfect readings. Section 4 concludes.

2 The meaning of the German present perfect

It is highly debated whether the German present perfect has a single uniform meaning that covers its various uses or if it is ambiguous between (3) and (4) (see for discussion Ehrich (1992), Thieroff (1992) ... ). (3) is a perfective present perfect. The first present perfect in (4) can replace the preterit.

(3) Jetzt, wo Sigurd angekommen ist, feiern wir.
    “Now that Sigurd has arrived, we’ll celebrate.”

(4) Sigurd ist gestern in Tübingen angekommen und gleich wieder abgereist.
    “Sigurd has yesterday in Tübingen arrived and at-once again left"

Many analyses propose a uniform semantics of the German present perfect covering (3) and (4). This is confirmed by (5) and (6) where there is a difference between the present perfect and the preterit. In (5), the embedded preterit can either have an anterior reading or a simultaneous reading. In the former, eight o’clock passed already, in the latter it is eight o’clock when Fred thinks so. The present perfect in (6) only allows for the first reading. This is somehow unexpected from a polysemous approach. If the present perfect had two independent meanings (a preterit and a perfective one), one could not explain why it cannot always substitute for the preterit (or one has to stipulate why substitution is not always possible). I therefore assume a single uniform meaning of the German present perfect.

(5) Fritz dachte, dass es 8 Uhr war
    “Fritz thought that it 8 o’clock was”
    Stechow (1999:98)
    (cf. also Latzel (1977:141))

(6) Fritz dachte, dass es 8 Uhr gewesen ist
    “Fritz thought that it 8 o’clock been is”
    Stechow (1999:98)

For reasons I present elsewhere (cf. Rothstein (to appear, in preparation)), I assume an ExtendedNow approach to explain the present perfect. The ExtendedNow-interval (XN) is a time span whose right boundary (RB) ends in the case of the present perfect at the moment of speech (S) (McCoard (1978)). The position of its left boundary (LB) is not specified or can be given by adverbials like since. The event time (E) denoted by the present perfect is within XN. I call McCoard’s (1978) XN the traditional ExtendedNow.

(7) „Traditional“ ExtendedNow (XN) (McCoard (1978):

a: XN
    E
    S,R
"S" is an indexical discourse referent.

To account for the futurate use of the present perfect as in (8), the traditional XN must be modified to (9). The ExtendedNow does not end at (S), but at (R). (R) is Reichenbach’s (1947) reference time point relative to which the event time (E) is evaluated. The most intuitive reading (8) has is that the conference has not already ended, but that it will have ended by tomorrow. This new time interval is called the \textit{perfect time span} (=PTS) (cf. Iatridou et al (2001)).

(8) Morgen hat die Konferenz bereits aufgehört.
\textit{Tomorrow has the conference already ended}
\textit{“The conference will have ended by tomorrow.”}

(9) Modified XN:

\begin{itemize}
  \item \textbf{a:} \begin{tikzpicture}
  \draw[->] (0,0) -- (5,0);
  \filldraw[black] (2,0) circle (2pt) node[below] {S}
  \filldraw[black] (3,0) circle (2pt) node[below] {E}
  \filldraw[black] (4,0) circle (2pt) node[below] {R}
  \filldraw[black] (3,0) circle (2pt) node[below] {PTS}
  \end{tikzpicture}
\end{itemize}

As Pancheva & Stechow (2004) note there is a contrast between German and English (see (10)).

(10) a. Ich habe hier immer gewohnt … bis vor kurzem.
\textit{I have here always lived … until recently.}

The adverbial \textit{always} suggests that the eventuality the present perfect denotes holds throughout the entire PTS (Iatridou et al (2001) for English). To capture uses of the present perfect as in (10), Pancheva & Stechow (2004) allow the PTS to be completely separated from (R) in languages like German. The right boundary of PTS can reach up to the reference time (R) of the auxiliary. I give a somewhat simplified meaning in (11).
According to Pancheva & Stechow (2004), PTS is defined as a time span with vague boundaries that contains (E). (E) is somewhere in PTS, its exact position is unknown. To account for temporal succession of (E)s in present perfect sentences as in (12), something must be said about the temporal position of each (E). If one assumes a vague PTS containing an unfixed (E), it is not possible to prevent the PTSs of different present perfects from overlapping. If the PTS overlap, nothing can be said about the temporal order of the different (E)s. For instance, if PTS₁ and PTS₂ overlap and if they are defined as containing a vague (E), (E₂) can actually precede (E₁). It is therefore desirable to restrict the PTS interval.

(12) Sigurd ist heute morgen in Tübingen angekommen (E₁) und gleich in die Unibibliothek gegangen (E₂). Am Nachmittag hat er dann Freunde getroffen (E₃).

“Sigurd arrived this morning in Tübingen. He went to the university library. In the afternoon, he met some friends.”

A simple solution is to assume a dynamic PTS which is identical to (E) and only distinct from (E) if context requires it. More precisely, certain adverbials such as seit (since) or perfective uses of the present perfect require RB of PTS to be later than the final subinterval of (E). This solution has the advantage that it easily allows for analyses of temporal succession. The meaning I assign to the German present perfect is the following:

(13) My XN: (for German)
To conclude, the perfect introduces a time interval in which the event time is located. This interval is called the perfect time span (PTS). In German, PTS is dynamic. By default, RB is the final subinterval of (E). RB is only distinct from (E) if context requires it.

After having discussed the meaning of the present perfect, we now turn back to the question how to account for the perfective and preterit readings of the perfect.

3 The preterit and perfective readings of the German present perfect

How can the two readings be distinguished systematically? At a first glance, it could be thought that event time modification by certain positional adverbials like yesterday triggers automatically a preterit reading. This is however not the case. For instance, the embedded present perfect in (14) has a perfective reading although it is modified by gestern (Carla has moved to the apartment and as a consequence, a key for the toilet is needed).


Hence, a perfective reading of the present perfect is fully possible within the context of a past time adverbial and the distinction between the perfect readings must rely on a broader context.

To distinguish the present perfect readings, Musan (2002) proposes pragmatic principles, but she almost exclusively analyses isolated sentences. Her principles can easily be overridden by context. To account for the perfect readings in German, a discourse based approach becomes necessary.

Various interpretations of tenses in texts have been proposed in the last twenty years (among others by Hinrichs (1986), Partee (1984) and Kamp & Rohrer (1985) or Kamp & Reyle (1993)). Partee (1984) and Hinrichs (1986) propose that events introduce a “reference time point“ in time that serves as a default anchoring time point for the event of the next sentence. States do not introduce such “reference time points”, but they take over the reference point from their local context. This explains the often observed fact that narrative progression states retard the story while events put the story forward. The simplicity of these approaches is very attractive, but there are some problems (cf. Kamp et al (2004) for further discussion):

(16) John turned off the light. The room was pitch dark.

In (15) the pushing must have occurred before Max fell. In (16), the darkness is the result of switching off the light and cannot already have obtained before turning off the light. On Partee’s and HINRICH’s account, the falling would have preceded the pushing, since the reference time of the falling serves as anchoring point for the event in the next sentence and the predicted reading of (16) would be that the dark room could not be the result of the turning off. Therefore, these analyses fail.

Hans Kamp discovered that a simple Reichenbachian approach to the pluperfect cannot account for its uses in extended flashbacks as in (17) (cf. Kamp & Rohrer (1985)). The pluperfect denotes an event time (E) before a reference time (R) that is before (S) (for reasons of simplicity, I abstract from the perfect time span). For instance, in (17), the preterit sentence serves as a reference time point for the preceding event time(s) in the pluperfect. The sequence starts with a past tense that serves as (R) for the pluperfects. The events (e₂) to (e₆) are temporally ordered. Fred first gets up, then takes a shower and so on. In order to be able to give the right temporal order of the events (e₂) to (e₆) one cannot (as for instance Hinrichs (1986)) refer to (R), since (R) for the five instances of the pluperfect in (17) is always the same: it is e₁, the event of Fred arriving.

(17) Fred arrived at 10 (e₁). He had got up at 5 (e₂); he had taken a long shower (e₃), had got dressed (e₄) and had eaten a leisurely breakfast (e₅). He had left the house at 6:30 (e₆). Kamp & Reyle (1993:594)

Kamp argues that Reichenbach’s reference time must be split up in what he calls a reference time point (Rtp) and a temporal perspective point (Tpt). Tpt corresponds to what Reichenbach called reference time, it is the intrinsic unchangeable reference time of a tense relative to which (E) is located. To avoid terminological confusion, I keep Reichenbach’s term (R) for what Kamp and co-authors call Tpt.

Kamp et al (2004:71) state the following: “The antecedent discourse gives an Rtp in relation with which the following tense form establishes an anaphoric relation” To avoid terminological confusion with (R), I call Kamp’s (Rtp) (D)iscourse time point.

(18) Reference time (R):
(R) is a point in time relative to which (E) is located.

(19) Discourse time point ((D)):
(D) is a point in time set by an antecedent discourse in relation with which the following event time establishes an anaphoric relation.

If one takes the notion of (D) to be given, the analysis of (17) becomes easy. (D)₂ precedes (D)₃ which precedes (D)₄ and so on.

The setting of (D) does not explain by itself why (D)₂ precedes (D)₃ and so on. The temporal anaphoric relations in a coherent discourse depend first on the temporal meaning of the involved tenses and second on rhetorical relations between the eventualities. For instance, if α is an explanation for β, α must precede β (see Lascarides & Asher (1993)). As far as I can see, (D) is fully compatible with their assumptions. In the following, (D) will be used as a tool to distinguish the different present perfect readings.
The basic framework within which discourse relations between sentences are analysed is DRT as elaborated by Kamp & van Genabith & Reyle (2004). The following example is an illustration:

(20) Peter betrat die Bar. Er bestellte einen Whisky

Peter entered the bar. He ordered a whisky.

In (20) and in its DRT representation (21), we find the discourse referents for the times (S, t₁, t₂). S stands for the moment of speech (see Kamp, van Genabith & Reyle (2004:75) for a more detailed discussion on S), t₁ and t₂ are variables for time points. We then find the eventualities (e₁, e₂). The meaning of the two clauses are given in the two boxes, the temporal relation between these two is given in the little box in brackets and consists of a presupposition that must be resolved in order to fix the temporal relation between the eventualities (e₁) and (e₂). The resolution of the presupposition consists of finding specifications for (D) and p. p is the temporal relation between the event time of an eventuality from the context and the (D) of the eventuality to which the presupposition belongs. (D) has to be linked by an anaphoric presupposition resolution to the event time of an element from the context. For the first sentence there is no discourse context. I ignore here default rules for out of the blue sentences. The temporal relation for (e₁) and (e₂) is the relation of succession, so (e₁) must precede (e₂). (D) must therefore be resolved to t₁ and p is a prior to relation. As (D) is resolved to t₁ and p is specified as <, we can now incorporate the presupposition into the representation of the second sentence. (22) is the final representation for (20).

Kamp defines (D) as always referring to an event time in discourse, but I think, it can also refer to other points in time. It is plausible to assume that in some cases it is rather the result of an eventuality that serves as a (D) for a following tense than the eventuality...
itself. In (23), (D) clearly does not refer to the result of having lost the glasses, since the glasses were found again, while in (24), the glasses are still lost and it is therefore more plausible to assume that (D) refers to the result of having lost them.

(23) Ich habe meine Brille verloren und heute morgen erst wieder gefunden.
*I have my glasses lost and today morning particle again found.*

(24) Ich habe meine Brille verloren. Ich finde sie einfach nicht.
*I have my glasses lost. I find them simply not.*

It is clear that in (24), I am looking for my glasses because I have lost them, but also because they are not there. Hence, in (24) it is not the event of losing the glasses that is put into a discourse relation to the following event, but the fact that they are still not in sight. In other words, the (D) to which looking for them refers to is not the event but the result of the event.

However, (D) can not be set freely. First, (D) can not precede (E). The event time of Hochzeit stattfinden can not take a (D) that is prior to the moment in time when Albin asks for Sandrine’s hand.

*Albin has for Sandrine’s hand asked. The wedding took in Lyon place.*

Second, (D) cannot be later than (R). In (26), for instance, our party is simultaneous to (R) of the present perfect and it is not possible to take an (D) that is later than (R).

(26) Jetzt, wo Albin zurückgekommen ist, feiern wir.
*Now where Albin arrived has celebrate we*

“Now that Albin has arrived, we’ll celebrate

The emerging generalisation is given in (27).

(27) **First restriction for (D) in the present perfect**
(D) can either be resolved to (E) or (R).

There is an interesting correlation between PTS and (D). As argued in section 2, both LB and RB are vague in German, but it is possible to identify RB by discourse. (D) and RB interact. The possible combinations are shown in (28) and (29), where “;” separates the presuppositional part from the semantical part. (28) is the representation of (25) and (29) of (26).
There is an interesting consequence for the inclusion relation between PTS and (E). If (D) is later than (E), PTS and (E) are not identical. If (D) is resolved to (E), PTS and (E) are identical.

(30) **Correlation between (D) and RB**

(D) is always identical to RB. If (D) is later than (E), (E) and PTS are not identical.

The various combinations of (D), PTS, (E) and (R) will now be used to account for the different present perfect readings. The claims for the preterit and perfective readings are as follows:

(31) If (D) is resolved to (E), PTS is identical to (E) and the present perfect has a preterit reading.
(32) If (D) is resolved to a point in time within PTS that is later than (E), PTS is not identical to (E) and the present perfect has a perfective reading.

Let me start by looking at the temporal relation a preterit establishes with a following preterit. (33) is such an example. Its DRT is given in (34). The meaning of (35) is given in the two big boxes, the presupposition is in the little box in brackets. This presupposition must be resolved. The temporal ordering of (33) is easy to see: Albin must first ask for Sandrine’s hand before there can marry, if not there will be no wedding (under circumstances that I consider as being normal). So (e₁) clearly precedes (e₂). The presupposition is therefore resolved by saying that (e₂) takes (e₁) as (D) and that p is a prior relation. The final structure is (35).

(33) Albin hielt um Sandrines Hand an. Die Hochzeit fand in Lyon statt.

*Albin asked for Sandrine’s hand. The wedding took in Lyon place.*
Let us now have a look at a sequence with a present perfect that is followed by a preterit. (36) is the present perfect version of (33). The temporal reasoning and the presupposition resolution are the same as for (33), so I do not describe them here. As a final DRT we get (35). As one can see, (D) is resolved to the event time denoted by the present perfect hat gehalten.

(36) Albin hat um Sandrines Hand angehalten. Die Hochzeit fand in Lyon statt.
Albin has for Sandrine’s hand asked. The wedding took in Lyon place.

(37)
(38)

<table>
<thead>
<tr>
<th>a</th>
<th>s</th>
<th>h</th>
<th>S</th>
<th>R₁</th>
<th>E₁</th>
<th>PTS</th>
<th>R₂</th>
<th>E₂</th>
<th>e₁</th>
<th>e₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albin (a)</td>
<td>Sandrine (s)</td>
<td>PTS (LB,RB)</td>
<td>R₁ (\prec) S</td>
<td>E₁ (\subseteq) PTS</td>
<td>RB (\prec) R₁</td>
<td>e₁ (\subseteq) E₁</td>
<td>e₂: “um Hand anhalten” (a,s)</td>
<td>E₁ (\prec) E₂</td>
<td>“Hochzeit” (h)</td>
<td>E₂ = R₂</td>
</tr>
</tbody>
</table>

The same analysis holds for sequences where a present perfect is followed by a present perfect. The preterit reading of the present perfect can therefore be identified by saying that the event time of the present perfect must serve as a (D) for another past event time.

(39) **Second restriction for (D) in the present perfect**

If the event time₁ for a present perfect₁ serves as (D) for an event time₂ that is before (S), the present perfect₁ has a preterit reading.

Let’s have a look at the so-called perfective use of the present perfect in (40). Albin is still there and a party will be given to honour him. The preterit in (41) is not possible, since it does not say anything about whether Albin is still there.

(40) Albin ist gestern zurückgekommen. Deshalb feiern wir nun.

*Albin has yesterday returned. That’s-why celebrate we now.*

(41) ??Albin kam gestern zurück. Deshalb feiern wir nun

*Albin returned yesterday verb-particle. That’s-why celebrate we now.*

The most intuitive interpretation of (40) is that the (D) of the present perfect is simultaneous to the time of utterance. If it was simultaneous to the event of Albin arriving there, the present perfect would get a preterit like interpretation as shown for (33) or (36) and under this reading (40) should not be possible.

Let us now think about why (41) is less acceptable. It is obvious that this must be due to the temporal specification *jetzt, wo*. It asks for a relative clause that is coreferential in time with the *jetzt* denoted by the tense of the matrix verb. In (41) the matrix tense is the present tense and we therefore need an embedded tense form that allows this coreferentiality. As the preterit locates a time t before (S), this is not possible.

But how can one know whether (E) or the final subinterval of PTS of a present perfect serves as (D) for a tense that is not prior to (S)? With (40), we are facing the problem how tense shifts within a text are motivated. Whenever a shift from the present perfect to the present tense or vice versa occurs, we theoretically have two possibilities to set
(D) of the present perfect. It can either be resolved to (E) or (R). (42) is an example where (e₁) does not follow from (e₂). One does not get better because one was sick at some time in the past. So, (D) is not resolved to a point in time later than (E₁), but to (E₂) itself.

(42) Heute geht es Albin richtig gut, aber neulich ist es ihm richtig schlecht ergangen

The choice between these two options cannot be explained by looking at temporal relations between tenses. It has to be motivated by a rhetorical cause-effect relation between the involved eventualities. An example is (40). As already mentioned, the arriving of Albin (E₁) is the reason to party (E₂). The only available reading is that he will participate at the party since he is still there. The version in the preterit is marked if not impossible (see (41)). It is therefore plausible to assume that RB of PTS allows for a rhetorical relation with (E₂) that does not automatically follow from (E₁). It follows that (D) must be located at the final subinterval of PTS that is in case of (40) the moment of speech. (40) has therefore a perfective reading.

Contrary to the first two generalisations on present perfect readings, the emerging third principle consists therefore of two parts. Like the second one (see (39)) it is defined relative to a following event time, but it additionally requires a rhetorical relation between the present perfect and the following tense. This is not the case in the second generalisation where only the temporal relation the present perfect enters with a following tense is considered.

(43) Third restriction for (D) in the present perfect

If there is no event time₁ before (S) that takes the event time₂ of a present perfect as a (D) and if the final subinterval of PTS of the present perfect allows for a cause effect relation with the event time₁, (D) is located at (S).

An analysis is now given for (44). As there is no (E) before (S) that takes the (E) of the present perfect as (D), there are two options for the resolution of (D). It can either be (E) or (R). Given that the reason to party is the ongoing presence of Albin, (R) allows for a cause effect relation with the following present tense.
To sum up, a discourse based approach to tense is proposed. The present perfect has a preterit reading when (D) is simultaneous to the event time denoted by the present perfect, and a perfective reading when (D) is located at (R). The preterit reading arises when the (D) serves as an evaluation time for another event time located before the time of utterance. In other cases, the present perfect has a perfective reading. Furthermore, (D) serves to identify the boundaries of the PTS-interval. Whenever (D) is not simultaneous to the event time, RB is identical with the point in time (D) is resolved to.

Finally, some remarks on the binding patterns of the present perfect. The contrast between (5) and (6), repeated as (46) and (47), is resolved if the present perfect is analysed as a compositional tense consisting of a present tense and a past participle. The present perfect denotes an event time prior to the present tense. A bound present tense is evaluated in relation to the reference time of the binding verb (see (48)). Hence, it follows that the present perfect must express a time prior to the time of the matrix verb (see (47)) and that it therefore can only replace the preterit in a “prior-to-matrix verb” relation. I argue that (D) is not sensitive to binding, since a transformation from direct to indirect speech does not change the temporal order of the reported events (cf. Rothstein (in prep.) for further discussion of the binding patterns of the present perfect).

(46) Fritz dachte, dass es 8 Uhr war

Fritz thought that it 8 o’clock was

Stechow (1999:98)

(47) Fritz dachte, dass es 8 Uhr gewesen ist

Fritz thought that it 8 o’clock been is

Stechow (1999:98)

(48) Fritz dachte, dass es 8 Uhr ist

Fritz thought that it 8 o’clock is

4 Conclusion

In this paper, I argued for an ExtendedNow approach to the German present perfect. To account systematically for its preterit and perfective readings, a discourse based approach was proposed. More specifically, I argued for a dynamic perfect time span that the German present perfect introduces. Due to context, its length varies. I further argued for a “split-Reference time-hypothesis” much in the spirit of Kamp & Rohrer (1985) by
saying that Reichenbach’s reference time (R) must be split into a semantic part and a
part that operates on the discourse level. (R) is a time point relative to which (E) is
located, the semantic part is called (D). (D) is used to describe temporal ordering of
events in narration. (D) is a point in time set by an antecedent discourse in relation with
which the following tense form establishes an anaphoric relation. (D) is used to identify
RB of PTS. (D) is always identical to RB. If (D) is resolved to the final subinterval of
(E), the PTS is identical to (E) and the present perfect has a preterit reading. If (D) is
resolved to a point in time within PTS that is later than (E), PTS is not identical to (E)
and the present perfect has a perfective reading:

(49) First restriction for (D) in the present perfect
(D) can either be resolved to (E) or (R).

(50) Second restriction for (D) in the present perfect
If the event time₁ for a present perfect₁ serves as (D) for an event time₂ that is
before (S), the present perfect₁ has a preterit reading.

(51) Third restriction for (D) in the present perfect
If there is no event time₁ before (S) that takes the event time₂ of a present perfect
as a (D) and if the final subinterval of PTS of the present perfect allows for a
cause effect relation with the event time₁, (D) is located at (S).

This approach has the advantage that it considers context to be the essential part of
disambiguation of the present perfect readings. As far as I know, the systematic
disambiguation of the present perfect readings by context has never seriously been
pursued.

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THE SEMANTICS OF RISING INTONATION IN INTERROGATIVES AND DECLARATIVES *

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Abstract

We analyze rising declaratives in English as modal expressions of epistemic uncertainty and argue that their question-like behavior is a secondary effect derived from maxims of rational conversation. In order to express the meaning with formal semantics, we combine Veltman’s update semantics with the test operator with a simple semantics for polar questions.

1 Introduction

The semantics of intonation is notoriously difficult to capture formally and it has even been suggested that its meaning is metaphorical, non-denotational and non-compositional (a.o., Cook (2002), from the perspective of a cognitive psychologist) and fundamentally related to speaker’s emotions rather than rational linguistic behavior. Since there is no general consensus on what the smallest meaningful intonational units are, it makes sense to focus on sentence melody as a carrier of information: In many languages it is used to express questions and even in languages which posses the means to render questions morphosyntactically (e.g., in English with subject-predicate inversion, or in French, with inversion or the ‘est-ce que’ phrase), intonation can still “turn” statements into questions.¹

In general, yes/no-questions are usually reported to be associated with a rising contour, presence of a high pitch and/or a high boundary and experimental evidence shows that rising contours facilitate questions recognition. It is thus rather tempting (and, in fact, common in many typological and semantic studies) to identify rising intonation with question intonation. Undermining this view, however, are the results of corpus studies which show that there are questions (including many declarative questions) without rise and, crucially, rises which do not express questions. Moreover, rise in general is associated with a number of other meanings, such as checking whether the audience has understood what is being said, maintaining speaker-hearer solidarity, politeness, tentativeness, non-conduciveness, reservations nad conciliatory attitude, friendliness, uncertainty, submissiveness and pleasantness. Gussenhoven (2004), similarly to Merin and Bartels (1997) and following Ohala (1984), considers many of these to be affective meanings of questioning but this view has been disputed, e.g., by van Alphen (2003)).

¹The author would like to thank Marc Pauly and the audience of SuB 9 for their comments.

In a large spoken corpus of American English free conversations, ‘declarative questions’ were counted more frequent than interrogative questions, i.e., questions expressed by means of syntactic inversion, and in French, inverted and est-ce que-questions are becoming rare in natural conversations (see Šafářová (in prep.) for details).
In this paper, we first shortly discuss existing semantic analyses of the rise (Pierrehumbert and Hirschberg (1990) and Gunlogson (2001)) and subsequently offer an alternative which can reconcile the conflicting empirical observations regarding its use in questions. Throughout, we make use of the results of the experiments by Šafářová and Swerts (2004) and Šafářová (in prep.) which unambiguously show that while some contours in AmE are more likely to be perceived as signaling questions – in particular those described by Gunlogson (2001) – they are neither sufficient nor necessary for this end. Combined with the observation that the contours can also appear on statements and that they are associated with a number of other meanings (though not, it seems, continuation), the idea that their semantics could be expressed solely in terms of questionhood is not tenable. At the same time, however, the semantic analysis has to account for the close association of rises with questions, and for the fact that their meaning is not ‘weaker’ than that of lexical-pragmatic features.

We suggest that these properties can be captured in a uniform way if we take the meaning of the final rise to be that of a modal expression of uncertainty. Formally, we express the meaning in terms of Veltman’s (Veltman (1996))♦-operator, defined originally for expressions such as it might be that as introducing tests on the content of the common ground. We offer a simple update semantics for both the ♦ and the ? operators which is a combination of Veltman’s update semantics with a question semantics for propositional formulas and we represent rising declaratives as a ♦φ-type of statements, rising interrogatives as ?♦φ and falling interrogatives and indicatives as ?φ and φ, respectively. One advantage of the proposal is that the relation between syntactic and semantic types is kept uniform, i.e., all syntactic declaratives are analyzed as statements. We can thus do away with the “hybrid” category of declarative questions, utterances with declarative syntax but the contextual behavior of questions. For example, a declarative question like ‘Those are not all related languages ↑’ (where ↑ symbolizes a final rise) is semantically analyzed as ♦ those are not all related languages, comparable to the statement ‘It might be that those are not all related languages’. We argue that the fact that this utterance would usually receive a reply from the addressee is due to the maxims of rational conversation which force the participants to address the issue under discussion and to make the strongest possible statement given their state of knowledge. A part of the analysis is a formalization of Grice’s maxims of quality, quantity and relation which also allows us to explain why statements of the kind ♦φ and questions like ?♦φ are not redundant in discourse, despite their semantics (according to which an update with ?♦φ does not disconnect any worlds in the context and an update with ♦φ does not change the context unless there are no worlds making φ true). We thus account pragmatically for what is sometimes considered a weak point of Veltman’s semantics for possibility. It follows straightforwardly from the analysis that rising declaratives are sometimes interpreted as indicating politeness, tentativeness and other affective states. We thus show that it is possible to address the semantics of intonation in a formal way without ignoring its ‘emotional’ aspects.

2 The Meaning of the End Rise in English

In this section, we sum up the properties of the ‘final rise’ relevant for a semantic account. Hence on, we will use the term ‘final rise’ as defined by Gunlogson (2001), i.e., as a nuclear contour which is non-falling and ends higher than the nuclear pitch accent. These
contours have been found to be the best predictor of questioning (Šafářová and Swerts (2004), Šafářová (in prep.).) We will symbolize the final rise by ↑. For details on the empirical claims summarized below, see Chen and Gussenhoven (2003), Chen, Rietveld and Gussenhoven (2001), Fries (1964), Gunlogson (2001), Hirschberg (2000), Hirschberg and Ward (1995), McLemore (1991b), McLemore (1991a), Pierrehumbert (1980), Šafářová (in prep.) and Uldall (1964), among others.

1. ↑ is possible but not necessary with inverted yes/no- and wh-questions - compare, for instance, the realization of the question ‘Can I help you?’ with a high rise in Fig. 1. and a fall in Fig. 2.

![Figure 1: A high-rising question (H*H-H%) with the nuclear pitch accent on ‘help’. [speaker L.M.]](image1)

2. ↑ is possible on declaratives.

3. ↑-declaratives can receive different interpretations
   - some of which do not result in a commitment from either the speaker or the addressee: biased questions where the addressee is often considered an expert on the issue, as in (1), and try-out statements where the speaker is stating a likely hypothesis, as in (2b):

   (1) you’re leaving for vacation today↑

   (2) a. Speaker A: John has to leave early
       b. Speaker B: he’ll miss the party then↑

   - others result in speaker’s commitment: checking statements where the speaker conveys new information but wants to keep contact with the addressee, as in (3), or as informative
**Statements** expressing polite/submissive/uncertain attitude, as in (3):

(3)  
  a. Speaker A: *I put a sign-up sheet over on the board*↑
  b. Speaker B: *it’s for Dad’s Day*↑

- are only used in case of a previous commitment from the addressee, as in **echo questions**, viz (4b).

(4)  
  a. Speaker A: *that copier is broken*  
  b. Speaker B: *it is*↑ thanks, *I’ll use a different one*

4. All these types of ↑-declaratives usually elicit a response from the addressee or give the impression of the response being welcome, i.e., they are question-like.

5. However, ↑-declaratives are not interchangeable with interrogative polar questions in context because they often convey a certain bias of the speaker, viz (5).²

(5)  
  [as an exam question]  
  a. *is the empty set a member of itself?*  
  b. *# the empty set is a member of itself*↑

6. ↑-utterances are considered to be more polite and friendly, but less confident.

7. ↑ is not associated with continuations.

8. The meaning of ↑ is not weaker than the lexical-pragmatic features of an utterance.

It would be desirable if the semantic theory of the final rise could account for all these facts, as well as the observation that declarative utterances that are ‘hetero-cognitive’ (e.g., give an account of the addressee’s internal epistemic state) are question-like in the sense that they are responded to as if they were polar questions.

In the following subsections, we will shortly discuss two existing semantic proposals from the perspective of the empirical claims summarized above.

### 2.1 Pierrehumbert & Hirschberg (1990)

Pierrehumbert & Hirschberg suggest that particular tunes specify the relationship between the propositional content of the utterance over which they are employed and the mutual beliefs of the conversation participants. Their analysis is strictly compositional in that it ascribes meaning to all the (at that point) existing ToBI units, with some generalizations made about the meaning of the starred tones in pitch accents.

As for H*H-H%, sometimes referred to as the **high rise**, Pierrehumbert & Hirschberg suggest that it is used in questions which at the same time convey new information, as opposed to L*H-H%, which, according to them, is a question tune that does not convey new information (the L* tone indicating that the unit carrying the pitch accent is old news). McLemore (1991b) and McLemore (1991a), however, gives examples from her corpus of checking statements (i.e., statements conveying new information where the speaker uses the ↑ because she wants to maintain contact with her audience) with L*H-H%, as in (6).

²The # symbolizes a semantically anomalous sentence.
She notes that “[the speakers] often use L*[with a high boundary] in the first intonational phrase of a monologue when other participants are assumed to have equal rights to the speaking floor” (p. 79). It is unclear how Pierrehumbert & Hirschberg’s description would apply to these contexts.

(6)  

Y’all I was gonna tell (L*) y’all (H-H%)…

As for L* L- H%, the authors take it to be signaling the continuation rise, an assumption that has not been supported by experimental evidence. They also associate the high boundary tone with a forward-looking function but the boundary tones do not appear to behave uniformly with respect to question identification. In sum, Pierrehumbert & Hirschberg’s proposal is interesting in its broad outlines - compositionality of the tone meaning, intonation as signaling relations to the mutual beliefs of discourse participants, etc., but the exact semantics remains rather informal and is not quite supported by the data. The idea of the H% tone having a ‘forward-looking function’ is not unintuitive, but it is not immediately obvious what the function does in a formal semantic or pragmatic sense. One could speculate that a tone with this function should not occur at points of (sub)-dialogue closure (in the sense in which it is discussed, e.g., by Muller and Prévot (2003) but there is not enough empirical evidence at this point to prove whether this proposal is sustainable or not. Finally, Pierrehumbert & Hirschberg’s system does not explain why ↑-declaratives convey a speaker bias and are not interchangeable with interrogatives.

2.2 Gunlogson (2001)

Gunlogson’s proposal is in the spirit of Pierrehumbert & Hirschberg in that it also takes the semantics of intonation to be expressing beliefs and mutual beliefs of participants about the truth of the conveyed proposition. Unlike the authors above, however, she is not concerned with the meaning of individual tones but with the contours of nuclear phrases as a whole. Disregarding interrogatives, Gunlogson focuses on the instances of final rises on syntactic declaratives and makes the following observations:

- Rising declaratives express a bias that is absent with the use of interrogatives; they cannot be used as neutral questions.

- Rising declaratives, like interrogatives, fail to commit the speaker to their content.

- Rising declaratives can only be used as questions in contexts where the addressee is already publicly committed to the proposition expressed (‘Contextual Bias Condition’).

As an illustration of the first point, consider the example in (7): while the interrogative in (7a) is acceptable in a context that has to be neutral, both the rising declarative in (7b) and the falling declarative in (7c) are excluded.

(7)  

[on a health insurance form]
Gunlogson argues that the reason why (7b) and (7c) cannot be used in the context of a legal investigation is that they express a bias for the contained proposition being true. As for the second and third observation, consider the exchange in (8):

(8)   a. Speaker A: the king of France is bold
   b. Speaker B: France is a monarchy↑

The rising declarative in (8b) clearly does not commit the speaker A to the truth of its content, rather, it questions a presupposition to which the speaker B has committed herself by using (8a).

In the semantics Gunlogson assigns to rises to account for these facts, her approach is closely related to that of Merin and Bartels (1997) who propose that rises ‘alienate choices to Alter’ (the addressee), while falls ‘appropriate choices to Ego’ (the speaker), and Steedman (2004) for whom the H% versus L% boundary tone distinction correlates with the ‘ownership’ of the content expressed. Specifically, Gunlogson implements the hypothesis that rising declaratives commit the addressee to the proposition expressed, while falling declaratives commit the speaker. Note that her description of the rise in terms of changing the commitment set of the addressee, however, does not really capture the observation made with respect to (8), that rising declarative can question a commitment already made by the addressee in the context. But even that condition is in general too strong; rising declarative questions are also used and recognized in contexts where the addressee is not publicly committed to the truth of the expressed proposition, but at most to knowing whether the proposition is true or not, given that he or she is regarded as an expert on the issue (9b).³

(9)   a. Speaker A: he had a lot of real wacky ideas on big levels...he wanted a world power system, that you could tap into the air basically, and get power anywhere on earth...
   b. Speaker B: that’s what the Tesla coil was about↑
   c. Speaker A: yeah, the problem was, that it interfered with, well, matter...I mean, it was not a clean broadcast system

It is also not correct that rising declaratives always fail to commit the speaker to their content. As already noted above, they can be used as a politeness or checking device in situations where the speaker is informed with respect to an issue while the addressee is ignorant, as in (10), due to (Pierrehumbert 1980).

(10)   [to a receptionist] hi, my name is Mark Liberman↑

³Only a small subset of declarative questions is actually used after the addressee has explicitly committed himself/herself to the proposition expressed – namely, echoic questions – and their main function in the dialogue seems to be asking for additional evidence in support of the proposition expressed, rather than asking for a simple confirmation.
One cannot reasonably claim for these cases that the addressee is either already committed to the truth of the propositions expressed by the speaker, or becomes so committed after they have been uttered (while the speaker does not). In fact, it turns out that rising declaratives can also be used without a prior or a subsequent commitment from either the speaker or the addressee: this is in case they are used as questions and the addressee chooses to be uncooperative and leaves them unanswered.

(11) a. A: he was going to uh, Peggy . . . you remember Peggy White↑
    b. B: yeah

To illustrate, consider the example above: if speaker B would not reply, neither her nor speaker A would be committed to the proposition that ‘B remembers Peggy White’, while Gunlogson’s description of the context change potential of rising declaratives would predict that the proposition would be in B’s commitment set even without the confirmation in (11b).

This brings us to our final objection to Gunlogson’s approach, which is that the analysis does not explain why rising declaratives are usually responded to by the addressee as if they were questions. Gunlogson stipulates that un informativeness with respect to the addressee is a necessary condition for an utterance to qualify as a polar question, but not that it is a sufficient condition. Given that the conditions on the use of rising declaratives are presumably a part of the rules of rational conversation exchange and thus mutual knowledge, Gunlogson’s analysis would predict a response from the addressee neither in case she disagrees with the proposition – because she would be inconsistent with herself –, nor if she agrees with it – because she would be agreeing with what she is already publicly committed to, which is superfluous.4 If we accept Gunlogson’s setup and make the natural assumption that the goal of the conversation is to exchange information and thus create shared commitments, it should make perfect sense that the speaker states whether she agrees or disagrees with the proposition. However, neither seems to be the case in conversation: ↑-declaratives usually elicit a confirmation or a disconfirmation from the addressee (be it at least in terms of a nod or a short backchannel) and are not commented upon by the speaker.

To sum up, Gunlogson’s proposal cannot account for a prevalent number of rising declarative usage types. Specifically, it cannot deal with examples where a rising declarative is used not because the addressee is committed to its content but rather because he or she is regarded as an expert on the issue, examples where it commits the speaker to its content, as well as those were neither the speaker nor the addressee become committed. Also, the approach does not offer a plausible explanation as to why rising declaratives in all of these cases tend to elicit a response from the addressee.

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4As a matter of fact, Gunlogson would allow for the second case because for her, a sentence is informative if it is informative at least with respect to one commitment set. Note, however, that this has the unwanted consequence that a participant in a dialogue could repeat a sentence for as long as the addressee does not explicitly agree or disagree with it and still be informative.
2.3 Final Rise as a Modal Expression

2.3.1 General Remarks

In our proposal, we follow the approaches described above in that we take intonation use to reflect the status of propositions in the set of mutual beliefs/common ground in the conversation. We suggest that the crucial properties of ↑-declaratives can be captured in a uniform way if we take the meaning of the final rise to be that of a modal expression of epistemic uncertainty.\(^5\)

The connection between final rises and uncertainty has been noted in several studies in the past (Uldall (1964), Chen and Gussenhoven (2003), Chen et al. (2001), Gussenhoven (2004)) and other attitudes usually associated with the rise like tentativeness, subservience or conciliatory attitude can be seen as secondary derivatives of ‘uncertainty’. In many contexts, expressing uncertainty may also sound more polite than a direct statement or a question, cmp. the examples below.

\[(12) \text{ Do you perhaps know…} \]
\[(13) \text{ Could you maybe tell us when you’ll be arriving?} \]
\[(14) \text{ Maybe we could leave now.} \]
\[(15) \text{ I’m not sure but I think…} \]

These modal expressions help to preserve the addressee’s face by giving him more space to refuse a request (e.g., for information) or an update of the mutual knowledge state. Uncertainty and lack of confidence was considered to be a secondary attitude accompanying the primary meaning of rising declaratives, typically taken to be ‘questionhood’\(^6\).

As already mentioned, we suggest that uncertainty is the primary meaning associated with the rises, and questioning is a derived pragmatic effect of using a rising declarative. In particular, both the attitudinal effect and the question-like interpretation of ↑-declaratives can be derived pragmatically, if we take the ↑ to be a kind of an ‘intonational adverb’, comparable, for instance to it might be that. Together with the assumption that every statement is an answer to a (polar) question, this allows for an analysis that stays “true to form,” i.e., represents all declaratives as statements and all interrogatives as questions; it only follows from pragmatic reasoning about the content of the rising declarative that the addressee should comment on it.

\(^5\)Interestingly, apart from the language internal data discussed in this section, there seems to be cross-linguistic evidence in support of the connection between questions and an expression of epistemic uncertainty (albeit of a morphological type): As noted by Palmer (1986), there are languages that use a ‘dubitative’ or ‘uncertainty’ morpheme to turn statements into questions: for example, in Hixkaryana, there are two ways to express non-past - certain and uncertain - and when the ‘non-past uncertain’ is used alone (without other modal particles), it expresses a question. What is relevant about these and other cases given by Palmer is that in various languages, questions appeared to be expressed with the help of a modal expression which, however, does not express interrogativity by itself or in general.

\(^6\)Note here that questions in a conversation fulfill different roles. Some of them raise new conversation goals - we assume that those have to be raised explicitly and that it is crucial for their interpretation who raises them. Others steer the conversation in a direction which the speaker expects to be optimal with respect to reaching the conversation goal. Yet others can remain implicit (not uttered) because it is clear that an answer to them has to be found/grounded if the conversation goal is to be reached.
2.3.2 The Proposal

In order to be able to translate both falling and rising statements and questions into the formal language, we combine Veltman’s update semantics with a simple semantics for questions. Due to the semantics of the $\diamond$, it is not possible to make direct use of the partition semantics for questions (Groenendijk and Stokhof (1996)) but we will make use of the idea that questions disconnect worlds in an information state. With respect to the language with the $\diamond$ operator, $L_\diamond$, we stick to Veltman’s original definition: we allow for stacking of the $\diamond$ operator and exclude its embedding under negation or in conjunction/disjunction. In $L_r$, we allow for the embedding of $\diamond$ under $?$ and exclude stacking and embedding of the $?$ operator. Hence, we can now have both statements with a $\diamond$, $\diamond \phi$, as well as questions, $\bar{?}\diamond \phi$, in other words (because we analyze the rise as $\diamond$), we have both rising statements (declaratives), as well as rising questions (interrogatives).7

Definition 1. [Language]
Let us define the language $L$ as the set of formulas $\phi ::= p|\neg \phi | \psi | \phi \lor \psi$, where $p$ ranges over atomic propositional formulas.
Then $L_\diamond= L \cup \{\diamond \phi | \phi \in L_\diamond\}$, and $L_r = L \cup \{?\phi | \phi \in L_\diamond\}$.

Definition 2. [Context]
Let $W$ be the set of possible worlds and $V$ a valuation function which in all $w \in W$ assigns to each propositional letter a truth value 0 or 1. Then a context $\sigma$ is an equivalence relation on $W$, $\sigma \subseteq W \times W$, and $dom(\sigma)$, the domain of a context is the set of possible worlds in $\sigma$, $dom(\sigma) = \{w \in W | (w, w) \in \sigma\}$.

We write $\sigma/_{X}$, $X \subseteq W$ for a restriction of a context, such that $\sigma/_{X} = \{(w, w') \in \sigma | w, w' \in X\}$ and we will call $\sigma^0= W \times W$ the state of complete ignorance and indiﬀerence where no statements have been made and no questions asked.

Definition 3. [Semantics]
- $\sigma[p] = \sigma/_{dom(\sigma) \cap \{w \in W | V(p)(w) = 1\}}$
- $\sigma[\neg \phi] = \sigma/_{(dom(\sigma) - dom(\sigma[\phi]))}$
- $\sigma[\phi \land \psi] = \sigma/_{(dom(\sigma[\phi]) \cap dom(\sigma[\psi]))}$
- $\sigma[\phi \lor \psi] = \sigma/_{(dom(\sigma[\phi]) \cup dom(\sigma[\psi]))}$
- $\sigma[\diamond \phi] = \sigma$ if $dom(\sigma[\phi]) \neq \emptyset$ and $\emptyset$ otherwise
- $\sigma[?\phi] = \{(w, w') \in \sigma | w \in dom(\sigma[\phi]) \text{ iff } w' \in dom(\sigma[\phi])\}$

Definition 4. [Common Ground and Information States]
The common ground, $\sigma_{CG}$, is a context representing the shared beliefs of the speaker and the addressee in the discourse. $\sigma_S$ is the speaker’s information state and $\sigma_A$ is the addressee’s information state.

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7Gerbrandy (1999) in his dissertation gives a formalization of Veltman’s update semantics which allows for $\diamond$ being in the scope of negation. The interpretation of the formula we get with the semantics is, however, not intuitive: $\neg \diamond \phi$ is interpreted as $\sigma - \sigma[\diamond \phi]$, which is $\emptyset$ if there is at least one $\phi$ world and $\sigma$ otherwise. In natural language, however, a statement like ‘It is not the case that he might come’ would rather be interpreted as conveying the information that ‘He is (certainly) not coming’, i.e., as an update with $\neg \phi$ (or stronger, if possible in the formal language), not as a contradiction if it is not yet known whether $\phi$ or not.

One could try to give a fixed interpretation to $\neg \diamond \phi$ formulas as being simply equal to $\neg \phi$, but such a system basically collapses to propositional logic. Thanks to Bernhard Schröder for the argument.
Definition 5. [Discourse and Updates]
A discourse $\Delta$ is a sequence of formulas $\phi_1, \ldots, \phi_n \in L$ where with each formula $\phi_i$ we associate a state of the common ground $\sigma_{CG}$, a state of speaker’s belief state $\sigma_A^i$, and a state of the addressee’s belief state $\sigma^i_S$, such that $\forall i : \text{dom}(\sigma^i_S) \subseteq \text{dom}(\sigma_{CG}^i)$ and $\text{dom}(\sigma_A^i) \subseteq \text{dom}(\sigma_{CG}^i)$ and $\sigma_{CG}[\phi_i] = \sigma_{CG}^i$, $\sigma^i_S[\phi_i] = \sigma^i_S$, and $\sigma^i_A[\phi_i] = \sigma^i_A$. We write $\phi_1 \prec \phi_2$ for $\phi_1$ precedes $\phi_2$ in $\Delta$.

With respect to answers, our aim is to have a definition which assigns to the question $\phi$ its possible answers (same for $\neg \phi$) and to the question $\Diamond \phi$, $\Diamond \phi$, $\phi$ and $\neg \phi$ as its possible answers. This effect does not come out straightforwardly with partition semantics of questions as in Groenendijk & Stokhof because, e.g., $\Diamond \phi$ does not introduce a partition based on its ‘yes’ and ‘no’ answers (one, elements of a partition cannot be empty, and two, there is no $\Diamond \phi$ in our language). Therefore, we propose a new definition of answerhood below.

Definition 6. [Syntactic Answerhood]
A syntactic answer to $\phi$ is $\phi$.

Definition 7. [Semantic Answerhood]
Let $\Upsilon$ be the set of semantic answers to $\phi$ and $\phi$ its syntactic answer. Then $\phi \in \Upsilon$ and for any $\psi \in \L_{\phi}$, $\psi \in \Upsilon$ if $\neg \exists v \in \Upsilon$, $v \in L : \text{dom}(\sigma^0[\psi]) \subset \text{dom}(\sigma^0[v])$ and $\exists v \in \Upsilon, \sigma^0[\psi][v] = \emptyset$.

Take the simple case of a question like $\phi$. Then $p$ is its answer syntactically and $\neg p$ is its answer because $\sigma^0[\neg p][p] = \emptyset$. Take $\Diamond p$ as another example. Then $\Diamond p$ is its syntactic answer. Next, $\neg p$ is its answer because $\sigma^0[\neg p][\Diamond p] = \emptyset$. Finally, $p$ is its answer because $\sigma^0[p][\neg p] = \emptyset$. Furthermore, the condition $\neg \exists v \in \Upsilon, \text{dom}(\sigma^0[\psi]) \subset \text{dom}(\sigma^0[v])$ has as its goal to exclude the possibility that $\neg p \land q$ would become an answer to $\phi$ (because $\sigma^0[\neg p \land q][p] = \emptyset$) and then $q$ would become an answer because $\sigma^0[\neg p \land q][q \land q] = \emptyset$ and so on, potentially infinitely. Also, the condition excludes contradictions as possible answers. An update of $\sigma^0$ (the state of complete ignorance) with a contradiction gives $\emptyset$, which would be a proper subset of the state of ignorance updated with, e.g., the syntactic answer to the question. Note that if the question itself concerns a contradiction, this is not the case; e.g., a question $\phi \land \neg \phi$ can have anything as its answer, including contradictions, because its syntactic answer is $\phi \land \neg \phi$.

Given this definition, the question *Is Sarkozy a clever man?* (with falling intonation) would have in its set of possible answers only (16a) and (16b), while the question *Is Sarkozy a clever man?* (with rising intonation) would have all (16a), (16b) and (16c) as its possible answers.\(^8\)

(16)  
\[ a. \text{Yes. (Sarkozy is a clever man).} \]  
\[ b. \text{No. (Sarkozy is not a clever man).} \]  
\[ c. \text{Maybe. (Sarkozy might be a clever man).} \]

Based on Grice’s principles of rational conversation, we define four maxims which will restrict the number of eligible discourses, namely Quality, Relation, Quantity (1) and

\(^8\)To be precise, given the analysis of rises here, it can also receive (16a) and (16b) with rising intonation as an answer.
Quantity (2). Note that one of the goals of the analysis is to explain why both \( \Diamond \) statements and \( \Box \) questions are nonredundant. Existing formulations of redundant conversation moves (e.g., Groenendijk (1999)) assume that a statement is redundant if updating with it does not change the content of the common ground. Similarly, a question would be redundant if an answer to it would already be known, which technically translates into ‘not disconnecting any possible worlds’ or ‘not creating a (non-empty) partition’ of the common ground. Under this view, both \( \Diamond \) statements and \( \Box \) questions come out as being redundant, which is an undesirable effect. Therefore, we propose a different definition of redundant conversation moves, formulated in Quantity (2).

**Definition 8. [Maxims of Conversation]**

- **Quality:** A discourse \( \Delta \) conforms to Quality iff for every statement \( \phi \in \Delta \), \( \sigma^i_{CG}[\phi] = \sigma^i_S \).
- **Relation:** A discourse \( \Delta \) conforms to Relation iff for every statement \( \phi \in \Delta \), \( \phi \) is a semantic answer to the most recent unresolved question. \( ?\phi \) is unresolved in \( \sigma^i_{CG} \) iff \( \exists w, w' \) such that \( w \in \text{dom}(\sigma^i_{CG}) \) and \( w' \in \text{dom}(\sigma^i_{CG}) \) and \( (w, w') \notin \sigma^i[?\phi] \).
- **Quantity (1):** A discourse \( \Delta \) conforms to Quantity (1) iff for every statement \( \phi \in \Delta \), there is no stronger statement given \( \sigma^i_S \), speaker’s knowledge at that point in the conversation. \( \phi \) is stronger than \( \psi \) iff \( \text{dom}(\sigma^0[\phi]) \subseteq \text{dom}(\sigma^0[\psi]) \).
- **Quantity (2):** A discourse \( \Delta \) conforms to Quantity (2) iff for every \( \phi \in \Delta \), \( \phi \) is not redundant in \( \sigma^i_{CG} \). A question \( ?\phi \) is redundant with respect to \( \sigma^i_{CG} \) if all its semantic answers are redundant in \( \sigma^i_{CG} \). A statement \( \phi \) is redundant with respect to \( \sigma^i_{CG} \) iff with respect to \( \phi^i_{SUB} \in L \), \( \phi^i_{SUB} \) being the largest propositional subformula of \( \phi \), \( \sigma^i_S[\neg \phi^i_{SUB}] \subseteq \sigma^i_{CG}[\neg \phi^i_{SUB}] \).

By Quantity (2), questions like \( ?\Diamond \phi \) are only redundant if it is already known whether \( \phi \) or \( \neg \phi \). A statement \( \Diamond \phi \) is not redundant iff the speaker’s information state updated with \( \neg \phi \) would be a proper subset of the common ground updated with \( \neg \phi \), i.e., \( \sigma^i_S[\neg \phi] \subseteq \sigma^i_{CG}[\neg \phi] \). This will be the case if there are less \( \neg \phi \) worlds in \( \sigma^i_S \) then in \( \sigma^i_{CG} \), i.e., if the speaker believes \( \neg \phi \) to be less likely.

To see how the proposed theory works in practice, in the next section of this paper, we return to the points (1)-(8) from section 2.

### 3 Discussion

It is easy to express the observation that inverted yes/no-interrogatives can sometimes appear with a rise. If they do, we represent them as \( ?\Diamond \phi \) and correctly predict that they will be perceived as more polite (but possibly also more hesitant) than the falling \( ?\phi \): they allow for the weak answer \( \Diamond \phi \), while their falling counterparts require a stronger commitment from the addressee.\(^9\)

Similarly, rise on a declarative, \( \Diamond \phi \), is interpreted as a weaker type of statement than a falling declarative \( \phi \). Using it does not result directly in any commitment (either from the speaker or from the addressee), because an update with a test does not eliminate worlds from the common ground. However, by Quantity (2), the addressee can derive that there is at least one world in the common ground in which \( \neg \phi \) holds and in which the speaker

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\(^9\)Given the semantics we use, we have nothing to say about wh-question.
does not believe. In a common ground in which there is only one \( \neg \phi \) world, uttering \( \Diamond \phi \) will thus effectively result in an update with \( \phi \)!. We can thus also account for cases in which uttering a rising declarative results in a commitment by the speaker. As for echo questions, the present setup predicts that using a rising declarative \( \Diamond \phi \) directly after \( \phi \) has been uttered by the other participant is redundant. The fact that the speaker uses it nevertheless suggests that for some reason, the update of the common ground with \( \phi \) was not successful and/or the common ground has to be revised. This corresponds to our intuition that echo questions involve disagreement between the participants and can be interpreted as requests for additional information or at least confirmation. Accounting for this process exactly, however, requires a more fine-grained machinery than the one proposed in the present paper.

In general, we assume that uttering a possibility statement, i.e., a \( \Diamond \)-statement, accommodates a question to which it is a syntactic answer, i.e., \( ?\Diamond p \), which has \( \Diamond p, p \) and \( \neg p \) among its answers. In a rational conversation, participants cooperate on finding the strongest possible answers to questions that have been raised (whether overtly or accommodated). Therefore, if a \( ?\Diamond p \) question has been raised and there is a participant who knows that either \( p \) or \( \neg p \) is the case, she has to say so. Thus, a rising declarative (a \( \Diamond \)-type of statement), will frequently be followed by a ‘response’. Crucially, this response is not an answer to the rising declarative but to the question *accommodated due to the use* of the rising declarative.

The analysis can easily model the fact that rising declaratives are not interchangeable with questions: after all they are assertions, which express a bias also in contexts in which the ratio of worlds making them true and worlds making them false should remain 1:1. For example, used as an exam question, a rising declarative *the empty set is a subset of itself*\( ^\uparrow \) would swing the odds of the proposition ‘the empty set is a subset of itself’ being true for its favor in a common ground in which the amount of \( \emptyset \not\subset \emptyset \)-worlds is supposed to be equal to the amount of \( \emptyset \subset \emptyset \)-worlds.

Similarly to rising yes/no-questions, also rising declaratives come out as being more polite than their falling counterparts. If the speaker updates the common ground with a falling declarative \( \phi \) and the addressee believes \( \neg \phi \) to be true, the participants are in an open disagreement and a correction of the common ground may be needed. If, on the other hand, the speaker uses a rising declarative \( \Diamond \phi \), she generally does not eliminate all \( \Diamond \neg \phi \) worlds (unless there is only one) and the addressee can still utter the stronger statement \( \neg \phi \), if she believes it to be true, without overtly disagreeing.

The proposal does not predict any link between \( \uparrow \) and continuations, which is correct, given that in English, empirical studies suggest that different kinds of intonational patterns are involved (see (Šafářová in prep.) and the references cited there). Note also that the meaning of the rise is here treated on the same level as the meaning of the lexical features of the utterance and interacts with them; intonation is not semantically “weaker”.

As a final remark, let us stress that in our proposal, the \( \uparrow \) is *not* exactly synonymous with a particular lexical adverb and all the translations of the final rise with a lexical expression should be understood very loosely. The syntactic and semantic behavior of lexical adverbial expressions and corresponding adjectival phrases is rather complicated (viz, a.o., Cinque (1999), Nilsen (2003)): for example, the adverb *possibly* appears to be excluded from some (but not all) interrogatives, while its adjectival counterpart *it is possible that* is
not. Also, it is generally assumed that there is a syntactic and presumably also semantic difference between *it might be that*, *maybe*, *possibly*, *perhaps*, etc. In principle, we do not exclude the option of formalizing the meaning of one of these operators with Veltman’s test diamond (the semantics we make use of does not exclude multiple presence of the epistemic operator which will be represent with a ♦, so the option of combining intonational and lexical expressions exists). At least *‘maybe’*, however, seems to function differently from the rise, as show by the following dialogue:

(17)  
\begin{itemize}
    \item a. A: *I lost my ring*
    \item b. B: *did you leave it in the bathroom?*
    \item c. B’: *maybe you left in the bathroom*
    \item d. B”: *you left in the bathroom*
\end{itemize}

The reply (17d) patterns with the reply in (17b) in that a response by speaker A is expected. The relevant difference seems to be that in (17b) and (17d), but not necessarily in (17c), the speaker A is assumed to be knowledgeable with respect to the content of the utterance. However, this example cannot be handled by the formalization proposed below, because we lack the machinery to express propositions of the type ‘A knows that…’.

4 Summary and Future Work

The proposal in this paper can be summarized as $\uparrow = \Diamond$. While, in our view, it can model a number of facts about the use of rising intonation in American English, the formal language is quite simple and cannot express *wh*-questions and propositions of the type ‘A knows that’ or the effect of utterances like ‘*I don’t know*’ on the common ground. Employing a knowledge operator could possibly also help to address the fact that not only rising declaratives, but also falling declaratives are often responded to by the addressee if they concern an issue on which she is an expert.

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Thanks to David Ahn for bringing this example to my attention.


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THE SEMANTICS OF RISING INTONATION
IN INTERROGATIVES AND DECLARATIVES


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DON’T INTERPRET FOCUS!*  
WHY A PRESUPPOSITIONAL ACCOUNT OF FOCUS FAILS AND HOW  
A PRESUPPOSITIONAL ACCOUNT OF GIVENNESS WORKS  

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Abstract  
This paper advances a purely presuppositional analysis of intonation. I first show  
that a inspiring recent article by Geurts and van der Sandt (Theoretical Linguistics,  
2004) that pursues the same goal cannot account for multiple foci. Then, I show that  
if it is assumed that destressed rather than focussed material is semantically marked,  
multiple foci are accounted for correctly.  

1 Introduction  

My paper builds on and extends the purely presuppositional analysis of intonational marking in English. In a recent paper, Geurts and van der Sandt (2004) (and Fox, Nissenbaum and Sauerland (2001) in unpublished work) propose a radical simplification of the semantics of focus. Their proposal is that focus introduces an existential presupposition. Most previous work on focus (Jackendoff (1972), Rooth (1985), (1992), Krifka (1991), Schwarzschild (1999) and others) explicates focus by means of the notion Presupposition Skeleton, which is also called P-Set or Focus Alternative Set. Specifically, focus serves to define the presupposition skeleton of a higher node that contains the focus. The presupposition skeleton represents, loosely speaking, the meaning of a sentence without its focussed constituents. The effect of focus on interpretation within such an approach is therefore indirect and mediated by a concept specifically introduced for the account of focus, the presupposition skeleton. Eliminating this concept would constitute major progress in the semantics of intonation.  
The direction I pursue, therefore, is to interpret intonational marking directly as a presupposition following Geurts and van der Sandt (2004). This proposal captures a traditional intuition: for example, Chomsky (1970) discusses focus purely in terms of presuppositions. However, the purely presuppositional analysis was argued against by Jackendoff (1972) and fell into disregard. Geurts and van der Sandt (2004) have not only revived the purely presuppositional analysis, but spelled it out in a lot more detail. This level of detail

*Parts of this paper are inspired by earlier joint work with Danny Fox, Jon Nissenbaum, and myself, which was never completed because of the problem discussed in section 2 of this paper (cf. Fox et al. 2001). I thank the audiences at Sinn und Bedeutung 9, the Zentrum für allgemeine Sprachwissenschaft in Berlin, the Universität Potsdam and the Universität Leipzig and my colleagues Andreas Haida, Manfred Krifka, Arndt Riester, Chris Tancredi, Michael Wagner, and Kazuko Yatsushiro for their helpful comments. I gratefully acknowledge the financial support of the German Research Council DFG via the SFB 632 grant and via the Emmy-Noether individual grant (SA 925/1-2), which made this work possible.
allows us to capture new insights as I will show in this paper. The first new insight, which I present in the Section 2, was first made in unpublished work of Danny Fox, Jon Nissenbaum, and myself (Fox et al. 2001). Namely, the following negative result: A purely presuppositional entry for the focus feature predicts a semantics for multiple foci that is in many cases too strong. While the presuppositional analysis of focus, therefore, fails, I go on to argue that a presuppositional account of focus-intonation is feasible after all: As I show in Section 3, it requires the assumption that destressed material is marked by a givenness feature \( G \), whereas focus may be not marked by an interpreted feature.

1.1 Presuppositions

Since the analysis makes heavy use of the theory of presuppositions, this subsection briefly clarifies my underlying assumptions concerning presuppositions. This is also opportune since my assumptions differ from those of Geurts and van der Sandt (2004). They rely on an account of presuppositions where all presuppositional elements are anaphoric that earlier work of the same authors introduces (cf. van der Sandt (1992)). However, as far as I could see no aspect of the analysis relies on this specific account and therefore this paper uses the simpler truth-value gap analysis of presuppositions (Blau (1978), Heim (1983) and others), which I find more attractive. On this approach, an expression is without value if its presuppositions are violated. This is formally captured by representing the meaning of a phrase that has a presupposition as a partial function—functions that have a domain smaller that the set of all individuals of their argument type. Heim and Kratzer (1998) use the notation in (1) for partial functions.

\[
\lambda x. \text{presuppositions}(x) : \text{value}(x)
\]

Instead of the notation in (1), I use the following fraction notation for presuppositions:

\[
\lambda x \frac{\text{presuppositions}(x)}{\text{value}(x)}
\]

Here the domain of a function is specified by the expression above the fraction line, while the value is given by the expression below the line. For example, the verb \( \text{stop} \) presupposes that the subject had the property the complement specifies in the past, and asserts that the subject does not have the complement-property at the present time. The lexical entry for \( \text{stop} \) in fraction notation is the following:

\[
[\text{stop}] = \lambda P \lambda x \lambda t \exists t' < t : P(x)(t') \rightarrow \neg P(x)(t)
\]

Sometimes I will use the fraction notation without a leading \( \lambda \) operator with the presupposition part containing a contextually specified variable.

2 Focus

One attraction of a presuppositional analysis of focus is that it consists simply of a lexical entry for the focus feature. All other aspects of focus interpretation should then arise from the general mechanism of sentence interpretation; in particular, how presuppositions are
interpreted. The lexical entry of the focus feature must depend on the type of the phrase it is attached to. For the following, I focus on the case of focus on an expression of type $e$. Following (Fox et al. 2001), I assume the following lexical entry:

$$[F] = \lambda x^e \lambda P^{et} \exists x': P(x') = 1$$

Geurts and van der Sandt (2004) formulate the same proposal, but as a syncategorematic rule rather than as a lexical entry. I quote their rule in (2):

(2) Whenever focusing gives rise to a background $\lambda x. \phi(x)$ there is a presupposition to the effect that $\lambda x. \phi(x)$ holds of some individual.

The formulation in (2) leaves some room for ambiguity as to whether it is applicable to focus in some of the critical examples I discuss below. Therefore, I shall prefer the formulation in terms of a lexical entry for $F$.

Question-answer pairs are the prototypical case of focus in the account of Rooth (1992). Geurts and van der Sandt (2004), however, focus on more complex cases involving focus sensitive operators, where parallels between focus and presuppositions can be observed. But, for my concerns it turns out to be useful to follow Rooth’s method, and focus on question-answer pairs. For a first illustration of the account consider the answer of the question-answer pair in (3). The natural pronunciation of (2b) in this context has focus on the subject $Lina$.

(3) a. Q: Which girl ate a cookie?
   b. A: LINA-F ate a cookie.

The presupposition the focus feature that gives rise to in (3b) can be paraphrased as *Someone ate the cookie*. Note that focus feature changes the semantic type of the subject to that of a generalized quantifier, but this can be interpreted in the subject position without type-mismatch. Now consider why this focus placement is obligatory in example (3). First consider why the presupposition focus introduced must be satisfied. This follows, from the fact that the presupposition of the answer is entailed by a presupposition of the question since it is well known that non-rhetorical questions presuppose that a true answer exists.

Now consider (4) with focus on the object, which would not be well-formed in answer to (3a).

(4) Lina ate [the COOKIE]-F.

In the object position, the focus feature causes a type-mismatch as with other generalized quantifiers in object position. I assume that for type mismatch resolution the object moves to a position above the base position of the subject as shown in the LF-representation (5). The presupposition of (5) can be paraphrased as *Lina ate something*.

(5) [the COOKIE]-F $\lambda x$ Lina ate $x$

In general, the question in (3) does not entail that Lina ate something. Therefore, focus on the object is not predicted to be well-formed unless it is independently known that Lina ate something. The examples in (6) and (7) show that indeed focus placement is more flexible, when it is independently known that Lina ate something. Observe the ordering
effect: In (6), only subject focus is natural. In (7) subject focus is still the most natural, but object focus is marginally possible.

(6) a. Q: I know that Lina ate something, but tell me: Which girl ate a cookie?
   b. A: LINA ate the cookie.

(7) a. Q: Which girl ate the cookie?
   b. A: Well, I know Lina ate something. So maybe, SHE ate the cookie? So maybe, she ate the COOkie.

The facts in (6) and (7) indicate that presuppositions differ in how salient they are for the purpose of focus licensing and that the presuppositions of questions are very salient for the following discourse. I propose that the presupposition that is established most saliently must be expressed by means of focus. This is a generalization of the maximize presupposition principle of Heim (1991). I leave aside the possibility of multiple foci on the subject and the object at this point because I return to this matter in the following subsection.

The main argument of Jackendoff (1972) against a purely presuppositional account of focus concerned focus on negative quantifiers like no one. This issue can also arise in answer to a question: In answer to the question in (3), (8) would be pronounced with focus on the subject.

(8) NO one-F ate the cookie.

Geurts and van der Sandt (2004) discuss one possible solution to this question in detail. Namely, they suggest that focus in (8) brings about an existential presupposition, which is then cancelled by the assertion. This approach works well if the question, as in (3), establishes an existential presupposition. However, subject focus as in (8) is even required with a question like (9), which does not establish the existence of someone who ate the cookie for sure. Following (9), (8) should simultaneously trigger accommodation and cancellation of the existential presupposition, which seems difficult to square with the presupposition maximization maxim.

(9) Who, if anyone, ate the cookie?

Therefore, I would like to suggest that the existence presupposition of focus is actually epistemically weaker than I stated above. Namely, I suggest the following lexical entry, where the ◦-operator indicates existential possibility within the context set of Stalnaker (1979):

$$[F] = \lambda x^e \lambda P^e (\exists x' : P(x')) = 1 / P(x)$$

Furthermore, I assume that there is a default epistemic strengthening operation that predicts that stronger presupposition without ◦ unless the assertion explicitly contradicts it.

In addition to question-answer pairs, a second important type of examples involve association of focus with always. Consider the interpretation of (10) that can be paraphrased as Whenever Lina eats something, it’s a cookie. This ‘association with focus’ interpretation is salient when the word cookie is focussed (cf. Beaver and Clark (2003)).

(10) Lina always eats a COOkie-F.
Rooth (1999) first noted that association with focus in (10) can be reduced to the more general phenomenon of association with presupposition on a presuppositional analysis of focus (see also Geurts and van der Sandt (2004):(23)). (11) illustrates association with presupposition with the salient interpretation that, in situations where a unique first cookie exists (for example, after opening a package), Lina eats it.

(11) Lina always eats the first cookie.

Within theories of presupposition, association with presupposition is explained as accommodation of a presupposition of the scope of a generalized quantifier into the restrictor. In (11), accommodation adds the existence and uniqueness presupposition of the definite to the restrictor of *always*, which amounts to the condition that there be a unique first cookie. The focus example (10) is treated analogously: accommodation adds the restriction to situations where Lina eats something to the restrictor of *always*.

### 2.1 Multiple Focus

While the presuppositional account of focus works well for the examples with a single focus considered above, it runs into a problem with multiple foci. Consider the discourse fragment in (12):

(12) This woman saw this man.

Q: Which woman saw which man?
A: Mary-F saw John-F.

The question in (12) establishes the presupposition that some woman saw some man. However, the presupposition the two occurrences of focus in the answer give rise to turns out to be much stronger. Namely, the two foci each result in the presupposition that they would give rise to if the other focus was not there. This will result in the presupposition that someone saw John and Mary saw someone.\(^1\)

To verify this prediction, consider the LF-representation of the answer in (12) in (13):

(13) Mary-F $\lambda_x$ John-F $\lambda_y [x \text{ saw } y]$

The computation of the presupposition of (13) involves evaluating the following functional application:

$$
\left[\lambda P, \exists x.P(x) \over P(\text{Mary})\right] \left(\lambda x. \exists y.x \text{ saw } y\right)
$$

Since both the functor and the argument carry a presupposition, the presupposition of the functor must be satisfied by the actual value of the argument and in addition the presupposition of the argument must be satisfied. This yields the following result:

$$
\exists x.x \text{ saw John} \land \exists y.\text{Mary saw } y
$$

Mary saw John

---

\(^1\)Chris Tancredi (p.c.) points out that this presupposition may be appropriate in the case of pair-list answers. I have pursued this direction in several presentations, and believe that it offers a very interesting perspective on so called *topic-focus* accent. For space reasons, I cannot include this result in the present version of the paper other than a brief discussion in the conclusions.
The predicted presupposition is too strong and cannot be satisfied in (12). Multiple foci therefore are a problem for the analysis of Geurts and van der Sandt (2004). Initially it may seem that the reason behind this difficulty lies in the account of presuppositions, and that we would want to change the account so as to get the weaker double-existential presupposition *Someone is talking with someone* in (13). This would require modifying the following functional application principle:

\[ \lambda x : P(x) \left( \frac{R}{S} \right) = \frac{P(R/S)}{Q(R/S)} = \frac{P(S) \land R}{Q(S)} \]

Within the truth-value gap account of presuppositions, functional application is a well-defined mathematical operation of applying a function to some entity in its domain. This operation requires that the actual value of the argument must be in the domain of the function which is represented by the middle term in the functional application principle. Recall that the term R is present only when we make use of the notational convention to write presuppositions that involve only contextual parameters above the fraction.\(^2\) Therefore, the result is identical regardless of which of the fraction lines we write these above. The right hand side in (13) represents a simplification of this term that is applicable if the value of the function does not depend on the presuppositions of its argument. This assumption does not affect the presuppositions of the result. In sum then, the general principle above is a mathematical necessity for the truth-value gap based account of presuppositions.

Furthermore, the above principle makes the right prediction in clear cases of multiple presuppositions: the examples in (14) each contain two lexical presupposition triggers.

(14)  
  a. Taylor too is returning to England.  
  b. Mary stopped smoking again.

For example, *‘Taylor too P’* in (14a) presupposes that someone else has property P, while *‘x is returning to y’* presupposes that x has been in y at some time in the past. Both presuppositions involve existential quantification like the putative presuppositions of focus. The weak double-existential presupposition would, in this case, amount to: Someone else has been in England at some time in the past. But, (14a) clearly has the stronger presuppositions that Taylor has been in England in the past, and that someone else moved out of and back to England. This follows straightforwardly from the general functional application principle above, and therefore lends empirical support to the general approach to presuppositions. We must look elsewhere to for a solution to the multiple foci problem.

### 2.2 Movement?

Another direction that one should investigate is the following idea: multiple foci are analyzed rather like a single complex focus. In this subsection, I outline such an analysis, but then argue that for several reasons it cannot be upheld.

\(^2\)Formally, the following reasoning underlies this convention: If we add a contextual parameters as additional arguments to the argument term as in \( \lambda c.R \), and \( \lambda c.(P(c)/(c)) \) is defined only if \( R(c) \) is defined.
Concretely, the proposal would be that there is a dyadic focus feature, which I call FF, with the following semantics:

$$[\text{FF}] = \lambda x \lambda y \lambda R \frac{\exists x', y' R(x', y')}{R(x, y)}$$

The analysis of (15a) (=12)) could then be given as (15b). In (15b), both focussed constituents move to form a complex double-focus constituents, which provides the two arguments of type e to the FF-feature. The movement to FF would have to be generalized to all examples with more than one focus.

(15) a. Mary-F saw John-F.
    b. [Mary John ]-FF $\lambda y \lambda x \ x \ saw \ y$

The morpheme FF as defined above introduces a weak, double-existential presupposition and therefore (15b) is predicted to have the desired presupposition Someone saw someone.

The approach to multiple foci based on dyadic (and polyadic) focus features could be generalized to all instances of multiple foci by postulating morphemes such as FF for other types. However, at this point, there is already sufficient evidence to reject the approach. In particular, there are three arguments against the approach: The first argument is that the postulation of FF does not rule out multiple F-marking from occurring, which seems to cause a wrong prediction. Secondly, the movement that the approach requires can be empirically shown to not be subject to island constraints. Thirdly, the approach predicts unattested scope relations. Consider all three arguments in turn.

First consider the relation of FF and multiple F-marking. In examples like (12), it is impossible to tell whether the structure with two individual foci and the concomitant strong presupposition existed in addition to structure (15b) with FF: The strong presupposition would not be satisfied, and therefore only the structure with FF would be possible. However, example (16) indicates that multiple focus structures are not ambiguous between a structure with a weak and one with a strong presupposition, but only allow the former. The scenario in (16) entails that, whenever Cheney talks to someone and someone talks to Bush, then Cheney talks to Bush. This entailment paraphrases the interpretation predicted for the example sentence in (16) if a structure with the strong presupposition of two individual F-marks existed. But, since the example seems false in the scenario, it can be concluded that only the structure with FF and its weak presupposition is possible.

(16) Scenario: Cheney always talks to many people, and many people talk to Bush. Sometimes, Cheney also talks to Bush. But, when someone other than Cheney is talking to Bush, Cheney has to sit quietly next to Bush.
    #It’s always the case that CHEney talks to BUsh.

For the analysis of multiple foci based on FF, this result entails that an additional constraint is required. For example, the constraint might say that no F-marked constituent may occur in the scope of F or FF. Since we will see below that a different approach to multiple foci does not require such an additional constraint, this constitutes an argument against the approach based on FF.

The second concern with the approach based on FF is syntactic. The approach requires the formation of a constituent that does not contain any focus. The processes forming
constituents are well-studied in syntax, and, in particular, the formation of derived constituents is well-known to be constrained by island constraints (Ross 1968). Consider, however, multiple focus in (17b).

(17) a. Q: Which linguist is happy if which philosopher is coming?
    b. A: John-F is happy if Mary-F is coming.

To form a focus-free constituent in (17b) would require movement of Mary (or an equivalent process) from the subject position of the conditional into the matrix clause. This process would violate the well-established constraint that movement out of conditional clauses is not possible. Such island sensitivity would be surprising, in particular, since it contrasts with other cases where derived dyadic predicates are formed (Beck and Sauerland (2000)).

Finally, consider the third argument against the FF-based approach. This argument is more complex than the other two, and requires that I introduce data concerning the scope of focus existential closure first discussed by Fox et al. (2001). Consider example (18).

(18) Scenario: I regularly call a baby-sitting service and ask for someone to come. When my son is fussy, I ask for Lucy. But, at other times, there is no one specific that I ask for.
    #I always demand that LUCY-F come

The example (18) is judged false in the scenario. (18) is indeed predicted to be false on the presuppositional account to focus. The existential presupposition is projected to yield the presupposition I demand that someone come. When this is accommodated into the restrictor of always, an interpretation paraphrasable as (19) is the result:

(19) Whenever I demand that someone come, I demand that Lucy come.

Because in the scenario I often demand that someone come without requesting a specific person, (19) is predicted to be false. This corresponds to the intuition observed in (18). Now consider representation (20), where the focussed constituent has been moved to a position above demand.

(20) always (Lucy-F λx I demand that x come)

In this case, the existential introduced by F takes scope above demand in the presupposition. Therefore, structure (20) is predicted to receive the interpretation paraphrased by (21).

(21) Whenever there’s is someone such that I demand that he come, it’s Lucy.

Therefore, (20) is predicted to be true in the scenario given in (18). Consequently, it can be concluded that structure (20) is not available for (18) as would follow for instance from Fox’s (2000) scope-economy principle. The contrast between (18) and (22) corroborates this point. The surface position of the focus in (22) is outside the scope of the intensional verb want, and consequently (22) is judged to be true in the same scenario where (18) is false.

(22) I’m surprised that it’s always LUCY-F that you want to come.

Example (18) supports the presuppositional approach as Fox et al. (2001) discuss: Alternative approaches to focus do not predict the structural position of focus to have any
scopal effect. However, the scopal effect can also be tested in examples with multiple focus, and it provides evidence against the FF-approach in that case. Consider (23).

(23) Scenario: You’re working for a babysitting service. All customers never ask for a specific babysitter, except for sometimes the Millers. The Millers also often don’t ask for a specific person, but sometimes they do.

#Why is it always the case that the MILLERS demand that LUCY come?

The FF-aproach to multiple focus would predict that the final sentence of (23) should obligatorily have a structure where the two foci move to form a binary predicate $\lambda x \lambda y. x \text{ demand that } y \text{ come}$ as remnant. In this structure, the double existential quantification introduced by FF takes scope above demand, and therefore the interpretation that results should be acceptable in the scenario in (23). However, (23) is perceived to be odd in contrast to the prediction of the FF-approach.

In summary, this section presented three results. First, it was shown that the presuppositional account of focus does not work for multiple foci in general. The other two results considered and rejected two possible modifications of the presuppositional account of focus that would solve the problem with multiple foci. Namely, general modifications within the theory of presuppositions were argued to lead to bad predictions for other cases of presuppositions. And, the introduction of a special lexical entry for multiple focus was seen to be syntactically and semantically problematic. Therefore, I draw the overall conclusion that the account of Geurts and van der Sandt (2004) cannot be maintained.

3 Givenness

3.1 Single Givenness

The previous section showed that the presuppositional account of focus cannot be maintained. Nevertheless, a presuppositional account of intonation might be possible. I propose that it is not focus, but its complement, Givenness, that is marked by a semantic feature $G$. In several examples, this change does not affect the predicted presuppositions at all. Consider again (24) (= (3)). I propose that the intonationally prominent subject Lina does not bear any semantic mark, but that instead its complement, the verb phrase, is marked by a $G$-feature.

(24) a. Q: Which girl ate a cookie?
   b. A: LINA [ate a cookie]-G

I assume that $G$-features of various semantic types exist, and that their interpretation is always purely presuppositional. If the complement of $G$ has a semantic type ending in $t$, I assume that $G$ presupposes the existential closure of its complement. Specifically, I assume that in (24b) $G$ has the following interpretation:

$$[G] = \lambda f. \exists x \in D^c. f(x) = 1$$

Therefore (24b) receives exactly the same interpretation as in the analysis based on F. Specifically, the $G$-mark predicts the presupposition that someone ate a cookie. It follows that the account given above following (3) carries over to the approach based on
G-marking: The presupposition G-marking gives rise to is established by the question, and furthermore it follows from the maxim of presupposition maximization that the G-mark is obligatory. The phonology of assigning intonational prominence will need to be modified if givenness rather than focus is featurally marked. I believe that this will not cause any difficulties. For a start, assume the principle that intonational prominence is assigned to phrases that are not dominated by any G-mark.

Now consider again (25) (repeated from (12)) which turned out to be problematic for the analysis based on a lexical entry for F. In the new analysis, only the verb *saw* in (25b) would be G-marked.

(25)

Q: Which woman saw which man?
A: Mary saw-G John.

The presupposition of (25b) is therefore the existential closure of the transitive verb *saw*. The result is therefore exactly as desired: The predicted presupposition of (25b) can be paraphrased as *Someone saw someone*.

### 3.2 Multiple Givenness

In the previous subsection, I showed that the example (12) with multiple foci can be easily analyzed under the new purely presuppositional approach based on G-marking, since the new analysis of the example only contained a single G-mark. Do examples with multiple G-marks lead to similar problems on the present approach as examples with multiple F-marks did before? In this section, I show that multiple G-marks do not lead to presuppositions that are too strong. Rather, as I will discuss, the presupposition predicted by multiple G-marking are sometimes weaker than one might expect, but I will argue this to be a good result of the account. Consider the question-answer pair in (26).

(26)  

a. Q: What did Mary do to John?
   b. A: Mary-G praised John-G.

The question presupposes that Mary did something to John. First verify that the presupposition of the answer is entailed by the presupposition of the question. In this case, we cannot straightforwardly assume that a G-feature presupposes the existential closure of its complement since the complement of both occurrences of G is a proper name, which I assume is an expression of type $e$. Two lexical entries for the G of type $ee$ seem to be plausible. Ultimately the choice between the two will not affect the point of this section, but consider both proposals in (27):

(27)  

a. $[G] = \lambda x.e^{\exists f \in D^e.f(x) = 1}$
   b. $[G]^g = \lambda x.e^{\exists! i. g(i) = x}$

The semantics of the lexical entry in (27a) would result if we type-shift the proper name to the generalized quantifier type, and then applied existential closure. The presupposition (27a) predicts is very weak: that an individual have some property. (27b) is a stronger presupposition and is closer to the proposal of Schwarzschild (1999). (27b) states that an individual is given if it is the value of some index of the assignment. If we assume that only individuals that are salient are stored in the assignment, this presupposition amounts to a requirement that an individual be salient. For concreteness, I make use of (27b) in the...
following. The sentential presupposition of (26b) results from the following functional application:

$$\lambda x. \exists i. g(i) = \text{John} \quad x \text{ praised John} \quad (\exists j. g(j) = \text{Mary} / \text{Mary})$$

Since neither the presupposition of the argument nor that of the functor depend on the value of the argument, the givenness presuppositions just conjoin. The result is the presupposition that both John and Mary be values of indices of the assignment function, which amounts to a requirement that both John and Mary are salient.

The predicted presupposition certainly is not too strong since the question presupposes that Mary did something to John, and therefore makes Mary and John salient. However, one may wonder whether the presupposition is not too weak. The F-marking account discussed in Section 2 would predict a presupposition that Mary did something to John. In example (28), however, the question (28a) does not presuppose that Mary did something to John, but nevertheless the answer receives the same intonation as in (26b).

(28) a. Q: What did Mary and John do?
   b. A: Mary-G praised John-G.

Another possibility, though, is that the presupposition that Mary did something to John can easily be accommodated in (28). Some people have pointed out to me that the judgment in (28) could change if the order of conjuncts in the question is changed to John and Mary. It seems to me that other factors also play a role here: for example, whether the conjuncts are given in the phonologically most natural order (Müller 1997). Therefore, a full investigation of this case is beyond the scope of the present paper.

3.3 Comparison with Schwarzschild (1999)

The approach I propose has several similarities with the proposal of Schwarzschild (1999). However, a closer look shows that there are important differences as well. The central condition of Schwarzschild’s proposal is that every phrase that is not focussed must be given. His definition of givenness is the following (though (29) applies only to utterances, it is clear from the discussion that Schwarzschild intends (29) to apply to all phrases):

(29) Definition of GIVEN (final informal version): (Schwarzschild (1999):151)

An utterance U counts as GIVEN iff it has a salient antecedent A and

a. if U is type e, then A and U corefer;
   b. otherwise: module $\exists$-type shifting, A entails the Existential F-Closure of U

One minor difference between (29) and the purely presuppositional account of givenness is that (29) requires the existence of an antecedent A, while the purely presuppositional account just requires that a presupposition be entailed by the context set. However, since Schwarzschild follows the consensus that antecedents for focus/givenness licensing can be accommodated (cf. Tancredi (1992)), it is difficult to see whether this theoretical difference predicts any actual empirical differences. Therefore, I will put this difference between anaphoric and non-anaphoric presuppositions aside in the following.

The three major differences between (29) and my account are the following: 1) focus has a semantic effect according to (29), but not in my proposal; 2) (29) relies on the
presupposition skeleton (by its use of F-Closure), which my proposal does not, and 3) (29) applies to many more phrases than are G-marked on my proposal. To discuss these differences, consider again the concrete example (30) (repeated from (3)) with focus on the subject.

(30) LINA-F ate a cookie.

Schwarzschild’s givenness condition (29) is applied to any subconstituent of (30) except for the focussed subject. The application of (29) to the verb phrase, ate a cookie, makes the same prediction as G-marking of the verb phrase makes on my proposal (modulo the antecedent vs. presupposition difference): It presupposes that someone ate a cookie. The application of (29) to subconstituents of the verb phrase predicts a set of weaker presuppositions such as the ones that someone ate something and that a cookie exists. Since these presuppositions are all entailed by the presupposition of the verb phrase, it is impossible to discern the two proposal in this domain.

The major difference of Schwarzschild’s treatment of (30), however, is that (29) is also applied to the entire IP. In this case, condition (29) relies on the F-Closure which is defined as the existential closure of the presupposition skeleton. The application of givenness to the IP, therefore, necessitates Schwarzschild’s use of the presuppositional skeleton and the semantic role of F-features. In (30), application of (29) to the IP predicts the presupposition that someone ate a cookie. Since this is the same presupposition that also is derived from the givenness of the VP, the application of givenness to the IP seems initially redundant. But, actually this is not the case. Schwarzschild’s paper does not make this point directly for examples such as (30), but it can be done.

Consider the question-answer pair in (31), which Arndt Riester (p.c.) provided to me. In this case, Lina is explicitly mentioned in the question, and therefore should be given in the answer. Nevertheless the natural intonation of (30b) places focus on the subject.

(31) a. Q: Which of Lina and Kai ate a cookie?
   b. A: Lina-F ate a cookie.

On Schwarzschild’s proposal, the account of focus placement in (31b) relies on givenness of the IP: In (31), givenness of the IP is satisfied because the Existential F-closure of IP is that someone ate a cookie. On the other hand, if focus on the subject is omitted the IP can not be given since that would presuppose that Lina ate a cookie. Therefore, an alternative focus structure satisfying givenness for the answer (31b) is (32), where Schwarzschild (1999) would predict pitch accent to fall anywhere in the IP. That (31b) is the only natural intonation, however, must follow from a further condition: Schwarzschild’s Avoid F condition. Avoid F requires that a speaker F-mark as little as possible without violating givenness. Since in (32) the entire IP is F-marked while only the subject is F-marked in (31b), Avoid F prefers (31b) over (32).

(32) [Lina ate a cookie]-F

\[\text{3Schwarzschild (1999:158–60) discusses an example similar to (31), but not in the context of his full proposal. Namely, he abandons the focus projection principles used in this discussion later in the paper. The condition that F-marking of a small phrase is preferable to F-marking of a bigger phrase was explicit in a prepublication version of Schwarzschild’s paper, but the published version does not contain these parts anymore. I assume that nevertheless the condition is necessary to maintain Schwarzschild’s proposal.}\]
On my account, (31) is initially problematic. Since both the subject and the verb phrase satisfy givenness the structure in (33) should be possible. But, this would not predict the intonational prominence of the subject observed in (31).

(33) Lina-G [ate a cookie]-G

I propose that (33) is ruled out by the new condition in (34). This condition requires, in effect, that every non-given constituent must contain at least one lexical terminal that can be assigned intonational prominence. Since the IP in (33) is not given, (34) is violated.

(34) Stress Condition: At least one lexical terminal in every non-G marked phrase must not be dominated by G.

Having ruled out (33), the possibilities for G-marking in (35) should be considered.4

(35) a. Lina [ate a cookie]-G
    b. Lina-G ate a cookie

Example (35a) presupposes that someone ate a cookie, and (35b) presupposes that Lina has been already introduced into the conversation. While both presuppositions are satisfied, only structure (35a) predicts the correct accent placement. Recall though that we already observed in section 2 that the existence presuppositions underlying questions are particularly salient. Since only (35a) shares the existence presupposition introduced by the preceeding question, it follows that maximize presupposition prefers (35a) over (35b). This predicts the observed intonation in (31).

The special status of questions with respect to the salience of presuppositions is reminiscent of special conditions for question-answer congruence in other accounts of focus. Schwarzschild (1999) views it as an accomplishment of his account that it does not require special rules of question-answer congruence. However, the examples in (36) and (37) show that Schwarzschild's account predicts the wrong focus placement because he does not accord any special status to questions. In both (36b) and (37b) the verb and the object are given, but the verb phrase is not. Nevertheless focus placement correlates with the question.

(36) a. Which of praising and applauding to Mary do to John?
    b. She PRAISED John.

(37) a. Which of John and Bill did Mary praise?
    b. She praised JOHN.

Schwarzschild accounts for such all-given examples by means of a special constraint HEADARG, according to which focus of an argument is preferred over focus on a head. Therefore, Schwarzschild predicts that in both (36b) and (37b) the object should be focussed. Because this prediction is not correct, it seems inevitable that questions must be given a special status in some way.

4 Conclusion

In this paper, I presented two results concerning the account of focus. I first showed that the purely presuppositional account of focus as pursued by Geurts and van der Sandt

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4Parts of the verb phrase in (35b) may also be G-marked. This is not important for the following.
(2004) and Fox et al. (2001) despite being very attractive in cases with single focus, fails for examples with multiple foci. Specifically, I showed that for (38a) the account predicts the strong presupposition (38b). But, there are cases where (38a) can be used even though (38b) is clearly not presupposed.

(38)  
- a. Mary-F saw John-F  
- b. Someone saw John and Mary saw someone.

I argued instead that only given material is marked by a semantic feature; the feature G. Specifically, this predicts that structure (39a) instead of (38a). G is defined to presuppose the existential closure of its argument. Therefore, (39a) is predicted to presuppose (39b).

(39)  
- b. Someone saw someone.

The account I develop shows that a purely presuppositional account that does not make use of the notion of focus alternatives or the presupposition skeleton is viable.

One interesting further result that the full version of this paper is going to cover in detail is an argument that the strong presupposition (38b) provides a nice account of the semantics of the so-called topic-focus accent pattern (Büring 1997). This accent pattern is used, for example, in answers to pair-list questions as in (40). In these cases, it is plausible that the presupposition (38b) is satisfied as Chris Tancredi (p.c.) pointed out to me.

(40)  
- a. Q: Please list: Which girl saw which boy?  
- b. A: MARY-F saw JOHN-F and LISA-F saw BILL-F.

Answers to pair-list questions furthermore are odd unless the list contain more than one pair. This effect follows nicely from the strong presupposition in (38b). Namely, in conjunction with the proposition that $x$ saw $y$ for exactly one pair $(x, y)$, (38b) would entail that Mary saw John which is the assertion. Therefore (38a) is pragmatically odd since what is asserted would also be presupposed, unless it is presupposed that possibly more than one pair stands in the saw-relation.

References


MINIMIZE RESTRICTORS!
(NOTES ON DEFINITE DESCRIPTIONS, CONDITION C AND EPITHETS)*

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Abstract

Following a general line explored by Bolinger, Reinhart, Levinson and Schein, we seek to derive Condition C of the Binding Theory from a Gricean maxim of minimization (Minimize Restrictors!), which specifies that a definite description the A B is deviant if A could be dropped without affecting (i) the denotation of the description, and (ii) its various pragmatic effects. Thus the small (American) President is deviant if it is assumed that there is a single (American) President, as small contributes neither to (i) nor to (ii). By contrast, the stupid (American) President is entirely natural: although stupid does not affect (i), it contributes pragmatic information about the speaker's (negative) attitude towards the denotation of the description. If pronouns are treated as short descriptions and if the semantics is set up in a slightly non-standard fashion, Part (i) of Minimize Restrictors! can derive the standard cases of Condition C. Furthermore, Part (ii) accounts for some exceptions to Condition C. First, an element may contribute expressive information about the speaker's attitude towards the denotation of the description, as is the case of epithets (e.g. the idiot expresses the speaker's negative attitude towards the person in question). Second, an element may serve a disambiguating function, as happens in very long sentences in which a definite description is acceptable in violation of Condition C (e.g. the linguist in: A linguist working on Binding Theory, was so devoid of any moral sense that he forced a physicist working on particles to hire the linguist's girlfriend in his lab.)

1 Introduction

Condition C of Chomsky's Binding Theory specifies that a definite description or a proper name cannot appear in the scope of (=cannot be c-commanded by) a coreferring

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As the subtitle indicates, this is by no means a fully worked-out proposal. Due to time pressure I had to write up these notes before I was able to make the revisions that would have been necessary for a more systematic presentation.
expressions, as is illustrated in (1)-(2) (Chomsky calls proper names and definite descriptions 'R-expression', a terminology we will sometimes follow).

(1)  
  a. ??John loves people who admire John  
  a'. *Hei loves people who admire Johni  
  b'. Hisi mother loves people who admire Johni

(2)  
  a. *?The director loves people who admire the director  
  a'. *Hei loves people who admire the directori  
  b. The director's mother loves people who admire the director.  
  b'. Hisi mother loves people who admire the directori

Violations are particularly severe when the R-expression is c-commanded by a coreferential pronoun, as is shown in the a'-examples. When there the R-expression is not c-commanded by the other expression, no ungrammaticality ensues, as shown in the b-b' examples.

Interestingly, descriptions that have an expressive component escape at least some cases of Condition C. Standard cases involve epithets, which specify the speaker's negative attitude towards the denotation of the description ((3)a). But descriptions with a positive expressive component appear to behave in the same way ((3)b):

(3)  
  a. John/(?) he; is so careless that [the idiot]i will get killed in an accident one of these days.  
  b. Pope John Paul II was so beloved that the entire world is now mourning the great man.

Condition C is faced with two types of challenges.

(i) Explanatory Problem:  
  (a) First, it must be asked why Condition C should hold in the first place. In the classic theories of Chomsky and Lasnik (Chomsky 1981, Lasnik 1989), Condition C is stipulated. Reinhart 1983 tried to argue that Condition C derives from a general preference for binding over 'accidental coreference', but this preference itself does not follow directly from standard pragmatic principles (though it admittedly has a pragmatic flavor, in the sense that binding appears in a pre-theoretic sense to be more 'specific' than accidental coreference; but it is not trivial to cash this out formally).  
  (b) Second, it must be asked why epithets escape some instances of Condition C. Although several analyses have attempted to describe formally the anaphoric behavior of epithets, none that I know of has tied their semantics to their syntactic behavior. In other words, no current account explains why it is that those expressions that have an expressive component escape (some cases of) Condition C.

(ii) Empirical Problem:  
  On an empirical level, there are a host of exceptions to Condition C. Some of them have been discussed at some length by Reinhart and her followers, for instance (4):

(4)  
  (Who is this man over there?) He is Colonel Weisskopf (Reinhart & Grodzinsky (1993))

If Condition C were applied blindly, the sentence would be predicted to be ungrammatical, since he and Colonel Weisskopf denote the same person. One line of
analysis, due to Heim (1993), is to make semantic values more fine-grained than is usual by introducing 'guises' or values of implicit descriptions ('individual concepts') under which various denotations are apprehended. In the case at hand the implicit descriptive content of he may be something like the man you just pointed at, which is probably different from the usual descriptive content associated with Colonel Weisskopf. But there are other cases which have not been formally analyzed so far:

(5) a. A linguist working on Binding Theory was so devoid of any moral sense that he forced a physicist [working on particles] to hire the linguist's girlfriend in his lab.
   b. John Smith was so devoid of any moral sense that he forced Peter Smith to hire John's girlfriend in his lab.

In each case the expressions in bold are understood as coreferential. Thus the linguist in a. and John in b. are both c-commanded by a coreferential pronoun, which should lead to the most severe variety of Condition C effect. But for most speakers both sentences are acceptable. Intuitively, what is going on is that the definite description serves a disambiguating function that the possessive pronoun his could not fulfill. Specifically, if the embedded expression were his girlfriend there would be an ambiguity as to whether his denotes the linguist or the physicist (resp. John or Peter). This intuition is confirmed by the observation that the sentences degrade markedly when the underlined expression is replaced with me:

(6) a. *A linguist working on Binding Theory was so devoid of any moral sense that he forced me to hire the linguist's girlfriend in his lab.
   b. *John Smith was so devoid of any moral sense that he forced me to hire John's girlfriend in his lab.

Since his carries third person features, it could not be coreferential with me in (6). As a result, replacing his with an R-expression does not produce any additional disambiguation, which might account for the deviance of both example. Further exceptions to Condition C will be discussed below.

We will seek to solve both the Explanatory Problem and the Empirical Problem by reducing Condition C to a Gricean maxim of minimization (Minimize Restrictors!), which specifies that a definite description the A B is deviant if A could be dropped without affecting (i) the denotation of the description, and (ii) its various pragmatic effects. Thus the short (American) President is deviant if it is assumed that there is a single (American) President, as short contributes neither to (i) nor to (ii). By contrast, the stupid (American) President is entirely natural: although stupid does not affect (i), it contributes pragmatic information about the speaker's (negative) attitude towards its denotation. If pronouns are treated as short descriptions and if the semantics is set up in a slightly non-standard fashion, Part (i) of Minimize Restrictors! can derive the standard cases of Condition C. Furthermore, Part (ii) accounts for some exceptions to Condition C. First, an element that fails to affect the denotation of the description may still have an expressive component that suffices to justify it, as is the case with epithets: the idiot (or for that matter the great man) serves to express the speaker's attitude towards the

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1 Klaus Abels (p.c.) suggested that these examples might be analyzed, as involving Rizzi's principle of 'relativized minimality'. I leave this possibility open for future research.
denotation of the description. Second, an element may serve a disambiguating function, as is the case in (5), though not in (6).

Specifically, the structure of our theory is as follows.

A. Minimize Restrictors! is motivated by the contrasts in (7), which have nothing to do with Condition C as commonly analyzed since a single referring expression appears in the relevant sentences:

(7)  a. The President made important mistakes.
     b. The American President made important mistakes. (ok if other presidents were mentioned in the discourse)
     c. #The small American President made important mistakes.
     d. The stupid American President made important mistakes.

Minimize Restrictors! is presumably a special case of a Gricean principle, probably what Levinson 1998 calls the 'Maxim of Minimization', which he states as the following injunction: Produce the minimal linguistic clues sufficient to achieve your communicational ends. Of course it should be shown in detail how the Maxim of Minimization derives Minimize Restrictors!, but for present purposes we will be content to presuppose the latter principle.

B. In order for Minimize Restrictors! to have some bite in the Condition C cases we will consider, we will have to analyze pronouns as very short descriptions. The idea that pronouns can behave like descriptions is by no means new. It is most strongly supported by so-called 'paycheck' sentences, as in (8):

(8)  The man who gave his paycheck to his wife was wiser that the man who gave it to his mistress.

Analyzing it as a variable ranging over objects would appear to be quite difficult in this case; a more promising line is to treat the pronoun as going proxy for the definite description his paycheck, which makes the analysis far less problematic. In 'donkey' sentences, such as (9)a, some researchers believe that the pronoun it also goes proxy for a description:

(9)  a. Every farmer who owns a donkey beats it.
     b. Few students came to the party but they had a good time.

Specifically, proponents of the so-called 'E-type analysis' of anaphora contend that it has the same semantics as the description the donkey he owns. In fairness, however, many other researchers -proponents of 'DRT analyses'- would deny that this is the case; by treating the semantics of indefinites in a non-standard way they allow the pronoun it to be analyzed as a simple variable. Still, believers of both the E-type and the DRT analysis posit that pronouns can have the semantic behavior of descriptions in cases such as (9)b, where they is believed to go proxy for the description the students who came to the party (whether this is implemented in a syntactic or in a semantic fashion is a further question, which we leave aside).

Once the option of analyzing pronouns in this way is open for some examples, we might as well analyze all pronouns as descriptions, though the choice of the restrictor may vary. In the cases we will consider, the pronoun will correspond to an extremely short description, which by Minimize Restrictors! will have to be preferred to any full
description whenever this modifies neither the semantics nor the pragmatics of the resulting sentence.

In accord with Geurts 1999, we will also extend this theory to proper names. Geurts observed that in some cases a proper name, say Bambi, fails to be rigid and behaves like a donkey pronoun:

\[(10)\] If a child is christened 'Bambi', and Disney Inc. hear about it, then they will sue Bambi's parents. (Geurts 1999)

The extension will be crucial to explain why proper names fall under Condition C in the same way as standard definite descriptions.

C. Finally, in order to provide a link between the unembedded and the embedded applications of Minimize Restrictors!, we will have to explain how the context of utterance can be dynamically modified in the course of the interpretation of a sentence. The main thrust of the proposal is that the very same constraint applies to a description in its extra-linguistic context and in its intra-linguistic context. In order to implement this idea, we will need a formal notion of 'intra-linguistic context', which we will obtain by constructing sequences of evaluation in a non-standard way. The technique is inherited from the so-called 'de Bruijn notation' of the \(\lambda\)-calculus, but it has already had several applications in the analysis of anaphora (see among others Dekker 1994, Ben-Shalom 1996, van Eijck 2001, Bittner 2001, 2003, and Schlenker 2005a).

The claim that constraints on coreference are pragmatic in nature is by no means new; in fact, it was probably one the first ideas that came to mind when these constraints were initially discussed.

- In a pragmatic vein, Bolinger (1977, 1979) explored the view that an NP can appear 'to the right' of a coreferential pronoun if 'it answers to some need at that point for more semantic information than the bare minimum: to avoid ambiguity, to reidentify a prior referent that is distant either in space (length of utterance) or in grammar (...), to emphasize the nature of the referent (...), or to reintroduce the referent as topic. Apparent syntactic restrictions are only symptoms of pragmatic restrictions\(^2\). Although Bolinger had something very close to Minimize Restrictors!, he did not integrate it into a framework that could derive the role that c-command plays for Condition C. Levinson 1998, 2000 also explores some appealing pragmatic analyses of Condition C, but along with Bolinger he fails to derive the role of c-command.

- After it was discovered (largely by Reinhart herself) that Condition C should in fact be stated in terms of c-command, Reinhart (1983) argued that the constraint results from a pragmatic principle that requires that binding be preferred over 'accidental coreference' to achieve any given reading. Once it was observed that binding itself requires c-command, Reinhart was in a position to explain why c-command plays a role in Condition C as well (in non-c-command cases, binding is impossible, and hence the pragmatic principle is vacuously satisfied). What Reinhart did not have, however, was a principle akin to Minimize Restrictors! to establish a connection between Condition C and, say, the deviance of the small American president. Likewise, the preference for

\(^2\) Special thanks to Bart Geurts for pointing out the relevance of Bolinger's work in the present context and for making some of his papers available to me.
binding over accidental coreference cannot explain the data in (5)-(6), nor can it explain why a sentence similar to (7)a becomes bad again if the linguist is replaced with the linguist working on Binding Theory:

(11) A linguist working on Binding Theory was so devoid of any moral sense that he forced a physicist [working on particles] to hire a friend of the linguist working on Binding Theory in his lab.

By contrast, the Minimize Restrictors! theory has no trouble accounting for this new fact: the embedded definite descriptions contains idle material that does not play any role of disambiguation, since the sentence would be just as unambiguous if working on Binding Theory were dropped altogether from the definite description. Of course one could argue that both Minimize Restrictors! and Reinhart's principle must be assumed. But this is not necessary. As we will see, Minimize Restrictors! can be made to do all the work once the semantics is set up in the 'right' way.

Finally, let us mention two recent proposals that come very close to the present analysis. In unpublished work and lectures, Barry Schein explicitly explored the view that Condition C derives from Minimize Restrictors! I am not sure whether he derived the role of c-command, and apparently he did not discuss cases such as (5)-(6), but the spirit of the present proposal is clearly related to his analysis. Safir 2004 also proposes a related principle, which is not directly pragmatic but which often makes the same predictions as the present one. His principle is that one should prefer the most dependent form available, where reflexive pronouns are more dependent than non-reflexive pronouns, which are themselves more dependent than R-expressions. One arguable advantage of his proposal is that, unlike the present theory, it derives Condition B. One disadvantage is that it does not motivate the principle on pragmatic grounds, and therefore fails to connect Condition C to the examples in (7).

2 Minimize Restrictors! and the extra-linguistic context

In this section we motivate Minimize Restrictors! by considering pragmatic constraints on unembedded definite descriptions and pronouns. Only the extra-linguistic context will play a role in this discussion. Starting in Section 3, we will see how Minimize Restrictors! also constrains the relation between a description and the intra-linguistic context, which will derive Condition C and some exceptions to it.

2.1 Definite Descriptions

Basic Cases

The basic data designed to motivate Minimize Restrictors! were already introduced in (7). Let us add a couple of telling contrasts:

(12) a. John's blond father has arrived
    b. John's blond brother has arrived.
    c. John's idiotic father has arrived.

(12)a is deviant unless one assumes that John has several fathers (... which might happen if John is an adopted child, and thus has a natural father and an adoptive father. I believe that in this case the sentence is quite natural). But in the more usual situation in
which John has only one father, the adjective *blond* could be dropped without modifying the denotation of the description. Furthermore, unless you have a keen interest in people's hair color, the adjective is unlikely to produce any significant pragmatic effect. As a result, the description violates *Minimize Restrictors!* and is thus deemed deviant. (A prediction of this analysis is that if you do have a keen interest in a father's hair color the sentence might become more acceptable. This would have to be tested more extensively...).

(12)b is acceptable if it is known that John has several brothers, exactly one of whom is blond. If it is known that John has a single brother, the expression typically becomes deviant, for the reasons we outlined for case a.

Finally, (12)c is acceptable because although *idiotic* could be dropped without affecting the denotation of the description, it provides information of a different sort about the speaker's (negative) attitude towards John's father.

These observations naturally lead to the following definition of *Minimize Restrictors!*:

(13) Minimize Restrictors!
A definite description \(\text{the } A \ B\) [where the order of \(A\) vs. \(B\) is irrelevant] is deviant if \(A\) is redundant, i.e. if:
(i) \(B\) is grammatical and has the same denotation as \(A\) (=Referential Irrelevance), and 
(ii) \(A\) does not serve another purpose (=Pragmatic Irrelevance).

Referential irrelevance is easy to compute given any explicit semantics. On the other hand Pragmatic Irrelevance is entirely open-ended. A full analysis would have to provide independent criteria to test it, as well as a precise theory of the pragmatic effects that can license a modifier that is referentially irrelevant. In the present notes, however, we will have a much less ambitious goal: we will only seek to describe the phenomena in enough detail to draw a connection between *Minimize Restrictors!* and Condition C.

**Pragmatic (Ir)relevance**

Naturally, a variety of factors can enter in the computation of Pragmatic Irrelevance. Considered from the hearer's perspective, the general problem is -very roughly- as follows:

i) The speaker uttered \(\text{the } A \ B\)

ii) Semantically, this presupposes that there is exactly one object that satisfies both \(A\) and \(B\). [In our final analysis, we will treat \(\text{the } A \ B\) as presupposing only that there is exactly one most salient object that satisfies both \(A\) and \(B\); but this does not affect the rest of the argument].

iii) It is also presupposed that there is exactly one object that satisfies \(B\), and hence that \(\text{the } A \ B\) denotes the same object as \(B\). But then why did the speaker decide to utter \(\text{the } A \ B\) rather than \(B\), which is shorter? Some possibilities are as follows:

1) *Accommodation and Expressive Meaning*
The speaker may wish to force me to accommodate the information that the B-object also satisfies A. This, in turn, might be:

a) because it is quicker to do so than to assert (in a separate clause) that the B is A. We would expect this case to arise with particular frequency in speech situations in which space is limited, as in newspaper articles. The following was found in a film review:

(14) A young American poetess is left by her French husband for the Czechoslovakian wife of an American lawyer.3

(Certainly one need not understand that the poetess has several husbands, nor that the lawyer has several wives; infidelity is not polygamy, after all.)

b) because the speaker does not wish to present the information that the B is A as asserted so as not to allow the addressee to respond to it (for instance because it might distract from the main point of the conversation).

The following example, which seems to me to be felicitous even if it is known that the speaker has only one daughter, probably combines points a) and b):

(15) So you are a compassionate Republican? Well, my lesbian daughter doesn't think that Republicans are so compassionate these days.

(It is certainly quicker to assert the second sentence than to say: My daughter is a lesbian. And she doesn't think Republicans are so compassionate these days. In addition, the latter sequence would allow the addressee to ask all sorts of questions about the daughter's sexual orientation, which might distract from the speaker's main goal, which is to cast doubt on the coherence of the concept of a 'compassionate Republican').

c) because the speaker knows that I have no reason to challenge the assumption that the B is A. This might for instance be because the speaker knows that I know that only he has evidence as to whether the B is A. I would submit that this case arises in particular with expressives, which by definition are used to provide information about the speaker's (positive or negative) attitude towards an object. Potts 2003 has argued that expressive content should be treated as a new dimension of meaning, with its own composition rules, so to speak. This analysis is presumably compatible with the observation that expressive modifiers are authorized by Minimize Restrictors! even when they are referentially irrelevant, since they provide a different kind of pragmatic information.

I believe that the same conclusion can also be derived if one has a more conservative treatment of expressive content, according to which it is a particular kind of presupposition, which differs from other presuppositions in that it invites accommodation. This would be natural in view of the fact that the speaker should know what his attitude towards an object is, and thus that the addressee would be foolish to challenge such information. On this analysis the role played by expressives would simply be to trigger the accommodation of some information about the speaker's attitude. This line of analysis might be supported by the observation that with respect to

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3 From a review of James Ivory's Le Divorce, at:
http://parisvoice.com/03/oct/html/showtime/movie.cfm
our data, he expressive or non-expressive behavior of a modifier is not a \textit{lexical} property of the modifier in question, but is determined by the context. Thus Barry Schein (p.c.) notes the following contrast:

(16) a. ?The tall French President has just entered the room
   b. The tall, handsome French President has just entered the room.

Uttered out of the blue, (16)a is somewhat deviant. Adding \textit{handsome} to the description, as in (16)b, makes it clear that \textit{tall} is evaluative, which in turn makes the entire description acceptable. I suspect that the same effect can in fact be achieved if (16)a itself is uttered in a context in which it is clear that the President's height is ground for admiration.

(I have even talked to informants who find that \textit{John's blond wife is a doctor} is acceptable, presumably because they treat \textit{blond} as an evaluative modifier...)

2) \textit{Reminders and intentional redundancy}

Another kind of situation is one in which it is presupposed that exactly one object satisfies \( B \), but the speaker wishes to \textit{remind} me that this object also satisfies \( A \).

(17) Dr. Heidegger, do you realize what the situation is? Under the regime you support your Jewish Assistant will not be allowed to work for you any more!

(The sentence appears to me to be quite acceptable even if it is presupposed that Heidegger has only one assistant).

A related case is one in which the speaker has doubts about the addressee's ability to understand what he says, and thus goes out of his way to include redundant information, as is the case in (18):

(18) Let me remind you that my father is an arch-Republican. And my Republican father is certainly not going to give a dime to Move-on.org...

3) \textit{Formal niceties}

Finally, etiquette sometimes requires that a full title be used to refer to someone (presumably because the nature of the title is specified in a pre-established rule, and that one can conform to the rule only by using the \textit{precise} title that it specifies). This situation naturally arises in highly formal speech situations:

(19) [Uttered before the State of the Union Address:] Ladies and gentlemen, the President of the United States!

(Even though there is probably no more than one president in the domain of discourse when (19) is uttered, the full description is presumably acceptable because one should speak of the President using his full official title).

2.2 Pronouns

If we treat pronouns as very short descriptions, we would expect that \textit{Minimize Restrictors!} should in some cases prohibit the use of a full description. In order to implement this idea, we will have to say in greater detail what it means that a pronoun is
a 'very short' description. For the time being, however, let us simply observe that there are indeed cases in which the phenomenon is attested.

1) Prohibition against R-expressions that denote the speaker or addressee

As was mentioned in a different context in Schlenker 2005a (and no doubt by many others), one cannot normally use a proper name or a definite description to refer to the speaker or addressee:

(20) Context: John, who is the syntax professor, is speaking to Mary, who is the semantics professor.
   a. #John is happy.
   a'. I am happy.
   b. #Mary is happy.
   b'. You are happy.
   c. #John's mother is happy.
   c'. My mother is happy.
   d. #Mary's mother is happy.
   d'. Your mother is happy.
   e. #The syntax professor is happy.
   f. #The semantics professor is happy.

As is expected given the present analysis, there are various exceptions to this rule, which can all be accounted for because the referential irrelevance of the restrictor is compensated by its pragmatic relevance.

- Reminders: Daniel Vanderveken (p.c.) mentions French examples in which a full description provides the sentence with an illocutionary force that the mere pronoun would not contribute:

(21) [John is smoking. His father tells him]:
   Ton père t'ordonner d'arrêter de fumer immédiatement!
   Your father orders you to stop smoking at once!

(This would seem to have approximately the same force as: I am your father and I order you to stop smoking at once!)

- Formal niceties: There are also cases in which a first or second person pronoun are socially inappropriate, either because they sound too subjective or because politeness requires that a full title be used. The first case is illustrated in (22), which would appear to be licensed by the idea that a reviewer should not write in the first person (possibly because his opinion should appear as 'objective'; there might also be an illocutionary component to the restrictor reviewer):

(22) In this reviewer's opinion, the paper is unsuitable for publication.

4 For a related example, consider the sentence The Chair adjourns the meeting, uttered by the Chairman at the end of a faculty meeting. Presumably a meeting can only be adjourned by the Chair, and thus this sentence does not have the same illocutionary force as: I adjourn the meeting.

5 Another interesting example is provided by the following quote from a New Yorker piece by John Updike on the new Museum of Modern Art in New York:

(i) "It is not easy, while gingerly stepping over loose floorboards and extension cords as thick as boa
The second case is illustrated in (23), where the speaker addresses a Queen:

(23) Is her Majesty satisfied with the Government's work?

2) Prohibition against R-expressions that denote 'super-salient' entities

I would further suggest that the prohibition against R-expressions that denote the speaker or addressee is in fact a special case of a more general rule: entities that are extremely salient ('super-salient', as I will say) should always be denoted with a pronoun, not with an R-expression (... unless this serves some other pragmatic purpose). What is special about the speaker and addressee is that they are always super-salient, whereas people denoted with third person expressions may or may not be super-salient, depending on the context. Still, even in the latter case a full description is sometimes a bit odd, though the judgments are admittedly subtle. One example was provided by Roumi Pancheva (p.c.) [slightly modified]:

(24) [A professor and her Teaching Assistant are grading a late exam together. After both of them have looked at some length at the exam, the professor says:]  
   a. ?The student should pass. 
   b. He should pass.

Even though there is exactly one student in the discourse situation, the description the student appears to be overly specific; the student in question is so salient that the pronoun he must in this case be preferred to the full description.

Other cases can be found as well, though the judgments are somewhat delicate, presumably because it is difficult to 'force' an entity to be super-salient (a cooperative hearer will try to come up with a context in which the entity is not super-salient so as to justify the use of a full description):

(25) [I have just test-driven a car. While still in it, I say:]  
   a. ?The car drives well 
   b. It drives well  (T. Gibson, p.c.)

(26) [The speaker and the addressee have both examined the same watch for several minutes]  
   a. ?The watch is broken. 
   b. It's broken.

As in our earlier examples, expressive meaning (and presumably many other pragmatic factors as well) can 'save' a description that would otherwise be overly specific. Thus in the situation of (26) one could still utter felicitously:

constrictors, to picture the new Museum of Modern Art in every tidy and clean-swept detail, but enough was on view last month to persuade this visitor that the final effect will be immaculate, rectilinear, capacious, and chaste'. (John Updike, 'Invisible Cathedral', New Yorker, Nov. 15, 2004, p. 106)

In this case this visitor might also serve to establish a possible contrast with other visitors. If so the use of the description would in this case serve to emphasize the subjective character of the pronouncement.
(27) The stupid watch is broken.

This is exactly as is expected given Part (ii) of Minimize Restrictors!

3 Minimize Restrictors! with respect to the intra-linguistic context.

Let us now discuss the effects of Minimize Restrictors! with respect to the intra-linguistic context. Our basic hypothesis will be this:

- As a sentence is processed, top-down, the sister-to-sister relations that are found in the syntax are semantically analyzed with respect to a context which is dynamically constructed.

- The initial context is a sequence of objects that only includes the speaker, the addressee and any other 'super-salient' entities. Each time a pronoun or an R-expression which denotes d is processed in a context c, its sister is evaluated with respect to c’d, which is the context c to which d has been added. In other words, processing an R-expression has the effect of making it 'super-salient' for the expressions that are contained within its sister. This procedure will be seen to derive the role that c-command plays for Condition C.

- Whatever pragmatic rules constrain the relation between an expression and its extra-linguistic context also constrain its relation to its intra-linguistic context.

Within this framework, then, a context always includes those objects which, at a given point in the analysis of a sentence, are 'super-salient'. Minimize Restrictors! will require that these super-salient entities be denoted using a pronoun, unless some special pragmatic effect is obtained by using a full description.

Since the basic cases of Condition C were already discussed at the beginning of these notes, we shall not discuss them again until we provide a formal account. So we start right away with the exceptions.

3.1 Epithets

Dubinsky & Hamilton's Analysis

There are various accounts of the behavior of epithets with respect to Condition C. We will follow the theory of Dubinsky & Hamilton 1998, according to which epithets behave exactly like pronouns with respect to Condition C, except in attitude reports. According to Dubinsky & Hamilton, the 'except' clause stems from the fact that epithets are really anti-logophoric pronouns, i.e. pronouns which, in any attitude report, are interpreted as disjoint from the attitude holder (this is only an approximation of the facts, but for present purposes it will do).

- Let us start with some of Dubinsky & Hamilton's positive examples:

(28) a. John, ran over a man (who was) trying to give the idiot, directions (Dubinsky & Hamilton 1998)
    b. How about John?
    (?) He, ran over a man who was trying to give [the idiot], directions
Through an accumulation of slipups, John inadvertently led his students to conclude that the idiot couldn't teach. (Ok for Dubinsky & Hamilton 1998; O. Percus and G. Katz find the example slightly degraded)

As we noted earlier, the generalization does not simply apply to epithets, but more generally to Noun Phrases that have an evaluative component:

(30) [Pope John Paul II], was so beloved that the entire world is now mourning [the great man].

-In attitude reports, however, the data are different:

(31)  
  a. #Melvini claims that [the bastard] was honest. (Dubinsky & Hamilton's (4))
  b. # [Pope John Paul II], did not expect that the entire world would mourn [the great man].

-However Dubinsky & Hamilton argue that this fact has nothing to do with Condition C proper. Rather, epithets happen to behave like 'anti-logophoric' pronouns, which must be interpreted as disjoint from the agent of the attitude report even when no Condition C effect is present. They explain in this way the contrast between (32)a-b and (33)a-b (similar ideas were developed in Kuno 1972):

(32)  
  a. *It was said by John, that the idiot lost a thousand dollars on the slots.
  b. It was said of John, that the idiot lost a thousand dollars on the slots.
  (Dubinsky & Hamilton 1998)

(33)  
  a. *According to John, the idiot is married to a genius.
  b. Speaking of John, the idiot is married to a genius.
  (Dubinsky & Hamilton 1998)

In the a. examples, the second clause serves to report John's thought. Since epithets are anti-logophoric, the idiot must be interpreted as disjoint from John, which explains why the sentences cannot have the intended readings. By contrast, in the b. examples the second clause reports or expresses somebody else's thoughts, and the idiot can refer to John, as is expected.

Why should Epithets be Anti-Logophoric?

Of course the fact that epithets are anti-logophoric should in the end be derived. A possible strategy is as follows:

i) In order to analyze attitude reports in natural language, a distinction is needed between De Re and De Se readings (in addition to De Dicto readings, which do not enter in the present discussion). For presentational purposes it is expedient to start with the contrast between PRO, the unpronounced subject of an infinitive, which in attitude reports can only be read De Se, and he, which is ambiguously De Se or De Re.6

(34)  
  a. George hopes PRO to be elected
  b. George hopes that he is elected

Morgan 1970 and Chierchia 1987 observed that there is an interpretive difference between (34)a and (34)b. Suppose that George is drunk, and has forgotten that he is a

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6 A similar discussion is included in Schlenker 2005b.
candidate in the election. He watches TV and sees a candidate that he finds appealingly reactionary, hoping that this person -none other than himself, as it turns out- should be elected. (34)b might provide a passable way of reporting truly this admittedly unusual situation; (34)a would not. Somehow (34)a requires that the candidate be in a position to utter the first person statement: *I should get elected*. The reading we obtained in this way has been called, after Lewis 1979 and Chierchia 1987, a 'De Se' reading. The reading in (34)b which is true in the situation at hand is the 'De Re' reading.

ii) Within English there are arguments that suggest that a De Se situation makes a De Re logical form true. Let us consider (following Zimmermann 1991) a group of candidates that includes George, who is in the very same situation as in the previous scenario. By contrast, each of the other candidates thinks about himself: 'I should be elected'. It is then possible to say:

(35) Each candidate (including George) hopes that he is elected.

- Could the embedded clause have a De Se Logical Form? No, because this would automatically require that the VP *hopes that he* De Se is elected hold true of each candidate, which by assumption is not the case since George's hope is of the form: *He should be elected*.

- Therefore the embedded clause must be read De Re. But since the other candidates each think *I should be elected*, they have a De Se hope. Still, the VP *hopes that he* De Re is elected (with a De Re embedded clause) is true of each of them. Therefore a De Re reading must be true in a De Se situation.

iii) Although pronouns such as 'he' are typically believed to be ambiguously De Se or De Re, languages such as Ewe (Clements 1975) display a morphological distinction between De Se pronouns, which are called 'logophoric', and De Re pronouns, which are called 'anti-logophoric'. But if the De Se analysis of logophoric pronouns is correct, given ii) we would expect that a coreferential reading should be possible in a De Se situation both with a logophoric and with an anti-logophoric pronoun. But this is not the case: the anti-logophoric pronoun yields a disjoint reference effect in an 'out of the blue' context (presumably a context in which one is reporting a speech of the form: 'I left', which corresponds to a De Se situation):

(36) a. kofi be yè-dzo (Ewe, Clements 1975)  
*Kofi say LOG-leave*  
'Kofi says that he (=Kofi) left'  
b. kofì be e-dzo (Ewe, Clements 1975)  
*Kofi say he/she-left*  
'Kofi says that he (=Kofi) left'

Thus an additional constraint is needed, one according to which a *De Se logical form should be used whenever this is compatible with the situation to be reported.*

iv) Now all we need to observe about epithets is that they cannot be read De Se. This will follow on any theory according to which De Se pronouns must always be variables, as is the case, for instance, in the classic theory developed in Chierchia 1987 [one could further try to *derive* this condition, but we leave this for future research].
3.2 Other Exceptions to Principle C

Let us now consider other exceptions to Principle C.

*Formal Speech*

First, formal speech may obviate Condition C, as is seen in (37):

(37) a. The King of Transsylvania requests that his Majesty's ministers join his Majesty in Room Rosa Luxemburg.
   b. His Majesty will not hesitate to put to death any person who insults his Majesty's forefathers.

*Disambiguation*

Second, disambiguation can suffice to justify a definite description. The basic Condition C contrast is shown in (38):

(38) a. A linguist working on Binding Theory was so devoid of any moral sense that he hired the linguist's girlfriend in his lab.
   b. A linguist working on Binding Theory was so devoid of any moral sense that he hired his girlfriend in his lab.

In (39), we see that the description the linguist becomes acceptable if it serves to disambiguate between two possible antecedents.

(39) a. A linguist [working on Binding Theory] was so devoid of any moral sense that he forced a physicist [working on particles] to hire the linguist's girlfriend in his lab.
   b. A linguist working on Binding Theory was so perverse that he forced a physicist [working on particles] to hire the physicist's girlfriend in his lab.

As expected, if we replace the underlined expression with a first person pronoun, the sentence with the linguist becomes bad again, because the description does not disambiguate the sentence any more than a third person possessive pronoun would (since the 'intervener' is a first person pronoun):

(40) ??A linguist working on Binding Theory was so devoid of any moral sense that he forced me to hire the linguist's girlfriend in his lab.

More tentatively, we may observe that the anaphoric definite description must not contain material beyond what is necessary to disambiguate the sentence. Thus in (41)a the description the linguist working on Binding Theory is overly specific because the last four words could have been dropped without making the sentence more ambiguous (the judgments are delicate, and remain to be confirmed):

(41) a.?? A linguist working on Binding Theory was so devoid of any moral sense that he forced a physicist [working on particles] to hire a friend of the linguist working on Binding Theory in his lab.
b. ? A linguist working on Binding Theory was so devoid of any moral sense that he forced a linguist working on morphology to hire a friend of the linguist working on Binding Theory in his lab.

To my ear, the example in (41)b is more acceptable because there are now two linguists that have been introduced in the discourse, so that the long description the linguist working on Binding Theory plays a function of disambiguation.

Disambiguation and Reinhart's Preference for Bound Readings

Reinhart 1983 sought to derive Condition C from a preference for bound readings over 'accidental coreference'. However the examples of anaphoric descriptions that we gave clearly violate her principle, as shown in (42):

(42) a. John was so devoid of any moral sense that he forced Peter to hire John's sister in his lab.
   b. ? Only John was so devoid of any moral sense that he would force Peter to hire John's sister in his lab.
   => only strict reading.
   c. Only John was so devoid of any moral sense that he forced Peter to hire his sister in his lab.
   => strict and sloppy reading.

Even though (42)a is acceptable, it appears not to yield a 'bound reading', as suggested by (42)b (which contrasts in this respect with (42)c). I conclude that Reinhart's principle cannot account for the acceptability of the examples under discussion.

'Old' vs. 'Recent' Antecedents

A final point is that disambiguation does not consider all the conceivable antecedents that have been introduced in a sentence, but only the relatively recent ones. The data should definitely be investigated in greater detail, but it seems to me that there is a contrast between the following examples:

(43) [Linguists have no moral standards]
   a. A linguist [working on Binding Theory] was so devoid of any moral sense that he forced a physicist [working on particles] to hire the linguist's girlfriend in his lab.

   b. A linguist [working on Binding Theory] was so devoid of any moral sense that he forced a physicist [working on particles] to hire his girlfriend in his lab.

   c. ? A mathematician I once met at a party worked at a university where a linguist working on Binding Theory hired the linguist's girlfriend in his lab.

   d. A mathematician I once met at a party worked at a university where a linguist working on Binding Theory hired his girlfriend in his lab.
If the contrast is real, it might stem from the fact that the antecedent a mathematician... is too far from his to be a plausible antecedent, with the result that the sentence with his is already 'sufficiently' unambiguous, which makes the less economical description the linguist unnecessary and the pronoun mandatory. Obviously the role played by 'distance' should be further investigated in future research.

3.3 The Status of Disjoint Reference

By its very nature, Minimize Restrictors! rules out a sentence only in case there is 'more economical' competitor which achieves the same truth conditions. When no competitor is available, we predict that Condition C should be obviated. This appears to be the case in the following examples, which have the property that the plurality of the matrix subject makes it impossible for a singular pronoun to be anaphoric on them:

(44) a. The Clintons are both convinced that Hilary will be elected in 2008.
    b. #The Clintons are both convinced that Hilary Clinton will be elected in 2008.
    c. #Hilary is convinced that Hilary will be elected in 2008.

In these examples, an R-expression is licensed even though it overlaps in reference with the matrix subject, in violation of the version of Binding Theory developed by Chomsky and Lasnik, which prescribed that an R-expression should not overlap in reference with any c-commanding expression (e.g. Lasnik 1989). Importantly, the embedded R-expression should not contain any redundant material. This is presumably what accounts for the deviance of (44)b. In (44)c, we regain a standard Condition C violation, because in this case the 'short' description she is to be preferred over the longer description Hilary. [In addition, this example is ruled out by the Preference for De Se readings which was discussed earlier].

We note for completeness that the contrasts hold just as well when the matrix subject is a pronoun, a fact which is interesting since this is normally the situation in which a Condition C effect is most severe. Nonetheless (45)a is entirely acceptable:

(45) a. How about the Clintons? What do they expect for 2008?
    -They are both convinced that Hilary will be elected.
    b. How about the Clintons? What do they expect for 2008?
    -#They are both convinced that Hilary Clinton will be elected.
    c. How about Hilary? What does she expect for 2008?
    -#She is convinced that Hilary will be elected.

Similar examples can be produced with examples that involve larger groups rather than couples, and proper names rather than definite descriptions:

(46) a. The Seven Dwarves are all convinced that the youngest among them will eventually marry Snow White.
    b. The Seven Dwarves are all convinced that Dopey will eventually marry Snow White.
    c. How about the Seven Dwarves?
    They are convinced that Dopey/the youngest among them will eventually marry Snow White.
d. How about Dopey?

#He is convinced that Dopey will eventually marry Snow White.

## 4 Sketch of a formal account

### 4.1 Principles

In order to implement the theory we have started to sketch, we need a formal device that can encode both c-command relations and the hierarchical order in which discourse referents are introduced, since we saw earlier that a description may be licensed in violation of Condition C if this serves to disambiguate between antecedents that are 'not too far' (this assumes that the contrast in (43) is real; if it is not, alternative theoretical options might become available). Standard assignment functions, which give values to indices of bound and free pronouns alike, cannot encode the necessary distinctions. This is because an assignment function simply associates certain values to certain variables; it may for instance have the form \(\text{he}_1 \rightarrow \text{John}, \text{he}_2 \rightarrow \text{Peter}, \text{etc.}\) But this neither tells us whether at the point at which this assignment function is accessed, say by a pronoun \(\text{he}_3, \text{he}_1\) is or is not in a c-commanding position; nor does it tell us whether \(\text{he}_1\) c-commands \(\text{he}_2\) or vice-versa.

It is possible, however, to construct assignment functions in such a way as to encode all the information we need. This system, known in the \(\lambda\)-calculus as the 'de Bruijn' notation, has been applied to the analysis of anaphora by quite a few semanticists, including Dekker 1994, Ben-Shalom 1996, van Eijck 2001, Bittner 2001, 2003, and Schlenker 2005a (see Barendregt 1984, pp. 579-581 for a very brief introduction to the De Bruijn notation). The system we will develop here is simpler than that of Schlenker 2005a, in that we give a single interpretive rule for all referential expressions (be they pronominal or nominal). By contrast, in Schlenker 2005a different rules were introduced (this had the advantage of accounting for Condition B, which we entirely disregard in the present paper.)

Using the vocabulary of 'sequences of evaluation' rather than of 'assignment functions', we will pursue the intuition that a sequence represents the linguistic context with respect to which an expression is evaluated. The context is built incrementally as a sentence is processed, top-down, in accordance with the following rules (in what follows a 'context' is a sequence of objects, which starts with a world and is followed by an arbitrary number of individuals):

\[
\begin{align*}
(47) \quad (i) & \quad \text{The initial context c* only includes a world parameter, followed by the speaker and addressee, followed by those entities that are 'super-salient' in the discourse (we will come back to this notion). In other words, c* is of the form: c* = w’s’h’e_1’...’e_n, where w is the world parameter, s is the speaker, h is the addressee, and e_1 ... e_n are the super-salient entities (if any).} \\
& \quad (ii) \quad \text{If } \alpha \text{ is a referential expression (be it a pronoun, a proper name or a definite description), we have: } \\
& \quad \quad [ [ [ \alpha \beta ] ] c = [ [ [ \beta \alpha ] ] c = [ [ \beta ] ] c'( [ [ \alpha ] ] c)] \\
& \quad \quad \text{where } c'( [ [ \alpha ] ] c) \text{ is the result of 'adding' the value of } \alpha \text{ to the sequence } c.
\end{align*}
\]
In accordance with this simple rule, the sequence of evaluation will represent at each point:

(a) what is the world of evaluation
(b) who is talking to whom
(c) which entities are more prominent than which entities, where 'more prominent' means either i) more salient, or ii) denoted by an expression in a c-commanding position.

To give an example, if John is talking to Mary and no other entities are 'super-salient', the initial sequence of evaluation will be of the form \( w^\hat{j}^\hat{m} \). If in addition Peter is 'super-salient', the initial sequence will be \( w^\hat{j}^\hat{m}^\hat{p} \).

We still need to say how the value of various referential expressions are computed.

(48) (a) Anaphoric and indexical pronouns carry negative indices, and obtain their value from the sequence of evaluation, in accordance with the following rule:
\[
[-i]c = c_{i}, \text{ where } c_{i} \text{ is the } i^{th} \text{ element of } c \text{ counting from the end if such an element exists and is not a world, and } \# \text{ otherwise.}
\]

(b) By contrast, demonstrative pronouns carry positive indices, and obtain their value from a demonstration, encoded in a separate function (=the Demonstrative function, D for short), in according with the following rule:
\[
[]i]c = D(i)
\]

(c) Definite descriptions (be they 'standard' descriptions or proper names, analyzed as abbreviated descriptions) obtain their values in the usual way, except that we take the \( P \) to denote the most salient \( P \)-individual, in accordance with the following rule:
\[
[[\text{the N'}]]c = \# \text{ iff there isn't a most salient } d \text{ (according to } c) \text{ satisfying } [[N']]c^d = 1.
\]
\[
\text{If } \#, [[\text{the N'}]]c = \text{the most salient } d \text{ (according to } c) \text{ satisfying } [[N']]c^d = 1
\]

(d) Salience according to a sequence \( c \):
   a. Elements that are in \( c \) are more salient that than those that aren't.
   b. Elements that are closer to the end of \( c \) are more salient than those that are further away.

Some comments are in order.

Ad (a) and (b): The distinction between negative and positive pronouns allows us to encode formally the contrast between 'accidental coreference' and 'binding', which was forcefully argued for by Reinhart 1983. Thus in His\(_{1}\) mother likes John the possessive pronoun his\(_{1}\) can be evaluated with respect to a sequence of evaluation that does not contain John, for the simple reason that positive indices obtain their value from a different function, the 'demonstrative function' D. By contrast, in Peter likes his\(_{1}\) mother the possessive pronoun recovers its value from the sequence of evaluation, which will be of the form \( w^\hat{j}^\hat{m}^\hat{p}^\ldots \) on the assumption that John is the speaker and Mary is the addressee.
Ad (c) and (d): We make use of a modification of the semantics for definite descriptions argued for in von Heusinger 1994. In standard analyses, inspired by Frege and Strawson, the $P$ denotes the maximal $P$-individual, and yields a presupposition failure if there is no unique object that qualifies as a maximal $P$-individual (this object may be singular or plural). When $P$ is singular, the $P$ yields a presupposition failure unless there is exactly one $P$-individual (this is because in this case there are several objects that are maximal individuals satisfying $P$). When $P$ is plural, the $P$ yields a presupposition failure unless there are at least two $P$-individuals in the domain of discourse; and if it is admissible, the description denotes the sum of all $P$-individuals. However, this analysis faces serious difficulties, as suggested by the examples in (49)-(50):

(49) The dog is barking, but the neighbors' dog isn't.

(50) [There are ten girls and ten boys in the class. Three girls raise their hands. Talking to the speaker, I say:]
   a. Wait, the girls have a question!
   b. #Wait, every girl has a question! (P. Svenonius, p.c; see Schlenker 2004)

In (49) it would seem that there are two dogs in the domain of discourse, and yet the dog is acceptable. In (50), the girls can denote the three salient girls that raised their hands. By contrast, every girl has no choice but to quantify over all ten girls in the domain of discourse. These facts are unexpected given the standard analysis. By contrast, if one posits that the $P$ denotes the most salient $P$-individual (in the case of a plural: the most salient plural $P$-individual), the facts are easily explained. (48)c makes use of this analysis in the singular case, and (48)d specifies that elements that appear in a sequence of evaluation $c$ count as 'more salient' (according to $c$) than those that don't, and that elements that are more 'recent' (i.e. which appear closer to the end of the sequence) are more salient that elements that are less so.

Before we can come to the examples themselves, we need to say briefly how predicates, modifiers and some embedded clauses are analyzed. Modifiers and embedded clauses are treated in an entirely standard fashion, as coordination and as abstraction over worlds respectively. Predicates are more interesting. Due to the non-standard way in which sequences are constructed, we can recover from a sequence $c$ all the information that is necessary to evaluate a predicate as true or false. If $P$ takes a single argument, it is true under $c$ just in case the last element of $c$, written below as $c_1$, satisfies $P$ in the world of $c$, written below as $c_w$. If $P$ takes two arguments, it is true under $c$ just in case the pair of the last two elements of $c$, written below as $c_2$, satisfies $P$ in the world of $c$. The general rule is given in (51)c:

(51) Notational conventions: If $c$ is a context and $n$ is a non-null integer, $c_n=#$ if the length of $c$ is $<n+1$ or if one of the last $n$ elements of $s$ is $#$; otherwise $c_n=$the sequence of the last $n$ elements of $s$. $c_w$ is the world of $c$, i.e. its first coordinate.

(a) If $P$ is an $n$-place predicate,

\[
\begin{align*}
\llbracket P \rrbracket c &=# & \text{iff } c_n=#. & \text{If } #, \ & \llbracket P \rrbracket c=1 & \text{iff } c_n \in I_{c_w}(P)
\end{align*}
\]

(b) If $P$ and $P'$ are two predicates,

\[
\begin{align*}
\llbracket P \ P' \rrbracket c &=# & \text{iff } \llbracket P \rrbracket c=# \text{ or } \llbracket P' \rrbracket c=#. & \text{If } #, \ & \llbracket P \ P' \rrbracket c=1 & \text{iff } \llbracket P \rrbracket c=1 \text{ and } \llbracket P' \rrbracket c=1
\end{align*}
\]
Our last principle, *Minimize Restrictors!*, is stated in (52). It is admittedly partial, in the sense that it will have to be specified further to apply to quantified examples. But for present purposes it will do. It is intended to apply to explicit descriptions, such as *the small President*, as well as to proper names and pronouns. *John* is taken to be short for *the John*, where *John* is a predicate true of exactly one individual (namely John). *he*$_{-1}$ is taken to be short for *the *=-1*, i.e. the individual identical to -1; and similarly *he*$_{1}$ is short for *the *=-l.

(52) Minimize Restrictors!
In a definite description *the A B* [where B can be null; the order of A and B is indifferent], the description is deviant if A could be eliminated and replaced, if necessary, with a combination of negative indices and =, 

a. without changing the reference of *the A B* or making the sentence ungrammatical, and  

b. without changing the pragmatic effect of *the A B*

As stated, *Minimize Restrictors!* encodes the assumption that anaphoric and indexical pronouns can be added to a Logical Form 'for free', whereas demonstrative pronouns are 'costly'. The intuitive motivation behind this hypothesis is that demonstrative pronouns must be associated with an implicit or explicit demonstration that specifies their denotation; whereas the denotation of anaphoric and indexical pronouns is fully specified by the context as defined here.

4.2 Examples

Let us come to some to some illustrations of the analysis. In the meta-language each proper name is abbreviated with its initial (j for John, m for Mary, etc). Furthermore, in each of the examples to be discussed, we assume that:

(i) John is talking to Mary in world w. (We assume that neither John nor Mary is the President.)

(ii) no restrictor is empty, and some most salient element satisfying the relevant conditions can be found.

We write *pronoun*$_{±i}$ for *the *=±i* (i.e. the most salient individual identical to ±i)

We write *Peter* for *the Peter* (i.e. the most salient individual identical to Peter).

Extra-Linguistic Context

The first three examples are 'dry runs', so to speak. They do not involve any violations, but show how the system works for intransitive and transitive verbs, proper names and indexical pronouns. We provide in a. the sentence to be analyzed, in a'. its simplified Logical Form, and in b. its semantic analysis (we sometimes include both an abbreviated and a non-abbreviated Logical Form, in a'. and a". respectively).

(53) a. Peter is sick  
    a'. Peter be-sick
b. $[(a')] w^j m = [\text{be-sick}] w^j m^p$
   $= 1$ iff $p \in I_w(\text{be-sick})$

(54) a. Peter criticizes Ann
   a'. [Peter [criticizes Ann]]
   b. $[(a')] w^j m = [\text{criticize Ann}] w^j m^p = [\text{criticize}] w^j m^p a$
   $= 1$ iff $p a \in I_w(\text{criticize})$

(55) a. I am sick
   a'. pro$_2$ be-sick, which abbreviates:
   a". the -$2$ be-sick
   b. $[(a'')] w^j m = [\text{be-sick}] w^j m^j$
   $= 1$ iff $j \in I_w(\text{be-sick})$

More interesting, (56) illustrates the role that Minimize Restrictors! can play to rule out a simple example. The non-minimal description the John is deviant because it is less economical than the -$2$, where we replaced the predicate John with a combination of = and the negative index -$2$ (remember that according to (52) negative indices are 'free', and can be added to a description to compensate the elimination of a restrictor!)

(56) a. #John is sick
   a'. the John be-sick
   b. $[(a')] w^j m = [\text{be-sick}] w^j m^j$
   But the same sequence could have been obtained by replacing the John with pro$_2$, i.e. the -$2$, hence by Minimize Restrictors! the sentence is deviant.

The next three examples display explicit definite descriptions. The first one is felicitous, the second is ruled out by Minimize Restrictors!, and the third is ruled in because a modifier that is referentially irrelevant has an expressive component.

(57) a. the President is sick
   a'. the President be-sick
   b. $[(a')] w^j m = [\text{be-sick}] w^j m^r$
   $= 1$ iff $r \in I_w(\text{be-sick})$
   with $r =$the most salient $d$ in $w^j m$ satisfying $[\text{President}] w^j m^d$, i.e. $r =$the most salient $d$ satisfying $d \in I_w(\text{President})$

(58) a. #the tall President is sick
   a'. the tall President be-sick
   b. $[(a')] w^j m = [\text{be-sick}] w^j m^p$
   with $p =$the most salient $d$ in $w^j m^p$ satisfying $d \in I_w(\text{President})$ and $d \in I_w(\text{tall})$
   But there is a unique President, hence tall is redundant, and by Minimize Restrictors! the description is deviant.

(59) a. the stupid President is sick
   a'. the stupid President be-sick
   b. Same as in (58)b, except that stupid plays a pragmatic role, which is to convey the speaker's attitude towards the President.

We will now study some examples in which an entity - a car - is 'super-salient'. Being super-salient, the car in question appears in the initial context (as c), which has the
effect of disallowing the description the car, which is overly explicit since a description the =-1 can be used to denote the very same object.

(60) a. It drives well [talking about a super-salient car]
   a'. pro-1 drive-well [evaluated in a sequence wˆjˆmˆc, with c being the super-salient car]
   b. \[[ (a') \] ] wˆjˆmˆc=\[[ drive-well \] ] wˆjˆmˆcˆc
      =1 iff c∈Iw(drive-well)

(61) a. #The car drives well [talking about a super-salient car]
   a'. the car drive-well [evaluated in a sequence wˆjˆmˆc, with c being the super-salient car]
   b. \[[ (a') \] ] wˆjˆmˆc=\[[ drive-well \] ] wˆjˆmˆcˆc
   But the same denotation c could have been achieved by using pro-1, hence by Minimize Restrictors! the sentence is deviant.

At this point Minimize Restrictors! makes an interesting prediction. Consider the description the stupid car in the context we just described. car could not be eliminated or replaced with a combination of = and a negative index without making the sentence ungrammatical: the stupid appears to be simply ill-formed. stupid could be eliminated without making the sentence ungrammatical, but this would change its pragmatic import, which is to express the speaker's negative attitude towards the car. Thus this description is correctly predicted to be acceptable, as outlined in (62).

(62) a. The stupid car won't budge [about a super-salient car]
   a'. the stupid car won't-budge [where for simplicity won't budge is unanalyzed]
   b. \[[ (a') \] ] wˆjˆmˆc=\[[ drive-well \] ] wˆjˆmˆcˆc
   The same denotation c could have been achieved by using pro-1, but the pragmatic effect would have been different, hence Minimize Restrictors! does not make this sentence deviant.
   Hence \[[ (a') \] ] wˆjˆmˆc# and \[[ (a') \] ] wˆjˆmˆcˆc=1 iff c∈Iw(won't-budge)

Intra-linguistic Context

Let us now consider examples that have a bit more syntactic structure, and in which the notion of the 'intra-linguistic context', i.e. the context as it is created by the interpretation of the syntactic structure, plays an interesting role. We do not distinguish in this discussion between reflexive and non-reflexive pronouns, since we do not seek to account for Conditions A and B. (63) gives a grammatical example in which a pronoun is bound by an R-expression, and (64) illustrates the simplest case of a Condition C effect which is correctly ruled out by Minimize Restrictors!.

(63) a. Peter likes himself
   a'. Peter like pro-1
   a". Peter like the =1
   b. \[[ (a") \] ] wˆjˆm= \[[like Peter]\] wˆjˆmˆp=\[[like]\] wˆjˆmˆpˆp
      =1 iff pˆp∈Iw(like)
(64) a. ??Peter likes Peter
   a'. Peter like Peter
   a". the Peter like the Peter
   b. [[(a')]\ w^j^m^f = [[like Peter]] w^j^m^f^p
   But the same denotation could have been achieved with the pronoun him\(_1\)(self),
   i.e. with the =\(_1\), which is obtained from the Peter by (i) deleting Peter and (ii)
   adding a combination of a negative index and =. By Minimize Restrictors!, the
   sentence is deviant.

As we observed earlier, the sequence of evaluation turns out to represent the c-
command relations that are found in the syntax (even though the rules by which the
sequence of evaluation is constructed do not refer to c-command). This is essential to
explain why (65)a is acceptable. We analyze Peter's friend as the Peter friend, where
friend is a transitive predicate. Since Peter is itself short for the Peter, the full
expression comes out as the [the Peter] friend, as shown in a". The abbreviated Logical
Form given in a'. is somewhat more legible:

(65) a. Peter's friend likes Peter
   a'. [the [Peter friend]] like Peter
   a". [the [[the [Peter] friend]] like [the Peter]
   b. [[(a')]\ w^j^m^f = [[like Peter]] w^j^m^f^p
     =1 iff f^p \in I(w(like))
     with f=[the Peter friend] w^j^m=the most salient d satisfying [[Peter friend]]
     w^j^m^d=1, i.e. the most salient d satisfying [[friend]] w^j^m^d^p=1, i.e.
     d^p \in I(w(friend))

Why is this sentence not ruled out by Minimize Restrictors! ? Well, either occurrence of
Peter could certainly be replaced salva denotatione with a demonstrative pronoun he\(_1\),
on the assumption that the demonstrative function D assigns Peter to the index 1. But
Minimize Restrictors! only allows for the introduction of negative indices in Logical
Forms, not of positive ones (as mentioned earlier, this distinction is intuitively
motivated by the fact that positive indices have more semantic content that negative
ones because unlike the latter they require an implicit or explicit demonstration). On
the other hand replacing either occurrence of Peter with an anaphoric pronoun he\(_i\)
would not yield the desired denotation no matter what the value of i is. The first occurrence of
Peter is evaluated under a sequence w^j^m^d for various individuals d. No value for i
would make he\(_i\) refer to Peter. And the same point applies to the second occurrence of
Peter, which is evaluated with respect to the sequence w^j^m^f, where f is Peter's friend:
no value of i would allow he\(_i\) to refer to Peter, as is desired. Therefore Minimize Restrictors!
does not rule out the above sentence. Exactly the same reasoning could be
applied to His\(_1\) friend likes Peter, where D(1)=Peter: neither he\(_1\) nor Peter can be
replaced with a pronoun he\(_i\) salva denotatione.

The preceding examples involved a single clause. But Minimize Restrictors! can equally
well derive Condition C effects that arise in bi-clausal examples. We just need to make
use of the rule we posited in (51)c to handle embedded clauses:

(66) a. ??Peter forced me to hire Peter
   a'. Peter Tom forced to hire Peter
   b. [[(a')]\ w^j^m= [[Tom forced to hire Peter]] w^j^m^p

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The same denotation could be obtained by replacing the last occurrence of Peter with him. However the proper name serves a disambiguating function with respect to the sequence w' j m' p t, and hence it is acceptable.

Of course it is worth asking why (68)a is not in fact as acceptable as the long sentence in (66)a. The reason is probably that, due to Conditions A and B, a pronoun would in fact disambiguate the sentence: coreference with Tom would require the sentence to come out as Peter forced Tom to hire himself, leaving Peter as the only plausible referent for him in Peter forced Tom to hire him. In effect, then, this example might be rather similar to the one in (67)b, where the presence of me as an intervener makes the Condition C effect reappear because the linguist's girlfriend could be replaced with his girlfriend without making the sentence any more ambiguous.

5 Extension to Discourse

In this section we will sketch a possible extension of the analysis to cases of backwards anaphora in discourse. In a nutshell, the argument is as follows:

- According to our earlier discussions, the sequence of evaluation includes all elements that are salient at some point in the semantic analysis of a sentence, either because they were 'super-salient' in the discourse situation, or because they were processed at some earlier point in the analysis of the sentence.
In general, each new sentence may access a 'fresh' sequence of evaluation, which only includes the speaker and addressee (and thus does not include elements that were processed in the preceding sentences in the discourse).

However, when two sentences are 'narratively parallel', in a sense to be clarified in future research, the sequence cannot be re-set and must be inherited from the preceding sentence.

Combined with Minimize Restrictors!, this hypothesis derives some constraints on coreference in discourse.

5.1 Generalization and Examples

Basic Examples

Bolinger 1977, 1979 notes that the precise narrative content of a sentence can affect the possibilities it displays for backwards anaphora. Some examples can be found at the discourse level as well. The following contrasts are reminiscent of Condition C, but do not involve any notion of c-command:

(69)  a. #He entered. John sat down.
     b. He entered. John looked pale.
     a'. (?)He entered. The idiot sat down.
     b'. He entered. The idiot looked pale.

The surprising contrast is that between a. and b. There doesn't seem to be any structural difference between the two examples, and yet coreference is acceptable in b. but not in a. The analogy with Condition C is brought out by the fact that an expressive in the second sentence makes the backwards anaphora somewhat more acceptable even where it is disallowed with a proper name, as shown in a'.

But why should there be a contrast between (69)a and (69)b? One could try several potential explanations having to do with the aspectual class of the Verb Phrases at hand. But this cannot be the crucial factor, as suggested by the contrast in (70), where all the VPs involved are stative and individual-level:

(70)  a. #He had brown hair. John had blue eyes.
     b. He had brown hair. John was very handsome.

I would like to suggest that the difference between the 'good' and the 'bad' cases is that in the latter the two sentences are entirely parallel from a narrative point of view. In (70)a, which is deviant, two facts are stated that are on a par. In (70)b, by contrast, there is an implicit discourse relation between the two sentences: the second is naturally construed as a conclusion, one argument for which is presented in the first sentence. Similarly, in (69)b there is an asymmetry between the first sentence, which describes an event, and the second, which provides its background. No such asymmetry holds in (69)a, where each sentence describes an event on a par with the other.

Needless to say, the notion of 'narrative parallelism' will have to be investigated and clarified in future research. With considerable vagueness, our current generalization can be stated in the following way:
Tentative Generalization: Backwards anaphora is allowed in discourse between $S_1$ and $S_2$, unless $S_1$ and $S_2$ are narratively parallel (roughly, uttered from exactly the same perspective).

Why should this generalization hold? Our hypothesis is that when two sentences are narratively parallel, the second must be evaluated with respect to the context of evaluation with respect to which the last word of the first sentence was evaluated. In other cases, the sequence of evaluation can be 're-set' at the beginning of the evaluation of each sentence, which accounts for the general availability of backwards anaphora in discourse. The hypothesis is summarized in (72).

The Role of Connectives

Before we illustrate more formally how our theory can handle these examples, it is worth pointing out that the theory of 'narrative parallelism', imprecise though it is, predicts that discourse connectives should generally have the effect of making backwards anaphora in discourse much easier because they establish discourse relations that 'break' any narrative parallelism there would be without them. This prediction appears to be borne out, though further empirical work will be required to confirm these facts:

Other factors

In addition, the factors that were seen to obviate Condition C effects in previous sections are also at work with respect to backwards anaphora in discourse. We already saw that expressive content can play a crucial role, as in ?He entered. The idiot sat down., which to my ear is quite a bit better than #He entered. John sat down., understood with coreference. Similarly, disambiguation seems to me to make (75)b somewhat more acceptable than (75)a.

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5.2 (Semi-)Formal Analysis

Using the formalism we developed in the preceding sections, a semi-formal account can be developed. I call the account 'semi-formal' because it crucially hinges on a notion of narrative parallelism that is not made explicit, and is left for future research.

To start with an example in which two sentences are narratively parallel, consider (76).

(76) a. He entered. He sat down [talking about Peter]
   a'. he₁ enter. He₁ sat-down. with D(1)=Peter.
   b. Sentence 1: 
      \[ \text{[he₁ enter]} \text{w} j \text{m} = \text{[enter]} \text{w} j \text{m}^p = 1 \text{ iff } p \in I_w(enter) \]
      Sentence 2: no possible change of point of view, hence Sentence 2 is evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 1.
      \[ \text{[[he₁ sat-down]} w j m^p = \text{[sat-down]} w j m^p^p \]
      =1 iff \( p \in I_w(sat-down) \)

The discourse is entirely acceptable with coreference because the second sentence involves a pronoun, not an R-expression. In the analysis in (76) we have assumed that the two sentences are narratively parallel, and thus that the second sentence is evaluated with respect to the sequence with respect to which the last word of the preceding sentence was evaluated. In this case it is crucial that the second pronoun be anaphoric, i.e. that it bear a negative index, since otherwise Minimize Restrictors! would rule it out. This effect is seen in (77), which is correctly analyzed as being deviant.

(77) a. #He entered. Peter sat down.
   a'. he₁ enter. Peter sat-down. with D(1)=Peter.
   b. Sentence 1: 
      \[ \text{[he₁ enter]} \text{w} j \text{m} = \text{[enter]} \text{w} j \text{m}^p = 1 \text{ iff } p \in I_w(enter) \]
      Sentence 2: the point of view is a different one, hence Sentence 2 need not be evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 1.
      \[ \text{[[Peter sat-down]} w j m^p = \text{[sat-down]} w j m^p^p \]
      But in the context w j m^p the same denotation (=p) could have been achieved by using the pronoun he₁, hence by Minimize Restrictors! the sentence is deviant.

If we had not assumed that the two sentences were narratively parallel, the sequence would have been predicted to be grammatical. This is seen in (78), which is structurally analogous to (78), but whose interpretation proceeds differently because the sequence of evaluation can be 're-set' at the beginning of the second sentence. As a result, Minimize Restrictors! does not rule out the second sentence any more.

(78) a. He entered. Peter was pale [talking about Peter]
   a'. he₁ enter. Peter be-pale. with D(1)=Peter.
   b. Sentence 1: 
      \[ \text{[he₁ enter]} \text{w} j \text{m} = \text{[enter]} \text{w} j \text{m}^p \]
      =1 iff \( p \in I_w(enter) \)
      Sentence 2: the point of view is a different one, hence Sentence 2 need not be evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 1.
      \[ \text{[[Peter be-pale]} w j m = \text{[be-pale]} w j m^p \]
      =1 iff \( p \in I_w(be-pale) \)
Finally, we should mention two cases in which (a) several sentences are narratively parallel, and yet (b) backwards anaphora is in fact acceptable because a description plays a special pragmatic role. This is the case in (79), where the idiot has an expressive component that makes it acceptable.

(79) a. Peter entered. The idiot sat down.
   a'. Peter enter. The idiot sat-down.
   b. Sentence 1: $[[\text{enter}]] w^j m = [[\text{enter}]] w^j m^\text{p} = 1$ iff $p \in I_w(\text{enter})$
   Sentence 2: no possible change of point of view, hence Sentence 2 is evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 1. $[[\text{sat-down}]] w^j m^\text{p} = [[\text{sat-down}]] w^j m^\text{p} p = p$, on the assumption that $p$ is the most salient idiot of $w^j m^\text{p} p$.
   Although $p$ is already in the context $w^j m^\text{p} p$ and hence could have been referred to using $he_\text{p}$, the idiot contributes a different pragmatic effect, as it expresses the speaker's attitude towards $p$, and hence the sentence is acceptable.

Similarly, in (80) Peter plays a role of disambiguation that a pronoun couldn't fulfill, and thus despite Minimize Restrictors! the sentence ends up being acceptable.

(80) a. He entered. Albert yelled. Peter collapsed. [where he refers to Peter]
   a'. he enter. Albert yell. Peter collapse.
   b. Sentence 1: $[[\text{enter}]] w^j m = [[\text{enter}]] w^j m^\text{p} = 1$ iff $p \in I_w(\text{enter})$
   Sentence 2: no possible change of point of view, hence Sentence 2 is evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 1. $[[\text{yell}]] w^j m^\text{p} = [[\text{yell}]] w^j m^\text{p} a = a$ iff $a \in I_w(\text{yell})$
   Sentence 3: no possible change of point of view, hence Sentence 3 is evaluated with respect to the sequence obtained 'at the end' of the evaluation of Sentence 2. $[[\text{collapse}]] w^j m^\text{p} a^p = [[\text{collapse}]] w^j m^\text{p} a^p$
   If $a$ were not in the sequence, a violation of Minimize Restrictors! would be incurred. But thanks to the presence of $a$, the proper name (i.e. description) Peter serves a disambiguating function, and hence the sentence is acceptable.

6 Concluding remarks

We have tried to suggest that a pragmatic principle, Minimize Restrictors!, might account for Condition C and -more tentatively- for some constraints on backwards anaphora in discourse. There are many loose ends, however. I only list a few:

1. The analysis would have to be extended to handle quantified examples, which are entirely absent from our discussion.

2. It remains to be seen whether Minimize Restrictors! or related principles could be applied to other binding-theoretic phenomena such as Condition B and Crossover effects (one advantage of the theory of Schlenker 2005a, which was more coarse-grained with respect to Condition C, was that it offered a unified framework for several binding-theoretic effects; this is not the case in the present analysis).

3. Complex demonstratives (e.g. that man) can be anaphoric and may be c-commanded by a coreferential expression in violation of Condition C. An account should follow from the kind of analysis envisaged here, but the details are currently unclear.
4. There is recent processing work on definite descriptions that should be connected to the present analysis (see for instance Grodner & Sedivy 2005).

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EVENT-RELATED MODIFIERS IN GERMAN ADJECTIVAL PASSIVES

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Abstract

The claim that the German Zustandspassiv is not a voice-category but should be analyzed as a copular construction raises the question of how to explain the occurrence of event-related modifiers within these constructions. It is argued that event-related modifiers should not be analyzed as a uniform group, and that their admissibility (or unadmissibility) can be explained on the basis of their different syntactic positions as well as by the way pragmatics interprets these modifiers.

1 Introduction

In the last years, the adjectival passive in German (‘Zustandspassiv’) has been subject to many papers (cf. Lenz (1994, 1996), Kratzer (1994, 1998, 2000), Rapp (1997, 1998)). Rapp (1997, 1998) discusses at length that neither an analysis according to which the adjectival passive is an ellipsis from verbal passive (‘Ellipsentheorie’) nor the Genus verbi-analysis – which considers the Zustandspassiv as a voice-category on its own – can explain all data.

Instead, Kratzer (1994) and Rapp (1997, 1998) argue that the German Zustandspassiv is a copular construction and that accordingly the participle is always adjectival. This accounts for the fact that the participle often is prefixed by un-. As un- cannot be a verbal prefix, these forms are unambiguously adjectival, see (1a). However, sometimes there are event-related elements which seem to indicate a verbal character of the construction, like von-phrases (‘by-phrases’), instrumental phrases or adverbs like sorgfältig (‘carefully’), see (1b-e).

(1) a. Die Suppe ist ungewürzt.
   ‘The soup is unspiced.’
   b. Die Suppe ist von Maja gewürzt.
   ‘The soup is spiced by Maja.’
   c. Der Brief ist mit Wachs versiegelt.
   ‘The letter is sealed with wax.’
   d. Die Birnen sind in Rotwein gedünstet.
   ‘The pears are steamed in red wine.’
   e. Der Brief ist sorgfältig geschrieben.
   ‘The letter is written carefully.’
Therefore, Kratzer (1994) and Rapp (1997, 1998) propose that not only lexical but also phrasal structures can be input to adjectivization:

(2) **Lexical adjectival participles**  

\[
\begin{array}{c}
A' \\
\text{V} \\
A^{\text{aff}} \\
\emptyset \\
\end{array}
\quad \begin{array}{c}
A \\
\text{VP} \\
A^{\text{aff}} \\
\emptyset \\
\end{array}
\quad \begin{array}{c}
\text{XP} \\
\text{V} \\
\emptyset \\
\end{array}
\]

If it is possible to adjectivize the whole VP, the occurrence of event-related elements can be explained. Additionally, this approach explains why un-prefixation does not occur in the presence of event-related modifiers but only with lexical participles:

(3) a. *Der Brief ist mit roter Tinte ungeschrieben.*  
   ‘The letter is unwritten with red ink.’

b. *Die Suppe ist von Maja ungewürzt.*  
   ‘The soup is unspiced by Maja.’

However, the distinction between lexical and phrasal adjectival participles bears some problems: first, there are data where event-related elements and un-prexified participles do co-occur within one construction which is not expected under this approach, see (4). The problem becomes more apparent if the copular verb *sein* (*be*) is replaced by *bleiben* (*remain*): here, the co-occurrence of both un-prefixated participles and event-related phrases is not restricted at all, see (5b). Even stronger, this also holds for *sein*-constructions if *noch* (*still*) is added, (5c). In fact, *bleiben*- and *noch sein*-constructions are generally unadmissible if there is a von-phrase but no un-prefixation of the participle, (5d,e). However, assuming different underlying structures for copular constructions with *sein* and *bleiben* resp. or if *noch* is added seems very unattractive. This asks for an account that admits the co-occurrence of event-related modifiers on a regular basis.

(4) a. *Bevölkerung und Parlament sind von offizieller Seite völlig uninformiert.*  
   ‘The people and the parliament are totally uninformed by the officials.’

b. *Dieses Ergebnis war von vielen unerwartet.*  
   ‘This result was unexpected by many.’

   ‘Further chances were unused by the green-whites.’

   ‘Further chances remained unused by the green-whites.’
The second problem concerns the event-related modifiers. On a closer look, we find that they do not behave uniformly: among other things, von-phrases, as we just saw, often allow un-prefixation, whereas instrumentals never do:

   ‘The wood is unsplit with an axe.’

b. *Der Kuchenteig ist in der Schüssel ungerührt.
   ‘The cake mixture is unstirred in the bowl.’

These differences cannot be explained by analyzing event-related modifiers uniformly as part of the adjectivized VP. So, despite of a complex syntactic structure with two types of adjectival participles, the data in (4), (5) and (6) cannot be explained. Therefore, I reject the idea of phrasal adjectivization. Instead, I assume that the Zustandspassiv is exclusively based on lexical adjectivization, therein adopting the analysis of Maienborn (2004). Maienborn takes a strict separation between grammar and pragmatics as the basis of her analysis. She assumes that event-related modifiers are V-adjuncts and that these modifiers along with the participle form a prosodical and semantical unit. This unit can be grasped by the notion of ‘integration’ as proposed by Jacobs (1993, 1999). Thus, event-related modifiers are allowed by grammar. It is pragmatics which decides on the admissibility of this unit, given the linguistic and non-linguistic context.

One of the aims of this paper is to test Maienborn’s (2004) analysis for the problems presented above. This mainly concerns the categorization of the event-related modifiers. We already learned that they do not behave uniformly concerning un-prefixation. Apart from this, there will be more evidence for the claim that they do not form a uniform group and that accordingly they have to be assigned to different underlying positions. Besides, I will make a proposal on how the process of pragmatics licenses the unit of modifier and participle with regard to the different types of modifiers.

The structure of this paper is as follows: First, I want to introduce the concept of ‘integration’ as proposed by Jacobs (1993, 1999). Next, we will test whether the data we are concerned about come under this category. In part 3 more evidence will be presented to corroborate the view that there are different groups of event-related modifiers for which we will have to assume different underlying positions. Part 4 is about the pragmatical process of licensing the modifier-participle-unit. We will see that different types of modifiers make a different contribution to this unit. Finally, the results reached so far are discussed and integrated into the analysis as given in Maienborn (2004).
2 The Notion of Integration (Jacobs 1993, 1999)

The basic feature of the concept of ‘integration’ (or ‘informational autonomy’) is that it constitutes a relation between a head and its sister constituent. Thereby, the sister constituent is integrated into the head if it is informationally nonautonomous in relation to the head. The distinction between informational autonomy and informational nonautonomy is captured by the idea that the two constituents can either be processed separately or at once. If they are processed at once, the sister constituent is informationally nonautonomous and therefore integrated into the head. As there is one constituent which integrates the other (namely, the head) and one, which is integrated into the head, this relation is an asymmetric one. The following examples for integration resp. non-integration are by Jacobs (1993):

\[(7)\]
\[
a. \quad [[\text{auf}_2 [\text{dem Auto}]_1]] \\
\quad \text{on the car}
\]
\[
b. \quad [[\text{der Bundeskanzler}]_1 \text{ und } [\text{der Außenminister}]_2]
\quad \text{the Federal Chancellor and the Foreign Minister}
\]

In (7a), the constituent marked “1” is integrated into the constituent marked “2” because there is no independent semantic processing of this constituent (although the meaning of (7a) is composed of the meanings of both sister constituents). In (7b) in contrast, both constituents are processed separately from each other, and only afterwards combined with und. But neither of the constituents subordinates to the other, as it is the case in (7a).

The relevance of integration lies, among other things, in the fact that it explains phrasal stress patterns. The basic prosodical rule roughly says that if there is a relation of integration, then the nonautonomous, integrated constituent will be stressed, if not, the stress will be on the head.

Let us have a look at the data. Maienborn (2004) analyzes event-related modifiers as V-adjects. This yields a structure like in (8), and it can be easily seen that the structural requirements of integration are met:

\[(8)\]
\[
\text{A} \\
\text{V} \\
\text{PP mit Wachs} \\
\text{‘with wax’}
\]
\[
\text{A}^{\text{aff}} \\
\text{V versiegelt} \\
\text{‘sealed’}
\]

Jacobs assumes that integration takes place whenever the structural requirements are present. So in (8), we would expect the V-adjunct to be integrated. Therefore, given by the prosodical rule above, the modifier should be stressed. This is exactly what we find: If the modifier is stressed (cf. (9a), (10a)), this yields a neutral interpretation, whereas stress on the participle as in (9b), (10b) leads to contrastive interpretation.
We now compare *von*-phrases. We already saw that *von*-phrases differ from instrumentals in that they do allow *un*-prefixed participles. The data in (11) and (12) provide further evidence for the view that *von*-phrases differ from instrumentals:

(11)  
(9)  
(10)  

(13)  
(14)  

In (13) and (14), the neutral interpretation comes with the stress on the modifier, whereas the contrastive interpretation is the result of stress on the participle. We can conclude that there are obviously different types of *von*-phrases, one type which behaves like instrumentals, so they are V-adjuncts, and one type which does not. The next section will provide more evidence for the existence of such a distinction.

3 Categorization of Event-Related Modifiers

In this section, more data will be presented which show that event-related modifiers do not behave uniformly: on the one hand, *von*-phrases differ from instrumentals in that they allow *un*-prefixation of the participle whereas instrumentals do not. On the other hand, there is evidence that instrumentals and some *von*-phrases are integrated into the
participle and thus are V-adjuncts, whereas other von-phrases are not. This shows that event-related modifiers should not be analyzed uniformly, neither as part of an adjectivized VP, as in the Kratzer/Rapp-approach, nor as V-adjuncts, as in Maienborn (2004). However, these findings raise a problem for the categorization of the modifiers, because they seem to contradict each other: assuming that morphology cannot operate on complex syntactic structures suggests that von-phrases should not be analyzed as V-adjuncts, forming a complex V with the participle, as they do allow un-prefixation. On the other hand, some von-phrases seem to be integrated just like instrumentals and accordingly, they have to be analyzed as V-adjuncts, too.

Subsections 3.1 and 3.2 will present more evidence which support these contradictory findings. It will be shown that there are two types of von-phrases. One type of von-phrases will be analyzed as a V-adjunct, thereby refraining from standard morphological theory\(^1\), but the other type will not.

### 3.1 Number and Internal Order

Von-phrases in adjectival passives correspond to the external argument of the active verbal base, thus they are licensed by the argument structure. This is not true for the instrumentals in our data. Accordingly, von-phrases differ structurally from instrumentals because there is never more than one von-phrase within a construction, see (15b). This restriction is not true for instrumentals, see (15a).

\[(15)\quad \begin{align*}
a. & \text{ weil der Brief sorgfältig mit Wachs versiegelt ist} \\
& \text{‘because the letter is carefully sealed with wax’} \\
b. & \text{*weil der Brief (sicher) von Paul vom Absender versiegelt ist} \\
& \text{‘because the letter is sealed by Paul by the sender’}
\end{align*}\]

The restriction, of course, does not exclude that a von-phrase may co-occur with an instrumental in the same construction. Though, the internal order of these modifiers is restricted (at least with wide, “normal” scope). This seems to indicate that von-phrases have a higher base position than instrumentals.

\[(16)\quad \begin{align*}
a. & \text{ weil der Brief von Paul mit Wachs versiegelt ist} \\
& \text{‘because the letter is sealed by Paul with wax’} \\
b. & \text{??weil der Brief mit Wachs von Paul versiegelt war} \\
& \text{‘because the letter is sealed by Paul by the sender’}
\end{align*}\]

\[(17)\quad \begin{align*}
a. & \text{ weil die Birnen vom Koch in Rotwein gedünstet waren} \\
& \text{‘because the pears are steamed by the cook in red wine’} \\
b. & \text{??weil die Birnen in Rotwein vom Koch gedünstet waren} \\
& \text{‘because the pears are steamed by the cook in red wine’}
\end{align*}\]

These tests support the claim that von-phrases differ from instrumentals. The next tests will show that von-phrases themselves do not behave uniformly, as claimed in part 2.

\(^1\) There are other linguistic phenomena, for which it is argued that complex syntactic structures are input for morphology, like nominalized infinitives and particle verbs in German, see Höhle (1982), Lüdeling (2001). Of course, Kratzer (1994) and Rapp (1997) assume phrasal structures as input for phrasal adjectival participles, too.
3.2 Sentence Negation, Sentence Adverbials and Floating Quantifiers

Bierwisch (1988) and Steinitz (1989) argue for the existence of a position called $V^u$ close to the verb. From this position constituents hardly can be moved. V-adjuncts forming a complex V therefore should belong to $V^u$. Sentence negation, sentence adverbials and floating quantifiers can be used to prove whether a constituent belongs to $V^u$. Sentence negation indicates the left boundary of $V^u$:

(18) a. Die Birnen sind nicht in Rotwein gedünstet. (sentence negation)
    b. *Die Birnen sind in Rotwein nicht gedünstet.
       ‘The pears are not steamed in red wine.’
    c. Peter ist von dem Gejammer nicht genervt. (sentence negation)
    d. Peter ist nicht von dem Gejammer genervt. (constituent negation)
       ‘Peter is not irritated by the lamentation.’

Sentence adverbials, unstressed particles like doch as well as floating quantifiers are not admissible in $V^u$:

(19) a. Die Birnen sind wahrscheinlich in Rotwein gedünstet.
    b. *Die Birnen sind in Rotwein wahrscheinlich gedünstet.
       ‘The pears are probably steamed in red wine.’
    c. Peter ist wahrscheinlich von dem Gejammer genervt.
    d. Peter ist von dem Gejammer wahrscheinlich genervt.
       ‘Peter is probably irritated by the lamentation.’

(20) a. Die Birnen sind doch in Rotwein gedünstet.
    b. *Die Birnen sind in Rotwein doch gedünstet.
       ‘The pears are (particle) steamed in red wine.’
    c. Die Mannschaft ist doch vom Gegner geschlagen.
    d. Die Mannschaft ist vom Gegner doch geschlagen.
       ‘The team is (particle) beaten by the opposing team.’

(21) a. Die Birnen sind alle in Rotwein gedünstet.
    b. *Die Birnen sind in Rotwein alle gedünstet.
       ‘The pears are all steamed in red wine.’
       ‘The rabbits are all hit by the hunter.’

The data in (18) – (21) provide evidence for the claim that instrumentals belong to $V^u$ and therefore should be analyzed as V-adjuncts, whereas von-phrases do not. However, these results are not true for all von-phrases, as the data in (22) – (25) show:

(22) a. Die Wände sind nicht von Feuer geschwärzt. (sentence negation)
       ‘The walls are not blackened by fire.’
The \textit{von}-phrases in (22) – (25) behave exactly like the instrumentals in (18) – (21) which suggests that these \textit{von}-phrases should be analyzed as V-adjuncts, too. Moreover, these are exactly the same \textit{von}-phrases which exhibited the prosodical pattern of integrated modifiers – and only modifiers which are V-adjuncts can be integrated.

### 3.3 Two Types of \textit{Von}-Phrases

I conclude that there are two types of \textit{von}-phrases, V-adjuncts and VP-adjuncts. Additionally to the prosodical and syntactical evidence presented so far, they also differ from each other with respect to their semantics and the noun categories they belong to: \textit{von}-phrases which are VP-adjuncts typically realize the agent of the underlying event. They denote the direct causer which is an animate and / or volitionary entity. In contrast, \textit{von}-phrases being V-adjuncts realize the theme of the underlying event or denote an indirect causer. These \textit{von}-phrases sometimes can be replaced by a \textit{durch}-phrase (‘through’, ‘by’-phrase), which indicates the instrumental character. They often would provide information about the manner or reason of the event.

Let us have a look at the noun categories the \textit{von}-phrases belong to: \textit{von}-phrases of type 1 (VP-adjuncts) which denote animate entities are realized either as proper names or as a member of a group denoted by a collective noun (\textit{von dem Polizisten} – ‘by the policeman’). If they denote inanimate entities, they are realized either by the definite use of a mass noun (\textit{von Feuer} – ‘by the fire’) or an appellative which is used definitely (\textit{von der Bombe} – ‘by the bomb’). \textit{Von}-phrases of type 2 (V-adjuncts) which denote animate entities are realized as collective nouns (\textit{von der Polizei} – ‘by the police’). If they denote inanimate entities, it will be either a generic use of mass nouns (\textit{von Feuer} – ‘by fire’) or an indefinite use of appellatives (\textit{von einer Bomben, von Bomben} – ‘by a bomb, by bombs’).

These observations make it possible to identify both types of \textit{von}-phrases independently from the occurrence in a particular utterance. They are essentially based on the semantics of the \textit{von}-phrases. This leads to the basic question of what function do modifiers have when the modifier-participle-unit gets interpreted. Furthermore, we need to know how the interpretation and licensing of this unit can be spelled out.
4 Licensing the Modifier-Participle-Unit

According to the basic assumptions in Maienborn (2004), the modifier attaches to the participle as V-adjunct in order to form a complex V. She assumes that the semantics of the adjectival passive can be characterized as “ascribing the property of being in the resultant state of the event denoted by the verb to the subject referent”. Thus if the verb is complex, it is the resultant state denoted by the complex verb which holds for the referent. How then would pragmatics license (or not license) this unit?

One way to look at this is to make use of frames. Frames are dynamic conceptual structures whose form is flexible and context dependent (Barsalou (1992)). They can be used to represent objects in the world as well as states and events. Attributes (or ‘slots’) represent various aspects of this entity. If, for example, a frame represents an event, attributes would represent (among other things) the participants, location, and manner information. Note that the attributes are not restricted to the information which is usually encoded linguistically (e.g. by manner adverbs).

Barsalou (1983, 1991, 1992) argues for the existence of so-called ‘goal-derived categories’ and explains their derivation on the basis of frames. Goal-derived categories are categories like ‘things to take from one’s home during a fire’, ‘things to sell at a garage sale’ or ‘things to eat on a diet’. These concepts are derived spontaneously and they are explicitly made for the use in a particular situation, namely in order to achieve a certain goal. There are several differences between goal-derived categories and ‘ordinary’ taxonomic categories (like ‘animals’). One important difference is the way they are learned and established in memory. To put it very simple, taxonomic concepts are learned via the knowledge of an exemplar of the category. In contrast, goal-derived categories are derived by manipulating existing knowledge in memory. In this form of category learning, little experience with exemplars is necessary.

Establishing a modifier and a participle as a unit resembles the derivation of goal-derived categories since this unit is derived spontaneously and made for use in a particular utterance, too. Therefore, the mechanism Barsalou (1991, 1992) uses in order to explain the derivation of goal-derived categories seems to be a plausible explanation of how to interpret the modifier-participle-unit in pragmatics.

The mechanism is called framemodification. It is based on the assumption that attributes constrain each other within a frame. If an attribute is instantiated already, this prior instantiation cannot be ignored during instantiating further attributes, as the result should be coherent. An important point about this is that the constraints are made individually on the basis of beliefs and preferences of the speaker. Whether these constraints are logically or empirically true is irrelevant. If the attributes and the constraints that bear on them are combined, the original frame is modified and a new description of the conceptual entity is derived: through so-called framemodification.

In figure 1 this mechanism is applied to the data. It represents a partial frame for gedünstet (‘steamed’). It is partial, because only a selection of possible attributes is named. The attributes and the values (that sometimes are attributes themselves) form clusters. If in a frame for the property gedünstet the first instantiation is in red wine as value for the attribute ‘manner’ it can easily be seen how this constrains the instantiation of further attributes: according to our experiences, pears which are steamed in red wine are steamed as a whole and not in pieces, and if they are steamed in red
wine then they are not steamed in water, this happens in a pot rather than in a pan. By this mechanism of constraining the instantiation on the basis of the personal knowledge and beliefs of the speaker, the scope of the concept *gedünstet* is narrowed down and the result is a specific, modified concept, namely *in Rotwein gedünstet*.

We now can compare a frame for *gedünstet* where *in Wolken* (*in clouds*) is instantiated as first attribute. As long as the speaker is not equipped with additional knowlegde no constraints on the other attributes are possible. The frame for *gedünstet* thus remains unmodified. The fact that the construction *in Wolken gedünstet* (*'steamed in clouds'*) is marked indicates that integrated modifiers have to modify the frame where there are instantiated.

Comparing *von*-phrases gives us figures 3 and figure 4. They show frames for the property of being *informiert* (*'informed'*) as in (26a,b). The prosodical pattern as well as the semantic properties given in section 3.3 indicate that *von der Verwaltung* should be analyzed as V-adjunct and *von Herrn Maier* as VP-adjunct.
(26) a. weil die Bewohner von der VerWALTung informiert sind
   ‘because the inhabitants are informed by the administration’

b. weil die Bewohner von Herrn Maier inforMIERT sind
   ‘because the inhabitants are informed by mister Maier’

Figure 3 resembles figure 1 because the instantiation of the modifier constrains the instantiation of further attributes. The frame for informiert is considerably more specific after the instantiation of the attribute denoted by the von-phrase. This is exactly what is expected of a von-phrase being a V-adjunct.

Von-phrases like von Herrn Meier in figure 4 differ from the modifiers so far tested since they are not V-adjuncts but VP-adjuncts. Accordingly, they are not integrated, and there is no modifier-participle-unit which has to be licensed. Such a von-phrase can be instantiated, of course, but as figure 4 shows, this would not constrain the instantiation of further attributes.
In figures 2 and 4, both modifiers (the instrumental and the von-phrase respectively) do not constrain further attributes, but with the von-phrase, this does not lead to uninterpretability. The question, why is this so, brings us back to the differences between the modifiers we established in section 3: von-phrases denote the agent of the event whose resultant state is denoted by the participle. Consequently, they normally would not modify the resultant state denoted by the participle but just provide information about the causer of the resultant state. This function matches the semantic characteristics of von-phrases which are VP-adjuncts as given in 3.3: they typically denote the direct causer which is an animate, volitionary entity. This entity is referred to by proper names or definite descriptions. In contrast, von-phrases which are V-adjuncts primarily serve to narrow down the meaning denoted by the participle. In order to do this, manner information of the underlying event are useful. Therefore, these von-phrases do not refer to an individual direct causer. They rather denote an indirect causer that allows to infer manner information, for example by referring to an institution. This explains why von-phrases which are V-adjuncts are typically realized by collective nouns or by an indefinite use of appellatives, as stated in 3.3.

The second point to mention – which brings us back to Maienborn (2004) – is the relation between grammar as opposed to pragmatics. It should be clear that integration takes place at the level of syntax and semantics. From a grammatical point of view, a unit like in Wolken gedünstet (‘steamed in clouds’) is as well-formed as in Rotwein gedünstet (‘steamed in red wine’). It is the task of pragmatics to license this unit, spelled out by the mechanism of framemodification. So in our example, it is pragmatics which would rule out in Wolken gedünstet. However, if there is no modifier-participle-unit at the level of syntax and semantics, and as a result no integration, then framemodification is not applied since nothing has to be licensed. Although it is obviously possible to derive a frame that is instantiating a von-phrase being a VP-adjunct, it is not the task of this von-phrase to modify the frame. That is the reason why they may occur without narrowing down the meaning denoted by the participle and the result is perfectly fine.
5 Summary

In this paper, I argued that the adjectival passive in German is a copular construction based on lexical adjectivization exclusively. Thereby, I reject the analysis of Kratzer (1994) and Rapp (1997) according to which phrasal structures can be input for adjectivization, too. Following Maienborn (2004), I assume that the occurrence of event-related modifiers can be explained by assuming that they are V-adjuncts. This means that they form a complex V along with the participle, which can be characterized by the notion of integration (Jacobs 1993, 1999). However, I argued that the event-related modifiers do not form a uniform group. Von-phrases differ from instrumentals in certain respects, and among the von-phrases we find different syntactical, prosodical and semantical properties, too. Several tests provide evidence for the claim that instrumentals as well as one type of von-phrases in fact do form a complex unit along with the participle whereas another type of von-phrases do not. The second part of the paper deals with the question of how these modifier-participle-units are interpreted on the conceptual level and it introduces framemodification (Barsalou 1991, 1992) as exemplification of this process.

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ARE SCALAR IMPLICATURES COMPUTED ONLINE?*

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Abstract
We adopt the visual-world eye-tracking paradigm to test the hypothesis that scalar implicatures are integrated very locally to the utterance of scalar terms. Focusing on the ⟨and, or⟩ scale, we show that early point-of-disambiguation effects similar to those triggered by the integration of the lexical meaning of and can be triggered by the integration of the exhaustive meaning of or. Some design issues and an independent interpretive asymmetry holding between and and or are discussed as possible explanations for remaining differences between the effects found in the two cases. We conclude that the exclusivity implicature that is associated to sentences containing or seems to be calculated online, rather locally to the utterance of the disjunction.

1 Introduction: Scalar implicatures

Since Horn (1972) the notion of conversational implicature proposed by Grice (see the papers collected in his 1989 book) has been put to use to explain certain interpretive differences between expressions in natural language and their counterparts in formal logic.

(1) a. Uli or Philippe asked questions after the talk.  
   \[ \sim Uli \text{ or } Philippe \text{ asked questions after the talk, } \text{but not both.} \]
   b. Some students in the audience liked the talk.  
   \[ \sim \text{Some students in the audience liked the talk, but not all.} \]

The sentences in (1) seem to convey more than they would be expected to if the natural language disjunction or had the same meaning as the logical disjunction \( \lor \), or if the quantificational determiner some was interpreted as the existential quantifier \( \exists \). The intuitive meaning of the sentences in (1) imposes restrictions (the material underlined in the glosses) that go beyond the meaning of logical disjunction or existential quantification. Indeed, a logical formula like \( P \lor Q \) is true if both disjuncts are, and a formula like \( \exists x P(x) \) is true if the property \( P \) holds of all entities in the domain of quantification.

Horn proposes that the additional restrictions that seem to characterize sentences like those in (1) are not part of the lexical semantics of or and some, which does not differ

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from that of their logical counterparts. These additional restrictions associated with uses of or and some are implicatures, part of the pragmatic “overlay” that arises as a consequence of general rational cooperative behavior principles when natural language is used in conversational exchanges. In particular, the non-logical interpretation of or and some is due to a class of inferences that follow from Grice’s first maxim of Quantity: “Make your contribution as informative as required for the current purpose of the exchange.”

Horn points out that many expressions in natural language can be ordered into linguistic scales, i.e. sets of expressions of the same grammatical category that can be arranged in a linear order by degree of informativeness or semantic strength (2). If, as Grice argues, speakers routinely abide to conversational maxims like Quantity and take their interlocutors to do the same, use of a lower element on a linguistic scale implicates that the speaker is not in the position of using some higher (= stronger) element of the scale.

(2) Linguistic Scales
Ordered sets of expressions \( \langle \alpha, \beta, \gamma, \ldots, \omega \rangle \), where by substituting \( \alpha, \beta, \gamma, \ldots \) in a sentential frame \( \phi \) we obtain well-formed sentences \( \phi(\alpha), \phi(\beta), \phi(\gamma), \ldots \) such that \( \phi(\alpha) \) asymmetrically entails \( \phi(\beta), \phi(\beta) \) asymmetrically entails \( \phi(\gamma), \ldots \).

In particular, uses of or or some, which share the property of being the weaker element in the linguistic scales \( \langle \text{and}, \text{or} \rangle \) and \( \langle \text{all}, \text{some} \rangle \), implicate that the speaker is not in the position of uttering the stronger statement containing and or all. Under the common assumption that the speaker’s knowledge of the subject matter of the conversation is not incomplete, this scalar implicature conveys that the stronger sentence containing and or all is false. Hence uses of or convey but not both, and uses of some convey but not all.

As Bach (to appear, p.8) points out, “Grice did not intend his account of how implicatures are recognized as a psychological theory or even as a cognitive model. He intended it as a rational reconstruction. […] He was not foolishly engaged in psychological speculation about the nature of or even the temporal sequence of the cognitive processes that implements that logic.” Still, the misconception that implicatures in general, and scalar implicatures in particular, are late-arriving inferences which can be calculated only at later stages in the comprehension of a sentence is rather pervasive in the pragmatic literature.

Surprisingly, the issue has not received much attention in the experimental processing literature. Only a handful of recent contributions address the processing of scalar implicatures in adults (Breheny and Katsos 2003, Chierchia et al. 2003, Noveck and Posada 2003, Bott and Noveck 2004). But in general these works do not seem to focus on the actual timecourse of the computation of scalar implicatures: the processing of implicatures is probed offline, i.e. well after scalar items like or and some are presented to participants.

2 Experiment methodology and design
2.1 Experimental hypothesis

In this work, we aim at probing directly the timecourse of the computation of scalar implicatures, trying to determine whether this component of meaning is available at initial stages of processing or becomes available only at later stages. In particular, we focus on the \( \langle \text{and}, \text{or} \rangle \) scale, testing the hypothesis that the exclusive component of the inter-
pretation that is usually attributed to sentences containing a disjunction is computed and integrated very locally to the utterance of the disjunction or.

By saying that the exclusive meaning of or is calculated and integrated ‘locally’ to the utterance of the disjunction we mean the following. As an utterance unfolds, listeners try to integrate the information that can be extracted from what they have already heard into a (partial) representation of the content conveyed by the utterance. In particular, listeners access the information provided by the lexical meaning of words that they have heard. The integration of the lexical meaning of words is the paradigm of a very local process: as soon as a word is heard its lexical meaning (if known) becomes available and can be put to use. Our experimental hypothesis amounts to claiming that the implicated content that is normally associated with uses of the disjunction or does not differ much from lexical content. Like lexical content, the exclusive meaning of or should be “closely tied” to the utterance of this lexical item and become available as soon as the disjunction is heard.

In order to test this hypothesis, we adopt the so-called visual-world eye-tracking experimental paradigm (Tanenhaus et al. 1995). Within this paradigm subjects’ gaze constitutes the dependent measure. Using a head-mounted eyetracker, gaze is tracked while subjects hear linguistic stimuli instructing them to perform actions on objects that are part of a “visual world” of reference—an array of actual objects or a display on a computer screen—which is concurrently presented to them.

The experimental paradigm builds on the observation that, when instructed to interact with an array of objects, subjects fixate the intended target of action significantly more often than other objects in the array (Eberhard et al. 1995). Thus, that a subject fixates one object in a given array significantly more often than the rest can be taken as an indication that the subject has uniquely identified the intended target of action. Of course, whether the intended target can be uniquely identified depends on both the nature of the instruction received and on the nature of the array of objects. In particular, if the interpretation of the instruction is determined in an incremental way, changes in the nature of the array of objects could potentially change the point of disambiguation, i.e. the point at which the instruction has provided sufficient information to uniquely identify the intended target of action. The nature of the array of objects presented to the subject, thus, can be manipulated in order to test specific hypotheses on the processing of linguistic stimuli.

The behavioral measure provided by the visual-world experimental paradigm is closely time-locked to the auditory stimulus. Subjects typically launch eye movements to the intended target of action within 500msec after the onset of the disambiguating word (Eberhard et al. 1995). Given that a latency of about 200msec occurs between the programming and the launch of eye movements (Matin et al. 1993), subjects initiate saccades to the target of action within 300msec from the onset of the disambiguating word.

2.2 The logic of the experiment

It is probably easier to understand the logic of our experiment by looking first at a case in which only lexical meaning is at stake. Consider the meaning of the conjunction and (3). A conjunction of NPs in subject position denotes a function of type \( \langle et, t \rangle \), which returns the value \( \text{TRUE} \) if applied to properties that hold of the denotation of both conjuncts. Essentially, understanding the meaning a conjunction of NPs in the subject position of a
sentence amounts to knowing that the property denoted by the VP holds of both conjuncts.

\[(3) \quad [\text{and}] = \lambda B \lambda A \lambda P [A(P) \land B(P)] \quad \leadsto \text{look for a property shared by the conjuncts}\]

If this information is integrated as soon as and is heard, we should be able to change the point of disambiguation in sentences containing a conjunction of NPs as subject by changing the number of properties shared by the objects denoted by the two conjuncts. In particular, if the only relevant properties are being next to certain or other types of objects, changing whether the squares marked with A and B in the display in Figure 1 (center) contain objects of the same type or of different types should have quite a dramatic effect on the point of disambiguation for sentence-instruction pairs like the one in (4).

\[(4) \quad \text{The bananas and the grapes are next to some locks. Please click on those locks.}\]

\[
\begin{array}{|c|c|c|}
\hline
\text{one shared spatial property} & \text{two shared spatial properties} \\
\hline
\leadsto \text{expected early disambiguation} & \leadsto \text{expected late disambiguation} \\
\hline
\end{array}
\]

Figure 1: The logic of the experiment for the case of and

When the the objects in A and B are of different types (as in the display on the left in Figure 1), the bananas and the grapes share only the property of being next to some locks. If subject expect the follow-up instruction to ask them to perform some action on the objects mentioned in the VP of the first sentence, they should be able to uniquely identify the intended target of action already after having heard the conjunction and in the first sentence, i.e. before the intended target of action is mentioned at all. Conversely, when the objects in A and B are of the same type (as in the display on the right in Figure 1), the bananas and the grapes share both the property of being next to some lock and the property of being next to some camels. In this situation the integration of the meaning of and would not help subjects to identify the intended target of action, which could be distinguished from the other objects in the display only after being mentioned explicitly.

The same logic can be applied in investigating whether the exclusive meaning of or is integrated locally. Consider (5), where the exclusive component of the meaning of or is written directly into the lexical meaning of the disjunction. According to (5), a disjunction of NPs in subject position denotes a function of type \langle et, t \rangle which returns the value TRUE if applied to properties that do not hold of both disjuncts, i.e. that differentiate the two. If this information is integrated as soon as or is heard, we should again be able to change the point of disambiguation of sentences containing a disjunction of NPs as subject by changing the number of properties shared by the objects denoted by the two disjuncts.

\[(5) \quad [\text{or}] = \lambda B \lambda A \lambda P [A(P) \lor B(P) \& \neg (A(P) \land B(P))]] \quad \leadsto \text{look for a property that distinguishes the disjuncts}\]
Once again, we can expect that changing whether the squares marked with A and B in the display in Figure 2 (center) contain objects of the same type or of different types should affect the point of disambiguation for sentence-instruction pairs like the one in (6).

(6) The grapes or the oranges are next to some locks. Please click on those locks.

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Leaving empty properties aside, the function denoted by exclusive or is the complement of the function denoted by and: every nonempty set that is mapped to true by ‘NP₁ or NP₂’ is mapped to false by ‘NP₁ and NP₂’, and vice versa. This means that if the objects in A and B are of the same type (as in the display on the left in Figure 2), subjects should be led to disregard them as possible targets of action already after having heard the disjunction or in the first sentence. While this does not by itself uniquely identify the intended target of action—until hearing locks two alternatives remain open—the integration of the exclusive meaning of or should be reflected in an increase in looks to the two remaining potential targets of action. Conversely, when the objects in A and B are of different types (as in the display on the right in Figure 2) the integration of the exclusive meaning of or would not help subjects in “narrowing down” the set of potential targets of action, and looks should be more equally distributed among the four possible alternatives.

Crucially, however, only the local integration of the exclusive meaning of or is expected to distinguish between the display on the left and the display on the right in Figure 2. If subjects integrate the exclusive component of the meaning of the disjunction only at a later point in the processing of sentences like (6), or should be initially given the same inclusive interpretation as the logical disjunction ∨, an interpretation that would not exclude the roller skates as potential targets of action in the display on the left.

Thus, this experimental design allows us to probe the participants’ interpretation of or without setting up an explicit verification task, where subjects would be asked to consciously evaluate the interpretation(s) licensed by a sentence containing the disjunction. Behavioral data from such tasks likely confound and confound the participants’ processing of the linguistic stimuli with the verification strategy adopted to perform the task. In addition, an explicit verification task might encourage subjects to consider from the start interpretations that are not immediately considered in the normal processing of sentences.

2.3 A summary: Experimental conditions and predictions

Before addressing the design of the experiment, let us summarize the various experimental conditions and the predictions that follow from our experimental hypothesis.
We first investigate the effects of the integration of lexical content using the paradigm detailed for the case of and above. This preliminary step is essential in order to test that our experimental methodology works. Indeed, results like those in (Eberhard et al. 1995) concern primarily the effects of the integration of the meaning of open-class content words—adjectives, in particular—rather than more “functional” close-class words like and or or.

Furthermore, the methodology that we adopt departs slightly from the basic visual-world paradigm: we are interested in tracking the participants’ gaze while they hear a sentence that describes the visual display, rather than while being instructed to perform an action. Still, in our design subjects should process the first sentence in order to identify which objects the action requested by the following instruction should be performed on. We expect the basic results of the visual-world paradigm to be replicated within this setting.

For the case of and we consider two conditions (see Figure 3): an early disambiguation condition (AE), where we expect the integration of the meaning of the conjunction to help subjects in identifying the intended target of action already before it is mentioned in the VP of the sentence, and a late disambiguation condition (AL), where we expect the intended target of action to remain ambiguous until it is explicitly mentioned.

![Figure 3: The 5 experimental conditions](image)

Then, we test whether the effects that we expect to find in the case of and can be reproduced for the case of or, using the same logic detailed above. As in the case of and, we have two basic conditions for or: an early disambiguation condition (OE), and a late disambiguation condition (OL). In addition, we introduce a third condition (OI), which resembles the early disambiguation condition in that the same kind of displays are used, but which differs from it in that the two identical objects in the display are mentioned in the auditory stimuli as intended targets of action. Items of this sort, in which the disjunction in the first sentence must be interpreted as inclusive, are needed in order to avoid biasing subjects towards an exclusive interpretation of or. But these items are not mere fillers. Given our hypothesis that subjects should initially be driven away from shared properties by the exclusive meaning of or, we might expect a further disambiguation delay in the OI condition, similar to the garden-path effects discussed in syntactic processing literature.

3 The experiment

3.1 Methods

3.1.1 Materials

The actual displays in the experimental materials consisted of 3 × 3 square grids containing 9 (pairs of) objects. Adding a third row in the display was necessary to ensure that subjects had to process the first sentence in order to correctly perform the action requested.
by the follow-up instruction. If the simpler displays shown in the previous section had been used, subjects could have easily adopted a heuristic—“click on objects of the type mentioned in the VP of the first sentence”—that would have allowed them to perform correctly the requested action without actually paying attention to the meaning of the conjunction/disjunction in subject position. With the more complex display, we can ensure that subjects process the first sentence by varying whether the follow-up instruction requires them to click on the objects mentioned in the VP of the first sentence or on some other objects of the same type: the third row contains an additional pair of objects of this type. Consider the two alternative sentence-instruction sequences in (7) with respect to the display in Figure 4: those and other in the instructions can be interpreted only with respect to the information conveyed by the the first sentence.¹

(7) The bananas and the grapes are next to some locks.
   a. Please click on those locks.
   b. Please click on some other locks.

![Figure 4: An example of the full 3×3 grid displayed in a trial](image)

The pairs of objects used in the displays were constructed using images from the color Snodgrass picture set (Rossion and Pourtois 2004). The central column—containing pictures of bananas, grapes, and oranges—remained constant across all displays. The other two columns contained pictures chosen among the eight pairs of objects in Figure 5.

We chose to consider as experimental items only displays where the objects denoted by the subject of the first sentence are in contiguous rows. For each of the AL, AE, OL, and OE conditions 4 items were created. The O1 condition consisted of 8 items, in order to offset the exclusive interpretation of or required by the OL and OE conditions. In half of the experimental items the third row appears above the two relevant rows, and in the other half it appears below them. 12 filler items were created that are essentially identical to experimental items but for the fact that the two rows referred to by the subject of the first sentence are not contiguous. In addition 12 more filler items were created in which sentences like (8) are used to describe displays like those used in experimental items.

¹As pointed out by Carson Schütze (p.c.), the instruction in (b) is potentially confusing in the case of sentences containing a conjunction in subject position as in (7). The instruction could be interpreted as requiring to click on the two pairs of locks in the top two rows or on just one of these pairs. Both types of actions were considered as correct in analyzing the data. This potential source of confusion is removed in the follow-up experiments that we are currently running, as are the potential problems raised by the possibility of interpreting the indefinite in object position as scoping over the subject in the first sentence.
Finally, 64 filler items were created for which sentences like those in (9) are used as descriptions of the visual display. Altogether, the set of test items consisted of 112 items.

(8) Some locks are next to the bananas and/or the grapes.

(9) a. The bananas are next to some locks.
   b. Some locks are next to the bananas.

Care was paid in balancing this set as evenly as possible. All eight objects appeared as intended targets the same number of times, and overall all objects occurred equally often in the set of test items. Four different lists of experimental items were created. The 8 objects in Figure 5 were divided in two sets in order to ensure that different objects appeared as intended targets in the 4 AL/OL vs. the 4 AE/OE items, and one factor of difference between the lists was which set was used in which condition. Balancing the distribution of the intended targets of action and the remaining “alternative” objects among the 4 possible cells available in the grid would have required to create 8 items per condition. We chose to divide the possible alternative layouts in two sets, and have the choice between these two sets be the second factor of difference between the four lists of experimental items. Finally, the order of mention of objects in the conjunctions and disjunctions in the first sentence in the auditory stimuli was balanced too, as was whether the follow-up instruction designated as target of action objects in the rows referred to by the subject of the first sentence or the relevant object in the third row. These auditory stimuli were recorded as whole sentences spoken with normal intonation by a female native speaker of English.

3.1.2 Participants

Participants were sixteen (16) male and female undergraduates from the University of Rochester Department of Brain and Cognitive Sciences subject pool, all of whom were paid for their participation. All participants were native speakers of North American English with normal or corrected to normal vision and no hearing impairments. The participants were equally distributed among the four lists of experimental materials.

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2 One note about terminology. Since in our analysis we consider only looks to the two rows referred to by the subject of the first sentence, from now on we will use the term ‘intended targets’ to refer only to objects of the type mentioned in the VP that appear in these rows.

3 Fixation data from 6 additional participants were not analyzed: <90% correctness in performing the requested action was taken to indicate that participants were not attending to the experimental task.
### 3.1.3 Procedure

The experimental materials were presented using an Apple eMac computer equipped with a 17-inch monitor (1024×768 pixel resolution) and external stereo loudspeakers. During the experiment participants were seated about 30 inches away from the computer monitor. Each trial began with the presentation of a number at the center of the blank screen. After 500msec the number disappeared and a 3×3 square grid (768×768 pixels) containing 9 (pairs of) objects was displayed. After 3 seconds the first sentence—e.g. The bananas and the grapes are next to some locks—was played, followed by a 300msec pause and then by the follow-up instruction—e.g. Please click on those locks. After performing the requested action, participants pressed the spacebar to go to the next trial.

Before testing proper, subjects were presented with four practice trials in order to familiarize with the task to be performed. Practice trials differed from the trials in the testing phase in that objects other than those in Figure 5 were used in the visual displays, and in that subjects received explicit feedback on their performance in the follow-up task. A PsyScope script (Cohen et al. 1993) controlled the presentation of the stimuli and recorded the subjects’ performance in the follow-up task. The 112 items in the testing phase were presented in random order in one block (subjects were allowed to take breaks between trials). A run of the experiment took on average about 30 minutes.

Participants’ eye movements were monitored using an ISCAN EC-501 head-mounted eyetracker. An eye camera provides an infrared image of the eye and tracks its position by analyzing the positions of the center of the pupil and the first Purkinje reflection. A scene camera is aligned with the participant’s line of sight, providing a context with respect to which eye position data is localized. Output from the scene camera, along with a superimposed crosshair marking point of gaze, and the audio signal, were recorded for the whole experiment using a Sony Digital-8 professional editing VCR. Audio and video signals were synchronized; the recording camera samples at a rate of 30 frames per second and each video frame was stamped with a time code. Eye-tracker calibration was monitored and adjusted as necessary by the experimenter between trials.

For experimental trials, a frame-by-frame editing VCR was used to identify looks to the 9 cells on the screen. Coders did not know which cells contained intended targets of fixation, nor did they hear the auditory stimuli that were played in each trial. Subsequent automatic post-processing of the coded data identified the objects fixated in each trial.

### 3.2 The case of and

#### 3.2.1 Results

The results are expressed here as fixation proportions over time, pooling across all trials falling into a given condition. The graphs in Figure 6 show the proportion of fixations to target vs. alternative in the AL and AE conditions. For each frame (recorded on the x-axis), looks to target vs. alternative (recorded on the y-axis) are calculated as follows.

Taking the sentence in (4) as paradigm, target looks is the average amount of looks to the two cells containing locks in the two “relevant” rows of the display divided by the total number of looks to the screen in that frame, and alternative looks is the average amount of
looks to the two “other” cells in the relevant rows divided by the same number. A frame was coded as containing a look to a cell if either the participant was fixating the cell or the eye was in transit to that cell during a saccadic eye movement. The vertical bars on the graphs mark the frames corresponding on average to the beginning of the conjunction, the noun in the second conjunct, the verb in the VP, the noun in the object NP, the 300msec pause, and the follow-up instruction in the auditory stimuli.

Figure 6: Fixation timelines (and)

Visual inspection of the graphs reveals that, as expected, participants converged on fixating the target much earlier in the AE condition than in the AL condition. In AL looks to target (blue line) vs. alternative (purple line) diverge only after the beginning of the object noun, but the two diverge already after the second conjunct is played in the AE condition.

To more closely investigate disambiguation, we divided each auditory stimulus into time windows, corresponding to the seven regions delimited by vertical bars in the above graphs. The length of these windows varies on a per-item basis due to differences in the duration of the recorded stimuli. The start point and end point of each window were offset 200ms (6 frames) to account for the approximate amount of time needed to plan and launch a saccade based on incoming auditory information. For the first four regions following the conjunction—corresponding to (i) the noun in the second conjunct, (ii) the VP minus the object noun, and (iii) the object noun in the first sentence, and (iv) the pause between the first sentence and the follow-up instruction—we conducted an omnibus ANOVA with subjects as a repeated measure. Event (2nd Coord NP, Verb, Object NP, Pause), Condition type (Late, Early), and Object fixated (Target, Alternative) were within-subjects factors. The dependent measure was the average proportion of fixations in each time window.

The ANOVA reveals a significant Event×Condition×Object interaction ($F(3,45)=3.64$, $p=0.0196$). Planned comparisons show that the effect is due to differences between the AL and AE conditions in the participants’ preference for fixating the target vs. alternative objects. In AL participants do not display a preference for the target until the pause between the first sentence and the follow-up instruction. On the other hand, in AE participants prefer to fixate the target already while they hear the verb of the first sentence ($F(1,45)=16.26$, $p=0.0002$). Figure 7 shows the difference between the mean fixation to target and the mean fixation to alternative in the AL and AE conditions for the four time windows; values for which this difference is statistically significant are circled.

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4E.g. to ensure that auditory information about the object noun can influence eye movements in the corresponding window, the start point for the analysis window needs to be 6 frames after the onset of locks.
3.2.2 Discussion

The results suggest that participants in this study were able to access and integrate the lexical meaning of and very locally to the utterance of the conjunction and use this information to guide the further processing of the sentence. In particular, note that disambiguation of the target occurs immediately after hearing the second conjunct in the AE condition. As soon as the two relevant rows are identified, participants can use the information provided by the subject of the first sentence to uniquely identify the target, well before the target itself is explicitly mentioned in the auditory stimulus.5

This shows that the experimental methodology adopted in this study is appropriate to the task. Within the design of the experiment, the behavioral measure provided by the visual-world paradigm can detect local effects of the integration of lexical semantic information. We can thus turn to testing our experimental hypothesis: the implicated content of or—i.e. its exhaustive interpretation—should trigger similar local disambiguation effects.

3.3 The case of or

3.3.1 Results

The graphs in Figure 8 show the proportion of fixations to target vs. alternative in the OL and OE conditions. The way of computing looks to target and alternative is a little different in this case. Consider the OE condition first, assuming that subjects hear (6) as auditory stimulus. Under our experimental hypothesis we expect subjects to look away from the two pairs of roller skates, which thus constitute the alternative. But what about the target? One option would be to consider the other two cells in the two relevant rows as target. However, this is appropriate only until the word locks begins to be played: after that, we expect subjects to concentrate on the locks alone. Thus, for the OE condition we decided to compare the proportion of looks to the single cell containing the intended target to the

5When we presented our results, people in the audience voiced the concern that the early POD effect found in the AE condition might be due to properties of the visual stimuli. In AE subjects might prefer looking towards the two “alike” objects rather than towards the two “different” ones. This alternative account for the effect found in AE fails in light of the findings for the OE condition, which is visually indistinguishable from AE but does not seem to induce a comparable preference for the two alike objects.
average proportion of looks to the two cells containing identical objects. Items in the OL condition were constructed so that for each item in the OE condition a corresponding item existed that contained the intended target in the same cell, but replaced the two identical alternative objects with two different objects. Looks to alternative in the OL condition were calculated by averaging looks to the two cells containing these different objects.  

![Figure 8: Fixation timelines (or)](image)

Visual inspection of the graphs reveals that participants converged on fixating the target earlier in the OE condition than in the OL condition. In OL looks to target vs. alternative clearly diverge only after the end of the first sentence; in OE the two diverge while the object noun is being heard. The expected early POD effect is thus found in the OE condition, but this effect seems to be delayed with respect to the effect found in the case of and.

In order to better understand the results, we conducted an omnibus ANOVA with subjects as a repeated measure on the first four windows following the disjunction—corresponding to (i) the noun in the second disjunct, (ii) the VP minus the object noun, and (iii) the object noun in the first sentence, and (iv) the pause between the first sentence and the follow-up instruction. Event (2nd Coord NP, Verb, Object NP, Pause), Condition type (Late, Early, Inclusive), and Object fixated (Target, Alternative) were within-subjects factors. The dependent measure was the average proportion of fixations in each time window.

In this case, the ANOVA does not reveal a significant Event × Condition × Object interaction. However, planned comparisons show that the OE condition differs from the OL and OI conditions with respect to the participants’ preference for fixating the target. In OL and OI participants do not display a preference for the target until the pause between the first sentence and the follow-up instruction. On the other hand, in OE participants prefer to fixate the target already while they hear the object noun in the VP of the first sentence ($F(1,90)=10.713, p=0.0015$). Figure 9 shows the difference between the mean fixation to target and the mean fixation to alternative in the OL, OE, and OI conditions for the four time windows; values for which this difference is statistically significant are circled.

### 3.3.2 Discussion

The early POD effect found in the OE condition suggests that participants were able to locally use the exclusive meaning of or to guide the further processing of the sentence and restrict the set of possible targets. Notice that while disambiguation of the target occurs

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6Looks to target vs. alternative in the OI condition were calculated exactly as in the AE condition.

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in OE in the time window corresponding to the object noun (e.g. locks), the effect cannot be due to the explicit mention of the target. As shown by the results for the AL, OL and OI conditions, effects of the integration of the lexical meaning of the object noun can be detected only in the time window corresponding to the pause after the first sentence. This argues that the exclusive interpretation of or is available at an early stage in the processing of the first sentence. Indeed, were subjects to initially interpret or as the logical disjunction $\lor$, differences in their behavior in the OE condition vs. the OL and OI conditions would not be expected until after the integration of the meaning of the object noun.

4 General discussion

Two main results follow from our experiment. The first result is that the methodology that we devised seems to allow for investigating the meaning of functional words like and or or without setting up an explicit verification task. The data collected using this methodology are less likely to conflate or confound the effects of the integration of the meaning of these expressions with those due to strategies adopted by the participants. The second result is that we find evidence that the exclusive component of the meaning of or is integrated (and thus calculated) online. Our experimental analysis was led by the hypothesis that the exclusive component of the interpretation that is normally associated with sentences containing the disjunction or is calculated very locally to the utterance of this lexical item. It appears that or is given an exclusive interpretation already before the sentence containing the disjunction has been processed in its entirety, which clearly undermines the “extreme” alternative to our experimental hypothesis that many authors seem to have implicitly attributed to Grice. The exclusive interpretation of or seems to be available to participants at a point where the “literal meaning” of the sentence containing the disjunction cannot be calculated because the sentence has not been heard in its entirety. At the same time, the most extreme version of our locality hypothesis does not seem to be upheld by the results either. Participants in our experiment do not seem to use the information provided by the exclusive meaning of or as early as they use the information provided by the lexical semantics of and. The early POD effect attested in the OE con-

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7 “If Grice is right [...] you need to know the literal meaning or sense of a sentence before you can calculate its implicatures in a context [...]” (Levinson 1983, p.117).
dition occurs later, and is thus less local than the effect found in the AE condition. This provides a potential argument against the hypothesis that the exclusive component of the meaning of or becomes available as soon as the disjunction is heard. For the purpose of this paper, we would like to hold on drawing the latter conclusion. Our reluctance in abandoning the strong version of our experimental hypothesis is motivated by the observation that the asymmetry found between the effects in the case of and vs. or might be due to independent issues arising from specific properties of our experiment. One potential problem follows from our choice of investigating the ⟨and, or⟩ scale in the first place. An independent formal asymmetry holds between the two elements in this scale: while a conjunction of NPs can denote both in e and ⟨et, t⟩, a disjunction of NPs is inherently non-referential. This asymmetry might be playing an unwanted role in our experiment because the experimental task in the visual-world paradigm is essentially a referential one: subjects are implicitly asked to determine an interpretation for the auditory stimulus with respect to the referential domain provided by the visual display. It is thus possible that the delayed effect found in the OŒ condition indicates a delayed integration of the whole meaning of or, and not just of its exclusive component. That is, or could be interpreted as exhaustive as soon as it is heard, but its meaning be of a type that—unlike the meaning of and—cannot be used right away in the visual-world setting. A second problem is that we unwillingly introduced a strong bias in the experimental materials that militates against the effects that we expected to find in the OŒ and OI conditions. Consider again the visual display in Figure 4. A subject faced with a display of this type who always chose to concentrate on the cells containing the three identical objects would be 75% correct in guessing the identity of the target, without paying any attention to the nature of the coordination in the subject of the first sentence. Such a strong bias is likely to have been unconsciously picked up by participants, with the result of undermining both the early POD effect in OŒ and the expected disambiguation delay in OI. In ongoing follow-up experiments we address these potential confounds, improving the experimental design and extending the scope of investigation to the ⟨all, some⟩ scale, where an asymmetry similar to that occurring in the case of ⟨and, or⟩ does not arise.9

5 Conclusions

Our experiment provides initial evidence that the exclusive meaning of or is integrated locally to the utterance of the disjunction, and can guide the further processing of the sentence containing it. Like other types of linguistic information, scalar implicatures seem to be computed and integrated online, as part of the incremental processing of a sentence. As a parting note, we want to explicitly state that we do not intend to draw conclusions bearing directly on the current theoretical debate on the nature of scalar implicatures from the provisional results of our experimental investigation. Like Grice, most contenders in

8 Furthermore, we do not find the related expected further disambiguation delay in the OI condition.
9 Within the revised design, we plan to address relevant questions that have been raised by the audience at Sinn und Bedeutung IX. In particular, experimental items are blocked in order to test whether the participants’ behavior changes with exposure to the task; and versions of the experiments are planned in which no conjunction items are presented, in order to test the hypothesis that the local exclusive interpretation of the disjunction might be triggered by an implicit comparison to sentences containing a conjunction.

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the theoretical arena aim at an appropriate rational reconstruction of the logic underlying
the derivation of implicatures and of the types of information involved in it, and do not
commit to hypotheses concerning the use of this knowledge that can be straightforwardly
translated into behavioral predictions. Still, we think that these and further experimental
results can contribute to the debate by defining empirical requirements that a psychologi-
cally realistic analysis of scalar implicatures should be able to meet at no additional cost.

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BARE PREDICATE NOMINALS IN DUTCH*

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Abstract

Bare predicate nominals (BPNs) have interesting syntactic and semantic properties that set them aside from full nominals in predicative constructions. In Dutch the differences between BPNs and other nominals are especially visible in the syntax-semantics interface. This paper analyzes Dutch BPNs by making a syntactic distinction between NPs and NumPs/DPs, and a correlating semantic distinction between two ways of relating kinds to individuals realizing them. Whereas the general Carlsonian realization operator relates a kind to all the individuals realizing it, we propose an alternative, more restricted, capacity operator, which only maps a kind to the individuals that realize it in a particular ‘capacity’ (profession, nationality, religion etc.) of the individual. We study the implications of these two modes of realization in conjunction with the different syntactic layers within the DP.

1 Introduction

Many natural languages allow predicative constructions involving a nominal expression. However, some of the interesting questions concerning the interpretation of such nominals are not easy to appreciate cross-linguistically, due to the obligatory presence (or lack of) indefinite articles in many languages. For instance, in languages like Modern Hebrew, where the indefinite article is lacking or hardly useful, the noun in predicate nominals typically appears bare as in (1), similarly to indefinites in argument positions. In languages like English, where the singular article is obligatory, the predicative construction typically involves a full noun phrase with an indefinite article, as in (2). We use the terms bare predicate nominal (BPN) and marked predicate nominal (MPN) to refer to nominal phrases in sentences like (1) and (2).

(1) dan more BPN [Hebrew]

* We thank Bill Philip for his help with the English translation of certain Dutch examples. We thank audiences in Jerusalem, Utrecht (LUSH Colloquium), Nijmegen (Sinn und Bedeutung 9) and Brussels (conference on Weak Quantifiers and Indefinites) for comments and discussion. The second author spent the summer of 2003 in Utrecht as a visitor supported by a grant from the Netherlands Organisation for Scientific Research (NWO), which is hereby gratefully acknowledged. The first and the third author acknowledge NWO for financial support (grant 051-02-070) for the Cognition project Conflicts in Interpretation.)
It is often assumed that the indefinite article in MPNs is semantically void (cf. Partee 1986), and is inserted for syntactic reasons only. The observation that Modern Hebrew does not allow MPNs in the context of (1), whereas English doesn’t have BPNs in contexts like (2), supports the hypothesis that cross-linguistically, presence or lack of the indefinite article in predicate nominals is only a matter of syntax. The fact that we generally use the sentences in (1) and (2) as translational equivalents seems to confirm that there is no semantic contrast. The central claim of this paper is that this impression is misleading. Besides Hebrew-type languages and English-type languages, there is a third class of languages in which the indefinite article in predicate nominals is frequently optional. Thus, in Dutch for instance, both (3a) and (3b) are grammatical:

(3) a. Jan is leraar.  
    Jan is teacher  
   BPN [Dutch]  

b. Jan is een leraar.  
    Jan is a teacher.  
   MPN [Dutch]  

The contrast between (3a) and (3b) is subtle and not easy to pinpoint. Intuitively, speakers often claim that the BPN construction in (3a) indicates that Jan is a teacher by profession, whereas (3b) admits a wider range of interpretations, including readings in which Jan is teaching without being a professional teacher, or is playing a role, is behaving like a teacher, or is a teacher in some metaphorical way. Thus, we can tentatively assume that (3a) entails (3b), but the entailment in the other direction is at best dubious. The claim that Jan is a professional teacher can be explicitly expressed in BPNs by using a so-called ‘capacity qualifier’, as in (4a):

(4) a. Jan is leraar van beroep.  
    Jan is teacher by profession.  
   BPN [Dutch]  

b. *Jan is een leraar van beroep.  
    Jan is a teacher by profession.  
   MPN [Dutch]  

The combination of a capacity qualifier with a MPN is ungrammatical, as illustrated in (4b). The semantic contrast between BPNs and MPNs in (3) thus correlates with a difference in their syntactic properties.

In fact, among the European languages that have an indefinite article, English is the odd one out in not allowing bare and marked predicates side by side. Bare nominal predicates are common in the Romance languages:

(5) a. Gianni e’ ingegnere/professore/macellaio.  
    Gianni is engineer/professor/butcher.  
   [Italian]  

b. Jean est médecin.  
    Jean is doctor.  
   [French]  

c. Juan es médico.  
    Juan is doctor.  
   [Spanish]
In Germanic languages we find examples too, with contrasts very similar to the one we found in Dutch:

(6) a. Olivier var skuespiller.  
Olivier was an actor. (literally)  

b. Din lille pige er en skuespiller.  
Your little girl is an actress. (figuratively)  

(from Allan, Holmes and Lundskær-Nielsen 1995)

(7) a. Herr Weber är katolik.  
Mr Weber is a Catholic.  

b. Han är en god katolik.  
He is a good Catholic.  

(from Holmes and Hinchliffe 1994)

(8) a. Han er lærer.  
He is a teacher.  

b. Han er en luring.  
He is a sneaky person.  

(from Strandskogen and Strandskogen 1986)

(9) a. Er ist praktizierender Katholik.  
He is a professing Catholic.  

b. Er ist ein Aufschneider  
He is a swank.  

(from Engel 1996)

In all these languages, the bare construction is restricted to nouns referring to professions, nationalities, religions and the like.

The Dutch examples (3) and (4), and their counterparts (5)-(9) in other European languages indicate that a proper analysis of the relation between BPNs and MPNs may involve a characterization of the syntax-semantics interface with predicate nominals. In this paper we study Dutch predicate nominals, where some of the relevant interface properties are clearly manifested. We are not aware of the existence of capacity qualifiers in other languages that allow both BPNs and MPNs, and Dutch will be used to bring out the semantics of BPN constructions as realizing capacities of an individual. We will see in section 2 that Dutch BPNs and MPNs display an interesting correlation with adjective inflection, which reveals the relevance of the NumP layer for the BPN/MPN distinction.

The analysis we propose is embedded in a larger discussion on bare nominals in natural language in the linguistic literature. We know that in hospital and in a hospital do not have the same meaning in English, and that the bare construction tends to refer to a
more abstract notion (related to stereotypical function, habituality, genericity) than the use of the full indefinite. We also know that bare plurals in English are kind referring, whereas singular indefinites are not (Carlson 1978), so ‘bareness’ is somehow related to reference to kinds or abstract properties. Full noun phrases are typically blocked in incorporation constructions, where bare nominals are frequently used to refer to institutionalized or habitual activities. If a language allows incorporation of bare singulars as well as bare plurals (e.g. Hindi, Hungarian), we see that the singular displays semantic number neutrality, whereas morphological plurality entails semantic plurality as well (Dayal 1999, Farkas and de Swart 2003). Munn and Schmidt (2005) highlight the relevance of number in the syntax and semantics of indefinites in general. As we will show in section 2, number neutrality is also a relevant semantic feature of BPNs. Interestingly, the syntactic and semantic constraints on bare nominals may vary with the construction they appear in. Thus, Heycock and Zamparelli (2003) observe that English does not normally accept bare singulars in regular argument position, but the coordination of such expressions is often fine. Heycock and Zamparelli observe, however, that unlike bare plurals, coordinated bare singulars do not admit an existential reading. Roodenburg (2004a,b) extends the discussion to French, a language that does not normally accept either bare singulars or bare plurals in regular argument position. Roodenburg observes not only that coordinated bare singulars and plurals are acceptable in French, but provides evidence that coordinated bare plurals in French allow an existential interpretation, as bare plurals generally do in English. Thus, the relation between bare nominals and number has become an important topic in recent studies in linguistics. We take it that general questions about number and bareness of nominals, and their relations with interpretation, can only be tackled with by studying specific constructions in a wide range of languages. This paper attempts to contribute to the bigger picture by concentrating on an account of the syntactic and semantic properties of BPNs and MPNs in general, and in Dutch in particular.

The structure of the paper is as follows. Section 2 gives the main facts about bare predicate nominals in Dutch. Section 3 sketches the syntactic analysis, and section 4 relates this to the semantics of BPNs and MPNs. Section 5 concludes with some questions of a wider (cross) linguistic perspective. The appendix summarizes some facts about the variety of Dutch nominals that support BPN constructions.

2 Main facts about bare predicate nominals in Dutch

Section 2.1 focusses on semantic contrasts between BPNs and MPNs in contexts like (3) above. Section 2.2 focusses on capacity qualifiers, section 2.3 on the correlation with adjective inflection.

2.1 Semantic contrasts between BPNs and MPNs

Similarly to examples (3a, b) above, the following pairs of sentences exhibit the contrast between bare and marked predicate nominals in Dutch (Haeseryn et al. 1997):

(10) a. Peter is advocaat/Belg/christen.
    Peter is lawyer/Belgian/Christian.
Nouns that appear in BPN constructions normally refer to humans, and indicate profession, nationality, religion and the like. Thus, the BPN constructions in (11) are ungrammatical:

(11)  

a. Die vogel is een/*/∅ mus.  
That bird is a/*/∅ sparrow  
b. Dat voorwerp is een/*/∅ tafel.  
That object is a/*/∅ table.

We will not attempt to give a characterization of the class of nouns that appear in BPNs, but refer to Matushansky and Spector (2003) for a discussion that focuses on this issue. Appendix A provides a list that exemplifies the kind of Dutch nouns that are accepted in BPN constructions, based on Haeseryn et al. (1997).

As was argued above, there is a genuine distinction between the semantic interpretation of BPNs and MPNs. This distinction, though often a subtle one, becomes easily noticeable in the following examples:

(12)  

a. Henriëtte is manager.  
Henriëtte is manager.  
b. Henriëtte is een manager.  
Henriëtte is a manager.

Both sentences are perfectly grammatical. However, (12a) is false with respect to the first author of this paper, because according to her job description she is a university professor, not a manager. Sentence (12b), on the other hand, is true with respect to the same person, for university professors in the Netherlands spend a considerable part of their time on administrative duties, without being considered “managers” in the professional sense of the word. We see something similar in (13):

(13)  

a. Heleens echtgenoot is dictator.  
Heleen’s husband is dictator.  
b. Heleens echtgenoot is een dictator.  
Heleen’s husband is a dictator.

(13a) is true if Heleen is married to someone like Mussolini or Saddam Hussein, that is, someone described as the leader of a dictatorial regime. (13b) is also true under the institutional reading, but allows a much larger range of interpretations. For instance, (13b), but not necessarily (13a), is true if Heleen has a dictatorial husband who likes to push her around. In English, the contrast is mirrored in the adjectival versus the nominal predicative constructions in (14).\(^1\)

\(^1\) We are grateful to Donka Farkas (p.c.) for this example and the observed contrast in meaning.
(14) a. Yoad is Jewish.
   b. Yoad is a Jew.

(14a) is quite neutral, and predicates Jewishness of Yoad as a feature of his nationality, religion or birth. In addition to this neutral interpretation, (14b) allows a reading that calls up (positive or negative) stereotypes that can be associated with Jews.

For a final example, we observe that if, during a summer hike, we come upon a man fishing, we can assert that Hij is een visser (“he is a fisherman”), even if we do not know the man. Then we can walk over to him and ask: “Bent u visser (van beroep)?” (“Are you fisherman (by profession)?”). But it would be as uninformative to ask him “Bent u een visser?” as it would be to ask him “Are you fishing?”, because that is visibly what he is doing. We conclude from these examples that a sentence with a marked predicate nominal does not usually entail the corresponding sentence with a bare predicate nominal. However, the other direction of the entailment generally holds. Thus, the interpretation of BPNs is narrower than that of MPNs, and our semantics should reflect this.

Another important semantic property of BPNs, which contrasts them with MPNs, is their number neutrality. Compare the paradigms in (15) and (16):

(15) a. Jan is leraar.
    Jan is teacher.
   b. Jan is een leraar.
    Jan is a teacher.
   c. *Jan is leraren.
    Jan is teachers.
(16) a. Jan en Sofie zijn leraar.
    Jan and Sofie are teacher.
   b. *Jan en Sofie zijn een leraar.
    Jan and Sofie are a teacher.
   c. Jan en Sofie zijn leraren.
    Jan and Sofie are teachers.

While the BPN is acceptable with both singular and plural subjects – as witnessed by (15a) and (16a) respectively – the marked nominals een leraar in (15b,c) and leraren in (16b,c) have to agree in number with the subject.

2.2 Capacity qualifiers

As pointed out in (4) above, Dutch BPNs can appear with qualifiers attached to them, as in the examples in (17) (Haeseryn et al. 1997). MPNs as in (18) do not license such qualifiers.

(17) Peter is advocaat van beroep/Belg van nationaliteit/christen van religie.
  Peter is lawyer by profession/Belgian by nationality/Christian by faith.
2.3 BPNs and adjective inflection

Normally in Dutch, an adjective is inflected with a schwa (–e) when it modifies a non-neutral noun – a noun that takes the definite article de, rather than the neuter het. All human nouns in this paper (and, in fact, almost all human nouns in Dutch, except diminutives) are non-neuter in grammatical gender. Therefore the schwa on adjectives in MPN examples like (19a) is expected.

(19) a. Jan is een kleine/werkloze visser.
   Jan is a short[INFL+] /unemployed[INFL+] fisherman.

b. Jan is werkloos/*werkloze visser.
   Jan is unemployed[INFL-]/*unemployed[INFL+] fisherman.

c. Jan is *klein/*kleine visser.
   Jan is *short[INFL-]/*short[INFL+] fisherman.

By contrast, (19b) shows that adjectives in BPNs must be uninflected, even if the adjective may be inflected in its MPN counterpart in (19a). Further, all kinds of adjectives can in principle occur in MPNs as in (19a), but (19c) illustrates that not all adjectives occur in BPNs, not even if they are uninflected. Cross-linguistically, adjectives like short, good, etc. do not occur in BPNs, and typically require the insertion of an article (cf. the Swedish example in (7b) above).

Dutch shows exceptional lack of inflection for attributive adjectives in other cases as well (see Odijk 1992, Menuzzi 1994, Kester 1996, Haeseryn et al. 1997 and Broekhuis 1999 for discussion). One class of examples is especially relevant, because they share characteristics with BPNs. If the adjective and the noun together designate a particular type of profession or position, the adjective can remain uninflected even if it is not a BPN:

(20) a. een artistiek directeur/ een artistieke directeur
   an artistic[INFL-] director/ an artistic[INFL+] director

b. de behandeldend artsen
   the attending[INFL-] doctors
   ‘the doctors in attendance’
The uninflected and the inflected forms of the adjective *artistiek* in (20a) relate to two different meanings. The uninflected *artistiek directeur* relates to a kind of director (an art director). The inflected *artistieke directeur* indicates a director that has artistic inclinations, possibly unrelated to his job description. (20b) indicates that lack of inflection extends to plurals for the class of adjectives that allows this. (20c) indicates that we can have a combination of inflected and uninflected adjectives if the former precede the latter. The inverse order of inflections in (20d) is ungrammatical (and would remain ungrammatical even if we added a schwa to *scheikundig*).

The following two observations tie exceptional lack of inflection of adjectives to BPNs:

- A noun can be used as a bare predicate if and only if it allows (exceptionally) uninflected adjectives.
- The adjectives that occur in BPNs also occur uninflected in non-bare constructions.

Obviously, this is not a full description of the nouns that occur in the BPN construction, nor of the adjectives that can remain uninflected, but it shows that there are non-accidental correlations that motivate a unified analysis of the two classes. The following table summarizes our observations so far:

<table>
<thead>
<tr>
<th>Bare predicate nominals</th>
<th>Marked predicate nominals</th>
</tr>
</thead>
<tbody>
<tr>
<td>x is, zijn N</td>
<td>x is een N, zijn N-pl</td>
</tr>
<tr>
<td>F1 restricted class of nouns</td>
<td>all nouns</td>
</tr>
<tr>
<td>F2 restricted interpretation</td>
<td>wider interpretation</td>
</tr>
<tr>
<td>F3 capacity qualifiers possible</td>
<td>capacity qualifiers impossible</td>
</tr>
<tr>
<td>F4 number-neutral</td>
<td>number-sensitive</td>
</tr>
<tr>
<td>F5 only certain adjectives, uninflected</td>
<td>all adjectives, inflected</td>
</tr>
</tbody>
</table>

Sections 3 and 4 propose a syntactic-semantic account that captures these facts.

### 3 Layers within in the DP

We adopt the following, fairly standard structure of a layered DP in Dutch:

\[
\text{(21) } \ [\text{DP} \ldots \ D \ [\text{NumP} \ldots \text{Num} \ [\text{NP} \ldots \text{N} \ldots \ ] \ldots \ ] \ldots \ ]
\]

The NP level is unspecified for number. It contains the complements of the noun, and is highly restricted in the possibilities it allows for adjectival modification. The NumP
level encodes the number inflection of the noun phrase (Ritter 1991), and allows the full
range of modification (adjectives, PPs, relative clauses). The DP level involves
determination by articles, demonstratives and quantifiers, and has genitive possessives.
We make the following assumption about the syntactic structure of BPNs and MPNs
(see also Munn and Schmitt 2005 for a similar claim):

(A1) Bare nominals are NPs, marked nominals have at least a NumP projection.

An additional assumption is about the level at which adjective inflection is assigned:

(A2) Adjective inflection is assigned within the NumP.

According to these two assumptions, we obtain the following syntactic structures:

(22) a. Marie is [NP artistiek directeur ]
    Marie is       artistic[INFL-] director

b. Marie is [DP een [NumP-sing artistieke [NP directeur ] ] ]
    Marie is an     artsy[INFL+]    director

c. [DP die [NumP-sing succesvolle [NP scheikundig ingenieur ]]]
    that successful[INFL+] chemical[INFL-] engineer

Since a BPN is is assumed to be an NP, it contains no NumP to assign inflection, so the
adjective in (22a) needs to remain uninflected (Fact F5). If inflection is assigned in
MPNs, the syntactic structure is different (22b), and we will see that this has
consequences for the interpretation. The order of the inflected and uninflected adjectives
is fixed by the syntactic structure (22c), which explains the ungrammaticality of the
reverse order in (20d).

4 Capacities and sets

Our analysis is based on the following semantic assumptions:

(A3) Nouns lexically denote kinds of type $k$.

(A4) Predication of the form $x$ is $A$ always expresses a membership relation, where
the predicate $A$ in the sentence denotes a set of $e$-type entities.

One way of deriving the set of entities relevant in predication is using a Carlsonian
realization operator. This operator, which we denote “REL”, maps kinds to sets of
entities realizing the kind. We assume that REL is used for the interpretation of MPNs,
which leads us to postulate the following semantics for predicative constructions
involving full DPs:

(23) $x$ is een $A$ ..........> $x \in \text{REL}(A_k)$

In this representation the REL operator is assumed to be of type $<k, e, t>$ - from kinds
to sets of entities that realize it. Note that the REL operator is not defined beyond what it
type suggest – the exact ontological relation between kinds and their realizations is a matter that we leave outside the formal framework we develop here.

The semantics of BPN constructions is minimally, but crucially, different from this semantics of MPNs. The intuition behind our general proposal for BPNs is based on the behavior of BPNs with an overt capacity qualifier. For the sentences in (24) we propose the following semantics:

\[
\begin{align*}
\text{(24)} & \quad \text{\textit{x is A van beroep}} & \quad \text{\textit{\vdots \vdots \vdots \vdots \vdots}} & \quad x \in \text{van\_beroep}(A_k) \\
\text{\textit{x is A van nationaliteit}} & \quad \text{\textit{\vdots \vdots \vdots \vdots \vdots}} & \quad x \in \text{van\_nationaliteit}(A_k) \\
\text{\textit{x is A van religie}} & \quad \text{\textit{\vdots \vdots \vdots \vdots \vdots}} & \quad x \in \text{van\_religie}(A_k)
\end{align*}
\]

Capacity qualifiers are assumed to be of type \(<k,<e,t>>\), just like the realization operator \(\text{REL}\). The denotation of expressions like \(\text{van beroep}, \text{van nationaliteit, van religie}\) is thus assumed to map a kind \(A_k\) to the set of entities realizing \(A_k\) as a particular role in society, often associated with its typical activities. Capacity qualifiers \(\text{QUAL}\) are more restrictive than \(\text{REL}\), because only entities that realize the kind in the way that is expressed by the qualifier are in the set. Furthermore, capacity qualifiers are partial functions, cf. \#\text{advocaat van nationaliteit} (‘lawyer by nationality’), \#\text{Belg van religie} (‘Belgian by religion’). In some cases, two different qualifier functions have overlapping domains. For instance, the BPNs \text{jood van religie/van geloof/van geboorte} (‘Jew by religion/by faith/by birth’) are all acceptable.

We now extend this analysis of BPNs with qualifiers to general BPNs, by adopting the following assumption:

\[
\text{(A5) There is a covert general capacity operator } \text{CAP} \text{ of type } <k,<e,t>>, \text{ mapping a kind } A_k \text{ to the set of individuals realizing } A_k \text{ as a particular capacity.}
\]

We take the covert capacity operator \(\text{CAP}\) to be operative in BPN constructions. The restricted interpretation of BPNs (Fact F2) follows from the contrast between the general capacity operator \(\text{CAP}\) and the standard realization operator \(\text{REL}\).

Although we do not properly define the realization operator \(\text{REL}\) and the capacity operator \(\text{CAP}\), there are some semantic relations between these operators themselves, and with capacity qualifiers. To summarize these relations, we assume that for any kind \(A_k\) for any capacity qualifier \(\text{QUAL}\) defined for \(A_k\) the following subset relations hold:

\[
\text{(25) QUAL}(A_k) \subseteq \text{CAP}(A_k) \subseteq \text{REL}(A_k)
\]

These relations reflect entailments like the following:

- Peter is advocaat van beroep ⇒ Peter is advocaat ⇒ Peter is een advocaat
  Peter is lawyer by profession ⇒ Peter is laywer ⇒ Peter is a lawyer
- Jan is jood van religie ⇒ Jan is jood ⇒ Jan is een jood
  Jan is Jew by religion ⇒ Jan is Jew ⇒ Jan is a Jew
In addition, we assume the following:

(26) Whether or not \( \text{CAP}(A_k) \subseteq \text{QUAL}(A_k) \) depends on the kind \( A_k \) and on QUAL.

This (lack of) subset relation is reflected in (non-)entailments like the following:

- Peter is advocaat \( \Rightarrow \) Jan is advocaat van beroep
- Peter is lawyer \( \Rightarrow \) Peter is lawyer by profession
- Jan is jood \( \Rightarrow \) Jan is jood van geboorte
- Jan is Jew \( \Rightarrow \) Jan is Jew by birth

The syntax-semantics interface can now be defined as follows:

(A6) The \( \text{CAP} \) and \( \text{QUAL} \) operators optionally apply at any level within the DP. The \( \text{REL} \) operator mandatorily applies at the NumP level.

These assumptions are illustrated in the following figure:

\[ \begin{array}{c}
\text{NP} \quad \text{kind} \quad \text{CAP/QUAL} \\
\text{leraar} \\
\hline
\text{NumP} \quad \text{kind} \quad \text{REL} \\
\text{Num} \quad \text{NP} \quad \text{SING leraar}
\end{array} \]

(A6) immediately explains why capacity qualifiers are ungrammatical in MPNs (Fact F3): the obligatory presence of \( \text{REL} \) blocks all other operators of type \( \langle k, \langle e, t \rangle \rangle \).

The analysis also explains why BPNs are number neutral (Fact F4). According to the syntactic assumption (A1), BPNs do not have a NumP, so there is no room in the syntax to express number. Semantically, we can account for number neutrality by assuming a general distributivity operator \( D \), which is assumed by many semantic theories of plurals. This operator, following Link (1983), maps a set of entities \( X \) to the set of i-sums of members in the non-empty subsets of \( X \). The i-sum of a set \( Y \subseteq X \) is denoted \( \oplus Y \). With the distributivity operator \( D \), the interpretation of (16a) can now be spelled out as follows:

(27) \( \text{Jan en Sofie zijn leraar.} \)

\( \text{Jan and Sofie are teacher (= Jan and Sofie are teachers)} \)

\( j \oplus m \in D(\text{CAP(leraar)}) \leftrightarrow j \oplus m \in \{ \oplus A : \phi \neq A \subseteq \text{CAP(leraar)} \} \)

According to this semantics, Jan and Sofie both qualify as professional teachers.

Our syntactic assumptions (A1) and (A2) explain why the adjectives that occur in BPNs remain uninflected (cf. section 2 above). Our semantic assumption (A3) helps to explain why not all adjectives can occur in BPN constructions. The account we propose for Fact F5 is based on the assumption that there are two types of adjectives: exceptional
adjectives like *artistiek* in *artistiek directeur* (“art director”) denote functions from kinds to kinds, of type $k \rightarrow k$, whereas more common adjectival forms, as in *artistieke directeur* (“artsy director”) are intersective functions of type $et \rightarrow et$: from sets of entities to sets of entities. We further assume the following correlation between the two types of adjectives and inflection/location within the DP:

(28) $k \rightarrow k$ adjectives are in NP and are uniformly non-inflected
    e.g. *artistiek directeur*: \(REL(\text{artistiek}_{k \rightarrow k}(\text{directeur})) \) 
    artistic[INFL-] director

$et \rightarrow et$ adjectives are in NumP and are inflected or uninflected according to the general paradigm in Dutch
    e.g. *artistieke directeur*: \(\text{artistieke}_{et \rightarrow et}(REL(\text{directeur})) \) 
    artistic[INFL+] director

The only adjectives that occur in BPNs are those that modify the kind. Other adjectives modify the extension of the noun after application of the REL operator to the kind. This interpretation is appropriate for *artistiek*. When *artistieke* is inflected, it is not part of the NP, but appears in the NumP. It gets a different interpretation in this position, because it has a type $<<e,t>,<e,t>>$ denotation, rather than a type $<k,k>$ denotation. Our analysis thus accounts for the observed correlation between adjective inflection and interpretation in (20).

5 A wider perspective

The set of assumptions (A1) through (A5) accounts for the syntactic and semantic properties summed up in facts F2 through F5 at the end of section 2. We leave the lexical semantics of nouns that occur in BPNs (fact F1) for another occasion, but provide the observations by Haeseryn et al. (1997) in an appendix, so that the interested reader can compare the data to proposals made by Matushansky and Spector (2003) with respect to French BPNs.

Our proposal concerning inflected and uninflected adjectives raises the more general question of how this analysis fits into the lexical semantics of adjectives. The observation that the contrast between the more restricted ‘capacity’ reading and a wider interpretation can be mirrored in the contrast between adjectival and nominal predicative constructions such as *Jewish/a Jew* in the English example (14) indicates that bare nominals may in certain ways be closer to adjectives than to full nominals. This idea receives support from the observation that capacity qualifiers are compatible with adjectives, at least in certain dialects of Dutch:

(29) Hij is Belgisch van nationaliteit/christelijk van religie/joods van geboorte.
    He is Belgian (Adj) by nationality/christian (Adj) by religion/Jewish (Adj) by birth.

2 The examples are from Guido van den Wyngaerd (p.c.) on Flemish. In more northern dialects of Dutch (spoken in the Netherlands, rather than in Belgium), the construction seems less frequent, but the observation is obviously relevant to the general discussion.
A tentative explanation we would like to propose for the similarity between bare nominals and adjectives is that adjectives do not present the layered structure of DPs. In particular, adjectives do not involve a NumP, the level at which the standard realization operator REL applies. This opens up the possibility of using the overt/covert capacity operators CAP and QUAL in the semantics of predicative constructions involving adjectives, in Dutch as well as in other languages.

Such an approach raises new questions about the semantic type of adjectives and lexical nouns. So far, we have assumed that all lexical nouns refer to kinds, and the predicative construction maps them onto sets of individuals via the standard realization operator or a special capacity operator. In some sense then, we would like to extend this claim to adjectives, and assume that they refer to kinds as well. This is a non-standard assumption, and one that is not necessarily compatible with the classical Carlsonian framework. Neo-carlsonian approaches are currently rethinking and redefining the notion of kind, e.g. Chierchia (1998), Dayal (2004). Their claims about the denotation of bare singulars (in languages like Hindi), bare plurals and definite singulars referring to kinds (in languages like English), and definite plurals referring to kinds (in Romance languages) indicate a departure from the classical view that reference to kinds by nominals is similar to reference to entities by proper names. Rather, genericity expressed by plurals involves the construction of a plural group entity out of intensionally defined instances, whereas definite singular kinds are indirectly defined through type-shifting via the definite article. Only the bare singular seems to be directly referring to an atomic kind entity. If these analyses are on the right track, our conception of the ontological notion of kind is shifting, and needs rethinking. The notion of kind that arises not only from our discussion, but from some of the leading semantic analyses of bare constructions that have been advanced in the recent literature, involves an abstract concept that captures the essence of a lexical projection (AP or NP) stripped of all its functional layers (typically Num and D projections). Thus the study of bare nominals is an area where syntax, compositional semantics, and lexical-conceptual semantics meet.

References


Appendix: The class of nouns that occur in Dutch bare predicate nominals

There is no complete characterization of the class of nouns in Dutch that can appear in BPNs. The nouns that Haeseryn et al. (1997) use in their examples give a rough idea:


However, we also encountered BPNs with nouns like the following, sometimes accompanied by a PP complement:


(iii) lid van de club ‘member of the club’, slachtoffer van een misdrijf ‘victim of a crime’, winnaar van de tour ‘winner of the tour’, gevangene van een systeem ‘prisoner of a system’

BPNs with non-human nouns are very rare (Haeseryn 1997):

(iv) Deze kamer is opslagplaats. “This room is a storage depot”.

(v) Dat zinsdeel is bijwoordelijke bepaling. “That constituent is an adverbial adjunct”.

The modifiers that are possible in BPNs are of two basic kinds, compositional and non-compositional. The compositional modifiers apply relatively freely with a compositional semantics most of the time:


Examples of the other type are adjectives like scheikundig ‘chemical’ and maatschappelijk ‘social’ in combination with professions:

(vii) scheikundig ingenieur ‘chemical engineer’, maatschappelijk werker ‘social worker’

We think these adjective-noun combinations do not necessarily involve a compositional semantics. For scheikundig ingenieur, it may be maintained that a chemical engineer is a kind of engineer that is concerned with chemistry. However, for maatschappelijk werker the derivation of the name of the profession from the combination of the adjective and the noun requires an extra step. Here we do not get into this twilight zone between compositional semantics and lexical semantics.
FOCUS, CONTEXT, AND MANY ELEMENTS*

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Abstract

This paper investigates the interpretation of the determiner many. Previous literature has pointed out that the interpretation of many requires contextual information. Following this idea, some truth conditions for sentences with determiner many have been suggested. I will show that the analyses proposed in the previous literature are not sufficient, with some data which these analyses cannot explain. This paper argues that the determiner many is focus sensitive, taking a context variable C as its first argument. This context variable provides a set of alternatives for comparison, and predicts a previously unnoticed “list” reading. I will provide a detailed analysis following this idea to explain problematic data for previous analyses, and compare my analysis to the others.

1. Introduction

The goal of this paper is to present an interpretation of the determiner many that has not been addressed in previous literature. In the traditional analysis for determiners in which their type is defined as <et, <et, t>>, interpretations of canonical determiners seem to be straightforward; for example, \[ \text{every} = \lambda p_{et} \lambda q_{et}. \{ x: p(x) \subseteq \{ x: q(x) \} \}, \text{no} = \lambda p_{et} \lambda q_{et}. \{ x: p(x) \cap \{ x: q(x) \} = \emptyset \}, \text{some} = \lambda p_{et} \lambda q_{et}. \{ x: p(x) \cap \{ x: q(x) \} \neq \emptyset \}, \] and so on. The truth conditions of sentences with many, however, cannot be defined so easily. An analysis such as \[ \text{many} = \lambda p_{et} \lambda q_{et}. | \{ x: p(x) \} \cap \{ x: q(x) \} | \text{ is “large”} \] is too naïve to handle the data, and this denotation needs to be manipulated further. In previous literature, several kinds of analyses for this determiner have been suggested. They are necessary, but do not seem to be sufficient to interpret all the types of sentences with the determiner many. In this paper, we will investigate some data that previous works cannot treat, and provide an analysis.

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2. Data

In this section I will present the data to be investigated. First, consider the sentence in (1), where the noun Germans in the subject NP is focused.

(1) Many [GERMANS] like driving a Toyota.

Here, let’s suppose Situation A in graph (2a). This graph shows the number of drivers of Toyota in G8 countries. For example, the number of Japanese drivers of Toyota is 12 million, the number of German drivers of Toyota is 11 million, and so on. In this situation, the total number of Toyota drivers in these 8 countries is 64 million.

(2) a. Situation A  (total 64 million)  b. Situation B  (total 64 million)

Intuitively, in situation A the sentence (1) Many GERMANS like driving a Toyota can easily be judged as true.

Next, look at situation B in graph (2b). This situation is similar to situation A, but the numbers of drivers in each country are different. The number of Japanese drivers is extremely high. The important point here is that the total number of Toyota drivers in the eight countries is exactly the same as in situation A: 64 million, and so is the number of German Toyota drivers: 11 million. In such a situation, intuitively, sentence (1) is hard to judge as true, in contrast to situation A. It is not easy to say Many GERMANS like driving a Toyota in this situation.

Here is another case. Consider sentence (3).

(3) Many Germans like driving a [TOYOTA].

In this sentence, Toyota, which is part of the second argument for many, is focused. To interpret this sentence, suppose a situation different from A or B. (4a) is situation C under which sentence (3) is interpreted. This graph shows the number of German
drivers according to automobile makers. The total number of German drivers is 64 million. In this situation, BMW is the top car-maker in Germany, selling 14 million automobiles. Volkswagen is the second, Ford is the third, and so on. Toyota, in this case, is not a good car company in Germany, with a position of 5th out of 7 companies. Given this situation, it is hard to judge (3) as true. It is not easy to say *Many Germans like driving a TOYOTA* in this situation.

Given this situation, it is hard to judge (3) as true. It is not easy to say *Many Germans like driving a TOYOTA* in this situation.

Finally, look at the fourth graph, situation D, in (4b). This graph also shows the number of German drivers according to car-makers. The total number of German drivers is 64 million as well. In this situation, however, Toyota is a much better company than in situation C. It is ranked second here. In this situation, sentence (3) is easily judged as true.

Compare all the situations A, B, C, D. In all these situations, the number of German drivers of Toyota is the same, 11 million. The total number of elements in each situation is also the same: 64 million. This means the ratio of the number of German drivers of Toyota out of the number of all individuals involved in these situations is the same in all four situations: 11 million out of 64 million. The truth values, however, are totally different for some reason. The question we have arrived at is “why?”

From now on, we will call such readings the “List Reading” of *many*. In the following section, I will provide an analysis of this reading.

### 3. Analysis

In this section I will provide an analysis to account for the List reading of *many*. First off, we notice the characteristic point in (1) and (3). In both cases, focus is involved. To explain the data we need to assume (5) (see also Herburger 1997; 2000).

(5) The determiner *many* is focus sensitive.
Now, we will consider the focus structure of (1) and (3), following the analysis by Rooth (1985; 1992).

(6) is the syntactic structure of (1), where Germans is focused. Here we assume that many takes three arguments: a context variable C; the first <e, t> type argument, Germans; and the second <e, t> type argument, like driving a Toyota. If the first <e, t> type argument, Germans here, is focused, the alternatives to Germans (as in (7)) are available for interpretation by the context variable C.

If Germans is focused in this sentence, the only context available is one with several countries, not car makers. Compare the bar-graphs for situations A, B, and situations C, D. When Germans is focused, situations C, D are not available for interpretation, because these situations do not include an alternative set of nationalities. Therefore, situations A and B, which have alternatives with respect to nationality, are appropriate situations for sentence (1).

Next, look at (8). In this case, Toyota is focused.

When Toyota is focused, the sentence Many Germans like driving a Toyota implies that Germans liking a Toyota is contrasted with Germans liking other car brands. This is why the set of alternatives will be (9), which includes alternative car-makers.

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Following this focus structure, I’ll suggest the truth conditions in (10) (for the list reading of many).

(10)  
a. many\textsubscript{list}(C, ψ, φ) is defined only if ψ∈C or exclusive φ∈C.

b. When defined, many\textsubscript{list}(C, ψ, φ) = True iff
   
   (i) |{x∈C: |x ∩ β| > |α ∩ β|}| is “small,” and
   
   (ii) For all x∈C s.t. x ≠α, |x ∩ β| - |α ∩ β| is “small,”
   
   where α∈{ψ, φ} and α∈C, and β∈{ψ, φ} and β∉C

(10a) states a presupposition which predicts that (1) is not appropriate in situations C and D, and that (3) is not appropriate in situations A and B. ψ is the first <e, t> type argument, and φ is the second <e, t> type argument of many. In our examples (1) and (3), ψ is Germans, and φ is like driving Toyota. The presuppositions of many are satisfied only if ψ or φ is in the relevant set of alternatives exclusively. In other words, if ψ is in the relevant set of alternatives, φ is not. If φ is in the relevant set of alternatives, ψ is not. And, at least one of them must be in the relevant set of alternatives. (10) means that α is an <e, t> type argument which is in the set of alternatives, and β is the other <e, t> type argument which is not in the set of alternatives, following the focus structure. In (1), a focused element GERMANS is the argument which is in the set of alternatives as can be seen in (7). Therefore it is our α, and the other argument, like driving a Toyota is our β in (1). On the other hand, in (3), the non-focused element Germans is the argument which is not in the set of alternatives as can be seen in (9), therefore it is our β following the definition in (10). The other argument, like driving a TOYOTA, is our α because it is in the set of alternatives in this case.

(10b) is divided into two parts. Both of them should be satisfied for sentences with many to be judged as true. First, (10b)-(i) means that the number of elements in the set of alternatives that are superior to α, should be “small.” In other words, this condition prohibits that α be in a low position in the alternative list. It should be in a higher position in the ranking. Second, look at (10b)-(ii). This condition prohibits that there be some extremely outstanding alternative superior to α.

Now, let’s see how these truth conditions work. First of all, let’s see the interpretation of sentence (1) in situation A.

(11) Many [GERMANS]\textsubscript{f} like driving a Toyota.              (=1)

ψ = α = GERMANS
φ = β = like driving a Toyota

Here, the first <e, t> type argument ψ is focused, and we get a set of alternatives (7) by the context variable C. This argument is our α, because it is in the set of alternatives. The second <e, t> type argument φ, like driving a Toyota, which does not contain a focused element and is therefore not in the set of alternatives, is our β. Condition (10a) is satisfied because one of two <e, t> type arguments is in the set of alternatives exclusively.
For this set of alternatives, situations A and B are appropriate. Neither situation C nor D is appropriate for this sentence because these situations do not have appropriate alternatives in terms of nationality. “x” in (10b) is an arbitrary element in these alternatives, that is, in this situation, Japanese, American, Frenchmen, or anything else. Condition (10b)-(i) and (10b)-(ii) is represented as bar-graph (12).

(12) Interpretation of (1) in situation A

\[
\frac{\text{number of superior elements (Japan) is 1, which is “small”}}{(10b)-(i) ((13))}
\]

\[
\frac{\text{Difference is 1, which is “small”}}{(10b)-(ii) ((14))}
\]

< Truth condition (10b)-(i) for (1) in situation A >
(13) a. \[|\{x \in \text{ALT(German)} : |\text{Toyota drivers in country } x| > |\text{Toyota Drivers in Germany}|\} | \text{is “small”}

b. \[|\{x : x \text{ is in a superior position to GERMAN }\} | = |\{\text{Japan}\}| = 1, \text{ which is relatively “small”}

< Truth condition (10b)-(ii) for (1) in situation A >
(14) a. \[|\text{Toyota drivers in country } x| - |\text{Toyota Drivers in Germany}| \text{ is “small”}

b. \[|\text{Japanese Toyota Drivers} - |\text{German Toyota Drivers}| = 1 \text{million, which is relatively “small”}

(13a) says the number of superior elements to the focused element (GERMAN) should be “small”. It is the condition following (10b)-(i), and it is satisfied as can be seen in a bar-graph (12) and (13b). The only alternative which is superior to Germany is Japan. (14a) is another condition following (10b)-(ii), which says, the difference between the number of individuals in the outstanding group (the number of Japanese drivers of Toyota, in this case) and the focused one (GERMAN Toyota drivers) is “small.” It is shown in a graph (12) and (14b). In both conditions, the numbers are relatively small, so these two conditions are satisfied. This is why sentence (1) is easily judged true in Situation A.

Next, let’s look at the interpretation of sentence (1) in situation B. In this case, condition (10a) is satisfied as well, because one of the two \(<e, t>\) type expressions is in the alternative set, exclusively. Conditions (10b)-(i) and (10b)-(ii) are represented in bar-graph (15).
(15) Interpretation of (1) in situation B

\[ \sqrt{(10b)-(1)} ((16)) \]

The number of superior element (Japan) is 1, which is “small”

\[ *(10b)-(ii) ((17)) \]

Difference is 21, which is NOT “small”.

< Truth condition (10)b-(i) for (1) in situation B >
(16) a. \(|\{x \in \text{ALT(\text{German})}: |\text{Toyota drivers in country x}| > |\text{Toyota Drivers in Germany}|| \) is “small”
b. \(|\{x: x \text{ is in a superior position to GERMAN }\} = |\{\text{Japan}\}| = 1\), which is “small”

< Truth condition (10)b-(ii) for (1) in situation B >
(17) a. \(|\text{Toyota drivers in country x}| - |\text{Toyota Drivers in Germany}| \) is “small”
b. \(|\text{Japanese Toyota Drivers}| - |\text{German Toyota Drivers}| = 21, which is NOT “small”

These conditions are represented as (16a) and (17a) in detail. Here, condition (10b)-(ii) is not satisfied. (17b) shows that the difference between the number of GERMAN Toyota drivers and the number of individuals in the superior group (the number of Japanese Toyota drivers) is 21 million, which is not “small.” This is why the sentence (1) in situation B is hard to judge true.

Next, let's look at the interpretation of sentence (3) (repeated as (18) for convenience) in situation C.

(18) Many Germans like driving a [TOYOTA]\(_f\).

\[ \phi = \alpha = \text{like driving a TOYOTA} \]
\[ \psi = \beta = \text{Germans} \]

In this case, the second \(<e, t>\) type argument like driving a Toyota, is in the set of alternatives, because Toyota is focused, and we get a set of alternatives (9) by means of the context variable C. Therefore, this is our \(\alpha\). Germans, which is not focused, is our \(\beta\)
here. One of the two arguments of *many* is in the relevant set of alternatives exclusively, and condition (10a) is satisfied in situations C and D. Here again, “x” in condition (10b)-(ii) is an arbitrary element in these alternatives.

(19) Interpretation of (3) in situation C

< Truth condition (10b)-(i) for (3) in situation C >

(20)  

<p>| (x ∈ ALT(like driving TOYOTA)) |</p>
<table>
<thead>
<tr>
<th>drivers of Toyota in Germany</th>
<th>drivers of x in Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>{x: x is on superior position to TOYOTA}</td>
</tr>
<tr>
<td>=</td>
<td>{BMW, Volkswagen, Ford, Nissan}</td>
</tr>
<tr>
<td>= 4 (out of 7 elements), which is relatively NOT “small”</td>
<td></td>
</tr>
</tbody>
</table>

There are 4 alternatives which are superior to TOYOTA (BMW, Volkswagen, Ford, and Nissan). 4 out of 7 is not “small”, and condition (10b)-(i) is not satisfied. This is why the sentence (3) in situation C is hard to judge true.

(21) Situation D

√(10b)-(i) ((22))

The number of superior element is 1, which is “small”
Finally, let’s look at the interpretation of sentence (3) in situation D. In this case, condition (10a) is satisfied as well. Conditions (10b)-(i) and (ii) are represented in bar-graph (21). In this case, (10b)-(i) is satisfied in (22b), because the number of superior elements to the focused element *Toyota* is only 1, which is “small”. Next, (10b)-(ii) is also satisfied in (23b), because the difference between the topmost element and focused element is only 1 million, which is relatively “small.” This is why sentence (1) is easily judged as true in situation D.

< Truth condition (10)b-(i) for (3) in situation D >
(22)  a.  $|\{x \in \text{ALT(like driving TOYOTA)}: |\text{drivers of Toyota in Germany}| > |\text{driver of } x\text{ in Germany}|\}|
     b.  $|\{x: x\text{ is on superior position to TOYOTA}\}|$
     = $|\{\text{BMW}\}|$
     = 1, which is “small”

< Truth condition (10)b-(ii) for (3) in situation D >
(23)  a.  $|\text{drivers of } x\text{ in Germany}| - |\text{drivers of Toyota in Germany}|$ is “small”
     b.  $|\text{drivers of BMW in Germany}| - |\text{drivers of Toyota in Germany}|$
     = 1, which is “small”

As we have seen so far, given the truth conditions (10) for the List Reading of *Many*, we can explain the different judgments for (1) and (3) in situations A, B, C, and D.

4. Previous Treatments

In the previous literature, several kinds of analyses for *many* have been suggested. I will now compare my analysis of the List Reading of *many* to some of the previous analyses. Due to space limitations, I do not provide a detailed survey.

The first analysis is the so-called Proportional reading suggested by Partee (1988), among others.

(24) $\text{many}_\text{proportional}(\psi, \phi) = \text{True} \iff \frac{|\psi \cap \phi|}{|\psi|} > \rho$, where $\rho$ is “large.”

Let’s consider sentence (25).

(25) Many linguists are lazy

(26) $\text{Linguists (=}\psi) \quad \text{Lazy (=}\phi)$

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Here we have a Venn diagram (26). Domains A and B comprise the set of all linguists. Domains B and C comprise the set of lazy people. The Proportional reading in (24) says that the truth conditions of Many linguists are lazy can be represented as (27). That’s enough to judge the sentence Many linguists are lazy for the Proportional reading, as seen in (27). Here suppose a situation (28).

All linguists (= A+B): 1000
Lazy linguists (= B): 800

800 out of 1000 is actually large, so (25) is judged as true under the situation (28).

Let’s look at our German Toyota Drivers sentence. Its truth conditions would be (31).

If we suppose the situation A and B in (2) with additional information on the number of all Germans, as represented in (32), the truth conditions for Many Germans like driving a Toyota would be (33).

However, This analysis cannot explain our data. First, we didn’t have the population of Germany in our situations A, B, C, D to judge sentences (1) and (3). The population of Germany has nothing to do with the List reading under which (1) and (3) are interpreted. Second, in our situations A, B, C, D, the number of German drivers of Toyota is the same in all four situations: 11 million. This means the relevant proportion is 11 million out of 60 million in all cases. Therefore, the proportional analysis predicts that sentences (1) and (3) have the same truth value in all the situations A, B, C, D. This is not the case, however.

4.2. Reverse reading (Westerståhl (1985))
The next analysis is the Reverse reading proposed by Westerståhl (1985). In this analysis, the occurrence of ψ and φ in the Proportional reading is reversed, as represented in (34).
(34) \( \text{many}_{\text{reverse}}(\psi, \phi) = \text{True iff } \frac{|\psi \cap \phi|}{|\phi|} > \rho, \text{ where } \rho \text{ is “large.”} \)

Let’s see how this interpretation works in sentence (35) under situation (37).

(35) Many cooks applied

(36) Cooks (=\(\psi\))   Applicants (=\(\phi\))

(37) The number of all cooks (in a relevant context) (=A+B): 600

The number of all applicants (=B+C): 50

The number of cooks who applied (=B): 48

(38) a. \( |B| / |B+C| \) is “large”

b. \( 48/50 \) is “large”

Intuitively, \( \text{Many cooks applied} \) is true in situation (37). The Reverse reading in (34) means that the truth conditions of (35) are (38). This predicts that the sentence is true, appropriately. In this case, the interpretation violates the “live-on” property, which is mentioned in the Generalized Quantifier Theory of Barwise and Cooper (1981). The domain A in the Venn diagram has nothing to do with its interpretation.

Now we will look at our German Toyota Drivers sentences. The truth conditions would be (39). Here, let’s suppose the situation in (40). These numbers come from our situations A, B, C, D.

(39) a. \( |B| / |B+C| \) is “large”

b. \( |\text{German drivers of Toyota} / \text{All Drivers of Toyota}| \) is “large”

(40) The number of all Toyota drivers 64 million

The number of all German Toyota drivers 11 million

Now we would have the truth conditions for \( \text{Many Germans like driving Toyota} \) in (34).

(41) \( [\text{Many German like driving a Toyota}] = \text{True iff } \frac{11,000,000}{64,000,000} \) is “large”
11 million out of 64 million may be large, or may be small, but it doesn’t matter. The problem is, these truth conditions make an incorrect prediction for our situations A, B, C, D. In all four situations, the proportion of German Toyota drivers out of all Toyota drivers is 11 million out of 64 million. This ratio is the same in all four situations. The Reverse reading in (34) predicts that the sentence *Many Germans like driving a Toyota* has the same truth value in all four situations. Again, this is not the case.

4.3. Relative reading (Cohen (2001))

The third analysis is the Relative reading presented by Cohen (2001). This interpretation can be formalized as in (42).

\[
\text{many}_{\text{relative}}(\psi, \phi) = \text{True iff } \frac{|\psi \cap \phi|}{|\psi \cap \bigcup A|} > \rho, \text{ where }
\]

(i) \(\rho\) is “large” or

(ii) \(\frac{|\bigcup A \cap \phi|}{|\bigcup A|}\) where \(A = \{\psi' \cap \phi' | \psi' \in \text{ALT}(\psi) \land \phi' \in \text{ALT}(\phi)\}\)

Here we have a famous example (43). Let’s suppose the situation in (44). In this situation, sentence (43) is judged true, as shown in (45).

\[
(43) \text{Many Scandinavians have won the Nobel Prize in literature}
\]

\[
(44) \begin{align*}
\text{All Nobel Prize winner in literature} & \quad 81 \\
\text{All Scandinavian Nobel Prize winners in literature} & \quad 14 \\
\text{All Scandinavians} & \quad 60 \text{ million} \\
\text{All human beings} & \quad 6 \text{ billion}
\end{align*}
\]

\[
(45) \begin{align*}
&\frac{\text{Scandinavian Nobel Prize winner in Lit.}}{\text{All Nobel Prize winner in Lit.}} > \frac{\text{All Scandinavian}}{\text{All human}} \\
&\frac{14}{81} > \frac{60 \text{ million}}{6 \text{ billion}}
\end{align*}
\]

Intuitively, these truth conditions mean that Scandinavians are very good at the Nobel Prize in literature, even though the proportion of Scandinavians out of all human being is not large.

Now, let’s apply this Relative reading to our German Toyota drivers sentence. Suppose (46) as a situation for the sentence *many Germans like driving a Toyota*. Following the Relative reading, the truth condition would be (47). These truth conditions are applied to all our situations A, B, C, and D. There is no difference between these four situations with respect to the Relative reading.

\[
(46) \begin{align*}
\text{All Toyota drivers} & \quad 64 \text{ million (from situation A, B, C, D)} \\
\text{German Toyota drivers} & \quad 11 \text{ million (from situation A, B, C, D)} \\
\text{All German} & \quad 85 \text{ million} \\
\text{All human beings} & \quad 6 \text{ billion}
\end{align*}
\]
As consequence, the Relative reading analysis predicts that *Many Germans like driving Toyota* has the same truth value in all four situations A, B, C, D. Here again, this is not the case.

### 4.4. Cardinal reading

(Barwise and Cooper (1981), Partee (1988), de Hoop and Solà (1996), among others)

As we have seen, none of the previous treatments can explain why *Many Germans like driving a Toyota* does not have the same truth value in our situations A, B, C, and D. The only previous study that is compatible with my analysis is the final one: Cardinal reading suggested by Partee (1988), among others. The truth conditions of the Cardinal reading are shown in (48).

\[(48)\] \[
\text{many}_{\text{cardinal}}(\psi, \phi) = \text{True} \text{ iff } |\psi \cap \phi| > \rho, \text{ where } \rho \text{ is } \text{“large.”}
\]

\[(49)\] Germans (=\(\psi\)) \quad Driving a Toyota (=\(\phi\))

\[(50)\] |B| is “large”

The number of elements in the intersecting area of the denotations of the two arguments of the determiners, which is B in the Venn diagram, should be “large.” In short, the number of individuals in domain B of the Venn diagram should be “large.”

\[(51)\] German Toyota drivers \quad 11 million (from Situation A, B, C, D)

Following this analysis, it seems that our German Toyota Drivers sentence can be explained. That is, the number of German Toyota Drivers, 11 million, is “large” in situations A and D, but it is not “large” in situations B and C.

Yet, this analysis is too naïve to explain various kinds of data with *many*. It needs to be modified because the truth conditions are vague. In particular, it doesn’t explain the effect of focus on the judgments. My analysis of the List reading of *many* in (10), and this Cardinal reading (48), are basically on the same track. Yet, the List semantics (10) shows where the “large”-requirement comes from clearly, in terms of the focus structure.
5. Conclusion

We have seen examples of an interpretation that we named the “List reading.” The determiner *many* is focus sensitive, taking a context variable C as its first argument. This context provides a set of alternatives for comparison. I do not intend to say that the List reading is the only reading of *many*. We still need the interpretations identified in previous studies. These analyses are necessary, but not sufficient. What I’m trying to do in this paper is point out that previous treatments for determiner *many* are incomplete.

Previous studies cannot explain the data that I have presented, with the exception of the Cardinal reading. The List reading is basically similar to the Cardinal reading, but the List reading is more precise because it indicates how satisfaction of the “large”-requirement depends on focus structure.

References


Towards an Understanding of the Meaning of Nominal Tense*

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Abstract

Paraguayan Guaraní has nominal inflectional suffixes with temporal meanings. I challenge the claim that they are nominal tenses (cf. Nordlinger and Sadler 2004), and analyze them as nominal aspects. I present evidence that points to crosslinguistic variation in the way in which noun phrases are temporally interpreted, and address the implications of the existence of languages with nominal temporal markers for theories of temporality and crosslinguistic temporal interpretation.

Paraguayan Guaraní (Tupi-Guaraní language family) has two nominal suffixes -kue and -rā, which contribute to the temporal interpretation of the noun or nominal projection to which they attach. For example, in (1a), where the noun pa’i ‘priest’ is not marked with -kue or -rā, the referent of the noun is asserted to have been a priest at the time at which the speaker saw the individual. (Guaraní does not have a definite determiner.) The interpretation of (1a) contrasts with that of (1b) and (1c), where the noun pa’i ‘priest’ is marked with -kue and -rā, respectively: in (1b), the individual was a priest at a time before the speaker saw the individual, but not anymore at the time of the seeing event, whereas (1c) conveys that the individual is not a priest at the time at which the speaker saw the individual, but will be in the future. As the examples in (1) illustrate, Guaraní does not have a grammaticalized past tense for verbs, but the unmarked form of the verb (i.e., hecha ‘see’ in (1)) is used in present and past contexts alike.

(1)  

a. Kuehe a-hecha pa’i-pe.
yesterday I-see priest-PE
‘Yesterday I saw the priest.’

b. Kuehe a-hecha pa’i-kue-PE.
yesterday I-see priest-KUE-PE
‘Yesterday I saw the former priest.’

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1The language has a third nominal temporal marker -re, which is often suffixed to individual-level nouns to indicate that the referent is dead. A discussion of -re is left for future research.

2I use the following glosses in this paper: -KUE=nominal terminative aspect, in nasal contexts -ngue; KURI=tense/aspect marker; -PE=accusative/oblique/locative argument marker, in nasal contexts -me; -QU=question marker; -RA=nominal prospective aspect; -TA=irrealis mood or future tense.
In the examples in (1), the temporal interpretation of the noun pa’i ‘priest’ is determined relative to the time at which the verb hecha ‘see’ is interpreted, but this is not necessarily the case. The temporal interpretation of a noun phrase argument can be independent of the temporal interpretation of the main verb. For instance, in (2), the noun phrase che ru ‘my father’ is interpreted at a time after the time at which the verb complex kove ypy ‘be born’ is interpreted, because the individual denoted by the noun phrase was not the speaker’s father yet at the time of his birth in 1950.

(2) Che ru oi-kove ypy 1950-pe.
    my father 3-live origin 1950-PE.
    ‘My father was born in 1950.’

In principle then, the temporal interpretation of noun phrases in Guarani is independent of the time at which the main verb is interpreted. (Similar observations were made for the temporal interpretation of noun phrases in English, see, e.g., Enç 1981, Musan 1995, Tonhauser 2002.) Paraguayan Guarani is not the only language with nominal temporal markers: Nordlinger and Sadler (2004, §2) identify about 20 such languages from all over the world. The existence of such languages has a number of important implications: 1. Although it is probably true that there are more languages with verbal than with nominal tense/aspect morphology, co-occurrence with such morphology can no longer be considered a crosslinguistically valid criterion for verb-hood (cf., e.g., Crystal 1997, Givón 2001). 2. Modern linguistic theories of temporality in natural languages (e.g., Reichenbach 1947, Smith 1991, Kamp and Reyle 1993, Klein 1994) are almost exclusively concerned with the temporal interpretation of verbs and verbal projections. This is probably due to the fact that Indo-European languages, which provide the empirical basis for such theories, only have tense/aspect inflectional morphology for verbs. Since the denotation of other contentful expressions in the clause (like nouns, adjectives, possessives) also depends on the time of evaluation (cf. Enç 1981, Musan 1995, Tonhauser 2002 for English), the temporal interpretation of propositions is not complete (in any language) if it does not establish the temporal relationship of all properties and relations expressed within the clause with respect to, e.g., the utterance or reference time of the proposition. Thus, the existence of languages with nominal temporal markers points to an empirical inadequacy and lack of generality of current theories of temporality. 3. From the perspective of crosslinguistic semantics, the temporal interpretation of noun phrases raises the question of the nature of the variation in this domain of language. Is there variation in the way in which noun phrases are temporally interpreted, and does this variation correlate with whether the language has temporal inflections for nominal projections (e.g., Guarani) or not (e.g., English)? How do temporal adverbs like former and future differ from inflectional markers, and how is this difference captured in the formal

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3The notion ‘nominal tense/aspect morphology’ is used here for markers whose semantic contribution affects the interpretation of the noun phrase they are attached to (cf. Nordlinger and Sadler 2004, §2), but not for markers who affect the interpretation of the verb but just happen to be attached to a noun phrase argument (cf. Nordlinger and Sadler 2004, §3).
analysis? Many of these concerns and questions will not be addressed in this paper, but serve as pointers for future research.

The main contributions of this paper are the following. In section 1, I argue that the nominal temporal markers of Guaraní are nominal aspects, comparable to verbal aspects, rather than nominal tenses, as Nordlinger & Sadler claim. I present an implementation of the temporal interpretation of noun phrases that is compatible with theories of temporality like Reichenbach 1947, Smith 1991, Kamp and Reyle 1993, Klein 1994. In section 2, I present evidence for the existence of crosslinguistic variation in the domain of the temporal interpretation of noun phrases. Section 3 briefly discusses three areas for future research, and the paper is concluded in section 4.

1 Nominal temporal markers in Guaraní

My goal is this section is to present a formal analysis of Guaraní -kue and -rā as nominal aspects. It is instructive, however, to first consider the criteria that led Nordlinger and Sadler (2004) to propose that the Guaraní markers are nominal tenses, not only because the rejection of the tense analysis indirectly supports the aspectual analysis, but also because it allows us to re-evaluate Nordlinger & Sadler’s claim (p.801) that the nominal temporal markers of all the languages discussed in §2 of their paper have tense meanings.

1.1 Guaraní -kue and -rā are not nominal tenses

A temporal marker (and, hence, a language) is included in Nordlinger & Sadler’s study, if it (i) is a morphological category of the nominal word class, (ii) is not restricted to nominals functioning as predicates of verbless clauses but is encoded on arguments and/or adjunct NP/DPs in clauses headed by verbs, (iii) is productive across the whole word class and not restricted to a small subset of forms, and (iv) if it marks “a distinction in one or more of the categories of tense, aspect, and mood, where these categories are standardly defined as they would be for verbs (e.g., Crystal 1997)” (cf., Nordlinger and Sadler 2004, 778). It is criterion (iv) that I take a closer look at since it is the basis for the claim that the Guaraní markers are nominal tenses. According to Crystal (1997, 384f), tense “marks the time at which the action denoted by the verb took place”, from which I take it that Nordlinger & Sadler assume that Guaraní -kue and -rā mark the time at which the property denoted by the noun (e.g., pa’i ‘priest’ in (1)) is true for the denotation of the noun phrase. This seems intuitively correct because, for example, the time at which the property denoted by pa’i ‘priest’ is true is different in (1b,c) than in (1a), thanks to the semantic contribution of the nominal temporal markers -kue and -rā. However, members of the category ‘aspect’ are also known to be able to affect the temporal location of an event or state (cf., e.g., Smith 1991, Bohnemeyer and Swift 2004). We cannot rely on intuitions to determine whether a particular form is ‘tense’ or ‘aspect’, but need to examine the meaning contribution of the form to identify its category. In order to establish


5 Of course, it is logically possible that nominal temporal markers are neither like verbal tenses nor aspects, and that we need to invent new categories for nominal temporal markers. My working hypothesis
whether we can maintain the claim that these markers are tenses, I assume (following Crystal, and hence Nordlinger & Sadler) that tense identifies the time at which a state or event is true. In other words, tense is a relation between two times, one of which is the situation time (TSit) of the eventuality, i.e., the time at which the eventuality is true. I distinguish ‘deictic’ tense, where the second time is the time of utterance, from ‘relative’ tense, where the second time is any contextually given time (cf., Comrie 1985).

I discuss the question of whether Guaraní -kue is a deictic past tense based on the example (1b), which is repeated below for convenience. If -kue were a deictic past tense, it would locate the TSit of the noun pa’i ‘priest’, i.e., the time at which the property ‘priest’ is true for the individual denoted by the noun phrase, at a contextually salient time t prior to the utterance time. In (1b), this time t is the time denoted by kuehe ‘yesterday’. Thus, if -kue were a deictic past tense, we would expect (1b) to mean that the speaker saw an individual yesterday who at the time of the seeing-event was a priest. This is not what (1b) means.

(1b) Kuehe a-hecha pa’i-kue-pe.
yesterday I-see priest-KUE-PE
‘Yesterday I saw the former priest.’

Rather, the interpretation of (1b) requires that the property ‘priest’ is not true at t (the time denoted by yesterday and the time at which the speaker saw the individual), but was true at an earlier (unspecified) time. This meaning is schematically represented in (3). Following Tonhauser (2000), the state discourse referent s in (3) represents the TSit of the noun pa’i ‘priest’, and now refers to the time of utterance.

(3) The meaning of (1b): (omitting the representation of definiteness)

\[
\begin{array}{c}
\text{s:priest}(x) \\
\neg \text{s:priest}(x) \\
t=yesterday' \quad \text{now}
\end{array}
\]

According to (3), the temporal interpretation of the noun pa’i ‘priest’ in (1b) involves a state change from being a priest (at an unspecified time in the past) to not being a priest anymore at t. This state change is entailed by (1b): (4) is infelicitous because the state change is explicitly denied by the continuation ‘he was a priest yesterday’.

(4) #Kuehe a-hecha pa’i-kue-pe, kuehe ha’e pa’i kuri.
yesterday I-see priest-KUE-PE yesterday he priest KURI
(Yesterday I saw the former priest, he was a priest yesterday.)

Could an analysis of -kue as a relative past tense result in the desired interpretation of
(1b)? Such an analysis would locate the TSit of pa’i ‘priest’ at a time t’ that is prior to a contextually salient time t. In (1b), where the time t denoted by kuehe ‘yesterday’ is the most salient time (other than the utterance time), the resulting interpretation is that the state s:priest(x) is located at a time t’ prior to t, as given in (5).

(5) If -kue were a relative past tense, the meaning of (1b) would be like this:

```
         s:priest(x)
    ————
  t’      t=yesterday’ now
```

Although the state s:priest(x) is now correctly located in the past of yesterday, (5) again is not the desired interpretation. The problem is that the state change is not entailed, i.e., nothing requires that s:priest(x) is not true at t anymore. In order to maintain an analysis of -kue as a past tense, one has to find a way to incorporate the assertion of a state change into the compositional analysis of noun phrases marked with -kue. There are three logical possibilities: the state change could arise as (i) part of the meaning of the noun (phrase), (ii) part of the meaning of (nominal) past tenses, or (iii) part of the rule that combines the meaning of the noun and -kue. Option (i) is implausible because nouns that are not marked with -kue (like pa’i ‘priest’ in (1a)) do not entail a state change. Option (ii) also does not strike me as well-motivated because it would require the meaning of a nominal past tense to differ from that of a verbal past tense. No state change is entailed when a state is located in the past via a verbal past tense: for instance, sentence (a) in (6), where the state s:sick(x) is asserted to be true in the past, might implicate a state change (e.g., ‘Bill is not sick today’) but does not entail it because (a) can be felicitously continued by (b). (Compare (6) to the infelicitous discourse in (4).)

(6) (a) Yesterday Bill was sick. (b) ...and he still is today.

Thus, in order to maintain an analysis of -kue as past tense under option (ii), we would have to postulate that nominal but not verbal past tense entails a state change. While such an analysis is possible in principle, it is undesirable to assume that the meaning contribution of past tense varies with the lexical category of the host expression. Finally, an implementation of option (iii) would consist of stating that the rule that combines the meaning of a noun with the meaning of -kue not only locates the denotation of the noun in the past of a contextually salient time, but also adds the entailment of a state change. I reject option (iii) because it places a large burden on the semantic composition rule, and I conclude that -kue is not a past tense.

Turning to the other nominal temporal marker, i.e., -rā, consider a context in which a man knows that he will see his future wife in January of next year, and will marry her the following November. He can felicitously utter (7), where che rembireko ‘my wife’ is marked with -rā.

(7) Ambue ary-pe a-hecha-ta che rembireko-rā-me.
    other year-PE I-see-TA my wife-RA-PE
    ‘Next year I will see my future wife.’
An analysis of -rā as a nominal future tense cannot provide the correct interpretation of (7) in the given context. As a deictic tense, -rā would locate the state s:wife(sp,x) (where ‘sp’ denotes the speaker) at the time t denoted by ‘next year’ in the future of the utterance time. Thus, (7) would receive an interpretation in which the woman is the speaker’s wife at t ‘next year’, which is not true in the given context since they are not married when they meet in January. As a relative tense, -rā locates s:wife(sp,x) at a time t’ in the future of the time t denoted by ‘next year’. This is undesirable again since she will become his wife in the November that is included in t. The basic problem with the tense analysis of -rā is that it locates s:wife(sp,x) at a particular time (in the future of the utterance time or a contextually salient time). However, the meaning of (7) does not contain information about the time when the woman will become the speaker’s wife but merely asserts that she currently is his future wife. I conclude that -rā is not a future tense.

1.2 The temporal interpretation of noun phrases

Reichenbach (1947) assumes that three times are necessary to represent the temporal interpretation of a proposition: the time of utterance (TU), the situation time of the state or event of the proposition (TSit), and the reference time (RT), which is the time the proposition is about. Tense expresses the temporal relationship between TU and RT, and aspect expresses the temporal relationship between RT and TSit, where the temporal relationship can be one of precedence, overlap or succession. Since other theories of temporality (cf., Smith 1991, Kamp and Reyle 1993, Klein 1994) share these assumptions, the analysis of the temporal interpretation of noun phrases I develop here is compatible with them, too. How can these theories, which were developed with the temporal interpretation of verbs and verbal projections in mind only, be modified to incorporate the temporal interpretation of non-verbal expressions? And what are the predictions that such theories make regarding the temporal interpretation of non-verbal expressions? In this and the next section, I pursue one reinterpretation of current theories of temporality and present an aspectual analysis of the nominal temporal markers of Guaraní.

What does it mean for aspect to express the relationship between RT and TSit? Consider the example in (8). Following Klein (1994), I assume that tense and temporal adverbs constrain the times from which a RT can be selected in a particular discourse context; in (8), RT is therefore constrained to lie in the past of TU (because of the past tense on the verb win) and within the denotation of last year.

(8) Last year, a student won.

Since the verb win is realized in perfective aspect (unmarked in English), its TSit is realized within the RT (cf., e.g., Kamp and Reyle 1993, Klein 1994). Theories of temporality (more or less explicitly) assume that a proposition only contains one TSit, namely that of the main verb, and hence only one aspect relation is established. However, since the verb is not the only contentful expressions in a clause that needs to be temporally interpreted, I submit that a proposition can consist of more than one TSit, and hence more than one aspect relation. In particular, a proposition contains as many TSits as there are contentful expressions (e.g., verbs, nouns, adjectives, possessives, etc.), and each of these TSits is temporally interpreted by relating it individually to the RT. In contrast to aspect, the tense
relationship, i.e., the relationship between TU and RT, is unique for a given proposition since TU and RT are unique times for any given proposition. In (9), the representation of the proposition of (8), RT and TU are free variables: they are constrained by lexical material but need to be contextually resolved. (I assume, but do not represent, that the discourse referent \(x\) is existentially bound.) As indicated, tense is the unique relationship between RT and TU (here RT \(\prec\) TU, where ‘\(\prec\)’ is a linear precedence relationship between times). The aspect relationship is instantiated twice: the TSit of the noun \(\text{student}\) (represented by \(\tau(s)\), where \(s\) is a state discourse referent) includes the RT \(\text{RT} \subseteq \tau(s)\) because (unmarked) nouns receive an imperfective interpretation. The TSit of the event \(\text{win}\) (represented by \(\tau(\theta)\)) is located at the RT. Thus, at the time at which the individual \(x\) won, \(x\) was a student. \((\subseteq\) is an inclusion relation for times.)

\[
(9) \quad \text{RT} \prec \text{TU} \land \text{last\_year}(t) \land \text{RT} \subseteq t \land \text{e:win(x)} \land \tau(\text{e}) \subseteq \text{RT} \land \text{s:student(x)} \land \text{RT} \subseteq \tau(s)
\]

This reinterpretation of current theories of temporality is minimal because it still only operates with TU, RT and TSit, and because it assumes that the same constraints govern the temporal interpretation of all contentful expressions.

1.3 \text{Guaraní } -\text{kue} \text{ and } -\text{ra} \text{ are nominal aspects}

I propose that \(-kue\) is a terminative aspect and \(-ra\) is a prospective aspect (cf. Bohnemeyer (1998) for such aspects in Yucatec Maya). A terminative aspect asserts that the post-state of the eventuality is true at RT, and a prospective aspect asserts that the pre-state of the eventuality is true at RT, where post- and pre-state are defined as the states that hold (immediately) after the termination or before the initiation of the eventuality, respectively. I discuss the interpretations of (1a,b,c), given in (10a,b,c), before presenting a model-theoretic analysis of the two aspects. In (10a,b,c) (where I ignore the representation of definiteness for ease of exposition) I assume that yd’, the meaning of the temporal adverb \(\text{kuehe ‘yesterday’},\) constrains the RT, which is represented in (10a,b,c) by \(\text{RT} \subseteq \text{yd’}(t)\). (Once \(\text{yd’}\) is interpreted, the constraint ‘\(\text{RT} \prec \text{TU}\) is added.) The event \(e\) denoted by \(\text{hecha ‘see’}\) receives an imperfective interpretation, and hence its TSit (i.e., \(\tau(\text{e})\)) is contained within the RT (represented by \(\tau(\text{e}) \subseteq \text{RT}\)). In (1a), the noun phrase \(\text{pa’i ‘priest’}\) is not marked with \(-kue\) or \(-ra\) which results in an imperfective interpretation of the noun: thus, in (1a), the RT is contained by the TSit of \(\text{s:priest(x)}\) (represented by \(\text{RT} \subseteq \tau(s)\)). Consequently, at RT, \(e\) is true and the individual is a priest. \(\text{POST}\) and \(\text{PRE}\) are functions mapping an eventuality \(\text{ev}(\text{a state } s \text{ in } (10b,c))\) noted by \(P\) to its post- or pre-state \(s’\), respectively. The interpretation of (1b), where the noun \(\text{pa’i ‘priest’}\) is marked with the terminative aspect \(-kue\), is given in (10b). Here, the condition \(\text{RT} \subseteq \tau(s)\) means that the state \(s’\) (i.e., the post-state of \(\text{s:priest(x)}\)) is located at the RT. Thus, yesterday, when the speaker saw the individual, the individual was in the post-state of being a priest, which requires that the individual was a priest at an unspecified time in the past but is not anymore at the time of the seeing-event. The state change is entailed by the aspectual analysis of \(-kue\) because of the localization of the post-state of the eventuality at the RT. In (10c), the interpretation of (1c) where the noun is marked with the prospective aspect \(-ra\), the TSit of \(s’\) (the pre-state of \(\text{s:priest(x)}\)) is located at the RT. Crucially, this implicates
that s can be true at a time in the future, but it does not require the localization of s at a
time in the future (cf., the discussion of example (7)).

(10) a. \[ \text{RT} \subseteq \text{yd}'(t) \land e: \text{see}(sp, x) \land \tau(e) \subseteq \text{RT} \land s: \text{priest}(x) \land \text{RT} \subseteq \tau(s) \]
    b. \[ \text{RT} \subseteq \text{yd}'(t) \land e: \text{see}(sp, x) \land \tau(e) \subseteq \text{RT} \land s': \text{POST}(s: \text{priest})(x) \land \text{RT} \subseteq \tau(s') \]
    c. \[ \text{RT} \subseteq \text{yd}'(t) \land e: \text{see}(sp, x) \land \tau(e) \subseteq \text{RT} \land s': \text{PRE}(s: \text{priest})(x) \land \text{RT} \subseteq \tau(s') \]

(11a) and (11b) give a model-theoretical analysis for the terminative and prospective as-
pect, respectively. Both aspects basically are functions from an eventuality (i.e., state or
event) predicate P to a time range \( t_{RT} \) from which an actual RT is selected from context.
Thus, as discussed for the examples above, a terminative (TERM) aspect specifies that
the TSit of the post-state of the eventuality includes the RT, while a prospective aspect
(PROSP) specifies that the TSit of the pre-state of the eventuality includes the RT.

(11) a. \( \text{TERM} := \lambda P \lambda t_{RT} \exists s \exists e [P(e) \land s: \text{POST}(e) \land t_{RT} \subseteq \tau(s)] \)
    b. \( \text{PROSP} := \lambda P \lambda t_{RT} \exists s \exists e [P(e) \land s: \text{PRE}(e) \land t_{RT} \subseteq \tau(s)] \)

Further support for the aspectual analysis of \(-\text{kue}\) and \(-\text{rā}\) comes from the fact that a noun
phrase can be marked with more than one of these suffixes (in either order). In (12), for
instance, the noun \( pa'\text{i} \) ‘priest’ is marked with both \(-\text{rā}\) and \(-\text{kue}\) (\(-\text{ngue}\) in nasal contexts).\(^8\)

(12) Kuehe a-hecha pa’i-\text{rā}-\text{ngue}-pe.
    Yesterday I-see priest-RA-KUE-PE
    ‘I saw the former future priest.’

The interpretation of (12) under the aspectual analysis of \(-\text{kue}\) and \(-\text{rā}\) is given in (13): it
states that at the RT, the speaker saw the individual denoted by the noun phrase, and the
individual was in the post-state of the pre-state of being a priest. The aspectual analysis
correctly precludes the realization of the state \( s: \text{priest}(x) \) itself, unlike the tense analysis
(which I must leave up to the reader to check for reasons of space).

(13) \[ \text{RT} \subseteq \text{yd}'(t) \land e: \text{see}(sp, x) \land \tau(e) \subseteq \text{RT} \land s'': \text{POST}(s': \text{PRE}(s: \text{priest}))(x) \land \text{RT} \subseteq \tau(s'') \]

Besides the empirical advantage, examples like (12) also demonstrate a conceptual ad-
vantage of the aspectual over the tense analysis. The function of tense is to temporally
relate two times, at least one of which is contextually determined in all existing charac-
terizations of tense. This means that in examples like (12), the two nominal temporal
markers (if they were tenses) would express two different temporal relations for the two
times. Thus, conceptually, the co-occurrence of two tenses on a single expression is not
compatible with the function that is usually attributed to tense. This conceptual prob-
lem is not encountered by the aspectual analysis because aspect is assumed to identify
the perspective that is taken upon an eventuality, and one can imagine using two aspec-
tual markers to express a (temporally) more complex perspective, as in (12). Empirical
support is provided by the existence of languages like English, Georgian and Bulgarian
which realize multiple aspects on verbs (cf., Comrie 1976, 30ff.).

\(^8\)Despite the high frequency of examples with \( pa'\text{i} \) ‘priest’ in this paper, \(-\text{kue}\) and \(-\text{rā}\) are productive with
a wide range of nouns, which will be properly reflected and discussed in future work.
The final example I discuss here takes up the point I made above regarding example (2), repeated below for convenience. In (2), the noun phrase che ru ‘my father’ is not interpreted relative to the reference time (constrained by ‘in 1950’) but at the utterance time. For English, Enc (1981), Musan (1995) and Tonhauser (2002) point out that noun phrases are not necessarily interpreted at the reference time but, unlike verbs, noun phrases are free to be interpreted at other contextually salient times (like the utterance time). The example (2) illustrates that this seems to be true in principal for Guaraní, too.

(2) Che ru oi-kove ypy 1950-pe.
   my father 3-live origin 1950-PE
   ‘My father was born in 1950.’

An interesting question then is to determine which noun phrases are interpreted at times other than the reference time, and which times are relevant for the temporal interpretation of noun phrases (cf., Musan 1995, Tonhauser 2002). I believe that the key to answering these questions is the function of noun phrases: in contrast to the main verb of a clause, which serves to predicate a property or relation of the event participants, the function of a noun phrase is to identify an event participant. As such, the contentful expressions within a noun phrase (e.g., noun, adjective, possessive) need to express properties or relations that allow the identification of the event participant (together with the meaning contribution of the determiner or quantifier, of course). This goal is achieved if the denotations of these expressions are salient in the discourse context at a particular time for the event participant. Of course, it is not necessary that this time be the reference time. In (2), for example, the relational noun ru ‘father’ (with the speaker as the possessor) is highly salient at the time of utterance and thereby ideally serves to identify this event participant. The reference time (as the time which the proposition is about) is not relevant to identify the event participant in (2), but is relevant only to the verb which predicates a property of the event participant at this time. This is not to say that the reference time only plays a minor role in the temporal interpretation of noun phrases: in fact, in most instances it is the reference time that is the salient time for the denotation of a noun phrase, and hence for the denotations of the contentful expressions within a noun phrase (cf., the examples in (1)). Thus, I argue in Tonhauser (2002) that noun phrases are by default interpreted at the reference time, unless there is contextual evidence to the contrary.9

1.4 Conclusions

I argued that Guaraní has nominal aspects, comparable to verbal aspects. The formalization of the meaning of nominal aspects can be integrated to current theories of temporality, like Reichenbach 1947, Kamp and Reyle 1993, Klein 1994, if we assume that the aspect is not unique for a proposition but is established between RT and the TSit of each eventuality in a proposition.

9For reasons of space I cannot do justice here to previous proposals. However, in Tonhauser (2002) I point out that Enc (1981) does not restrict the temporal interpretation of noun phrases at all, and I give counterexamples to all of the restrictions proposed by Musan (1995).
2 Aspects of semantic variation in the temporal interpretation of noun phrases

One of the central concerns of crosslinguistic semantic research is to identify the nature of semantic variation and the locus of this variation in the system of grammar (cf., e.g., Barwise and Cooper (1981), Bach et al. (1995), Bohnemeyer (1998) and Chierchia (1998) for such studies in a variety of domains of natural language). In this section I briefly compare the temporal interpretation of noun phrases in English and Guaraní: I first identify a similarity between the two languages where we might not have expected one (given the exclusion of English from Nordlinger and Sadler (2004, §2)), and then point to a kind of semantic variation in this domain that has not been discussed in the literature yet.

The reason why a language like English is not included in Nordlinger and Sadler’s (2004, §2) study is that English does not have grammaticalized temporal expressions in the nominal domain, but “only” temporal adjectives (like former and future). However, it is evident from the examples in the last section that the temporal adjectives in English serve a similar functional purpose as the Guaraní suffixes: for instance, in (1b), in order to identify that the property ‘priest’ is not true for the individual denoted by the noun phrase, a speaker of English uses the adjective former and a speaker of Guaraní uses the suffix -kue. And, in fact, Dowty, Wall and Peters (1981, 163f.) propose an analysis of former which is strikingly similar to the one I gave for -kue in the last section: (14) basically states that former priest is true at a time t if priest is true at a time t′ that precedes t, but not at t.

\[
\text{[former]_{st, g, w, t} = \lambda R_{(s, e, t)} \left[ [R](\langle w, t \rangle) \neq 1 \land \exists t' \ s.t. \ t' < t \ [R](\langle w, t' \rangle) = 1 \right]}
\]

This (basically aspectual) analysis of former differs from the terminative analysis of -kue only in that (14) requires that R is not true at t, while TERM in (11a) requires that the post-state of R is true at t. This difference is crucial with respect to examples like (15).

According to the analysis of former in (14), the truth value of (15) is false because former requires policeman to be false at the time of utterance while the adjective present requires policeman to be true at the time of utterance.

(15) Peter Hoyle is a former and present Ukiah policeman.\textsuperscript{10}

I propose that former is better analyzed as a terminative aspect, just like Guaraní -kue. (15) then means that, at the utterance time, Peter Hoyle is a policeman as well as in the post-state of being a policeman. This is compatible with what we learn about him in the discourse context: Peter Hoyle was dismissed in the past, but then reinstated. It is not surprising that languages as different as Guaraní and English have expressions that directly affect the temporal interpretation of nouns. As a consequence of my analysis, both languages have nominal aspects (which of course differ in the degree of grammaticalization), and the two languages are not as exotically different as we might think.\textsuperscript{11}

However, there exists evidence that points to semantic variation in how noun phrases are temporally interpreted in Guaraní and English, a kind of variation that has not yet been identified in the literature. The first example, in (16), is taken from a folk tale: the main

\textsuperscript{10}http://www.greenmac.com/eagle/ISSUES/ISSUE23-9/08PoliceAccountability.html

\textsuperscript{11}One important difference between the Guaraní aspectual suffixes and the English adjectives is that the former can co-occur with a wider variety of nominal expressions, like relative and complement clauses.
actor, a monkey, has been tied to a post by a woman who then walked away. The monkey is now trying to trick a fox, who is passing by, into untying him and letting himself be tied to the post. The monkey says (16) to the fox:

(16) Che-jora pya’e ai-porotoro-moi che renda-kué-pe. me-untie quickly I-you-put my place-KUE-PE
‘Untie me quickly and I’ll put you in my place.’

The difference between English and Guaraní that is illustrated by (16) is the time at which the possessive relation between the monkey and the place is interpreted. According to the context, the possessive relation is true at the utterance time, but not at the time in the future (the reference time) at which the verb moí ‘put’ is interpreted. In Guaraní, where the possessive noun phrase che renda ‘my place’ is marked with the terminative aspect -kue, the possessive relation is interpreted relative to the reference time: -kue conveys that the possessive relation is terminated at the reference time. In the English translation, on the other hand, the noun phrase ‘my place’ is interpreted relative to the utterance time. The examples in (17) illustrate that one cannot force an interpretation of the possessive noun phrase ‘my place’ relative to the reference time: when the noun phrase my place occurs with temporal adjectives that force such an interpretation, the examples are considered strange and overly specify by native speakers of English.

(17) a. #Untie me quickly and I’ll put you in my former place.
   b. #Untie me quickly and I’ll put you in my then former place.

A second example of this type is (18). Imagine a context in which I state that my friend Juan is marrying tomorrow. A speaker of Guaraní could inquire about Juan’s best man using the question in (18a) (with the nominal aspect -rā) or the one in (18b) (with the predicative (future tense or irrealis mood) marker -ta), but, crucially, the question in (18c) is inappropriate in this context.12

(18) a. Máva-pa i-paino-rā?
   person-QU his-best.man-RĀ
   ‘Who is his future best man?’
   b. Máva-pa i-paino-ta?
   person-QU his-best.man-TA
   ‘Who will his best man be?’
   c. #Máva-pa i-paino?
   person-QU his-best.man
   ‘Who is his best man?’

In English, it is perfectly fine to inquire about the identity of Juan’s best man with Who is his best man? (cf., (18c)) although the wedding is known to take place tomorrow. Thus, the noun phrase i-paino ‘his best man’ in Guaraní must be interpreted at the reference time (which is the utterance time in (18a) and in the future of the utterance time in (18b)), while the English counterpart is not restricted to an interpretation at the reference time.

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12 Although both -rā and -ta on the surface suffix to the noun phrase i-paino ‘his best man’, I assume that -rā modifies the noun phrase while -ta modifies a phonologically unrealized copula.
(here, time of utterance) but can be interpreted at a contextually given time in the future. Concluding, in the two examples in (16) and (18), the Guaraní noun phrases are interpreted at the reference time, whereas the English counterparts can be interpreted at a contextually given time. Future research needs to determine the systematicity of this variation, as well as the contributing factors. For instance, is the variation a correlate of the fact that Guaraní has grammaticalized nominal aspect while English uses adjectives, or is this variation due to a difference between the temporal systems of the two languages, possibly independent of the level of grammaticalization of nominal temporal markers?

3 Some areas for future research

Before concluding this paper, I point to three areas for future research. First, I hypothesize that the nominal temporal markers of most of the languages identified in Nordlinger and Sadler (2004, §2) are nominal aspects, too, rather than nominal tenses, because their meanings are so strikingly similar to those of corresponding Guaraní examples. For instance, (19) is an example from Halkomelem (Salish) where the possessive noun phrase tel xeltel ‘my pencil’ is suffixed with -elh, which Burton (1997) and Nordlinger and Sadler (2004) analyze as a past tense (glossed PST), but I suggest is a terminative aspect.

(19) tel xeltel-elh
    my pencil-PST
    ‘my former pencil’ (Burton 1997, 67-68)

Second, there exists at least one language which seems to employ its nominal temporal markers very differently from Guaraní (and which I therefore don’t include in the hypothesis stated above). This language is Somali (Cushitic), discussed in great detail in Lecarme’s work (cf., e.g., Lecarme 2004). In (20a), the argument noun phrase ‘woman’, the directional adjunct ‘to town’ as well as the verb appear with what Lecarme and Nordlinger & Sadler call ‘past tenses’. According to the English translation of (20a), the property ‘woman’ is interpreted at the RT, which precedes the TU, as constrained by the verbal past tense. Thus, the ‘nominal past tense’ in this example does not convey an anteriority relationship that only applies to the noun ‘woman’. Rather, the ‘nominal past tense’ here conveys the same meaning as the verbal past tense (RT precedes TU), and identifies that the noun is true at RT. And (20b) raises doubt whether this marker really is ‘past’: noon is marked with ‘past tense’ but (according to the gloss and translation) the marker does not establish any kind of anteriority relationship in (20b) whatsoever.

(20) a. naāg-t-ii magaalá-dīi w-āy tag-t-ay.
    woman-f-[+past] town-detF[+past] F-2FS go.to-f-[+past]
    ‘The woman went to town.’
    (Lecarme 2004, (ex5a))

b. (wēligay) dūhur-kīi baan wax cunaa.
    always noon-detM[+past] F.1S thing eat[-past]
    ‘I (always) eat at noon.’
    (Lecarme 2004, (ex6a))

Finally, current theories of temporality assume that tense is the relationship between TU and RT (cf., section 1). This predicts that in order for a language to have nominal tense
that is distinct from verbal tense, we would have to abandon the assumption that there is a unique RT for every proposition. In such a language, nominal tense would express a relationship between TU and a RT that is relevant only for the temporal interpretation of the nominal phrase to which it attaches, while a verbal tense, within the same clause, could relate TU to a RT', where RT and RT' are distinct reference times. Given the characterization of the RT as the time the proposition is about (cf., e.g., Klein (1994)), the assumption that a proposition could be interpreted relative to two different RTs is conceptually implausible, which in turn precludes the existence of languages with nominal tense. The empirical basis and theoretical consequences of this move are will be addressed in future research.

4 Conclusions

I argue (section 1) that the nominal temporal suffixes of Guaraní are nominal aspects, comparable to verbal aspects in well-studied languages and similar in meaning to the English temporal adjectives former and future. Guaraní and English exhibit differences in the way in which noun phrases are temporally interpreted in context (section 2). The nature of the semantic variation in this domain of language, as well as the topics in section 3, are issues I hope to take up in future research.

References


Abstract

Standard logic tends to reduce propositions to their truth conditions. However propositions with the same truth conditions are not the contents of the same thoughts just as they are not the senses of synonymous sentences. I will first define a much finer criterion of propositional identity that takes into account predications that we make in expressing propositions. In my view, propositions have a structure of constituents. We ignore in which possible circumstances most propositions are true because we ignore real denotations of their attributes and concepts. In understanding them we just know that their truth in each circumstance is compatible with certain possible denotation assignments to their constituents and incompatible with others. So propositions have possible in addition to real truth conditions. I will explain why strictly equivalent propositions can have a different cognitive value. I will define the notion of truth according to an agent and a strong propositional implication that is known a priori. I will also formulate a logic of belief that is compatible with philosophy of mind. Human agents are minimally rather than perfectly rational in my logic. Epistemic paradoxes are solved.

1 Propositional identity and truth according to predication

In philosophy, propositions are both senses of sentences with truth conditions and contents of conceptual thoughts like attitudes and illocutions. In order to take into account their double nature, I will proceed to a finer analysis in terms of predication of their logical form. Here are the basic principles of my predicative approach. ¹

1.1 A finite structure of constituents

In expressing propositions we predicate in a certain order a finite positive number of attributes (properties or relations) of objects to which we refer. ² Understanding a proposition consists mainly of understanding which attributes objects of reference must possess in order that this proposition be true. We do not directly have in mind individuals like material bodies and persons. We rather have in mind concepts of individuals and we indirectly refer to them through these concepts. So our thoughts are directed towards individuals under a concept rather than pure individuals. Concepts can be deprived of denotation. By recognizing the indispensable role of concepts in reference, logic can account for thoughts directed at inexistential objects. It can also

² Predication as it is conceived here is independent of force and psychological mood. We make the same predication when we express a belief and a doubt that something is the case.
account for the predication of intensional properties that objects only possess whenever they are subsumed under certain concepts. Frege’s idea that propositional constituents are senses clearly explains the difference in cognitive value between the two propositions that Cicero is Cicero and that Cicero is Tullus. We a priori know by virtue of linguistic competence the truth of the first proposition while we have to learn the truth of the second. Frege’s idea moreover preserves the minimal rationality of speakers. We can wrongly ignore that Cicero has another proper name and believe that Cicero is not Tullus. But we cannot believe that Cicero is not Cicero. We could not be that irrational. So epistemic logic has to reject direct reference and externalism. Like Frege, Church and Strawson I advocate that any object of reference is subsumed under a concept. Proper names are often introduced into language by an initial declaration. A speaker first gives such names to objects with which he is acquainted. Next other speakers of the linguistic community adopt these names and keep using them to refer to the same objects. Later speakers who do not know much of named objects can always refer to them under the concept of being the object called by that name. Possible interpretations of language must then consider in their domain two sets of senses: the set Concepts of individual concepts and the set Attributes of attributes of individuals in addition to the set Individuals of individual objects which are pure denotations.

1.2 A relation of correspondence between senses and denotations

To propositional constituents correspond real denotations of certain types in possible circumstances. Thus to each individual concept $c_e$ corresponds in any circumstance the single individual which falls under that concept in that circumstance whenever there is such an object. Otherwise that concept is deprived of denotation in that circumstance. And to each attribute $R_n$ of degree $n$ of individuals corresponds the set of sequences of $n$ objects under concepts which possess that attribute in that circumstance. A possible circumstance is here a complete state of the real world at a moment $m$ in a possible course of history $h$. As in the logic of ramified time, the set Circumstances of possible circumstances contains pairs of the form $m/h$ where $m$ is a moment belonging to the history $h$. Individual things change during their existence. So different denotations can correspond to the same concept or attribute at different moments. However individuals have their essential attributes in all circumstances where they exist. For example each human being keeps the same genetic code.

Our knowledge of the world is incomplete. We do not know real denotations of most propositional constituents. We ignore also many essential properties of objects. So we often refer to an object under a concept without knowing that object. The police officer who is pursuing the murderer of Smith can just refer to whoever is that murderer. The concept gives identity criteria for the object of reference (e.g. to be Smith’s murderer). But few identity criteria enable us to identify that object. Moreover the object to which we refer is sometimes different from the denotation of our concept. Presumed murderers are often innocent. It can also happen that no object satisfies our identity criteria. Smith could have died of a heart attack. Whoever conceives propositional

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3 The notion of minimal rationality comes from C. Cherniak [1986]
4 The theory of direct reference is advocated by D. Kaplan in “On the Logic of Demonstratives” [1979]
5 A. Church introduced the relation of correspondence in intensional logic. See “A Formulation of the Logic of Sense and Denotation” [1951]
6 See S. Kripke “Speaker Reference and Semantic Reference” [1977]
constituents can always assign to them possible denotations of appropriate type. A chief of police who ignores the identity of the murderer can at least think of different persons who could have committed the crime. From a logical cognitive point of view, there are a lot of possible denotation assignments to senses. They are functions of the set 
\[
((\text{Concepts} \times \text{Circumstances}) \rightarrow \text{Individuals}) \cup ((\text{Attributes} \times \text{Circumstances}) \rightarrow \bigcup_{1 \leq n} \Pi(\text{Concepts}^n)).
\]
However, from a cognitive point of view, only certain entities could be according to us possible denotations of attributes and concepts that we conceive in circumstances that we consider. Whoever refers to an object considers that it could have certain properties but not others. So not all possible denotation assignments are compatible with the beliefs of agents. Suppose that the chief of police believes at the beginning of his investigation that Smith was murdered by his wife. Only possible denotation assignments according to which the same person falls under the two concepts are then compatible with his beliefs.

Let us attribute to Smith’s murderer the property of being mad. Clearly we do not \textit{a priori} know actual denotations of the concept and property of that predication. But we can consider denotations that they could have. According to a first possible denotation assignment, a suspect Paul would be Smith’s murderer and that suspect would be mad. According to a second, Smith’s wife Julie would be the murderer but she would not be mad. According to a third Smith would not have been killed. Sure we need to make an empiric investigation in order to verify the predication in question. However we all know by virtue of competence that it is satisfied in a circumstance if and only if the individual that falls under its concept possesses its property in that circumstance. So we \textit{a priori} know that the elementary proposition that Smith’s murderer is mad is true according to the first possible denotation assignment considered above and false according to the two others.

We respect meaning postulates. We associate denotations of appropriate types to each individual concept \(c_e\) and attribute \(R_n\) in possible circumstances. Thus \(\text{val} (c_e, m/h) \in \text{Individuals}\) when according to \(\text{val}\) the concept \(c_e\) has a denotation in circumstance \(m/h\). Also \(\text{val} (R_n, m/h) \in \Pi(\text{Concepts}^n))\). Moreover our denotation assignments respect internal relations that exist between constituents because of their logical form. We \textit{a priori} know that individuals subsumed under two concepts are identical when these two concepts have the same denotation. So for any possible assignment \(\text{val}, \langle c_1, c_2 \rangle \in \text{val} \) (=, \(m/h\)) when \(\text{val} (c_1, m/h) = \text{val} (c_2, m/h)\). As one can expect, the set Val of all possible denotation assignments contains a special real assignment (in symbol val*) that associates with each concept and attribute their actual denotation in every possible circumstance. We ignore real denotations of many concepts and attributes. However we cannot have them in mind without \textit{eo ipso} believing that they could have certain denotations and not others in given circumstances. So to each agent \(a\) and moment \(m\) there corresponds a unique set Val\((a,m)\) containing all possible denotation assignments which are compatible with the beliefs of that agent at that moment. Suppose that the agent \(a\) believes at a moment \(m\) that an individual under concept \(c_e\) has (or just could have) the property \(R_i\) in a certain circumstance \(m/h\). Then for every (or for at least one) denotation assignment \(\text{val} \in \text{Val}(a,m), c_e \in \text{val} (R_i, m/h)\). By nature, we, human agents,

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7 Otherwise either the assignment \(\text{val}\) is undefined for the concept \(c_e\) or that concept has an arbitrary denotation like the empty set according to that assignment. See Carnap Meaning and Necessity [1956]
are minimally consistent. We could not believe that the same individual under concept has and does not have a given property in the same circumstance. So the set \( \text{Val}(a,m) \) is a proper subset of the whole set \( \text{Val} \) when the agent \( a \) is conscious at the moment \( m \).

### 1.3 Possible truth conditions

By definition, a predication of the form \((R_n c_1^e, \ldots, c_n^e)\) whose attribute \( R_n \) is applied to \( n \) individuals under concepts \( c_1^e, \ldots, c_n^e \) in that order is satisfied in a circumstance \( m/h \) according to a denotation assignment \( \text{val} \) when \(<c_1^e, \ldots, c_n^e> \in \text{val } (R_n, m/h) \). So any complete possible assignment \( \text{val} \) associates certain possible truth conditions with each elementary proposition. For that proposition \( \text{would be true in all and only the possible circumstances where its predication is satisfied according to that assignment } \text{val} \text{ if it were real.} \) There are few analytically true elementary propositions that predicate of objects attributes that we \( a \text{ priori} \) know that they possess. So we ignore in which possible circumstances most elementary propositions are true. However we know in apprehending their logical form that elementary propositions are true in a circumstance according to all possible denotation assignments that satisfy their predication in that circumstance and false according to others. So in my approach propositions have above all possible truth conditions. They \( \text{could be true} \) in different sets of possible circumstances given the possible denotations that their constituents could have in reality. If one considers a number \( n \) of possible circumstances, one can distinguish as many as \( 2^n \) possible truth conditions. Formally each possible truth condition of an elementary proposition corresponds to a unique set of possible circumstances where that proposition is true according to a particular possible denotation assignment. Of course, from a cognitive point of view, not all such possible truth conditions are compatible with our beliefs. In order that a proposition \( \text{could be true according to an agent} \) at a moment, that proposition must be true according to at least one possible assignment \( \text{val} \in \text{Val}(a,m) \) compatible with the beliefs of that agent at that moment. So, for example, according to the chief of police at the beginning of his investigation Smith’s wife but not Paul could be Smith’s murderer.

Among all possible truth conditions of a proposition there are of course its actual characteristic truth conditions that correspond to the set of possible circumstances where it is true. Carnap did not consider other possible truth conditions By definition, the real denotation assignment \( \text{val}^* \) associates with each elementary proposition its actual truth conditions.

### 1.4 A recursive definition of propositions

In my analysis, propositions have a structure of constituents: they serve to make a finite positive number of predications. In order to make a predication of the form \((R_n c_1^e, \ldots, c_n^e)\) one must have in mind its attribute and objects under concepts. One must also apply that attribute to these objects in the right order. One makes two different predications in thinking that Mary loves John and that John loves Mary. The two elementary propositions have the same constituents but different truth conditions. However the order of predication only matters whenever it affects truth conditions. Whenever the predicated binary relation is symmetric it does not matter at all. The propositions that Cicero is Tullus and that Tullus is Cicero contain the same predication. For that reason, a predication of the form \((R_n c_1^e, \ldots, c_n^e)\) cannot be identified with the corresponding
sequence $<R_n c^1, ..., c^n>$. From a logical point of view, such a predication is rather an ordered pair whose first element is the set of its propositional constituents $\{R_n, c^1, ..., c^n\}$ and whose second element is the set of possible circumstances where it is satisfied according to the real assignment $val*$. Such an account identifies predications whose different order determines the same truth conditions. So the set Predications of all predications is a subset of $\Pi(Concepts \cup Attributes) \times \Pi(Circumstances)$. In addition to a structure of constituents propositions also have possible truth conditions. Their truth in each possible circumstance is compatible with a certain number of possible denotation assignments to their constituents and incompatible with the others.

Elementary propositions are the simplest propositions. They serve to make a single predication and their truth in each possible circumstance is only compatible with possible denotation assignments according to which their predication is satisfied. Other more complex propositions are obtained by applying truth functional, modal and other operations. Complex propositions are in general composed from several elementary propositions. When they contain a single one, they are true according to different possible denotation assignments.

Truth functions do not change the structure of constituents. They only make the predications of their arguments. Thus the negation $\neg P$ has the structure of constituents of $P$. The conjunction $(P \land Q)$ and the disjunction $(P \lor Q)$ of two propositions $P$ and $Q$ are composed from elementary propositions of both. Unlike truth functions, modal and epistemic propositions serve to make new predications of modal and epistemic attributes. In thinking that it is impossible that God makes mistakes we do more than predicate of God the property of not making mistakes. We also predicate of Him the modal property of infallibility, namely that He does not make a mistake in any possible circumstance. Infallibility is the necessitation of the property of not making mistakes. Similarly when we think that the pope believes that God exists, we also predicate of Him the property of being existent according to the pope. The property of being existent according to an agent is an epistemic property different from that of being existent. Agents can wrongly believe that an object exists. Moreover they can ignore the existence of many objects.

The new attributes of modal and epistemic propositions remain of the first order. Modal attributes of individuals are obtained from simpler attributes of individuals by quantifying universally or existentially over possible circumstances. They are necessitations and possibilizations of simpler attributes. Thus an object under concept $c_e$ possesses the necessitation $\Box R_1$ of a property $R_1$ when it possesses that property in all possible circumstances.\(^8\)

Epistemic attributes of the form $aR_n$ are also of the first order. They are satisfied by sequences of objects under concepts which satisfy according to agent $a$ the simpler attribute $R_n$. One can analyze them thanks to a relation of compatibility $Belief^a$ between possible denotation assignments that takes into consideration beliefs that agent $a$ could possess the necessitation $\Box R_1$ of a property $R_1$ when it possesses that property in all possible circumstances.\(^8\)

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\(^8\) More generally, the necessitation $\Box R_n$ of an attribute $R_n$ satisfies the meaning postulate: $<c^1, ..., c^n> \in val(\Box R_n, m/h)$ when, for every $m'/h'$, $<c^1, ..., c^n> \in val(R_n, m'/h')$. See G. Bealer Quality and Concept [1982] for the intensional logic of attributes.

\(^8\) A belief with undetermined truth conditions would be a belief without real content. It would not be a belief at all.
have at each moment $m$. First of all, whoever has a particular belief is able to determine under which conditions that belief is true. Suppose that according to the denotation assignment $\text{val}$ each agent $a$ has in mind a certain set $\text{val}(a,m)$ of propositional constituents at each moment $m$ and the agent has then beliefs about the denotations of these constituents in certain (generally not all) possible circumstances. The relation $\text{Belief}_a$ serves to determine the exact nature of these beliefs. Suppose that according to the denotation assignment $\text{val}$ the agent $a$ believes at the moment $m$ that certain concepts and attributes have such and such denotations in such and such possible circumstances. A possible denotation assignment $\text{val}'$ is compatible with what the agent $a$ then believes according to the assignment $\text{val}$ (in symbols $\text{val}' \in \text{Belief}_a(\text{val})$) when according to $\text{val}'$ the same concepts and attributes have the same possible denotations in the same possible circumstances. So if according to assignment $\text{val}$ the agent $a$ believes at moment $m$ that an individual object $u$ falls under a certain concept $c_e$ in the circumstance $m/h$ then according to any compatible assignment $\text{val}' \in \text{Belief}_a(\text{val})$, $u = \text{val}'(c_e,m/h)$. The concept $c_e$ however could have according to a compatible assignment $\text{val}'$ a different possible denotation $\text{val}'(c_e,m'/h') \neq \text{val}(c_e,m'/h')$ in another possible circumstance $m'/h'$ that agent $a$ does not consider.

By definition, the relation of epistemic compatibility corresponding to $\text{Belief}_a$ is reflexive and transitive: $\text{val} \in \text{Belief}_a(\text{val})$ and if $\text{val}' \in \text{Belief}_a(\text{val})$ and $\text{val}'' \in \text{Belief}_a(\text{val}')$ then $\text{val}'' \in \text{Belief}_a(\text{val})$. But it is not symmetric. Moreover, the set $\text{Belief}_a(\text{val}^*)$ that serves to determine the real beliefs of agent $a$ at moment $m$ is the set $\text{Val}(a,m)$ already defined. As one can expect, an object under concept $c_e$ possesses according to the agent $a$ the property $R_1$ in a circumstance $m/h$ (in symbols $c_e \in \text{val}^*(aR_1,m/h)$) when according to all assignments $\text{val}' \in \text{Val}(a,m)$ that object has that property in that circumstance. Of course, the agent $a$ has no beliefs at all at the moment $m$ according to $\text{val}$ when the set $\text{Belief}_a(\text{val})$ is the whole set $\text{Val}$. In that case, the set $\text{val}(a,m)$ is empty. He or she does not then have in mind anything.

What are the possible truth conditions of complex propositions? We determine them by respecting obvious meaning postulates. A truth functional negation $\neg P$ is true in a possible circumstance according to a possible denotation assignment to its constituents when the proposition $P$ is not true in that circumstance according to that assignment. A conjunction $(P \land Q)$ is true in a circumstance according to a denotation assignment when both conjuncts $P$ and $Q$ are true in that circumstance according to that assignment.

The modal proposition $\Box P$ that it is logically necessary that $P$ is true according to a denotation assignment in a possible circumstance when proposition $P$ is true according to that assignment in all possible circumstances. Finally, the proposition $\text{Bel}aP$ that

10 For according to a compatible assignment $\text{val}' \in \text{Belief}_a(\text{val})$, agent $a$ at moment $m$ can believe that certain propositional constituents of $\text{val}(a,m)$ have possible denotations in other circumstances. He or she can also have in mind other constituents. The assignment $\text{val}$ could not respect these new beliefs that agent $a$ has according to assignment $\text{val}'$ at moment $m$.

11 More generally, epistemic attributes of the form $aR_n$ satisfy the meaning postulate: $<c_1^{\downarrow}, \ldots, c_n^{\downarrow}> \in \text{val}(aR_n,m/h)$ when according to all assignments $\text{val}' \in \text{Belief}_a(\text{val})$. $<c_1^{\downarrow}, \ldots, c_n^{\downarrow}> \in \text{val}(aR_n,m/h)$.
agent \(a\) believes that \(P\) is true in a circumstance \(m/h\) according to a denotation assignment \(\text{val}\) when according to that assignment the agent \(a\) has in mind all the constituents of \(P\) at moment \(m\) and the proposition \(P\) is true in that circumstance according to all assignments \(\text{val}' \in \text{Belief}_{a}^{\%}(\text{val})\) which are compatible with what that agent believes at that moment according to assignment \(\text{val}\).

There are two borderline cases of truth conditions. Sometimes the proposition is true according to every possible denotation assignment to its constituents. It is a pure tautology. Sometimes it is true according to none. It is a pure contradiction. In my analysis, tautologies only have the universal truth condition that corresponds to the set of all possible circumstances and contradictions the empty truth condition that corresponds to the empty set. So tautologies (and contradictions) are special cases of necessarily true (and necessarily false) propositions. Tautologies are also a priori and analytically true (and contradictions a priori and analytically false).\(^{12}\)

1.5 The new criterion of propositional identity

Identical propositions have the same structure of constituents and they are true in the same possible circumstances according to the same possible denotation assignments to their constituents. Propositions which are true according to the same possible denotation assignments have the same possible truth conditions. So the set of propositions \(U_{p}\) is a subset of \(\Pi\text{Predications} \times (\text{Circumstances} \rightarrow \Pi\text{Val})\). Each proposition is an ordered pair containing first the finite non empty set of its predications and second a function associating with each possible circumstance the set of all possible denotation assignments according to which it is true in that circumstance.

My criterion of propositional identity is much finer than that of modal, temporal, intensional and relevance logics. My logic distinguishes strictly equivalent propositions with a different structure of constituents. We do not make the same predications in expressing them. So there are a lot of different necessarily true and necessarily false propositions and not only two as classical logic wrongly claims. Predicative logic moreover distinguishes strictly equivalent propositions which are not true in the same circumstances according to the same possible denotation assignments. They do not have the same possible truth conditions. So we do not understand in the same way under which conditions they are true. Consider the elementary proposition that the biggest whale is a fish and the conjunction that the biggest whale is and is not a fish. Both are composed from a single elementary proposition predicating of the biggest whale the property of being a fish. And both are necessarily false. In all possible circumstances where they exist, whales are mammals. They all have in common that essential property. However the two propositions have a different cognitive value. We can believe the first but not the second. Unlike Parry\(^{13}\) I distinguish such strictly equivalent propositions with the same structure of constituents. The first is true according to many possible denotation assignments but the second according to none. It is a contradiction.

1.6 Truth definition

In the philosophical tradition, from Aristotle to Tarski, truth is based on correspondence

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12 The necessary truth of tautologies is then metaphysical, logical and epistemic.
13 Parry elaborated a logic of analytic implication. See “Comparison of Entailment Theories” [1972]
with reality. True propositions represent how objects are in the actual world. Objects of reference have properties and stand in relations in possible circumstances. However they could have many other properties and stand in many other relations in these circumstances. In addition to ways in which things are, there are possible ways in which they could be. We consider a lot of possible truth conditions in expressing and understanding propositional contents. The truth of propositions is compatible with many possible ways in which objects could be. However in order that a proposition be true in a given circumstance, things must be in that circumstance as that proposition represents them. Otherwise, there would be no correspondence. Along these lines, a proposition is true in a possible circumstance when it is true according to any denotation assignment associating with its constituents their real denotation in every circumstance. Many possible circumstances are not actual: their moment just belong a possible inactual course of history of this world True propositions correspond to existing facts. So they are true at a moment in the actual course of history of this world. Classical laws of truth theory follow from my concise definition.

1.7 Cognitive aspects in the theory of truth

As I said earlier, to each agent $a$ and moment $m$ there corresponds a unique set $\text{Val}(a,m)$ containing all the possible denotation assignments to senses compatible with what that agent believes at that moment. Whenever the agent $a$ is provided with consciousness, the set $\text{Val}(a,m)$ is restricted; $\text{Val}(a,m) \neq \text{Val}$. Thanks to my conceptual apparatus logic can now define the subjective notion of truth according to an agent: a proposition is true in a circumstance according to an agent $a$ at a moment $m$ when that agent $a$ has in mind at the moment $m$ all its constituents and that proposition is true in that circumstance according to all possible assignments $val \in \text{Val}(a,m)$ that are compatible with his or her beliefs at that moment. As one can expect, tautological propositions are true and contradictory propositions are false according to all agents who have them in mind. But impossible propositions which are not contradictory can be true and necessary propositions which are not tautological can be false according to agents at some moments. For they have other possible truth conditions than the empty and the universal truth condition respectively.

So the logic of language imposes different limits on reality and thought. Necessarily false propositions represent impossible facts that could not exist in reality and that we could not experience. In my view, there is need to postulate impossible circumstances where such impossible facts would exist. Impossible facts are objectively impossible. In any possible circumstance where there are whales they are mammals and not fishes. So many ways in which we can think of objects do not represent possible ways in which these objects could be. Certain objectively impossible facts e.g. that whales are fishes are subjectively possible. We can wrongly believe that they exist. Their existence is compatible with certain possible denotation assignments to senses that do not respect essential properties. But corresponding possible truth conditions are subjective rather than objective possibilities.

1.8 The notion of strong implication

We, human beings are not perfectly rational. Not only we make mistakes and are sometimes inconsistent. But moreover we do not draw all valid inferences. We believe
(and assert) propositions without believing (and asserting) all their logical consequences. However we are not completely irrational. On the contrary, we manifest a *minimal rationality* in thinking and speaking. First we *a priori* know that certain propositions are necessarily false (for example, contradictions). So we cannot believe them nor attempt to do things that we know impossible.\(^{14}\) Moreover, we always draw certain valid inferences. We *a priori* know that certain propositions cannot be true unless others are also true, since we *a priori* know the truth of tautologies with a conditional propositional content. In that case we cannot believe (or assert) the first propositions without believing (or asserting) the others. There is an important *relation of strict implication* between propositions due to C.I. Lewis that Hintikka\(^ {15}\) and others have used to explain to which beliefs agents are committed. A proposition *strictly implies* another whenever that other proposition is true in every possible circumstance where it is true. According to Hintikka, whoever believes a proposition *eo ipso* believes all others that it strictly implies. However we ignore which propositions are related by strict implication, just as we ignore which are necessarily true.

So we need a propositional implication much finer than strict implication in epistemic logic. Predicative logic can rigorously define that finer propositional implication that I call *strong implication*. A proposition *strongly implies another* proposition when firstly, it has the same or a richer structure of constituents and secondly, it *tautologically implies* that other proposition in the following sense: whenever it is true in a possible circumstance according to a possible denotation assignment the other is also true in that circumstance according to that same assignment. Unlike strict implication, *strong implication is a priori known*. Whenever a proposition \(P\) strongly implies another \(Q\), we cannot express that proposition without *a priori* knowing that it strictly implies the other. For in expressing \(P\), we have by hypothesis in mind all elementary propositions of \(Q\). We make all the corresponding acts of reference and predication. Furthermore, in understanding the truth conditions of proposition \(P\), we distinguish *eo ipso* all possible denotation assignments to its propositional constituents which are compatible with its truth in any circumstance. These are by hypothesis compatible with the truth of proposition \(Q\) in the same circumstance. Thus, in expressing \(P\), we know for certain that \(Q\) follows from \(P\). Belief and knowledge are then closed under strong rather than strict implication in epistemic logic.

### 2 Formal semantics for a minimal epistemic logic

#### 2.1 The ideographical object – language \(L\) of that epistemic logic

Its lexicon contains a series of *individual constants* naming agents and a series of *propositional constants* expressing propositions.

The *syncategorematic expressions* are: \(\neg, \Box, \text{Tautological}, \text{Bel}, \land, \geq, (\text{and})\)

Here are the *rules of formation*. Any propositional constant is a *propositional formula* of \(L\). If \(A_p\) and \(B_p\) are propositional formulas of \(L\) so are \(\neg A_p\), \(\Box A_p\), *Tautological*\(A_p\), \((A_p \geq B_p)\), \((A_p \land B_p)\) and *Bel*\(a A_p\), for any individual constant \(a\). \(\neg A_p\) expresses the *negation* of the proposition expressed by \(A_p\). \(\Box A_p\) expresses the *modal proposition* that

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\(^{14}\) See my contribution “Attempt, Success and Action Generation: A Logical Study of Intentional Action” [2005]

\(^{15}\) See J. Hintikka *Knowledge and Belief* [1962]
it is logically necessary that \( A_p \) and \( \text{Tautological}A_p \) the proposition that it is tautological that \( A_p \). \( \text{Bela}A_p \) expresses the proposition that \( A_p \) believes that \( A_p \). \( (A_p \land B_p) \) expresses the conjunction of the two propositions expressed by \( A_p \) and \( B_p \). Finally, \( (A_p \geq B_p) \) means that the proposition that \( A_p \) has the same or a richer structure of constituents than the proposition that \( B_p \).

2.2 Rules of abbreviation

I will use the usual rules of abbreviation for the elimination of parentheses and the connectives \( \lor \) of disjunction, \( \Rightarrow \) of material implication, \( \Leftrightarrow \) of material equivalence, \( \diamond \) of logical possibility and \( \dashv \) of strict implication. Here are rules of abbreviation for new notions:

- **Analytic implication**: \( A_p \rightarrow B_p =_d (A_p \geq B_p) \land (A_p \dashv B_p) \)
- **Strong implication**: \( A_p \leftrightarrow B_p =_d (A_p \geq B_p) \land \text{Tautological} (A_p \Rightarrow B_p) \)
- **Propositional identity**: \( A_p = B_p =_d A_p \leftrightarrow B_p \land B_p \leftrightarrow A_p \)
- **Same structure of constituents**: \( A_p \equiv B_p =_d (A_p \geq B_p) \land (B_p \geq A_p) \)
- **Strong psychological commitment**: \( \text{Bela}A_p \trieq \text{Bela}B_p =_d \text{Bela}A_p \leftrightarrow \text{Bela}B_p \)
- **Weak psychological commitment**: \( \text{Bela}A_p \triangleright \text{Bela}B_p =_d \text{Bela}A_p \leftrightarrow \neg \text{Bela}B_p \)
- **Certainty**: \( \text{Certain}A_p =_d \text{Bela}A_p \land \text{Tautological}A_p \)

2.3 Definition of a model structure

A **standard model** \( M \) for \( L \) is a structure \( <\text{Moments}, \text{Individuals}, \text{Agents}, \text{Concepts}, \text{Attributes}, \text{Val}, \text{Predications}, \text{Belief}, \triangleright, \land, \equiv, >\), where \( \text{Moments}, \text{Individuals}, \text{Agents}, \text{Concepts}, \text{Attributes}, \text{Val} \) and \( \text{Predications} \) are non empty sets and \( \text{Belief}, \triangleright, \land \) and \( \equiv \) are functions which satisfy the following clauses:

- The set \( \text{Moments} \) is a set of moments of time. It is partially ordered by a temporal relation \( \leq \) as in ramified temporal logic. \( m_1 < m_2 \) means that moment \( m_1 \) is anterior to moment \( m_2 \). By definition, \( < \) is subject to historical connection and no downward branching. Any two distinct moments have a common historical ancestor. Moreover, the past is unique: if \( m_1 < m \) and \( m_2 < m \) then either \( m_1 = m_2 \) or \( m_1 < m_2 \) or \( m_2 < m_1 \). A maximal chain \( h \) of moments is called a history. It represents a possible course of history of the world. The set \( \text{Circumstances} \) of all possible circumstances contains all pairs \( m/h \) where \( m \) is a moment belonging to the history \( h \).

- The set \( \text{Individuals} \) is a set of possible individual objects. For each moment \( m \), \( \text{Individualsm} \) is the set of individual objects existing at that moment. \( \text{Agents} \) is a non empty subset of \( \text{Individuals} \) containing persons.

- \( \text{Concepts} \) is the set of individual concepts and \( \text{Attributes} \) is the set of attributes of individuals considered in model \( M \). For each natural number \( n \), \( \text{Attributes}(n) \) is the subset of \( \text{Attributes} \) containing all attributes of degree \( n \).

- The set \( \text{Val} \) is a proper subset of \( ((\text{Concepts} \times \text{Circumstances}) \rightarrow (\text{Individuals} \cup \{\emptyset\})) \)

\[
\bigcup_n ((\text{Attributes}(n) \times \text{Circumstances}) \rightarrow (\text{Concepts}(n)))
\]

\( \text{Val} \) contains all possible denotation assignments of the model \( M \). Such assignments are also called possible

\[\text{Certainty}\]

16 I can only deal here with certainties whose propositional content is necessarily true.
valuations of constituents. For any possible circumstance \( m/h \), \( \text{val}(ce,m/h) \in \text{Individuals} \) when individual concept \( ce \) has a denotation in the circumstance \( m/h \) according to assignment \( \text{val} \). Otherwise \( \text{val}(ce,m/h) = \emptyset \). For any attribute \( R_n \) of degree \( n \), \( \text{val}(R_n, m/h) \in \text{(Concepts}_n) \). The set \( \text{Val} \) contains a real valuation \( \text{val} \) which assigns to concepts and attributes their actual denotation in each possible circumstance according to the model. Moreover, there corresponds to each agent \( a \), moment \( m \) and assignment \( \text{val} \) a particular set \( \text{val}(a,m) \) containing all propositional constituents that the agent \( a \) has in mind at that moment according to that assignment.

- Belief is a function from \( \text{Agents} \times \text{Moments} \times \text{Val} \) into \( (\text{Val}) \) that associates with any agent \( a \), moment \( m \) and valuation \( \text{val} \), the set \( \text{Belief}_a^m(\text{val}) \subseteq \text{Val} \) of all possible denotation assignments to which are compatible with the beliefs that agent \( a \) has at the moment \( m \) according to that valuation. The relation of epistemic compatibility corresponding to \( \text{Belief}_a^m \) is reflexive and transitive. Moreover, \( \text{val}(a,m) \subseteq \text{val'}(a,m) \) when \( \text{val'} \in \text{Belief}_a^m(\text{val}) \). As one can expect, \( \text{Belief}_a^m(\text{val}) = \text{Val} \) when \( a \notin \text{Individuals}_m \).

- The set \( \text{Predications} \) is a subset of \( (\text{Attributes} \cup \text{Concepts}) \times \text{Circumstances} \) that contain all predications that can be made in the language \( L \). Each member of that set is an ordered pair of the form \( (R_n, c_1^1, ..., c_n^2) \) whose first element is the set of propositional constituents \( \{R_n, c_1^1, ..., c_n^2\} \) and whose second element is the set of all possible circumstances \( m/h \) such that \( <c_1^1, ..., c_n^2> \in \text{val}(R_n,m/h) \). The power set \( \text{Predications} \) is closed under union \( \cup \), a modal unary operation \( * \) and, for each agent \( a \), a unary epistemic operation \( \otimes a \) of the following form: For any \( \Gamma \), \( \Gamma_1 \) and \( \Gamma_2 \in \text{Predications} \), \( \Gamma \subseteq ^* \Gamma \) and \( ^* \Gamma \subseteq ^* \otimes a \Gamma \). Moreover, \( ^* (\Gamma_1 \cup \Gamma_2) = ^* \Gamma_1 \cup ^* \Gamma_2 \) and \( ^* \otimes a \Gamma = \otimes a \Gamma \). By definition, when \( \text{Belief}_a^m(\text{val}) \neq \text{Val} \) and \( \Gamma \subseteq \text{val}(a,m) \), \( \Gamma \subseteq ^* \otimes a \text{val}(a,m) \).

- \( \equiv \) is an interpreting function which associates with each individual constant \( a \) an agent \( \equiv a \in \text{Agents} \) and with each propositional formula \( Ap \) the proposition \( \equiv Ap \equiv \) that is expressed by that formula according to the model. In my analysis, each proposition has two essential features: the set of all its predications and the set of possible denotation assignments according to which it is true. So the set \( \text{Up} \) of all expressible propositions is the smallest subset of \( \text{Predications} \times (\text{Circumstances} \rightarrow \prod \text{Val}) \) that is defined recursively as follows:

- \( \text{Up} \) contains all elementary propositions \( P \) whose first element \( id_1 P \) is a singleton of the form \( \{(R_n, c_1^1, ..., c_n^2)\} \) and whose second element \( id_2 P \) is the function that associates with each circumstance \( m/h \) the set \( \{\text{val} / <c_1^1, ..., c_n^2> \in \text{val}(R_n,m/h)\} \).

The set \( \text{Up} \) is closed under operations corresponding to our logical connectives:

- \( id_1\equiv \neg B_p \equiv = id_1\equiv B_p \equiv \) and \( id_1\equiv \neg B_p \equiv \text{Val} \) \( = id_1\equiv B_p \equiv (m/h) \).

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17 Only existing agents can have beliefs.
18 As one can expect, each agent who has beliefs has beliefs about himself. In particular given the reflexivity and transitivity of \( \text{Belief}_a^m \), whoever has a belief also believes that he or she has that belief.
- $id_1 \equiv \text{Tautological}\text{B}_p \equiv id_1 \equiv \text{B}_p$ and $id_2 \equiv \text{Tautological}\text{B}_p \equiv (m/h) = \text{Val}$ when $\equiv \text{B}_p \equiv \text{Val}$. Otherwise, $id_2 \equiv \text{Tautological}\text{B}_p \equiv (m/h) = \emptyset$.

- $id_1 \equiv \mathbf{B}_p \equiv * id_1 \equiv \text{B}_p$ and $id_2 \equiv \mathbf{B}_p \equiv (m/h) = \bigcap_{m'/h \in \text{Circumstances}} id_2 \equiv \text{B}_p \equiv (m'/h')$

- $id_1(\equiv \text{B}_p \land C_p) = id_1(\equiv \text{B}_p) \cup id_1(\equiv C_p)$; $id_2 \equiv \text{B}_p \land C_p \equiv (m/h) = id_2 \equiv \text{B}_p \equiv (m/h) \cap id_2 \equiv C_p \equiv (m/h)$.

- $id_1(\equiv \text{B}_p \supset C_p) = id_1(\equiv \text{B}_p) \cup id_1(\equiv C_p)$ and $id_2 \equiv \text{B}_p \supset C_p \equiv (m/h) = \text{Val}$ when $id_1 \equiv \text{B}_p \equiv \subseteq id_1 \equiv C_p \equiv$. Otherwise, $id_2 \equiv \text{B}_p \supset C_p \equiv (m/h) = \emptyset$.

- Finally, $id_1 \equiv \text{Bel}_a \text{B}_p \equiv \otimes a (id_1 \equiv \text{B}_p)$ where $\equiv a = a$ and $id_2 \equiv \text{Bel}_a \text{B}_p \equiv (m/h) = \{\text{val} \in \text{Val} \mid \text{firstly, for all } (R_n, c_1, \ldots, c_n) \in id_1 \equiv \text{B}_p, \{R_n, c_1, \ldots, c_n\} \subseteq \text{val}(\equiv a = m) \}$ and secondly, $\text{Bel}(\equiv a = \text{val}) \subseteq id_2 \equiv \text{B}_p \equiv (m/h)$.\footnote{In other words, any valuation $\text{val}$ compatible with the fact that an agent $a$ believes a proposition $\equiv \text{B}_p$ in a circumstance $w$ must satisfy two conditions. Firstly according to that valuation the agent $a$ must have beliefs about all propositional constituents of the believed proposition $\equiv \text{B}_p$ in circumstance $w$. Secondly, all possible denotation assignments $\text{val}'$ which are compatible with the beliefs of that agent in that circumstance according to that valuation must themselves be compatible with the truth of that believed proposition in circumstance $w$.}

2.4 Definition of truth and validity

A propositional formula $A_p$ of $\mathbf{L}$ is true in a possible circumstance $m/h$ according to a standard model $\mathbf{M}$ if and only $\models A_p$ is true in $m/h$ according to $\text{valM}$. The formula $A_p$ is valid (in symbols: $\models A_p$) when it is true in all possible circumstances according to all standard models of $\mathbf{L}$.

3 An axiomatic system

I conjecture that all and only valid formula are provable in the following axiomatic system:

3.1 Axioms

The axioms of my system are all the instances in the object-language $\mathbf{L}$ of classical axiom schemas of truth functional logic and S5 modal logic and instances of the following new schemas:

Axiom schemas for tautologies

(T1) $\text{Tautological}A_p \Rightarrow \mathbf{A}_p$
(T2) $\text{Tautological} A_p \Rightarrow \text{Tautological} \text{Tautological}A_p$
(T3) $\neg \text{Tautological} A_p \Rightarrow \text{Tautological} \neg \text{Tautological}A_p$
(T4) $\text{Tautological} A_p \Rightarrow (\text{Tautological} (A_p \Rightarrow B_p) \Rightarrow \text{Tautological} \text{B}_p)$

Axiom schemas for propositional identity

(11) $A_p = A_p$
(I2) \((A_p = B_p) \implies (C \implies C^*)\) where \(C^*\) and \(C\) are propositional formulas which differ at most by the fact that an occurrence of \(B_p\) in \(C^*\) replaces an occurrence of \(A_p\) in \(C\).

(I3) \((A_p = B_p) \implies \text{Tautological } (A_p = B_p)\)

(I4) \(\neg (A_p = B_p) \implies \text{Tautological } \neg (A_p = B_p)\)

**Axiom schemas for belief**

(B1) \((\text{Bela}_A p \land \text{Bela}_B p) \implies \text{Bela}(A_p \land B_p)\)

(B2) \(\text{Tautological } A_p \implies \neg \text{Bela} \neg A_p\)

(B3) \(\text{Bela}_A p \implies ((A_p \implies B_p) \implies (\text{Bela}_B p))\)

(B4) \(\text{Bela}_A p \iff (\text{Bela}_B \text{Bela}_A p)\)

(B5) \(\text{Bela}_A p \implies \text{Bela} \Diamond A_p\)

**Axiom schemas for propositional composition**

(C1) \((A_p \geq B_p) \implies \text{Tautological } (A_p \geq B_p)\)

(C2) \(\neg (A_p \geq B_p) \implies \text{Tautological } \neg (A_p \geq B_p)\)

(C3) \(A_p \geq A_p\)

(C4) \((A_p \geq B_p) \implies ((B_p \geq C_p) \implies (A_p \geq C_p))\)

(C5) \((A_p \land B_p) \geq A_p\)

(C6) \((A_p \land B_p) \geq B_p\)

(C7) \((C_p \geq A_p) \land (C_p \geq B_p)) \implies C_p \geq (A_p \land B_p)\)

(C8) \(A_p \equiv \neg A_p\)

(C9) \(A_p \equiv \text{Tautological } A_p\)

(C10) \((A_p \land B_p) \equiv (A_p \geq B_p)\)

(C11) \(\Box A_p \geq A_p\)

(C12) \(\text{Bela}_A p \geq \Box A_p\)

(C13) \(\Box \neg A_p \equiv \Box A_p\) And similarly for \(\text{Bela}\). (C14)

(C15) \(\Box (A_p \land B_p) \equiv (\Box A_p \land \Box B_p)\) And similarly for \(\text{Bela}\). (C16)

(C17) \(\Box \Box A_p \equiv \Box A_p\) And similarly for \(\text{Bela}\). (C18)

3.2 **Rules of inference**

The two rules of inference of my axiomatic system are:

The **rule of Modus Ponens**: (MP) From sentences of the form \(A\) and \((A \implies B)\) infer \(B\).

The **tautologization rule**: (RT) From a theorem \(A\) infer \(\text{Tautological } A\).

4 **Important valid laws of epistemic logic**

4.1 **Laws about the structure of constituents**

A proposition has all the elementary propositions of its arguments. \(\models A_p \geq B_p\) when \(B_p\) occurs in \(A_p\). However modal and epistemic propositions have in general more elementary propositions than their arguments. Thus \(\not\models A_p \geq \Box A_p\) and \(\not\models \Box A_p \geq \text{Bela}_A p\).
4.2 Laws for tautologyhood

Tautologyhood is stronger than necessary truth and contradiction stronger than necessary falsehood. \( \models (\text{Tautological}A_p) \Rightarrow \Box A_p \). But \( \not\models \Box A_p \Rightarrow \text{Tautological}A_p \). There are modal and epistemic tautologies. Thus \( \models \text{Tautological} (\Box A_p \Rightarrow A_p) \).

4.3 Agents are minimally rather than perfectly rational.

They do not believe all necessary truths and they can believe necessarily false propositions. \( \not\models \Box A_p \Rightarrow BelaA_p \) and \( \not\models \neg\Diamond A_p \Rightarrow Bela\neg A_p \). However they are minimally consistent: they cannot believe that a tautology is false or that a contradiction is true. \( \models \text{Tautological}A_p \Rightarrow \neg \text{Bela} \neg A_p \) and \( \models \text{Tautological} \neg A_p \Rightarrow \neg \text{Bela} A_p \). Now in order to believe a proposition an agent must have in mind its attributes and concepts. Unlike God, human agents do not have in mind all propositional constituents. Consequently they do not know or even believe all tautologies. \( \not\models \text{Tautological}A_p \Rightarrow \text{Bela} A_p \). The limits of their language imposes limits to their thoughts. However whenever they express a tautology and a contradiction, they know just by apprehending their logical form that the first is necessarily true and the second necessarily false.

So \( \models \text{Tautological}A_p \Rightarrow (\text{Bela} A_p \Rightarrow (\text{Certain} A_p)) \).

4.4 Laws for tautological implication

Ta\text{utological implication} is much finer than strict implication. \( \models \text{Tautological} (A_p \Rightarrow B_p) \Rightarrow (A_p \rightarrow \in B_p) \). But \( \not\models (A_p \rightarrow \in B_p) \Rightarrow \text{Tautological} (A_p \Rightarrow B_p) \). Necessarily true propositions are strictly implied by others. \( \models \Box A_p \Rightarrow (B_p \rightarrow \in A_p) \). But only tautologies can tautologically imply other tautologies. \( \models ((\text{Tautological}B_p) \land \text{Tautological} (A_p \Rightarrow B_p)) \Rightarrow \text{Tautological} A_p \). So \( \not\models \Box A_p \Rightarrow \text{Tautological}(B_p \Rightarrow A_p) \). Similarly necessarily false propositions strictly imply all other propositions. \( \models \Box \neg A_p \Rightarrow (A_p \rightarrow \in B_p) \). But only contradictions can tautologically imply contradictions. So \( \not\models \Box \neg A_p \Rightarrow \text{Tautological}(A_p \Rightarrow B_p) \).

Beliefs are not closed under tautological implication. \( \not\models (\text{Tautological} (A_p \Rightarrow B_p)) \Rightarrow (\text{Bela} A_p \Rightarrow \text{Bela} B_p) \). Because \( \not\models (\text{Tautological} (A_p \Rightarrow B_p)) \Rightarrow (A_p \geq B_p) \). However whoever believes a proposition cannot believe the negation of a proposition that the first tautologically implies. For the conjunction of both is a contradiction. This is why tautological implication generates weak psychological and illocutionary commitment. Any assertion that P weakly commits the agent to asserting any proposition Q that P tautologically imply according to illocutionary logic.\(^{20}\) Similarly, \( \models \text{Tautological} (A_p \Rightarrow B_p) \Rightarrow (\text{Bela} A_p \rightarrow \in \neg \text{Bela} \neg B_p) \) in epistemic logic.

\(^{20}\)See “Success, Satisfaction and Truth in the Logic of Speech Acts and Formal Semantics” [2004]
4.5 Laws for strong implication

Strong implication is a stronger kind of propositional implication than strict, tautological and analytic implications. It requires the same or a richer structure of constituents in addition to tautological implication. There are two reasons why a proposition can fail to strongly imply another. Firstly, the second proposition requires new predications. \( \models \neg (A_p \geq B_p) \Rightarrow \neg (A_p \rightarrow B_p) \). In that case, one can think the first proposition without thinking the second. Secondly, the first proposition does not tautologically imply the other. In that case even if the first implies the second, one can ignore that implication.

So strong implication is finer than analytic implication which does not require tautological implication. \( \not\models (A_p \rightarrow B_p) \Rightarrow (A_p \land B_p) \). So \( \not\models (A_p \rightarrow B_p) \Rightarrow BelaA_p \Rightarrow BelaB_p \).

Unlike strict and tautological implications, strong implication is anti-symmetric. Consequently, \( \models A_p \leftrightarrow B_p \Leftrightarrow ((A_p \land B_p) = A_p) \)

Strong implication is decidable. For \( \models A_p \geq B_p \) when all propositional constants which occur in \( B_p \) also occur in \( A_p \). And \( \models \text{Tautological} (A_p \Rightarrow B_p) \) when any semantic tableau of S5 modal logic for \( (A_p \Rightarrow B_p) \) closes.

Moreover, strong implication is finite: every proposition only strongly implies a finite number of others. For it contains a finite number of elementary propositions. \( \models \text{Tautological} B_p \Rightarrow (A_p \leftrightarrow B_p \Leftrightarrow A_p \geq B_p) \). Similarly a contradiction only strongly the propositions having its elementary propositions. \( \models \text{Tautological} \neg A_p \Rightarrow (A_p \leftrightarrow B_p \Leftrightarrow A_p \geq B_p) \)

For all these reasons, strong implication is a priori known. \( \models (A_p \leftrightarrow B_p) \Rightarrow (BelaA_p \Rightarrow Certaina(A_p \Rightarrow B_p)) \). However \( \leftrightarrow \) does not obey the rule of Modus Tollens. \( \not\models (A_p \leftrightarrow B_p) \Rightarrow (\neg B_p \leftrightarrow \neg A_p) \). For \( \not\models (A_p \leftrightarrow B_p) \Rightarrow (B_p \geq A_p) \). So \( \not\models (A_p \leftrightarrow B_p) \Rightarrow (Bela\neg B_p \Rightarrow Bela\neg A_p) \)

4.6 Natural deduction

Valid laws of inference of natural deduction generate strong implication when their premises contain all propositional constants of their conclusion. Here are some laws:

The law of introduction of belief: \( \models A_p \leftrightarrow B_p \Rightarrow BelaA_p \Rightarrow BelaB_p \)

The law of elimination of conjunction: \( \models (A_p \land B_p) \Rightarrow A_p \) and \( \models (A_p \land B_p) \Rightarrow B_p \)

The law of elimination of disjunction: \( \models ((A_p \leftrightarrow C_p) \land (B_p \leftrightarrow C_p)) \Rightarrow (A_p \lor B_p) \Rightarrow C_p \)

Failure of the law of introduction of disjunction: \( \not\models A_p \Rightarrow (A_p \lor B_p) \).

So strong implication is stronger than entailment which obeys the law of introduction of disjunction. Clearly \( \not\models A_p \Rightarrow Bela(A_p \lor B_p) \).

The law of introduction of negation: \( \models A_p \Rightarrow \text{Or} \Rightarrow (A_p \Rightarrow \neg A_p) \) where \( \text{Or} \) is any contradiction.
Failure of the law of elimination of negation: \( \not\equiv (A_p \land \neg A_p) \equiv B_p \)

Agents can have relatively inconsistent beliefs. \( \not\equiv (A_p \equiv \neg \neg B_p) \Rightarrow \neg \Box _a (A_p \land B_p) \)

They are paraconsistent. \( \not\equiv (A_p \equiv \neg \neg B_p) \Rightarrow (\Box _a (A_p \land B_p) \equiv \Box _a C_p) \)

But they always respect the principle of non contradiction. \( \not\models \neg \Box _a (A_p \land \neg A_p) \)

The law of elimination of material implication: \( \models (A_p \land (A_p \Rightarrow B_p)) \equiv B_p \)

The law of elimination of necessity: \( \models [A_p \equiv B_p] \equiv A_p \)

The law of elimination of possibility: \( \models [\Diamond_a (A_p \land B_p)] \equiv A_p \equiv B_p \)

4.7 Laws of propositional identity

All the classical Boolean laws of idempotence, commutativity, associativity and distributivity are valid laws of propositional identity: So \( \models Bela A_p = Bela (A_p \land A_p) \); \( \models Bela (A_p \land B_p) = Bela (B_p \land A_p) \); \( \models Bela \neg (A_p \lor B_p) = Bela (\neg A_p \lor \neg B_p) \); \( \models Bela (A_p \land (B_p \lor C_p)) = Bela ((A_p \land B_p) \lor (A_p \land C_p)) \) and \( \models Bela \Box_A (A_p \land B_p) = Bela (\Box _A A_p \land \Box _A B_p) \).

The classical laws of reduction are also valid: \( \models \neg \neg A_p = A_p \) and \( \models Bela Bela A_p = Bela A_p \) Unlike hyperintensional logic, predicative logic does not require that identical propositions be *intensionally isomorphic*.21 First of all, as I said earlier, the order of predication does not always affect truth conditions. Similarly, the order and number of applications of propositional operations does not always affect the logical form. Clearly, \( \models Bela (A_p \leftrightarrow B_p) = Bela (B_p \leftrightarrow A_p) \) Intensional isomorphism is too strong a criterion of propositional identity.

However, propositional identity requires more than the *co-entailment* advocated in the logic of relevance. As M. Dunn points out, it is unfortunate that \( A_p \) and \( (A_p \land (A_p \lor B_p) \) co-entail each other.22 For most formulas of such forms are not synonymous. Co-entailment is not sufficient for synonymy because it allows for the introduction of new sense. \( \not\equiv A_p \Rightarrow (A_p \land (A_p \lor B_p) \). \( \not\equiv Bela A_p \Rightarrow Bela (A_p \land (A_p \lor B_p) \) in epistemic logic.23

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WHERE LEXICAL SEMANTICS MEETS SPATIAL DESCRIPTION:
A FRAMEWORK FOR KLETTERN AND STEIGEN

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Abstract

When representing motion linguistically, more information is hidden in the interaction of verb, subject, object and directional PP than current linguistic theories normally use. In order to capture this information interplay lexical verb entries must look deeper into the situation, using a formalization of conceptual knowledge – the information gained can be used to make lexical entries of verbs more simple and more efficient. After a case study of German *steigen* and *klettern* (both: climb) we want to propose a toolkit to model both semantic and conceptual knowledge and their interaction, thereby proposing a three-level framework. As a result, we will present both lexical entries and conceptual knowledge modules of the associated parts of information, to the effect that lexical entries can be kept less complex than suggested in previous theories.

1 Introduction

When encoding real world situations in language, various kinds of information are dealt with. Words in a sentence have meanings, and the sentence meaning depends on both the word meanings and the way these are combined. While representation of word meaning is just a matter of the right framework – there is a choice between a vast number of semantic theories –, it means more than just combining word meanings mechanically ‘in the right way’ to derive a sentence meaning that represents a real world situation: There are interactions between verb meanings and subjects and objects (*to ride a horse* vs. *to ride a bus*) or between preposition meanings and objects (like in *on the table* vs. *on the wall*). As a consequence, this has led to complex lexical representations of word meanings that have to account for possible subcategorizations and exclude impossible cases.

In this paper, we discuss the linguistic representation of motion verbs and motion situations. These are promising candidates for an exploration of the extent to which verbal lexical entries are able to deal with situational information, since the situations described by motion verbs are clear-cut – they can easily be judged on the basis of normal portion of spatial and physical intuition. On the other hand, staying in the domain of linguistics, motion situations cause a vast amount of problems whose solution is hidden to purely linguistic analysis. There are sentences which are semantically good but, nevertheless, describe situations physically impossible in our world (e.g. (1)):

(1) a. ?? Peter climbed onto the cloud
   b. ?? The balloon climbed out of the hole [and we know that the hole’s only exit is at its bottom]
While in (1a) the information is needed that a cloud has no solid surface, in (1b) things are even worse: No linguistic analysis will be able to falsify this sentence in this situation without including further knowledge about the situation described.

We will claim that information is hidden in the interaction of verb, subject, object and directional PP that is not used in most theories. We will present ideas on how to capture this information interplay suggesting lexical entries that look deeper into the situation. Technically, we propose distributing information into three parts: On the semantic level, the word meanings are represented in a way so as to enable semantic composition of meaning. On the conceptual level, more conceptual knowledge about objects and events is stored. This knowledge is used to filter out sentences that are conceptually odd. Additionally, there will be a third level, whose task will be to model everyday world knowledge (like ‘gravity causes that things normally fall down’), on the one hand, conceptual knowledge about words, on the other. We will call this the simulated world level.

In doing this, we are building on the tradition of Conceptual Semantics developed by Jackendoff (1983, 1991), a core point of which is what we call the ‘CS triangle’: Spatial knowledge and representation, on the one hand, and linguistic knowledge and representation, on the other, is not directly connected, but mediated by a conceptual representation: the model of world and situations we have in mind.

We will find that the verb is responsible for compiling an interaction between the Subject, which is source of a MANNER of movement, and the Object, which interacts with a PATH. We will discuss current theories, suggest and develop some basics of a framework to model both semantic and conceptual knowledge and their interaction and, in the end, propose lexical entries and conceptual knowledge modules.

2 A Case Study on Motion Verbs: klettern, steigen, and climb

Motion verbs are an ideal example for the interaction of information that takes place between verb, complements, concepts and context. All these different movement concepts have one core structure in common: There is motion, there is a MANNER of motion (whether explicitly referred to or not); and there is a PATH made up from the places in space the subject has occupied some point of time. In this paper, we focus on one special kind of motion verbs: we will call them MANNER-PATH-verbs (MPVs) and define them as

**Definition 1 (MANNER-PATH-verbs)** := Verbs of motion in combination with a \{ goal object NP, directional PP, directional adverb \} where an object moves along a path in a certain manner.

2.1 German klettern and steigen: First analysis

As a sample, let us focus more narrowly on two verbs: German klettern and steigen. At first sight, both verbs are equivalents of English to climb. However, they differ in meaning: while klettern is approximately equivalent to clamber and climb, steigen has the meaning of climb, go up, ascend and increase.
This seems to be a systematic difference: Looking at the core meaning of the verbs, we find that although both *klettern* and *steigen* express information about the **direction** of movement and about **manner**, there seems to be a systematic effect of emphasis: *steigen* puts more emphasis on the direction, while *klettern* puts more emphasis on the manner. This can be seen in examples where no object is present at all and where only one of the options is semantically good:

(2)  
   a. Das Flugzeug {steigt / *klettert}.  
      (The plane is climbing (go up).)  
   b. Der Affe {klettert / *steigt}.  
      (The monkey is climbing (clamber).)

This fact, however, constrains the choice of subjects. While (2a) only expresses an increase of height, (2b) only expresses the manner of the monkey’s movement.

A prepositional phrase given as a second argument introduces a **PATH** (where at least one of {goal, route, source} is specified). As soon as a **PATH** is explicitly introduced, an interdependence of **PATH** and **DIRECTION** can be found: If the subject needs contact to the ground and if the object has a solid surface, then the path adapts to the object’s shape. Hence, it is no longer true in all cases that **UPWARD** holds:

(3)  
   a. Peter {steigt / klettert} auf den Berg.  
      (Peter is climbing (go up) the mountain.)  
   b. Das Kind {steigt / klettert} auf den Stuhl.  
      (The child is climbing onto the chair (in order to stand on it).)  
   c. dem Felsen entlang {steigen / klettern}  
      (climb along the rock)  
   d. aus der Tonne {steigen / klettern}  
      (climb out of the bin)  
   e. *Peter klettert auf die Wolke  
      (Peter climbs onto the cloud)

So far, the lexical entries for both verbs would look like in (4), where $x$ denotes the subject and $P$ a path, and where the brackets denote the ‘default’ status:

(4)  
\[
\begin{array}{c}
\text{‘steigen’}(x,P) \\
go(x,P) \\
\text{DIRECTION: [upward]}
\end{array}
\quad
\begin{array}{c}
\text{‘klettern’}(x,P) \\
go(x,P) \\
\text{MANNER: clambering}
\end{array}
\]

This is not all, however. Consider the following contrast:

(5)  
   a. Peter klettert auf das Dach.  
      (Peter climbs onto-the roof)  
   b. Peter klettert vom Dach herunter.  
      (Peter climbs from-the roof down)  
   c. Die Lokomotive der Zahnradbahn klettern bergwärts.  
      (The locomotive of-the rack railway is climbing up-the-mountain.)  
   d. ??Die Lokomotive der Zahnradbahn klettern talwärts.  
      (The locomotive of-the rack railway is climbing down-the-mountain.)
In these examples we observe that a sentence becomes semantically problematic if both
the PATH has been adapted to downward direction and the subject is a vehicle instead
of an animate entity. We conclude that PATH adaptation to the object is just one aspect;
the meaning additionally depends on the subject and, therefore, on MANNER information.
This point will be taken up again later.

Before we go on to develop our own framework we will, in the next section, review a
framework Jackendoff (1985) proposed for the verb climb.

2.2 Jackendoff (1985): climb

Jackendoff (1985) analyzes the verb to climb in a case study, and he lists evidence for both
climb cases where only ‘upward’ and cases where only ‘clambering’ occurs as a feature.
It follows that none of these features are necessary features, but at least one of these
features must be present. Jackendoff proposes a lexical representation for climb, based
on his ‘Semantics and Cognition’ (1983) framework (there are two architectural changes
in Jackendoff (1991b), p.76, which matter only notationally), where both ‘clambering’
and ‘upward’ are treated as default features (marked with a P) in a so called ‘preference
rule system’, which is a “collection of features or conditions on a category judgment, (i)
any single one of which, under proper circumstances, is sufficient for a positive
judgment. (ii) In the absence of evidence against any such feature in an item that has already been
categorized on the basis of other features, the feature is assumed present by default. (iii)
The more of the preference features that can be satisfied in a particular instance, the
more secure the judgment, and the more stereotypical the instance will be judged. (iv)
None of the features is necessary. But if none of the preference features in the system
can be satisfied, a negative judgment results” [Jackendoff (1985), enumeration added].

In the Semantics and Cognition framework, five operators create trajectories: VIA / TO /
TOWARDS / FROM and AWAY FROM (cf. Landau and Jackendoff (1993)). There is
one optional subcategorization of an object phrase, denoted by [_____ (XPj)]. The curly
brackets denote a choice of semantic constituents: depending on the semantic category
(here: Thing or Path), one of the analyses is automatically chosen:

This architecture is able to cope with all situations Jackendoff discusses. Consider, for
example:

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example:

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Bill is climbing (onto) the ladder. / The train is climbing (onto) the mountain.

\[(\text{GO}(\text{Train}, [\text{Path, UPWARD}]) / \text{CLAMBERING})] / * \left[\text{GO}(\text{Train}, [\text{Path, } \emptyset])\right]\]

Bill is climbing. / * The train is climbing down the mountain.

However – looking closer, there are some critical points concerning this framework. We want to mention three of them. The first point of critique concerns the separation from neighbouring words. Consider example (9):

(9) a. The train climbed.
b. *The train went.

(10) a. The train climbed the mountain.
b. The train went up the mountain.

There are syntactic differences that are responsible for (9b)’s being syntactically wrong. In Jackendoff’s lexical entry, this would be captured by different subcategorization rules. But, compare (10a) and (10b). One would like to claim that there are semantic differences, that there is more to the meaning of climb than only ‘upward movement’. However, since ‘clambering’ is deleted with non-animate subjects, no difference to a simple go remains in Jackendoff’s architecture for non-animate subjects.¹

The second point we want to criticize is the way default constituents are used: “If the PP is incompatible with ‘Upward’, though, then ‘Upward’, as only a preferred condition, is suppressed (Jackendoff 1985)”. This has two consequences. On the one hand, the default presence of features is representationally justified by the fact that stereotypicality increases with the presence of features. What is missing, on the other hand, is a justification of the deleting / suppressing mechanism: features are not deleted due to active counterevidence, but only due to incompatibilities in assigning features to objects, which results in both incorrect deleting and incorrect not-deleting. Consider (11):

(11) a. Bill climbed out of the hole.
b. Bill climbed out of the hole [and we know the hole’s exit is at its bottom end]

In (11b) the ‘Upward’-feature must be deleted in order to describe the situation. But, semantically, since out of is neutral with respect to vertical direction, there is no reason to eliminate ‘Upward’. So, where does this information come from? Both syntax and semantics are not able to contribute that piece of information. In fact, Jackendoff’s default deletion does not work here, since the information needed does not come from Semantics but from world knowledge. The deletion mechanism is more like a passive ‘veto policy’

¹For animate subjects the difference we feel can get quite small. Compare:

(i) a. Peter climbed the ladder / the stairs.
b. Peter went up the ladder / the stairs.
triggered by Syntax and Semantics, instead of an active search for a consistent solution.
The third point we want to criticize is a technical one: Despite the promise to offer a theory
which is able to represent stereotypicality and family resemblance effects, the resulting
architecture is not a framework where representations are derived from a prototypical
core-meaning – but, in fact, it emerges as list architecture by simply rewriting (12a) as
(12b):

<table>
<thead>
<tr>
<th></th>
<th>+UPWARD</th>
<th>−UPWARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>+CLAMB</td>
<td>Bill climbed up the hill</td>
<td>Bill climbed down the hill</td>
</tr>
<tr>
<td>−CLAMB</td>
<td>−CLAMB</td>
<td>−CLAMB</td>
</tr>
</tbody>
</table>

b. climb\(_1\): [... +UPWARD, +CLAMB ...]
   climb\(_2\): [... +UPWARD, −CLAMB ...]
   climb\(_3\): [... −UPWARD, +CLAMB ...]

To conclude, there is a class of context factors which Jackendoff’s account is not able
to deal with. Reviewing the discussion of neighbouring words, feature deletion and list
architecture, three questions arise that a theory will have to cope with: First, what exactly
does a feature (e.g. ‘clambering’) encode? Can the same be encoded in a more general
way? Second, how can a lexical semantic verb entry both account for and profit from
‘situation knowledge’ instead of assigning and deleting features by rules? Third, is it
possible to get a core meaning architecture from which possible readings are derived
from several kinds of knowledge?

Keeping in mind both the questions that arose in the last chapter as a wish list which a new
framework should be able to cope with, and the type of problems Jackendoff’s framework
has to cope with, we will now take a new route towards a different framework. We will
ask what exactly is the conceptual knowledge involved in motion processes, then propose
a framework, give some formal definitions and end up with lexical and conceptual entries
for the climb test case.

3 A conceptual toolkit

To begin with, we advance some hypotheses concerning architectural issues and check the
inventory of formal conceptual knowledge encoding proposed in literature. To resume:
In linguistic motion encoding, there is an interaction between subject / manner, path, and
object.

*This interaction is mainly located on the conceptual level. When one has in
mind a concept of the moving subject, a concept of the path, and a concept of
the object, then the movement patterns the object provides put restrictions on
a possible path, which is also restricted by the shape and material character
of the object. When providing all knowledge used, all motion situations of the
kind klettern / steigen / climb can be lexically represented simply as ‘a subject
moves along a path by performing suitable manner patterns, where the path
is located relative to the object in a position that the subject is technically
able to be at’.*
Along these lines, discussion will lead us to the need for involving some pieces of physical knowledge in the analysis, for example in order to decide about the ‘possible positions’ subjects can take in space. In spite of their central role here, we will not discuss manner patterns in great detail – we have to postpone that to further work. What we will focus on here is the notion of PATH, which has attracted several attention in literature: There is a great variety of different definitions for PATH.

### 3.1 Path theories

**Kaufmann (1993) and Piñón (1993)** do not believe that the PATH information can be of any help in semantic modelling. Kaufmann (1993) argues that “… ontologically there is no such thing like a single object ‘path’. […] ‘path’ is to be interpreted as some instantiation of the relevant properties. (p. 224)”, while Piñón (1993) proposes a model-theoretic version, using an event-semantics, in which verbs are analyzed as predicates of events. He makes the assumption that Jackendoff’s ‘projected world’ is identical to the real world. Hence, paths are entities in the real world, and thus play no role in modelling.

**Eschenbach, Tschander, Habel and Kulik (2000)** distinguish a linguistic level and a spatial level and see a path as a “bounded linear oriented structure” on the spatial level. A path has a geometry. In their framework, PP and verb specify motion: “The semantics of the verbs of motion is responsible for connecting the path with the bearer of motion”. They use a first order predicate logic with $\lambda$ calculus for representing semantic structure in a decompositional manner and link situations to paths via the predicate OCCURS-ON($s$, GO($\cdot$, $w$)). A Path is defined via a linear ordering relation: $\prec (w, Q, Q')$ and has marked points stpt($w$) (starting point) and fpt($w$) (final point). Hence, since a path is only fixed via stpt and fpt, it cannot be further localized in space. Finally, they hold the view that MANNER is completely independent from PATH.

**Zwarts (2004)** ’s understanding of paths is more algebraic: He defines a path as having “a starting point, an end point, and points inbetween on which the path imposes an ordering:

$$I \text{ will assume constructed paths, defined as continuous functions from the real unit interval } [0, 1] \text{ to positions in some model of space. The relation with positions is straightforward: the starting point of path } p \text{ is } p(0), \text{ the end point is } p(1) \text{ and for any } i \in [0, 1] \text{ } p(i) \text{ is the corresponding point of the path.}$$

Zwarts develops a path algebra $\langle P, \leq, + \rangle$ which we review as a promising approach: it copes with bounded vs. unbounded (to vs. towards) paths (cf. as well Zwarts (2003)). The formal definition of path combines two ways of modelling a path: Its architecture strikes a middle ground between a Kaufmann / Piñón -like notion of path, where nothing more than Source, Via and Goal make up a path, and a purely spatial notion of path where a path is modelled as a chain of points localized in space.

Comparing the theories mentioned so far, it turns out that not only PATH has been defined from different theoretical perspectives, but, looking deeper, there are different conceptions of how ‘conceptual knowledge’ is to be modelled and what its duty is in linguistic
representation. The conceptions of conceptual knowledge can be roughly divided in (1) theories that strongly focus on the semantic side and use the conceptual side as ‘all remaining information that is not semantics’ and (2) theories that focus on the interplay between semantic and conceptual structure – which requires a more formal view of what conceptual knowledge is. And, to go one step further, when formalizing conceptual knowledge, one has to establish a definitional border between conceptual knowledge and a type of knowledge that is ‘world knowledge’. We will discuss the role of spatial knowledge in the next subsection.

3.2 Conceptual vs. spatial knowledge

Jackendoff (1983, 1991) maintains the idea of an indirect linking of spatial cognition to language via conceptual structure which is seen as an interface between both. He defines PATH as ‘the quantity of space traversed’. Although this looks like a spatial approach, the definition fits into the Conceptual approach, since conceptual constituents (like path) refer to entities in the projected world (and therefore not to entities in the real world). The interface to syntax and semantics is defined via the role of prepositional phrase constituents: Certain types of PPs are used referentially to pick out paths. ‘On the other end of’ conceptual knowledge there is the interface with the so called Spatial Representation, which encodes geometric properties of the world and relationships among them in space. Spatial Representations define Trajectories and Paths. In a footnote, Jackendoff (1991a) underlines the need for specialized representations: ‘However, conceptual structure is not the only form of representation available to encode one’s understanding of the world. Aspects of the world that are understood spatially are encoded in another central representation whose properties resemble Marr’s (1982) 3D model structure [discussed in many places in Jackendoff]; there may well be other central representations as well, for instance a “body representation” that encodes the position and state of the body. What distinguishes conceptual structure from these others is its algebraic character – its being formalized in terms of features and functions – and its capacity to encode abstractions’ (p. 10, fn. 2).

Nikanne (2003), starting out from Jackendoff’s (1983) indirect linking theory, discusses an example of the kind (13):

(13) Twenty scientists went to Konstanz

Semantically, the meaning of this sentence is that a movement of individuals has taken place and that, as a result, the individuals are located in Konstanz. Conceptually, we get the information that there is a Path whose goal point is Konstanz. This is where most analyses stop. Looking deeper, however, in order to see which situations can be described by the sentence, we become aware of an ambiguity that both semantic and conceptual information was not able to find: Two possible spatial settings arise from the plurality of subjects – either each single object is moving along its own path and all paths have the place Konstanz as a goal point, or the group of travelling scientists is treated as one group of objects traveling at the same time at the same speed in the same direction (like in ‘the group of scientists is travelling together’).
As a result, Nikanne claims the need for a framework with three levels, including interactions between them: first, the Linguistic Representation level. Each sentence on this level must have an interpretation in conceptual structure – the interpretation of sentences cannot violate the well-formedness constraints of conceptual structure. Second, there is the Conceptual Representation level. This level contains the PATH information that one of the features SOURCE, ROUTE (defined as a set of points) and GOAL must be present. In the current example (13) this is the information that the goal of the path is the place called Konstanz. The third representational level in Nikanne’s proposal is the Spatial Representation level. It is the job of this level to derive spatial models for the possible situations arising from the information processing of Semantic- and Conceptual levels. In our example, a linguistic expression with a single (abstract) path may require several separate paths at the spatial level.

Note that one key point in Nikanne’s proposal is that due to the filtering function of the Conceptual Level Semantic and Spatial level do not influence each other directly. We consider that proposal a desirable approach, since it promises to ensure a modular and encapsulated processing of both linguistic (i.e. general) and spatial (i.e. situational) information and to model information interaction via interfaces and inheritance processes. And, the strongest argument in favour of the three-level model, the lexical representation will be simpler due to shared responsibilities and avoidance of duplication of information among the levels.

In the next section, we develop these ideas towards an implementation in a formal framework. We will first define and describe the three levels we will use, then define interfaces between them as mapping functions, then infer a suitable architecture of lexical verb entries, and in the end come back to the case study described above in order to test the new framework.

4 The three-level model, formalized

Assuming the need of a third modelling level, and motivated by Nikanne’s statement, we will propose some basic architectural issues of a three-level framework, keeping in mind the key features that information will be distributed among levels, duplication of information across levels will be minimized, and interfaces between the levels generate interaction – which will lead, altogether and due to specialization, to more simple lexical entries (both semantic and conceptual).

4.1 The levels

Semantic and Conceptual Levels. We distinguish the Semantic Level, the Conceptual Level and the $\sigma$- (Simulated World-) Level. On the Semantic level, relations among sentence participants are modelled compositionally (via structures accounted for by syntax): The verb selects arguments and builds relations between referents, while adjectives and adverbs modify parts of this structure. Each word has a (generalized) lexicalized meaning which will be part of the sentence meaning. On the Conceptual Level, conceptual knowledge about the relations and the referents used is encoded. For example, the conceptual knowledge of a PATH comprises that it has a GOAL, a VIA and a SOURCE information.
Parallel to the semantic composition process, the conceptual knowledge of the situation will be updated – in the Path example, PLACES will be identified with GOAL, VIA or SOURCE.

The Simulated World Level. The third level is the Simulated World (σ-) Level. Its contribution is to simulate the relations between referents in a model, a process initialized by the Conceptual Level, which provides prestructured conceptual information as input. The σ-Level knows about settings in the real world – like the structure of space and time, physical laws like gravitation. Given conceptual knowledge of a potential situation, it proposes possible configurations and sends back a judgement of how situations described by a sentence fit into the reality the sentence producer is talking about (e.g. real world, space, fictive worlds, etc.). Note that unlike the other levels this level is not a level that provides data on objects and events, but rather specializes in inferring consequences following from relations between them. Its only ability is to ‘know’ real world’s general settings. In a linguistic analysis, the its only concern will be the judgement if a sentence will make any sense in terms of the situation it describes and the environment the situation is expected to live in. However, given a framework interested in implementing events in real world – presumably a concern of AI research – this level can be used as an efficient interface to linguistic analysis.

Going back to the example of encoding motion verbs and situations, one (but not the only) crucial point is physical knowledge about space, objects, paths, gravitation, and so forth. In order to explain what is going on on these levels, we will build a fragment of a framework which will be able to deal with klettern and steigen situations. Let us start with some definitions.

Definition 2 (σ-world, σPoS, NEIGHBOUR(x_i, x_j)) The σ-world is a model of a situation in the real world of this, where all influences of known forces and other known effects (physical forces, social influences) are taken into account. The set σPoS = {p_i ∈ 3dimensional Euclidean Space} is the set of all ‘points of simulated space’. These points make up the σ-world. The position of the object in real world is mapped on point positions, where each object conceptually represented in a situation gets its place and role. Furthermore, let NEIGHBOUR(x_i, x_j) be a topological neighbourhood relation.

Definition 3 (σ-Path) A Path in the σ-world is a chain of points, two of which are designated as source and goal:

\[
\text{PATH} = \{x_i \in \text{PoS}, i \in [0..1] : \text{NEIGHBOUR}(x_i, x_j) \& \text{NEIGHBOUR}(x_j, x_k) \text{ iff } i < j < k, x_0 = \text{‘source’}, x_1 = \text{‘goal’} \}. 
\]

Note. It is not trivial to define direction: its basic definition would be a vector. But, the definition of the direction of a path is ambiguous: Since a path is defined as a set of points, each pair of points describes a vector. Vectors between neighbours as well as the vector from source to goal are candidates for specification of direction.\(^2\) On the conceptual level, the same ambiguity can be found: What is the direction of a crisscross path? Is it ‘criss-cross’? Or is it defined inherently via turn left, than right, then . . .’, or is

\(^2\)One might define the first as local and the second as global direction.
it defined globally as ‘from $a$ to $b$, not mentioning the detours? Due to space limitations in this paper further details of this discussion are left out here.

**Note.** A path can have even more features. A curved path, for example, may have a radius and a middle point.

### 4.2 The interfaces

The task of the $\sigma$ level is to build physical models of the situation, according to the knowledge provided by semantic and conceptual levels, in order to judge for physical (im)possibility of a situation described in the actual world settings. The procedure is as follows: In a first step, information about paths and things etc. is mapped from the conceptual level to $\sigma$ level, using the function $\text{PoT}$.

**Definition 4 (PoT)** 

The function $\text{PoT}$ assigns to a thing $a \in \text{THING}$ (in the conceptual level) a set of points $\text{PoT}(a) \subset \text{POS}$ (‘points of thing’, in the $\sigma$ level) such that $\text{PoT}(a)$ is a model of $a$ in that it has identical shape and measure relations.

Since conceptual knowledge does not offer all the information $\text{PoT}$ needs to build a model, further knowledge has to be retrieved (be it from world knowledge, from looking at referents, or wherever else). This is exactly where impossible situations are filtered out. Imagine the processing of a sentence like *Peter climbed onto the cloud*. As soon $\text{PoT}$ has built a model of a cloud and tries to fix the points of the path on it, the consistency of the cloud interferes and creates a contradiction. In a third step, the information that it is not possible to fix a path on a cloud such that an object can stand on it having contact to the ground is passed back via the conceptual level to the semantic level and creates the ‘semantic oddness marks’ (‘??’) as output. Note that there is no transitivity in that mapping, which means that each step has to be performed separately.

In order to deal with examples like *cloud*, the notion of a *surface* offers an interface to conceptual knowledge about objects:

**Definition 5 (surface)** 

The set $\text{SURFACE}(a)$ denotes the points that physically form the surface of thing $a$:

$$\text{SURFACE}(a) = \{ x \in \text{PoT}(a) : \exists y \in \text{PoT}(a), \exists z \notin \text{PoT}(a) (\text{NEIGHBOUR}(x, y) \land \text{NEIGHBOUR}(x, z)) \}$$

A thing $a$ has a defined shape iff

$$\forall p \in \text{SURFACE}(a) \text{ most' } q (\text{NEIGHBOUR}(p, q) \Rightarrow q \in \text{SURFACE}(a)).$$

Note that, for example, with *cloud* the model $\text{PoT}$ will still consist of a defined number of points, but there will be no contiguous surface. In such cases we will need the set $\text{BOUNDING BOX}$, which can be defined like that:

$$\forall p \in \text{PoT}(a) : \text{INSIDE}(p, \text{BOUNDING BOX}(a)).$$

After having defined the levels and some interfaces, we are able to define the core parts of the framework: the information units, namely the concrete bits of information stored in the lexicon.
4.3 Towards a lexical entry

There are two kinds of information units which are both stored in lexicon: \textit{lexical entries}, and \textit{conceptual knowledge modules}. For the sake of an efficient design of the lexical entries (p. 6), one of our goals is to strictly avoid redundancy. Every piece of information is stored in only one place. We will present this in our toy scenario for \textit{klettern / steigen}.

\textbf{Lexical entries, conceptual knowledge modules.} In the above discussion, we raised the questions if, first, there is a more general means of representation that can replace the feature pair ‘upward’ and ‘clambering’ that did not work out in all situations, second, whether situational knowledge can be made use of, and, third, whether this can lead to a core meaning architecture from which possible readings are derived due to several kind of knowledge.

We now list the lexical entries (in square brackets notation and with lambda variables) and the conceptual knowledge modules (in square boxes notation, partially formal). To start with, three verb entries, cf. (14):

\begin{align*}
(14) & \quad \lambda P \lambda x \left[ \begin{array}{c}
\text{gehen} \\
\text{Go}(x, P)
\end{array} \right] \quad \lambda P \lambda x \left[ \begin{array}{c}
\text{steigen} \\
\text{Go}(x, P) \\
P : \text{HDP}
\end{array} \right] \quad \lambda P \lambda x \left[ \begin{array}{c}
\text{klettern} \\
\text{Go}(x, P) \\
\text{MANNER} : \text{CLAMBERING}
\end{array} \right]
\end{align*}

In this information processing, the verb entries in (14) access the conceptual knowledge modules in (15b) and (15b):

\begin{align*}
(15) & \quad \text{Go}(x, P): \\
& \quad x : \text{MOVABLE} \\
& \quad P : \text{PATH} \\
& \quad \text{“apply } x\text{’s default movement pattern } \Rightarrow \text{ linearly change } x\text{’s position in the order given by } P." \\
\text{a.} & \quad \text{NTP (NONTRIVIAL PATH)} \\
& \quad \text{– RP} (\text{RARE PLACES PATH}) \\
& \quad \text{– HD} (\text{HEIGHT DIFFERENCE PATH}): \text{going up by default.}
\end{align*}

In (15b), both \text{RARE PLACES PATH} and \text{HEIGHT DIFFERENCE PATH} are different kinds of \text{NONTRIVIAL PATHS}, the first one defined via \text{PLACE}="where an object can stand in its normal standing position” and the second using measuring distances in absolute height.

In (16) the ‘reach the top’ feature of \textit{besteigen} is made necessary part via the unification of the \text{PATH’s goal} with \textit{y.OUTSTANDING PLACE}, which is the uppermost place of the object \textit{y} one can stand on.

\begin{align*}
(16) & \quad \lambda y \lambda x \left[ \begin{array}{c}
\text{besteigen} \\
\text{Go}(x, P) \\
\text{P : HDP} \\
y : \text{SOLID OBJECT} \\
P . \text{GOAL} = y . \text{OUTSTANDING PLACE}
\end{array} \right]
\end{align*}

Finally, we are able to give a lexical entry for \textit{climb} (17), which is a kind of unification of the entries proposed for the German equivalents:
WHERE LEXICAL SEMANTICS MEETS SPATIAL DESCRIPTION:  
A FRAMEWORK FOR 'KLETTERN' AND 'STEIGEN'

\[
(\lambda P/\lambda y) \lambda x \begin{bmatrix}
\text{climb} \\
\text{GO}(x, P) \\
P : \text{NTP} \\
P.\text{GOAL} = y.\text{OUTSTANDINGPLACE}
\end{bmatrix}
\]

Choose the right features. In order to check if these lexical entries meet our intuition, let us track some features we would expect to play a role in the representation of the MANNER-PATH-verbs klettern and steigen – cf. table 1:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'movement'</td>
<td>definition of \text{GO}(x, P)</td>
</tr>
<tr>
<td>'upward'</td>
<td>conceptually encoded in the PATH constraints</td>
</tr>
<tr>
<td>'to the top' (in resultatives only)</td>
<td>(1) \text{GO}(x, P) ⇒ \text{reach P.GOAL} if \text{P.bounded} (telic) (Zwarts 2004) ∧ (2) \text{P.GOAL} = y.\text{OUTSTANDINGPLACE} ∧ (3) conceptual definition of \text{OUTSTANDINGPLACE}.</td>
</tr>
<tr>
<td>'manner'</td>
<td>explicit in klettern, follows from \text{SHAPE}(P) in other cases.</td>
</tr>
<tr>
<td>'surface and contact'</td>
<td>definition of \text{GO}(X,P) together with type of \text{x} \rightarrow manner.</td>
</tr>
</tbody>
</table>

4.4 Applications

In order to test the proposed bits of information, we will now discuss a few example cases.

(18) ??Der Affe steigt. (the monkey is climbing (go up).)

In (18), \text{x} is of type \text{ANIMATEOBJECT}. Therefore ‘\text{GO}(x, P)’, links to conceptual knowledge about moving objects (like ‘\text{repeat}\left(\text{STANDON(PLACE \subset PATH)}\right)’). It follows that \text{CONTACT} is required – but there is no PATH in (18). Therefore, the sentence is not valid.

In (19) the ‘\text{MANNER} : clambering’ doesn’t fit the non-animate object.

(19) ??Das Flugzeug klettert. (the plane is climbing (clamber)).

Adding PPs. In all cases, the PP \text{P} introduces a PATH – the information \text{PATH.GOAL} := \text{PLACE(P.GOAL)} is added. In (20b) \text{auf} links to being on a \text{PLACE} and having \text{CONTACT}. This is impossible since there is no solid surface. The case is different in (20c). In (20d) the definition of \text{PLACE} as horizontal solid area to stand on contradicts the fact that the wall is completely vertical. This is a case where the \text{σ}-level finds the contradiction.

(20) a. Peter steigt / klettert auf den Berg. (Peter is climbing the mountain.)
    b. ?? Das Flugzeug steigt auf die Wolken. (The plane is climbing onto the clouds.)
    c. Das Flugzeug steigt über die Wolken. (The plane is climbing to over the clouds.)
    d. ??Die Fliege steigt die Wand hoch. (The fly is climbing (going up) the wall.)

Other directions. Since it is conceptually encoded that most subjects need contact to the ground (‘\text{x} : \text{ANIMATEOBJECT} \rightarrow \exists y \in \text{SOLID.THING} : \text{PATH \subset SURFACE(y)}’),
the path has to adapt in shape. Consider the following examples:

(21) a. Peter steigt / klettert der Dachrinne entlang.
   (Peter is climbing the eaves gutter along.)
   b. \( \forall \text{ segment } \subset \text{ PATH} : \text{ segment } \subset \text{ SURFACE}(y) \) \( (y : \text{ SOLID. OBJECT}) \)

(22) a. Peter steigt / klettert [vom Dach herunter].
   (Peter is climbing from-the roof down.)
   b. PATH.GOAL := PLACE(P.GOAL)

(23) a. Peter steigt / klettert über den [Zaun].
   (Peter is climbing over the fence.)
   b. PATH.GOAL := PLACE(RELBEHIND(y))
   \( \land \exists \text{ segment } \subset \text{ Path} : \text{ OVER}(\text{segment, BBOX}(x)) \)

Other objects

(24) ??Das U-Boot steigt nach unten.
   (The submarine is climbing to down.)

In (24), the submarine is freely floating without contact. The default feature ‘upward’ of the PATH cannot be deleted, since there is no object the path can adapt to. This fact, however, contradicts the PP meaning to down.

5 Conclusion

Analyzing the MANNER-PATH-verbs klettern and steigen in a case study, we found that there are situations in which knowledge available on the semantic and conceptual level is not enough to judge sentences describing situations. Therefore, we proposed a three-level division of representational knowledge into semantical, conceptual, and \( \sigma \) (simulated) level. Aiming at avoiding redundancies, this led to very simple lexical entries (and even a core meaning architecture), that access ‘conceptual knowledge modules’ when processing representational information. The retrieved information is checked by the \( \sigma \)-level, which may return ‘contradiction alarm’ in case the situation modelled does not fit physical reality in the world settings the situation lives in.

The framework we propose is different from frameworks proposed so far for MANNER-PATH-verbs in various respects. Its main goal is to derive information from the interplay between MANNER- and PATH-information and from the types of the objects involved. It uses conceptual and world knowledge, but keeps that information separate, which leads to small lexical verb entries. In contrast to Jackendoff (1985)’s analysis, our theory avoids family resemblance structure – it instead changes parts of the lexical entry depending on information provided by the objects. Technically, our framework uses formalizations of spatial representation, and in particular, the notion of PATH.

In a nutshell, what we want to argue for is not to exclude conceptual and world knowledge when doing lexical semantics but rather use their different architectures and viewpoints on information in order to make both linguistic representation and flow of information more efficient.
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DEGENERATE PLURALS*

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Abstract

We argue that the wh-mo construction in Japanese should be analyzed as an i-sum denoting degenerate plural, distinct from group denoting true plurals and from universal quantifiers. Universal quantification-like behavior we derive from an optional distributive operator that can occur with plurals as well as with wh-mo expressions. The optionality of this operator makes it possible to account for quantificational variability in examples containing adverbs of quantification as well.

1 Introduction

Japanese has a quantification-like construction in which a wh-expression can be associated long-distance with the particle mo. This construction is illustrated in (1).

(1) [DP[CP Dono-gakusei-ga  tj kai-ta] ronbun j]-moi omoshiro-katta
     which-student-NOM write-past paper-MO interesting-past
     ‘Whichever student wrote a paper, it was interesting’

As the gloss suggests, the interpretation associated with this construction is related to English expressions with wh+ever, though the connection is loose in several ways. For starters, while mo can be syntactically separated from the wh expression it associates with in Japanese, in English wh and ever form a single lexical item that cannot be split. The semantic interpretations associated with these expressions differ in important ways as a result of this morphological distinction. In English, the semantic scope of ever can extend to an NP argument of wh+ever and a relative clause, as in the expression whatever student wrote a paper. This can be seen in the fact that the referent of the expression is taken from among the set of students who wrote a paper, and not simply from the set of students. Corrective contexts aside, however, the scope of ever cannot easily extend to a higher DP. Thus the expression the paper that whichever student wrote can only be given a pragmatically unrealistic interpretation, presupposing that there is one jointly authored paper which any student you pick has contributed to and referring to that paper. The semantic scope of ever in this case is the set of students, and cannot be extended to

* This research has benefited from discussions with audiences at the Sinn and Bedeutung conference, the York conference on Strategies of Quantification, Princeton University, the University of Maryland, and the University of Tokyo, to all of whom we express our thanks.
the set of papers that the students wrote. The Japanese wh-mo expression dono-gakusei-ga kaita ronbun-mo in (1) has the exact opposite properties from its English counterpart. The Japanese DP can only be given an interpretation in which the semantic scope of mo is over the entire DP, typically giving rise to a distributive type of interpretation in which for every student x who wrote a paper reference is made to the paper that x wrote. It cannot be interpreted as referring to a single paper that is presupposed to be multiply authored by a group of students. That is, the semantic scope of mo cannot be restricted to the wh-expression dono-gakusei (which student), but rather must extend to the entire DP to which it is adjoined.

In this paper we are interested first in the question of how to generate the universal quantificational force typically associated with the wh-mo construction. Analyses of the construction by von Stechow (1996), Shimoyama (2001), Kratzer and Shimoyama (2002) and Tancredi and Yamashina (2002) all analyze mo as denoting a universal quantifier as part of its lexical semantic interpretation. However, such an analysis cannot make room for the fact that the universal force can be overridden by adverbs of quantification, a fact first noted in Nishigauchi (1986). We argue that the universal force should be seen as coming from the optional occurrence of a distributive plural operator. However, we show that wh-mo interpretation cannot be reduced to plural interpretation since wh-mo expressions fail to exhibit several typical plural behaviors. To account for the semi-plural character of the construction, we then propose that wh-mo expressions denote i-sums, but that plurals underlyingly denote groups.

We develop our analysis of the wh-mo construction based loosely on Shimoyama (2001). In section 2 we briefly review Shimoyama's analysis. Then in section 3 we show three basic problems that her analysis cannot handle and propose modifications to overcome them. In section 4 we then address the question of how to account for both the plural-like and the quantification-like behavior of wh-mo expressions while still distinguishing them both from true plurals and from quantifiers. Section 5 contains a conclusion, and section 6 an appendix in which the formal analysis argued for is spelled out in detail.

2 Shimoyama (2001)

Shimoyama (2001) analyzes wh-expressions as restricted variables. At LF, wh-expressions are assumed to be in an IP adjoined position and coindexed with an operator that occurs in the immediate scope of mo, as in (2) for example (1).

(2) [[IP Dono-gakusei-ga [IP ti kai-ta]] ronbun Op]-mo omoshiro-katta

The operator forms a set of interpretations from its sister as follows. The wh-expression is analyzed as a restricted variable, with the restriction contributed by the internal argument of the wh-expression itself, i.e. gakusei (student). Formally this restriction is analyzed as the proposition that the referent assigned to a variable x has the property of being a student. This proposition is conjoined with that denoted by the IP, which itself serves as a separate restriction on the variable contributed by the trace of the wh-expression. The relative clause containing this IP modifies the head noun ronbun (paper), with the DP as a whole given an existential quantifier interpretation.\(^1\) The operator

\(^1\) The DP could also be definite, as noted by Shimoyama, though we gloss over this possibility here.
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collects together all such existential quantifier interpretations that can be generated by substituting individuals in place of the original wh-variable. This set is universally quantified over by \( mo \) and the resulting quantification is applied to the main predicate of the sentence, here \( omoshirokatta \) (was interesting). The interpretations Shimoyama gives for \( Op \) and \( mo \) are given in (3) and (4) and their formal application is illustrated in (5) for the LF in (2).

(3) \( \llbracket XP \, Op_{1,...,n} \rrbracket g = \{ \llbracket XP \rrbracket g' : g' \approx_{1,...,n} g \} \)

(4) \( \llbracket mo \rrbracket = \lambda P \lambda Q. \forall X[P(X) \rightarrow Q(X)], \text{ where } X \in D_t \text{ and } P, Q \in D_{<t,t>} \).

(5) \begin{align*}
\llbracket [[[IP Dono-gakusei-ga [IP ti kai-ta]] ronbun Op_i]] \rrbracket g \\
= \{ \lambda P. \lambda Q. \forall X[P(X) \rightarrow Q(X)] : g' \approx_1 g \}
\end{align*}

\begin{align*}
= \{ \lambda P. \exists x[\text{paper}(x) \& \text{student}(g'(z)) \& \text{wrote}(g'(z), x) \& P(x)] , \\
\lambda P. \exists x[\text{paper}(x) \& \text{student}(a) \& \text{wrote}(a, x) \& P(x)] , \\
\lambda P. \exists x[\text{paper}(x) \& \text{student}(b) \& \text{wrote}(b, x) \& P(x)] , \\
\lambda P. \exists x[\text{paper}(x) \& \text{student}(c) \& \text{wrote}(c, x) \& P(x)] , \\
\ldots \}
\end{align*}

\( = \mathbf{A} \)

\( \llbracket [[[IP Dono-gakusei-ga [IP ti kai-ta]] ronbun Op_i]-mo omoshiro-katta] \rrbracket g \\
= \llbracket mo \rrbracket g (\llbracket [[[IP Dono-gakusei-ga [IP ti kai-ta]] ronbun Op_i]] \rrbracket g) \\
= \forall X [X \in A \rightarrow X(\lambda x. \text{interesting}(x))] \)

The final formula in (5) says that every existential quantifier meaning in \( A \) applies truthfully to the predicate \( (\lambda x. \text{interesting}(x)) \). The sentence is thus predicted to be true just in case \( a \) is a student and there is a paper that \( a \) wrote that was interesting, \( b \) is a student and there was a paper that \( b \) wrote that was interesting, etc., for all individuals \( a, b, \ldots \) in the universe of discourse.

3 Problems for Shimoyama

In this section we identify and propose solutions for three problems with Shimoyama's analysis. These problems derive from an incorrect analysis for the restriction of wh-variables, unexplainable blocking effects on the wh-\( mo \) association from strong quantifiers, and unexpected quantificational variability with adverbs of quantification.

3.1 Restricting the Domain of Quantification

The first problem with Shimoyama's analysis lies in her treatment of restrictions on the wh-variable. Shimoyama treats these restrictions as part of the assertion, thus taking \( \text{student}(g'(z)) \) and \( \text{wrote}(g'(z), x) \) in (5) to be assertions about the individual assigned by the variable assignment function \( g' \) to the variable \( z \). For (1), however, this makes for truth conditions that are impossible to satisfy in any non-empty universe. For the first

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\( \llbracket \text{omoshirokatta} \rrbracket \) is type-shifted into an \( <<<et>,t>,t> \) type expression. We take the relevant interpretation to be \( \lambda \varphi \in D_{<e,t,t>} \varphi (\lambda x. \text{interesting}(x)) \).

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expression listed in the set produced by the operator to apply truthfully to the predicate $(\lambda x.\text{interesting}(x))$, it is necessary that $a$ be a student, and that $a$ wrote an interesting paper. This means that the universe will need to contain both $a$ and an interesting paper written by $a$. Suppose that this paper is $d$. Then since $d$ is also an individual in the universe of discourse, there will be some interpretation in $A$ of the form $\lambda P. \exists x [\text{paper}(x) \& \text{student}(d) \& \text{wrote}(d,x) \& P(x)]$. This is so since $mo$, by quantifying over every variable assignment $g'$ that differs at most from $g$ in the values it assigns to variables contributed by $wh$-expressions, effectively quantifies over all individuals in the universe, and not only over students. However, since $d$ is not a student, the existential quantifier interpretation just given cannot possibly apply truthfully to $(\lambda x.\text{interesting}(x))$.

This problem can be avoided by analyzing the restrictions on the $wh$-variable as presuppositions rather than as parts of the assertion. We implement this idea by analyzing $wh$-expressions not as individual variables but as choice function variables applied to the internal (often implicit) argument of the $wh$-expression. Applied to a given set, a choice function selects a member of that set. If the original set consists only of students, then the individual selected is guaranteed to be a student as well. However, the fact that the selected individual is a student does not thereby become part of the assertion. This analysis makes it possible to interpret $wh$-expressions either in the IP-joined position in which Shimoyama locates them or in situ. With this modification, the set generated by $Op$ in (2) will be the following, with $f_1$ a choice function variable:

$$(6) \quad \{ \lambda P. \exists x [\text{paper}(x) \& \text{wrote}(g'(f_1)(\text{student}), x) \& P(x)] : g' \approx^{1, \ldots, n} g \}$$

As the reader can verify, the fact that there are individuals in the universe of discourse that are not students has no undesired consequences under this analysis.

3.2 Blocking Effect of Strong Quantifiers

A second problem for Shimoyama’s analysis is that it fails to distinguish strong quantifiers from weak quantifiers. As seen in (7), these two classes of quantifiers behave differently in wh-mo sentences.

$$(7) \quad \begin{align*}
\text{a. } & \quad [[ \text{Dono-gakusei-ga} \ \varepsilon_i \ \text{kai-ta}] \ \text{ronbun-i-mo omoshiro-katta} \\
& \quad \text{which-student-NOM write-past paper-MO interesting-past} \\
& \quad \text{‘Whichever student wrote a paper, it was interesting’} \\
\text{b. } & \quad [[ \text{Dono-gakusei-ga} \ \varepsilon_i \ \text{kai-ta}] \ \text{mittu-no-ronbun-i-mo omoshiro-katta} \\
& \quad \text{which-student-NOM write-past 3-GEN-paper-MO interesting-past} \\
& \quad \text{‘For every x who wrote papers, 3 papers x wrote were interesting’}
\end{align*}$$

3 A Hamblin semantics such as that used in Kratzer and Shimoyama (2002) would serve our purposes equally well here. Our choice to employ choice functions comes in part from our not yet seeing a clear argument in favor of one of the approaches to $wh$ interpretation over the other.

4 There will of course be choice functions which do not have the set of students in their domain and hence which will give an undefined result when applied to that set. We assume that in such cases no interpretation for the DP gets generated at all, making the existence of such choice functions innocuous.
c. *[[Dono-gakusei-ga e_i kai-ta] subete-no-ronbun]-mo omoshiro-katta
   which-student-NOM write-past all-GEN-paper-MO interesting-past
   ‘For every x who wrote papers, all papers x wrote were interesting’

d. *[[Dono-gakusei-ga e_i kai-ta] hotondo-no-ronbun]-mo omoshiro-katta
   which-student-NOM write-past most-GEN-paper-MO interesting-past
   ‘For every x who wrote papers, most papers x wrote were interesting’

Strong quantifiers like subete (all) or hotondo (most) block the association between a wh-
expression and mo, while weak quantifiers like mittu (three) and the covert indefinite
determiner do not. Under Shimoyama’s analysis, however, there is no reason to expect
this difference in behavior. It could, of course, be stipulated that strong quantifiers make it
impossible to copy the index of a wh-expression onto the operator below mo. However, such a stipulation would be ad hoc. Our solution to this problem is to add to mo the presupposition that the set it quantifies over must consist only of individuals.\(^5\) This solution requires re-analyzing indefinites as referring expressions, an analysis
worked out and defended in Tancredi and Yamashina (in preparation), and given in the
form of the semantics for the indefinite determiner in (8).\(^6\)

\[(8) \quad [[D_{	ext{indef.}}]] = \lambda P. f(P)(w)\]

The intensional choice function variable f in (8) is assumed to be bound by existential
closure. With this change in place, the set generated by the operator for an example like
(7a) will consist of papers written by students, one paper per student. (7b) will be similar,
with the sole difference that there will be a plurality of three papers per student rather
than only one. The examples in (7c,d) cannot be interpreted under this proposal, however, because there is no way of giving a referential analysis of the strong quantifiers,
and hence no way of generating a set of individuals for mo to quantify over.

### 3.3 Over-riding the Universal Nature of Mo

The third problem for Shimoyama's analysis is that it predicts that mo should always be
associated with a universal quantification interpretation. However, when adverbs of
quantification are added to a sentence like (1) they give rise to quantificational variability
effects, a fact already noted in Nishigauchi (1986) and illustrated in (9).

\[(9) \quad \text{Dono-gakusei-ga kai-ta ronbun-mo taitei omoshiro-katta}
   \quad \text{which-student-NOM write-past paper-MO mostly interesting-past}
   \quad \text{‘Papers that whichever student wrote were mostly interesting’}\]

This sentence has one interpretation in which the wh-mo expression is given a universal
quantificational interpretation. On this interpretation the sentence entails that for
everyone who wrote papers, most of their papers are interesting. However, it also has

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\(^5\) Essentially this same proposal was made in Kratzer and Shimoyama (2002) as well, though for reasons
left unspecified.

\(^6\) The variation comes from our using the Hamblin semantics framework of Kratzer and Shimoyama
(2002) in that paper but not here.
another interpretation in which it entails that for most of the people who wrote a paper, a/the paper they wrote was interesting. This latter interpretation fails to have any universal quantification associated with mo. This behavior of wh-mo expressions differs strongly from that found with overt universal quantifiers as in (10) below, where the universal quantification disallows a quantificational variability interpretation induced by the adverb.

(10) Subete-no ronbun-ga taitei omoshiro-katta
   ‘Every paper was mostly interesting’

As with its English interpretation, the sentence in (10) can only mean that each paper had the property of being mostly interesting, and not that most of the papers had the property of being interesting.

A related problem shows up with examples like (11), where once again a universal quantificational interpretation would appear to be inappropriate.7

(11) [[[ t_1 Dono-kyoku-o i hiita] sorisuto]-moi] (ensoukai-no ato-de) atsumatta.
   ‘Soloists who played whatever piece gathered (after the recital)’

Under Shimoyama’s analysis, the verb atsumatta (gathered) should be required to apply separately to interpretations of the form [the x: soloist(x) & played(x,a)], with different such interpretations generated by substituting different musical pieces in place of a. Thus in an appropriate context, the sentence is predicted to imply that the people who played Chopin’s first ballade gathered, the people who played Liszt’s Spanish Rhapsody gathered, and the people who Bach’s Italian Concerto gathered, for a total of three separate gatherings. While such an interpretation is available, there is also another interpretation in which (11) is true if all soloists gathered together in a single gathering regardless of what piece they played. This is clearest in a situation in which each piece under consideration was played by exactly one person, as in a typical recital. In such a circumstance, the reading produced by Shimoyama would be predicted to be infelicitous, since it would entail that each person who played a piece gathered, and one person cannot gather. The sentence is still acceptable in this circumstance, however, suggesting that it is possible to interpret this sentence in such a way that mo does not introduce a universal quantifier into the interpretation.

The easiest way around the above two problems is to adopt a suggestion of Nishigauchi’s (1986) and assume that mo is not itself a universal quantifier but is rather associated by default with a covert universal quantifier. Implementing this change directly within Shimoyama’s analysis would leave mo vacuous. However, if mo is reanalyzed as taking over the function that Op has in her analysis, this problem is at least partially resolved.

7 More accurately, a non-plural universal quantificational interpretation is inappropriate. See example (20) below and the surrounding discussion. Technically, this example leaves open the possibility of analyzing wh-mo expressions as plural universal quantifiers. However, since subete-no N also falls into this category of plural quantifier and yet contrasts with wh-mo expressions with respect to quantificational variability, this alternative is unable to solve all of the problems examined in the present paper.
Our third modification to Shimoyama's analysis is thus to analyze *mo* as taking over the function of Shimoyama's set forming operator, and combining *mo*-phrases with a covert universally quantifying operator. Nishigauchi proposed that the operator in question is a covert adverb of quantification. In the next section, we will suggest instead that it is the covert distributive operator that can occur with plural expressions.

Summarizing at this intermediate point, we have argued for the following changes to Shimoyama's original proposal: (i) *mo* has the functions of Shimoyama's set forming operator; (ii) the universal quantification associated with *mo* comes from a covert operator and can only operate over individuals, not over quantifier meanings; and (iii) in generating individuals from a DP, *wh*-expressions introduce individuals presupposed to satisfy the lexical restrictions of the *wh*-expression, these presuppositions deriving from a choice function analysis of the *wh*-expressions.

### 4 Wh-mo and Plurals

The analysis we have come to through revisions to Shimoyama (2001) is in many respects adequate as it stands. However, the analysis does not yet fully address the question of how to relate *wh-mo* interpretations to the interpretations of plurals and quantifiers. In this section we argue that *wh-mo* interpretation should be both connected to and distinguished from full-fledged plurality. We saw in section 3.3 two types of examples in which a *wh-mo* expression does not have an obvious universal quantificational interpretation. In the first example the quantificational force associated with the *mo*-phrase was determined by an adverb of quantification. In the second, the *mo*-phrase combined with the verb *atsumaru* (gather) without any apparent quantification. Both of these behaviors are found also with simple plural expressions, hence forming the intuitive basis for a connection between *wh-mo* expressions and plurals. We thus begin by examining the hypothesis that *wh-mo* interpretation is identical to plural interpretation.

#### 4.1 The Wh-mo = Plural Hypothesis

A plural analysis of *wh-mo* expressions receives some support from the observation that just like *wh-mo* expressions, plurals give rise to quantificational variability effects with adverbs of quantification and can co-occur with predicates like *atsumaru* (gather), as seen in (12) and (13) below.

(12) Korera-no ronbun-wa taitei omoshiro-katta
    These-GEN paper-TOP usually interesting-past
    These papers were usually interesting
    (‘Each of these paper was mostly interesting’ OR
     ‘Most of these papers were interesting’)

(13) Sorisuto-tachi-ga (ensoukai-no ato-de) atsumatta.
    Soloist-pl.-NOM recital-GEN after gathered
    ‘(The) Soloists gathered (after the recital)’
However, wh-
mo expressions lack cumulative readings (14), Scha readings (15) and group responsibility readings (16) available for standard plurals. (14a), with true plurals, has a reading according to which the total number of companies involved in computer making is three and the total number of computers made is 6000. The sentence is true on this reading if each of three companies made 2000 computers. The availability of such a reading is a hallmark of plural interpretation (cf. Scha 1981, Link 1983). (14b), containing a wh-
mo expression in place of the first plural, is false in this same situation, however. (14b) can only be true if each of the companies that someone visited made 6000 computers.

\[(14) \begin{align*}
a. & \text{San-sha-no kaisha-ga 6000-dai-no konpyuta-o tukutta} \\
& \text{three-count-GEN company-NOM 6000-count-GEN computer-ACC made} \\
& \text{‘Three companies made 6000 computers’} \\
b. & \text{#Dare-ga tazuneta kaisha-mo 6000-dai-no konpyuta-o tukutta} \\
& \text{who-NOM visited company-mo 6000-count-GEN computer-ACC made} \\
& \text{‘The company that whoever visited made 6000 computers’}
\end{align*}\]

Another place where plurals exhibit unique behavior is in examples like (15a), based on similar examples in Scha (1981). The sentence is easily judged to be true of the figures drawn below when demonstratively referring to all four sides of each figure, despite the fact that not every side of figure A is parallel with every side of figure B. It suffices that every side of figure A is parallel with some side of figure B and vice versa. For the sentence in (15b) in which the plurals from (15a) are replaced by wh-
mo expressions, however, similar facts do not obtain. Assuming for example that each side of the two figures was drawn by a different person, (15b) is false of the two figures in question. It would only be true in a situation in which all sides of the one figure were parallel to all sides of the other (and hence also parallel to one another).

\[(15) \begin{align*}
a. & \text{Zu-A-no korera-no hen-wa zu-B-no korera-no hen-to} \\
& \text{figure-A-GEN these-GEN side-TOP figure-B-GEN these-GEN side-with} \\
& \text{heikou de-aru parallel COP} \\
& \text{‘These sides of figure A are parallel with these sides of figure B’} \\
b. & \text{#Zu-A-no dare-ga kaita hen-mo zu-B-no korera-no} \\
& \text{figure-A-GEN who-NOM drew side-MO figure-B-GEN these-GEN} \\
& \text{hen-to heikou de-aru} \\
& \text{side-with parallel COP} \\
& \text{‘The sides of figure A that whoever drew are parallel with these sides of} \\
& \text{figure B’}
\end{align*}\]

Finally, in (16a) we see a type of case from Landman (1996) in which a thematic relation appears to apply to a group rather than to individuals within the group, which once again is a hallmark of plural interpretation. The sentence is judged to be true if the students act
together to reach the ceiling, e.g. by making a human pyramid so the top person can make physical contact with the ceiling. Such a situation can be understood as one in which the group of students as a whole touches the ceiling, hence as one in which the subject thematic role of the predicate applies to the group and not to the individuals within it. Once again we find that the wh-mo example is false in this same situation and hence cannot be interpreted as a plural. For the sentence in (16b) to be true, each individual student needs to make physical contact with the ceiling separately.

Student-pl-NOM ceiling-DAT touch-past  
‘The students touched the ceiling’

b. #Nani-o yatte-ita gakusei-mo tenjo-ni sawat-ta.  
What-ACC doing-were student-mo ceiling-DAT touch-past  
‘The student(s) who had been doing whatever touched the ceiling’

Further indication that wh-mo expressions are not true plurals comes from a contrast in their behavior with different inherently plural predicates. While atsumaru is clearly a candidate for an inherently plural predicate, we find that not all such candidates behave alike with respect to wh-mo expressions. In particular, while predicates composed with the adverb issho-ni (together) pattern with atsumaru in taking either a true plural or a wh-mo expression as seen in (17), on its most prominent reading the subject of wa-ni naru (form a circle) can only be a plural, and not a wh-mo expression, as seen in (18).

(17) a. Korera-no kyaku-ga issho-ni suwatta  
These-GEN guest-NOM together-DAT sat  
‘These guests sat together.’

b. Nani-o tabeta kyaku-mo issho-ni suwatta  
what-ACC ate guest-MO together-DAT sat  
‘The guests that ate whatever sat together’

(18) a. Korera-no ishi-ga wa-ni nat-ta  
these-GEN stone-NOM circle-DAT become-past  
‘These stones formed a circle’

b. #Dare-ga nageta ishi-mo wa-ni natta  
who-NOM threw stone-mo circle-DAT become-past  
‘The stone that whoever threw formed a circle’

In (17a) the subject is a plural and in (17b) it is a wh-mo expression, but both are equally acceptable and can be given parallel interpretations. The sentences in (18) are to be considered in a situation in which 10 people threw one stone each, and the 10 stones that they threw happened to land in a circular formation. (18a) is an acceptable way of describing this situation, using korera-no ishi (these stones) to refer to the 10 stones thrown. (18b), in contrast, cannot be used to describe this situation. The use of a wh-mo

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8 Like its English counterpart, the predicate wa-ni naru (form a circle) can marginally apply to an atomic individual, as in the sentence Kono ishi-wa wa-ni natta (This rock formed a circle). The sentence is true if and only if the single rock referred to somehow came to be in the shape of a circle. We ignore such an interpretation here as irrelevant to our present concerns.
expression in this case imposes an obligatorily distributive interpretation, leading only to an unnatural interpretation according to which each individual stone is claimed to have formed a circle on its own. These examples once again show clearly that wh-mo expressions must not be analyzed as plurals, since such an analysis would make these contrasts in behavior between wh-mo expressions and true plurals unexplainable.

4.2 Wh-mo Expressions as Degenerate Plurals

We saw in section 3.3 that wh-mo expressions cannot be analyzed as inherently quantificational. In section 4.1 we also saw that they cannot be analyzed as plurals. However, they clearly share some properties both of quantified expressions and of plurals. For instance, in the absence of an adverb of quantification and when co-occurring with a singular predicate, they typically give rise to distributive readings, like both universal quantifiers and plurals. Furthermore they combine with at least some predicates that could be argued to select plural arguments, just not with them all. To account for this behavior, we make the following proposal: (i) wh-mo expressions denote i-sums, but never form groups; (ii) the distributive operator applies exclusively to i-sums, universally distributing over the atomic parts thereof; (iii) plurals have a group interpretation as their basic interpretation; and (iv) the grammar allows free application of Landman’s (1996) de-grouping operator ↓. This proposal is summarized in a slightly different form below.

Individuals: j, b, s (names, singular DPs)
I-sums: j ⊕ b, j ⊕ s, b ⊕ s, j ⊕ b ⊕ s (mo-phrases, ↓-shifted plurals)
Groups: ↑(j ⊕ b), ↑(j ⊕ s), ↑(b ⊕ s), ↑(j ⊕ b ⊕ s) (plurals)

\[
\text{[XP mo}_{1,\ldots,n}\text{]} = \Sigma(\{\text{[XP]}_{g'}^{g} : g' \approx_{1,\ldots,n} g\})^9
\]
\[
\text{[Op}_{\text{dis}]} = \lambda x\lambda P.[\forall x' \Pi x] (P(x'))
\]

The proposal makes it possible in principle to explain all of the data considered so far. True plural behavior like that seen in (14) through (16) can be analyzed as requiring group interpretation, thus excluding mo-phrases. Furthermore, the analysis allows for two distinct classes of plural-taking predicates – one that applies to i-sums, including atsumaru (gather) and issho-ni (together) predicates, and one that applies to groups, including wa-ni naru (form a circle). Since plurals can be de-grouped for free, it follows that both classes of predicates can apply to true plurals. If we assume that there is no free application of a group forming operator in the semantics, we furthermore account for the fact that only the former group of predicates can apply to wh-mo expressions. Finally, if we assume that adverbs of quantification can minimally quantify over i-sums, we predict their behavior as well, namely that they can operate over wh-mo expressions (9) and plurals (13), but not over independently quantified expressions (10).

While the analysis proposed shares an i-sum / group distinction with Landman (1996), it should be noted that we put this distinction to a very different use, allowing plurals to denote either kind of expression but restricting wh-mo expressions to the former. Furthermore, while Landman takes the i-sum interpretation of plurals to be basic and optionally generates a group interpretation from it, we take the group interpretation of

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9 1,\ldots,n are the indices on the unbound wh-expressions in XP, and Σ is an i-sum forming operator.
plurals to be basic. This makes it possible to differentiate full fledged plurals, i.e. those that can denote either groups or i-sums, from degenerate plurals, i.e. expressions like wh-
mo expressions that can only denote i-sums.

4.3 Extensions

In this section we examine two extensions for the analysis presented above. The first extension is motivated by the fact that predicates like *atsumaru* (gather) can occur with a quantificational subject as seen in (19), something that is not expected if these predicates select for i-sums.

(19) Subete-no / Hotondo-no sorisuto-ga (ensoukai-no ato-de) atsumatta
   All-GEN / Most-GEN soloist-NOM recital-GEN after gathered
   ‘All / Most soloists gathered (after the recital)’

While it is tempting to take such facts to indicate that *atsumaru* (gather) can select a quantifier, such a conclusion would be hasty given that the quantifiers *kaku* (each), distributive *sore-zore* (each) and *dochira … mo* (both) cannot occur with these predicates, as seen in (20) below.

(20) a. #Kaku sorisuto-ga atsumatta
    each soloist-NOM gathered
    ‘Each soloist gathered’

b. #Sorisuto-ga sorezore atsumatta
   soloist-NOM each gathered
   ‘The soloists each gathered’

c. #Dochira-no sorisuto-mo atsumatta
   which-of-2-GEN soloist-MO gathered
   ‘Both soloists gathered’

This suggests that what makes the examples in (19) acceptable is that they involve plural quantification. Support for this view comes from parallel observations in English where the singular / plural nature of the quantification is overtly marked on the noun. While the examples in (21) involving plural quantification are perfectly acceptable, those in (22) involving singular quantification are degraded.

(21) Most / Few / All / Some / No / Two or more men gathered

(22) *No / *Some / ??Every / ??More than one man gathered

Within the context of our current analysis, these facts suggest that plural quantification should be analyzed as involving true plurality. *Most men φ on such an approach could be
seen as asserting the existence of a group constructed from an i-sum consisting of more than half of the men as atomic parts to which \( \phi \) truthfully applies. ¹⁰

The second extension needed to the analysis proposed above is to account for cover readings for wh-mo sentences. Consider once again the sentence in (11), repeated here with minor variation.

\[
(11') \quad [[[t_j Dono-kyoku-o_i \ hiiita] \ sorisuto_i-mo_i] atsumatta \n\quad \text{‘Soloists who played whatever piece gathered’}
\]

Under the recital scenario originally presented, the most natural way of understanding this sentence is as having one soloist per piece played. We noted that under this interpretation it is possible for the sentence to be true in the event that all soloists gathered in a single gathering. However, the sentence is also true in the event where the soloists split up into multiple gatherings and never gathered together into one large group. This is what Schwarzschild (1996) refers to as a cover reading, and it is clearly available here with singular \text{sorisuto}. To account for it, we assume that a cover reading is generated from application of an i-sum selecting predicate to an i-sum. ¹¹

Now consider a variation of (11) in which \text{sorisuto} is taken to be plural rather than singular. Such a reading can be gotten from (11) itself or from (23) in which the plural marking is made explicit.

\[
(23) \quad [[[t_i Nani-o_i \ hiiita] \ sorisuto-tachi_i-mo_i] (konkuru-no \ aто-de) atsumatta \n\quad \text{‘Soloists who played whatever gathered (after the competition)’}
\]

To make such a change in interpretation pragmatically plausible, consider the context of a competition in which for each piece performed there are several soloists who played it. Observationally, the sentences both have a cover reading available in these circumstances. In particular, they can be true if there were several gatherings of groups of soloists, adding up to all of the soloists who played any piece in the recital but not necessarily including all of them in any single gathering. Importantly, under such a cover reading, for any piece played, the soloists who played that piece have to have all been part of the same gatherings. Thus if there were 5 pieces played and the soloists who played pieces 1 and 2 gathered together as did the soloists who played pieces 3, 4 and 5, then the sentence is true. If, however, the two gatherings each consisted of half of the soloists who played each of the pieces, then the sentence is false. That is, the cover can

¹⁰ The downward entailing quantifier \text{few men} would have to be analyzed as denying the existence of a group consisting of many men to which \( \phi \) truthfully applies on such an approach. We leave full working out of the details of this approach for a later date.

¹¹ For our present concerns, any analysis of cover readings that can be spelled out using i-sums will suffice.
extend down to the level of groups, but not down to the level of individuals inside the groups.12

Assuming that i-sum selecting predicates can generate cover readings from their i-sum denoting arguments, the analysis developed above easily generates appropriate cover readings. However, without further change it is also capable of generating an unwanted global cover reading. This can be done by degrouping the DP *dono-kyoku-o hiita sorisuto* (the soloist(s) who played which piece) prior to sum formation by *mo*. *Mo* will then form a large i-sum out of a set of smaller i-sums, and the individuals within the larger i-sum will no longer be differentiated according to the pieces that they played. Under such an interpretation, any grouping of soloists into separate gatherings is expected to make the sentences true, contrary to what was observed. We can easily account for the absence of global cover readings, however, by analyzing *mo* as generating i-sums from atomic individuals, including normal individuals and groups, but not from i-sums. If *mo* cannot apply to an i-sum denoting expression, application of de-grouping prior to i-sum formation will be blocked by the semantics. Without de-grouping, however, *mo* applied to a plural DP will generate an i-sum whose atomic parts are groups. On the plausible assumption that cover readings can be generated from an i-sum but cannot look inside the atoms from which the i-sum is constructed, the observations made regarding the interpretation of (11) and (23) are then just what is expected.

5 Conclusion

In this paper, we have shown that wh-*mo* expressions in Japanese cannot be analyzed either as universal quantifiers or as plurals. We have argued instead for a degenerate plural analysis, in which wh-*mo* expressions denote i-sums and standard plurals underlyingly denote groups. Such an analysis was motivated by the need to distinguish wh-*mo* expressions both from universal quantifiers and from plurals while at the same time accounting for the similarities among these expressions. The analysis provided makes it possible to distinguish two types of plural predication, that exhibited by *atsumaru* (gather) and *issho-ni* (together) predicates on the one hand and by *wa-ni naru* (form a circle) on the other. It also allows for a straightforward analysis of ambiguities stemming from the interaction of wh-*mo* expressions with adverbs of quantification. Finally, it makes it possible to analyze universal interpretations as involving the distributive operator employed in plural interpretation by analyzing this operator itself as operating over i-sums.

6 Appendix

In this appendix, we provide a formalization of the analysis developed in the preceding sections, and illustrate how the analysis accounts for ambiguities found in two wh-*mo* sentences.

Lexical Entries:

12 This behavior is unexpected under Schwarzschild's analysis of cover readings since Schwarzschild does not make a group / non-group distinction. We take this behavior, thus, to argue for a group / non-group distinction in plural interpretation.
Sample Semantic Calculations:

Example (11) was seen to be ambiguous between a single gathering reading in which all soloists gathered and a multiple gathering reading in which soloists gathered into groups according to the piece that they played. We analyze this distinction as arising from optionality of the distributive operator. We give derivations for a non-distributed interpretation with a singular DP, and for a distributed interpretation with a plural DP.

(11") Nani-o hiita sorisuto-mo atsumatta
what-ACC played soloist-MO gathered
‘The soloists who played whatever gathered’

Single gathering reading (with singular the):

(25)

a. \[\text{CP}_1[\text{DP}[\text{IP} \text{ t} Nani-o hiita \text{ Op}_k] \text{ D}[\text{Nsorisuto} \text{ the }] \text{ mo}_1] \text{ atsumatta}\]

b. \[\text{IP}^g = \lambda e. \text{played}(x_k, \text{thing}^{g_0}_o, e)\]
\[\text{CP}_2^g = \lambda x_k \exists e \text{played}(x_k, \text{thing}^{g_0}_o, e)\]
\[\text{DP}^g = \sigma (\{x: \text{AT}(x) \& \text{soloist}(x) \& \exists e \text{played}(x, \text{thing}^{g_0}_o, e)\} : g' \approx_i g)\]
\[\text{mo}_1^g = \sigma (\{\sigma (\{x: \text{AT}(x) \& \exists e \text{played}(x, \text{thing}^{g_0}_o, e)\} : g' \approx_i g)\})\]
\[\text{CP}_1^g = \exists e'. \text{gathered}(\Sigma (\{\sigma (\{x: \text{AT}(x) \& \exists e \text{played}(x, \text{thing}^{g_0}_o, e)\} : g' \approx_i g)\}), e')\]

Multiple gathering reading (with plural the):

(26)

a. \[\text{CP}_1^g = \lambda e. \text{played}(x_k, \text{thing}^{g_0}_o, e)\]
\[\text{DP}^g = \Sigma (\{\sigma (\{x: \text{AT}(x) \& \exists e \text{played}(x, \text{thing}^{g_0}_o, e)\} : g' \approx_i g)\})\]
\[\text{CP}^g = \exists e' (\text{gathered}(\downarrow x, e'))\]

(9), we saw, was also ambiguous. On one interpretation the wh-mo expression is given a universal quantificational interpretation and takes wide scope over the adverb of quantification taitet (usually). On the other, there is no universal quantification at all associated with the wh-mo expression, the only quantificational force coming from the adverb. Derivations generating these two readings are given below for a slightly simplified variation of the sentence.

(9’) \[\text{DP[CP Dare-ga kai-ta] ronbun]-mo taitei omoshiro-katta}
who-NOM write-past paper-mo usually interesting-past
‘The papers that whoever wrote were usually interesting’
Every (person) > Most (papers)

(27) a. $[[\text{moP}[\text{DP}[\text{Darei-ga t} J \text{ kai-ta} \text{ ronbun, the} \overset{\uparrow}{-}\text{moi}] \text{ Opdist}[\text{IP t} \text{ taitei omoshiro-katta}] ]]$

b. $[[\text{DP}]]^g = \uparrow \sigma (\{x: \text{paper}(x) & \exists e' \text{ wrote(person}_{g(i),x,e'})\})$

$[[\text{moP Opdist}]]^g = \lambda P. [\forall x \ PI (\{\uparrow \sigma (\{x: \text{paper}(x) & \exists e' \text{ wrote(person}_{g(i),x,e'})\}): g' \approx_i g\})] (P(x))$

$[[\text{IP}]]^g = \lambda x. [\text{most x' PI x} \exists e (\text{interesting(x',e)})$

$[[a]]^g = [\forall x \ PI (\{\uparrow \sigma (\{x: \text{paper}(x) & \exists e' \text{ wrote(person}_{g(i),x,e'})\}): g' \approx_i g\})] (\text{most x' PI x} \exists e (\text{interesting(x',e)}))$

Most (people) > The (papers)

(28) a. $[[\text{moP}[\text{Darei-ga t} J \text{ kai-ta} \text{ ronbun, the} \overset{\uparrow}{-}\text{moi}] \text{ [taitei omoshiro-katta}] , \text{ IP}]]$

b. $[[\text{moP}]]^g = \Sigma (\{\uparrow \sigma (\{x: \text{paper}(x) & \exists e' \text{ wrote(person}_{g(i),x,e'})\}): g' \approx_i g\})$

$[[a]]^g = [\forall x \ PI (\{\uparrow \sigma (\{x: \text{paper}(x) & \exists e' \text{ wrote(person}_{g(i),x,e'})\}): g' \approx_i g\})] \exists e (\text{interesting(x',e)}))$

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OVERLAYING CONTEXTS OF INTERPRETATION

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Abstract

The paper proposes a theory of the context of interpretation that is always an information state with some extra structure. It departs from existing models in going for uniformity and in the way uniformity is achieved: the context is the local context together with as much of the embedding context as can be added without losing consistency. The paper gives a formalisation, shows a number of applications of this idea and expands on the connection between this idea of the context and intentional identity.

1 Introduction

Counterfactuals have long been a challenge to the conception of truth-conditional semantics. It is not easy to give a truth-conditional account and the ones that have been given are controversial (Lewis (1973) and Kratzer (1981)). In this paper, counterfactuals are properties of information states. A given information may support a counterfactual or not. For this, information states must come with two mechanisms: the possibility of adding new information to the state, even if that information is in conflict with information already in the state, and, second, a relation = between the state and formulas expressing that the information expressed by the formula is contained in the information state. It is then possible to define:

A counterfactual \( A \rightarrow B \) is supported by an information state \( IS \) iff \( IS + A = B \).

If this is all there is, the assertion of a counterfactual in a conversation only gives information about the speaker: she could not have found out that \( A \) without having to assume \( B \). The hearer cannot just add the counterfactual if her information state lacks that property. But the hearer can ask the speaker for explanation. In this respect, it is rather like the assertion of an epistemic possibility: it only gives information about the speaker. And one may need an explanation of why the speaker does not rule out the possibility.

Counterfactuals are related in a fundamental way to human cognition. It is possible to add conflicting material to an existing information state. This is fundamental in our vision where the background is stable and new (almost by definition conflicting) information is flowing in at the changing focus. It is fundamental in the knowledge of our environment that is changed only by our current experience. It is fundamental in language understand-

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ing\textsuperscript{1}, where secondary contexts conflicting with the primary context can be brought in by negations, modal statements, belief reports, plans and others. The claim of this paper is that these contexts exist as temporary revisions of our primary context.

But the paper is really making a claim about contexts of interpretation. It is the claim that even under operators like negation, belief, supposition and others, the context of interpretation is a single information state. The information states may have a foreground-background division which allows the definition of updates for logically complex information and a definition of presupposition accommodation, but it is still a determinate question what objects and facts there are in the context. Early theories of context like Kaplan (1989) had the uniformity property. The insight of Karttunen, Stalnaker, Heim and Kamp that these contexts could be replaced by the information state under construction has the uniformity property only for the simple cases. It is high time to restore this property, because it simplifies thinking about anaphora and presupposition and is able to shed light on a number of open puzzles.

I will model the non-monotonic merging of two information states by combining Hans Kamp’s Discourse Representation Theory with an operation invented by Gerald Gazdar: satisfiable incrementation Gazdar (1979). The paper first explains the problem, then sketches its solution and then goes into the puzzles.

## 2 Happy and Unhappy Updating

Basic DRT Updating is given by the following definition.

- \textit{update}(K, S) = K \cup \{ S \} if \ S \ is \ atomic \ or \ a \ discourse \ referent \ and \ K \cup S \ is \ consistent.
- \textit{update}(K, S and S_1) = \textit{update}(\textit{update}(K, S), S_1)
- \textit{update}(K, not S) = K \cup \{ \neg \textit{update}(K, S) \ \setminus \ \ K \}
- \textit{update}(K, if S then T) = K \cup \{ \textit{update}(K, S) \ \setminus \ K \rightarrow \textit{update}(\textit{update}(K, S), T) \ \setminus \ \textit{update}(K, S) \}

A fuller system is obtained by adding rules for articles (no, every, the, a(n)), relative clauses, generalised quantifiers, and tenses.

Within this fragment, there are the following uniformities, uniformities that give content to a notion of “happy updating”.

a. Accessibility of discourse markers coincides with being a discourse marker of the context of interpretation.

b. Presuppositional satisfaction (\sim \ resolution) is truth in the context. Presupposition accommodation leads to truth in the context.

c. All contexts are consistent.

\textsuperscript{1}It is tempting and correct to see a relation with topic and focus expression in natural languages. The intonation of English corrections maps very precisely to the proposal in this paper, other cases can be related to foreground and background as in vision.
The last condition follows from the update condition for atomic formulas. Inconsistent contexts cannot play the role of contexts for disambiguation and resolution because any reading would be equally inconsistent and any discourse referent or fact would hold. So contexts of interpretation must have at least one model.

But one does not need to look far to find problems for this idyllic picture: unhappy updating.

1. Accommodation is adding the presupposition to its trigger’s context and gives local accommodation only. This conflicts with the literature, in which global accommodation is the default. (Accommodation Problem I)

2. If global accommodation is inconsistent so is local accommodation: the local context is always an extension of the global context. The literature lets local accommodation save the day if global accommodation is inconsistent. (Accommodation Problem II)

3. Correcting negation. These are inconsistent updates

4. Counterfactuals seem to involve inconsistent temporary updates

5. Beliefs and other attitudes/intensional operators. There can be overtly false beliefs and overtly impossible desires. They can be ways the world could have been which do not obtain.

Accommodation problem I

There is no full consensus about accommodation, but it would be simplest if it were just the minimal adaptation of the context that makes the use of the trigger felicitous. This gives a problem known since Karttunen: a systematic prediction of weaker accommodations than are observed. In fact, the criticism of Gazdar (1979) on Karttunen’s contribution Karttunen (1973), Karttunen (1974) problems, Heim’s alternative to Karttunen Heim (1983) and a recent critique by Geurts Geurts (1996) of the ”satisfaction theorists” all stem from this difficulty.

Without claiming to understand why NL treats presuppositions in this way, one wants to be able to formally recapture Heim’s solution for the happy fragment. This can be done by putting some extra structure over the incoming contexts by giving them a foreground/background structure. Some $K$s may be written as $K_1$ over $K_2$ with $K_1$ the foreground and $K_2$ the background. The $\text{over}$ operation allows structured DRSs of the form $K_1$ over $K_2$ and inverse operations $\text{foreground}$ and $\text{background}$.

$$K = \text{foreground}(K) \text{ over } \text{background}(K)$$

One can then define accommodation as directed to the background.

- $\text{acc}(A, K) = \text{foreground}(K) \text{ over } \text{acc}(A, \text{background}(K))$ if $\text{foreground}(K)$, $\text{background}(K)$ and $\text{acc}(A, \text{background}(K))$ defined, otherwise:
- $\text{acc}(A, K) = \text{update}(\text{foreground}(K), A) \text{ over } \text{background}(K)$ if $\text{foreground}(K)$, $\text{background}(K)$ are defined and $\text{update}(\text{foreground}(K), A)$ is consistent, otherwise:
- \( \text{acc}(A, K) = \text{update}(K, A) \) if \( \text{update}(K, A) \) consistent and \( K \neq K_1 \) over \( K_2 \).

Accommodation is accommodation in the background, but if that leads to inconsistency, it can be done in the foreground (if that is consistent). It is standard update if there is no foreground or background and the update maintains consistency. Otherwise, it is undefined.

**Accommodation problem II**

If a statement is inconsistent with the background of a context, it is inconsistent with the context. This means that the normal way of explaining local accommodation in the face of a preference for global accommodation is not available. It will never fire.

The solution is to define the problem away, and I will do that. But the motivation for the definition that deals with this problem has to do with inconsistent updates, i.e. the three remaining problems.

**Correcting negations**

(1) a. There is no king of France, so the king of France is not bald.
   b. Santa Claus does not exist.

The second conjunct in the first example presupposes that there is a king of France, while the first conjunct negates it. Proceeding as up to now adds the presupposition to the global context and makes it inconsistent. But the same happens when it is added to the local context — which is an extension of the global context.

In the second example, the sentence itself denies its presupposition: that there is someone called Santa Claus. Addition to the global context is therefore not an option. But the local context is just an extension of the global context and therefore just as inconsistent.

It can be argued that these sentences are not really negations but denials or that they contain a special negation with different properties from the normal one. That may be so, but a uniform analysis would be preferable. Under these interpretations, the sentence (with its negation operator) are corrections of the corresponding positive sentences uttered (or implied) by the other interlocutor.

(2) a. The king of France is bald.
   b. Santa Claus exists.

In fact, all corrections have that problem.

(3) a. No, Bill did not eat the cake.
   b. No, Bill ate the cake.

Another construction with the same problem is the proof by *reductio ad absurdum*.

(4) Suppose that A. ... Then not A. So not A.

How can one suppose that A if A is a false mathematical statement? How can one maintain a consistent context with a necessarily false statement? Notice however that corrections and proofs contain anaphora and presupposition triggers that presumably have to be
treated in the same way as always. A related and similar construction is the counterfac-
tual. It is similar to the conditional but it is distinguished from the indicative conditional
by the fact that its condition can not be added consistently to the context (and by special
tense and modal markers that seem to mark that this is the case).

Belief

But the worst problem for happy updating are attitude sentences. What is the context of
interpretation for the complements of such sentences? There are four options.

1. the context is empty
2. the context is the embedding DRS
3. the context is the Kamp/Heim/Zeevat/Geurts context given by everything that ac-
   cording to the embedding DRS the belief subject believes
4. the context is 2. merged with 3.

The first solution is not able to deal with anaphora and presupposition in the complement
sentence, solution 2 is not able to deal with presupposition triggers that are bound by
other beliefs of the belief subject, solution 3 with anaphora that take antecedents in the
embedding DRS or with presuppositions bound by material in that DRS. The only solution
is 4, but the subject may well have beliefs that conflict with material in the embedding
DRS, so that 4 would be an inconsistent context. None of the 4 solutions is viable.

Indeed belief contexts —more than any of the other cases— seem a reason to give up on
having a uniform context of interpretation and to move to something more complex, like
a stack of contexts, an accessibility path or something similar. There is nothing wrong
with either option from a mathematical point of view but it replaces the natural picture of
a context as an information state by something that does not make intuitive sense.

Solution

How to solve this? My claim is that the second accommodation problem, the downdate
problem, and the belief problem can be solved uniformly by giving the following inter-
pretation to the foreground/background structure.

The new interpretation is an application of Gazdar’s satisfiable incrementation operation:

$K_1$ over $K_2$ denotes the set $K_1$ satisfiably incremented with $K_2$. This operation is a
kind of default unification: $K_1$ gets priority and is entirely preserved by satisfiably in-
crementing it with $K_2$. But only those parts of $K_2$ are added that do not give rise to
inconsistencies. If $K_1$ is consistent, so is $K_1$ satisfiably incremented by $K_2$. If $K_1 \cup K_2$
is consistent, $K_1$ satisfiably incremented by $K_2$ is $K_1 \cup K_2$.

Gazdar’s satisfiable incrementation:²

²The first place where this is found is Heim (1992) where it is attributed to Kamp. In Zeevat (1992) it is
split into a context preparation and a context insertion rule. Geurts (1999) develops the same notion in pure
DRT using presupposition resolution.

³The following is a slightly more semantic definition. Let $K_1$ and $K_2$ be consistent sets of formulas.

\[
Mod(K_1, K_2) = \{ M : M \models K_1 \land \exists Y \subseteq K_2 (M \models Y \land \forall Z (Y \subseteq Z \subseteq K_2 \rightarrow \neg \exists M' M' \models K_1 \cup Z) ) \}
\]
\[
K_1 \cup !K_2 = \{ \varphi : Mod(K_1, K_2) \models \varphi \}
\]
I want to maintain that the choice for combining Gazdar with DRT is a healthy one. DRT breaks down semantic material to atomic level whenever it can and so the granularity of the formulas to which Satisfiable Incrementation is applied is nonarbitrary.  
The choice for Kamp and Gazdar is not essential. Any successful approach to defaults leads to a solution (and there may be ones that lead to improvements with respect to counterfactuals).

3 Contexts of Interpretation and Updates

Presupposition

Certain inputs $A$ are presupposition triggers which means that the triggered presupposition should be available in the context, either in the foreground or in the background. The presupposition needs to be developed and this can be done as follows:

$$K_1 = \text{foreground}(\text{update}(1 \text{ over } K, P))$$

$K_1$ now is the DRS corresponding to $P$. The background $K_2$ is the new context deriving from $K$ in which accommodations can have taken place.

- $\text{pres}(K_1, K_2) = K_2$ if $K_2 \models K_1$, otherwise:
- $\text{pres}(K_1, K_2) = \text{foreground}(K_2) \text{ over } \text{pres}(K_1, \text{background}(K_2))$ if $\text{foreground}(K_2)$, $\text{background}(K_2)$ and $\text{pres}(K_1, \text{background}(K_2))$ are defined, otherwise
- $\text{pres}(K_1, K_2) = \text{update}(\text{foreground}(K_2), K_1) \text{ over } \text{background}(K_2)$ if $\text{foreground}(K_2)$ and $\text{background}(K_2)$ are defined and $\text{update}(\text{foreground}(K_2), K_1)$ is consistent, otherwise
- $\text{pres}(K_1, K_2) = K_1 \cup K_2$ if $K_1 \cup K_2$ is consistent.

The full update with the trigger $A$ with presupposition $P$ on $K$ is given by:

$$K_1 \text{ over } K_2 = \text{update}(1 \text{ over } K, P)$$

$$\text{update}(A, \text{pres}(K_1, K_2))$$ if $\text{pres}(K_1, K_2)$ is defined.

I am here not taking account of other restrictions on accommodation such as Van der Sandt’s condition on bound variables Van der Sandt (1992), and not of the unification of variables on resolution and the side effects that that generates. It is not difficult to deal with these, but their treatment is not relevant for the issues addressed in this paper.  
The happy part of the system can remain as it is. Monotonic updates are just updates of the background and fail if they reach an inconsistency. Updating $K$ over $K$ leads to the same result as updating $K$. The general format of non-monotonic updates is updating $1$ over $K$.

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4Gazdar’s application of the operation depends on the precise syntactic identification of the presuppositions. E.g. Sue is a bachelor or a spinster should presuppose that Sue is unmarried, but it does not if one stipulates that spinster and bachelor have conjunctive pre-suppositions: $x$ is adult and female, $x$ is adult and male
monotonically. The conflicting information in $K$ then becomes invisible behind the new information in the foreground. The choice of 1 (the state of no information, the empty DRS) is correct for corrections, suppositions and counterfactuals. Operators like belief, would and particles like then pick up non-factual contexts (other beliefs, contextually evoked possibilities) that can be loaded “over” $K$.

Belief update

$$update(K, \text{believe}(x, S)) = \{B(x, K_1 \setminus \text{bel}(x, K))\} \cup K_2.$$  
where $K_1$ and $K_2$ are given by: $K_1$ over $K_2 = update(\text{bel}(x, K) \text{ over } K, S)$

This is a monotonic update of $x$’s beliefs (with possible side effects in the background). $\text{bel}(x, K)$ collect the beliefs of $x$ in $K$ and is defined in Geurts (1999) or Zeevat (1992). It is possible to generalise this to non-monotonic corrections of $x$’s beliefs.

Desire update

$$update(K, \text{want}(x, S)) = \{W(x, K_1 \setminus \text{want}(x, K)), B(x, K_2 \setminus \text{bel}(x, K))\} \cup K_3$$  
$K_1$ over $K_2$ over $K_3 = update(\text{want}(x, K) \text{ over } \text{bel}(x, K) \text{ over } K, S)$

This update uses the idealisation that desires are consistent among themselves. It implements Karttunen’s observation that presuppositions triggered in desires can be resolved to other desires and to beliefs of the same subject, as well as to the global context. The treatment can handle the resolutions needed for (5).

(5) a. John wants to marry a Swede and he wants his wife to be rich.  
b. John believes he has a rich aunt and he wants to inherit her money.  
c. John has a rich aunt. He wants to inherit her money.

Counterfactual update

$$update(K, If were S, would T) = K_4 \cup \{(K_1 \text{ over } K_2) \rightarrow K_3\},$$  
where

- $update(1 \text{ over } K, S) = K_1$ over $K_2$ and  
- $update(K_1 \text{ over } K_2, T) = K_3$ over $K_4$

Conditional update

$$update(K, if S, then T) = K_4 \cup \{(K_1 \text{ over } K_2) \rightarrow K_3\},$$  
where

- $update(K \text{ over } K, S) = K_1$ over $K_2$ and  
- $update(K_1 \text{ over } K_2, T) = K_3$ over $K_4$

I treat both conditionals as similar as possible here: they both get coded into the DRS by a syntactic structure that remembers the context of the antecedens. In this way today’s conditional may become tomorrow’s counterfactual, after it has become clear that the circumstances that were possible today cannot occur anymore. Conditionals and counterfactuals may cease to be true when new information comes in. In this way, (6a) can become first (6b) and then (6c).

(6) a. If John goes to the party, Mary goes too.
b. If John went to the party, Mary went too.
c. If John had gone to the party, Mary would have gone too.

I would like it to be the case that $A \overline{\overline{K}} \equiv B$ is the correct condition under which $K$ supports a counterfactual "If were A, then would B”. Not quite, since the rule does not yet say anything specific about the "counterfactual” aspect. But this can be done: one can demand that $K \models \neg A$. If the first condition holds but not the second, $K$ supports the indicative conditional "If A then B".

Non-monotonic negation

$$\text{update}(K, \text{not } S) = K_2 \cup \{\neg K_1\}$$

$$\text{where update}(1 \overline{\overline{K}}, S) = K_1 \overline{\overline{K}}$$

Correction with $S$ would be the sequence of updating $1 \overline{\overline{K}}$ with $S$ and then reverting to $K_1 \overline{\overline{K}}$ where $K_1 \overline{\overline{K}} = \text{update}(1 \overline{\overline{K}}, S)$.

Reductio ad absurdum starts with a statement: suppose that $A$. This can be be represented by updating $A$ on $1 \overline{\overline{K}}$. (It does not need to lead to a proof, one can suppose for fun). Even if $A$ is necessarily false, 1 does not have the axioms to derive absurdity. The proof consists in monotone updates of the foreground with material from the background until the point that absurdity can be derived. This establishes $\neg K_1 \setminus K$ and makes $K_1 \setminus K = \{A\}$. A bare supposition can be terminated by reverting to the background.

4 Interface with natural language

Conflicts with the background are marked by a number of devices, like the subjunctive mood, the past tense, negation, suppose, correction intonation and denial markers.

They are straight cases of context marking in the sense of Zeevat (2003), a linguistic rule that marks an expression if its content bears a certain relation to its context. A marker differs from a presupposition trigger in that its occurrence is obligatory and in not allowing accommodation. Both can be resolved to the context (the context marker must be under Gricean meaning$_{mn}$) and so seem to play a similar role in interpretation.

In this case, there is a relation of inconsistency between the context and the content of the current utterance and there is a rule of language that forces it to be marked. The effect of the marking rule is that the speaker can be assumed to give consistent information when there is no marking and to allow the safe expression of inconsistent information.

It is possible to explain two uniformities using this account of contexts. The first is the similarity in form between (some) corrections and negations. A successful correction entails a true negation that is no longer a correction.

(7) A (at time t): No, JOHN did not eat the cake.
    B (later): John did not eat the cake.

One can think of the negation operator as a semantic bleaching of the corrective context

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5There is a problem with having conditional updates: they do not seem to serve a purpose. Space prevents me from a full discussion here
marker: the correction implies the falsity of what is denied and marks that the context entails it. In an ordinary negation only the implication of falsity is retained and the context marking aspect has disappeared. It is interesting that there is no formal separation between the negation and the correction marker in the languages I know. This means that in interpreting a "not", the hearer is always forced to search for something that it might correct and —where nothing is found— to come up with a mere suggestion or expectation that can be corrected by the negation.

Something similar is going on with counterfactuals and indicative conditionals. Counterfactuals are marked conditionals, twice marked in fact, once by the subjunctive past tense in the antecedens, once by the "would" in the consequens.

5 Overlays and Presupposition

There is one serious difference in what this account of context predicts and what happens in Van der Sandt’s theory of presupposition. Van der Sandt uses the standard notion of accessibility in DRT and lets a presupposition trigger to be bindable from any accessible DRS. In our terms this would be identical to interpreting the \( \text{over} \) -operation as set union and using for resolution not the relation \( \models \) but the weaker notion of \( \subseteq \) (perhaps after closure by some mild conceptual inference, e.g. allowing an explicit inference from "John is married" to "John has a wife").

We get a restriction on the set of possible antecedents for presupposition triggers because of the impossibility of having simultaneously \( K_1 \text{ over } \ldots \text{ over } K_n \models p \) and \( K_1 \models \neg p \). Information that is available in the background can be blocked by conflicting information in the foreground. This gives a restriction on resolution:

**Prediction:** there is no resolution to material in the background if it is blocked by conflicting information in the foreground.

The examples are really hard to tell.

(8) a. ??It is raining. John thinks that it is sunny and that Bill thinks that Mary regrets that it is raining.
   b. ??Jane has a niece, but Harry thinks that she has not but he accepts that she really believes that her niece will visit her next week.

These examples have the problem that the resolution may be blocked but that new accommodation may take place. The following examples use "too" and "again", because accommodation is not a possibility there.

(9) a. #/?? Jane has been to Spain before, but Harry believes that she has made that up and also that she will go there again next week.
   b. #/?? Jane has been to Spain, but Harry does not believe that and believes that Mary has been there too.
   c. John may come. Mary will come too.
   d. #/?? John may come, but I doubt it. Mary will come too.

And, indeed, they seem worse. Suppose that John has seen my brother Tim fall on the street.
(10) John thinks that Tim/he/my brother is wounded.

John can be aware that my brother is called Tim, or can know that I have a brother. But it can also be the case that, for John, my brother is a stranger, or even that he can falsely believe that I have no brother or that nobody has the name Tim. In the last case, the presupposition cannot be resolved in its entirety: only the discourse referent is available. The second case is not a matter of blocking.

(11) a. #John thinks that I have no brother and that my brother is wounded.
b. #John thinks nobody is called Liba and that Liba will visit us tonight.

6 “Huitink’s paradox”

Consider the following example\(^6\).

(12) Mary wants me to eat pizza again.

I say (12) to you in a context where Mary is unaware of the fact that you and me had pizza yesterday. Mary and me agreed to meet soon, but I am not so fond of pizza that I will agree to her plan of going for some more of it when we meet. And you know all of this. The problem is how you can represent the information you take from my utterance and in particular the presuppositional information associated with ”again”. Conventional wisdom has it that ”again” presupposes another event of the same kind as the one described in the clause in which ”again” occurs which happened before it. In this case it is an event of the kind ”I eat pizza” and the antecedent is clear: it is me having pizza with you yesterday evening.

The problem is where my two pizza dinners precede one another. There are two subDRSs where this might happen: Mary’s desires (or her beliefs) and the common ground between me and you. The first context does not contain yesterday’s pizza eating, since Mary does not know about it or want it. The second context does not contain my pizza eating with Mary, because you and me agree it is not going to happen. So neither of them can have a condition to the effect that \(e < e'\). And there is no other subDRS where a condition of this kind may be inserted.

On the context notion that I have been developing in this paper, there is no problem. The relevant context is Mary’s desires over Mary’s beliefs over our common ground. It contains both pizza eatings and (desire is future oriented) entails that yesterday’s pizza is before the pizza with Mary. On the account in Zeevat (2003), ”again” is a context marker and is obligatory here because another pizza eating of me is reported in a context that contains an earlier occasion.

van der Sandt and Huitink (2003) propose a distinction between events and their temporal locations (also necessary for some aspects of the treatment of tense and aspect) and propose that ”again” has two presuppositions: one of the existence of the other event and one of the ordering of their temporal location. Space restrictions prevent me from discussing

\(^6\)I owe these examples to the master’s thesis of Janneke Huitink, but the following is my version and she does not agree that it is a paradox or with the conclusions I draw from it. For her position, see van der Sandt and Huitink (2003)
this fully. I will just note that it does not deal with corresponding problem with too like the following.

You are off to Spain, but Mary does not know you or your plans, and just talked to me on the phone.

(13) Eh, that’s funny. Mary dreamt that she met somebody who wants to go to Spain too.

We can assume that Mary’s dream was not about a real person. The received wisdom is that too (with the right intonation on the sentence) presupposes that somebody else did the same.

Now again it is clear that you are the other person going to Spain but unclear where in the DRS you are distinct from the person Mary dreamt about. You are not part of Mary’s dream and the person Mary dreamt about is not part of the common ground. Again, it is clear that on the notion of context developed in this paper, the problem largely goes away. On Mary’s dream over Common Ground, there is both you and the person Mary dreamt about and Corblin (2002)’s observation that DRs are distinct by default, the context entails the distinctness of the two objects. If too is a context marker, it follows that too is obligatory here.

The theory of contexts of this paper should answer an important question: the context I defined supports the presuppositions of again and too, but they disappear after the interpretation of the expressions that give rise to them. There is no representation of the temporal ordering of the events or of the distinctness of the objects that survives the interpretation process. What remains in the information state of the presupposition?

I think nothing remains. The information state just supports certain counterfactuals like the following (14).

(14) a. If Mary’s plan for having pizza were to come true, it would be after yesterday’s pizza dinner.
   b. If Mary’s dream were true, it would not be about you.

It is possible, but not necessary, to store these counterfactuals in the information state. Presumably, they should not be. It is—in the view of this paper—resolution and not accommodation, so no traces should remain.

7 Conditional Identities

Contexts and counterfactuals are also a sensible approach to the Geach sentences about Hob and Nob and to Edelberg’s counterexamples to all existing treatments of the Geach sentence (and a serious improvement on Edelberg’s own solution).

These examples are all of the form a thinks A and b thinks B with anaphora going from A to B. My claim is that in all cases the right predictions are obtained by claiming that

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7 The connection of intensional identities with counterfactuals was the joint conclusion of Paul Dekker and me in a discussion some years ago. But we did not know how to exploit this insight, it seemed an obvious case of obscurum per obscurior.
they presuppose an information state $K$ that supports "if what $a$ thinks were true $A$ would refer to an object $x$ and $b$'s belief $B$ would be about the same object $x$.

The following is a version of Geach’s Hob-Nob sentence.

(15) Hob believes that a witch poisoned his cow, and Nob believes that she blighted his mare.

If Hob’s belief that a witch poisoned his cow were true, Nob would believe that she blighted his mare.

Now the literature contains many explanations of how information states could be such that they support this counterfactual. Hob may have told Nob about his belief, there may be a rumour in the village about a witch that has played a causal role in the formation of Hob’s and Nob’s beliefs, there may have been an article in the local newspaper that Hob and Nob have each read. If one of those explanations is true, then, if Hob were right, Nob would have a belief about the very witch that Hob believes poisoned his cow.

Edelberg (1992) gives a number of examples that show that communication processes as usually assumed for the Hob-Nob sentence are not necessary for intensional identities. This is just one.

**Arsky and Barsky**

Context: Arsky and Barsky are investigating the purported murders of Smith and Jones. In fact, their deaths were accidents, but they do not believe this. Arsky thinks two distinct persons killed Smith and Jones, Barsky thinks the same person killed both Smith and Jones.

Now (16a) is a correct report but not (16b).

(16) a. Arsky thinks that someone killed Smith and Barsky thinks he also killed Jones.
    b. Barsky thinks that someone killed Jones and Arsky thinks he also killed Smith.

The counterfactual analysis gives the following two counterfactuals.

(17) a. If somebody killed Smith, Barsky thinks he killed Jones too.
    b. If somebody killed Jones, Arsky believes he killed Smith.

It is obvious that the information state of somebody who has grasped the context given by Edelberg supports the first counterfactual but not the second. Arsky does not believe at all that the killer of Jones killed Smith.

This connection is interesting, but there is no semantic reason why the content of Hob’s belief should be loaded over the information state. Nob’s belief could just be added to the context to which Hob’s belief was added.

It may well be that the pronoun itself makes it necessary to do that. One can resolve a pronoun to an antecedent in a suggestion $S$, but only by changing the context of interpretation $K$ to $\text{update}(1 \text{ over } K, S)$. Without that, it is as DRT has it: the antecedent is not accessible. And if the suggestion is temporarily added, the context supports the
counterfactuals when it contains one of the relevant explanations. So if the pronoun triggers this change of context, one obtains an almost trivial account of intentional identity. And quite the same holds for modal subordination.

(18) A wolf might come in. It would eat you first.

The account could be generalised to particles which as noted in Zeevat (2002) also take suggested antecedents. There is only one thing missing. It is not correct English to replace the pronoun in the Geach-sentence by a full NP (e.g. the witch that poisoned Hob’s cow) independently of the fact that it probably does not get the correct reading: in a position like that the pronoun is obligatory. This suggests that the context of interpretation (in its other aspect of context of generation) must —perhaps only as a live option— always contain the suggestion to trigger the anaphora or the other forms of context marking.

8 Conclusion

I have made the case for uniform contexts of interpretation. It is a solution to a problem inherent in the work of Kamp and Heim (Kamp (1981), Heim (1982)): to give a non-technical account of accessibility that generalises to belief contexts, counterfactuals, negations and corrections. The semantic account of accessibility in Zeevat (1989) or in Groenendijk and Stokhof (1991) only works for what I called happy updating, the account in this paper generalises the solution to the unhappy cases. The account solves some problems in Zeevat (1992). It also gives the kind of account of context that is necessary to make sense of context marking as discussed in Zeevat (2003) and in particular gives the solution to some interesting counterexamples to that account due to Marie Safarova. The last two sections gave some further applications of the context. My main conclusion is that the concept of a context of interpretation as a simple information state (with internal structure) can be maintained and that it is helpful not to give up on this intuitive conception in favour of unintuitive mathematical constructions. To my surprise, non-monotonicity is not much an extra complication. I also think the application to non-standard anaphora is a considerable step forward with respect to the various accounts in the literature, both in terms of conceptual economy and in terms of uniformity, if one compares them with Roberts (1989), van Rooy (1997), Edelberg (1992) or Zeevat (2000). I do not see it as my mission in life to come up with a new semantics for counterfactuals, but I would still welcome a less syntactic approach to my over-operation. One conclusion can be drawn from this new approach to contexts and its applications. Too much theoretical effort seems to have been directed towards theories that explain why a certain counterfactual is true, e.g. in trying to formulate solutions to the Geach examples. In a dynamic semantics, it may suffice to note that the context of evaluation may just support certain counterfactuals that one needs for the explanation of what is going on, without a formal statement of the underlying causal connections. A further elucidation of that causal order, especially for the semantic causality that seems involved, would be of considerable philosophical importance but does not really seem to be required for the linguistic analysis.
References


Abstract

In this paper we discuss a particular type of comparatives, that we call reflexive comparatives. These reflexive comparatives have the property that they compare an object with itself, but with respect to different temporal, spatial or scalar indices. We argue that this property can be viewed as the optimal outcome of a conflict between two general constraints on the arguments of a semantic relation. A semantics of reflexive comparatives is proposed which is based on paths in scalar and other domains.

1 Reflexive comparatives

In this paper we want to draw attention to a type of comparatives that has not received much attention in the literature. We call these comparatives reflexive for reasons that will become clear in the analysis that we will provide of this type. The sentence in (1a) below was uttered by the tennis player Lleyton Hewitt in an interview at the end of May 2004. Hewitt means that in the course of the tournament the matches become more difficult, i.e. each match is more difficult than the previous one (the universal quantifier gets a ‘consecutive’ interpretation). Discourse comparatives do not come with a than-clause. Usually the compared element can be recovered from the context. Yet, the examples in (1) find their interpretation independent of context. In this interpretation there is no comparison between two different objects, but a temporal or spatial change or development. Here are some (more) examples:

(1) a. Every match doesn’t get easier.
b. Elk jaar worden de eindexamens gemakkelijker.
   Each year get the final exams easier
   ‘The final exams get easier each year’
c. Die lockere Stadt schloss sich enger und enger um ihn, sie saugte ihn in sich hinein. Der Lärm wuchs, höher schienen sich die Häuser zu wachsen, grauer wurden ihre Fassaden, eiliger liefen die Menschen.
d. Wolves get bigger as you go north from here.
e. The crack gets wider at the north gate.
f. The higher his stakes, the lower his expectations.
g. Nowadays, more goods are carried faster.

* We thank the Netherlands Organisation for Scientific Research (NWO) for financial support (NWO-Cognition project Conflicts in Interpretation, and the PIONIER project Case cross-linguistically).
The kind of comparatives that have received most attention in the literature are those that have an explicit *than*-clause or *than*-phrase, as in (2a) below. The *than*-phrase can also be strongly reduced, as in (2b). In this example, the *than*-phrase does not contain an overt item of comparison, although it does provide the reference point for the comparison. However, it is quite common for a comparative to occur without a *than*-clause or *than*-phrase. With such a *discourse comparative*, as in (2c), the hearer has to recover from the preceding discourse or the situation that the match of this year is compared to, for example, the one of last year. The reflexive comparatives present a fourth type, in which the match is not compared to an explicitly or contextually provided object of comparison, but is described as developing in a particular way (2d).

(2)  
  a. This year’s match was easier than last year’s match. (explicit)  
  b. The match was easier than last year. (reduced)  
  c. This match was easier. (discourse)  
  d. The match gets easier every year. (reflexive)

Such reflexive comparatives distinguish themselves from the other comparatives in a number of respects. The *than*-clause or *than*-phrase that is explicit in (2a), present in reduced form in (2b) and can be added in (2c), is impossible in (2d) and in other reflexive comparatives. In example (1d), originating from Carlson (1977), it is impossible to add a *than*-phrase without changing the meaning:

(3)  
Wolves get bigger than ??? as you go north from here.

There is nothing that we could add to make explicit that the size of wolves correlates with latitude. Another feature of reflexives is that reduplication of the adjective is possible, as is shown in (1c) above. This is not possible with the explicit, reduced or discourse comparatives:

(4)  
  a. * This year’s match was easier and easier than last year’s match.  
  b. * The match was easier and easier than last year.  
  c. * This match was easier and easier.  
  d. The match gets easier and easier every year.

Notice furthermore that universal quantification of the subject pertains to a temporal sequence in the case of reflexive comparatives only:

(5)  
  a. Every match was easier than last year’s matches.  
  b. Every match was easier than last year.  
  c. Every match was easier.  
  d. Every match gets easier.

In (5a), (5b) and (5c) all the matches of one particular year are compared with matches in the preceding year. There are just two years. In (5d) however, there is an indefinite sequence of years over which the matches develop in easiness. More in general, in reflexive comparatives the comparative morpheme always indicates a scalar progression that correlates with time (1a) and (1b), space (1c), (1d), (1e), or another scale (1f), (1g). Finally, the subject of the comparative often refers to stages or parts of
an object. As Carlson already observed, the intended reading of (1d) is not that a wolf grows in size when we put it in our car and drive north with it, but that spatial parts (‘stages’) of the wolf population differ in size. Example (1e), a variation on a sentence from Gawron (2004), describes a crack in a city wall. The parts along the length of this crack differ in width.

So comparatives have a special use with the properties that we just described. The question is how this interpretation arises. Our hypothesis is that the reflexive interpretation of the examples in (1) is the optimal interpretation that we get as the result of a compromise between two general constraints: DOAP (Don’t Overlook Anaphoric Possibilities) and Principle B. This compromise involves spatial, temporal and scalar indices on the arguments of the comparative relation and determines the special interpretive properties that we find.

We will first discuss the two constraints that we assume in our account and the Optimality-Theoretic interaction between them in a range of examples (section 2). In section 3 we will show how these constraints account for the reflexive use of comparatives. Section 4 discusses the nature of the indices that we argue to play a crucial role in the interpretation of reflexive comparatives. Finally, in section 5, we turn to the resulting semantics of comparatives based on paths in scalar and other domains.

2 Constraints on anaphoric elements

The claim of Optimality-Theoretic Semantics is that anaphoric relations are determined through the interaction of a small set of general constraints (Hendriks and de Hoop 2001). In this section we will show how three constraints determine the interpretation of discourse comparatives. One of the basic constraints in this interaction is Don’t Overlook Anaphoric Possibilities (DOAP) (Williams, 1997):

(6) Opportunities to anaphorize text must be seized.

We can see this constraint at work in the interpretation of the following example:

(7) Jane smokes more than Jacky, but Robert drinks more.

The comparative more is a discourse comparative. Robert’s drinking is compared to something else that we need to complete our interpretation of the sentence. DOAP says that our interpretation has to be anaphoric. If we represent the interpretation informally in the form of an explicit than-clause, then DOAP rules in those interpretations in which the than-clause refers to someone who is already mentioned in the previous sentence, but it rules out referring to someone who is not already mentioned:

(8) ✓ Jane smokes more than Jacky, but Robert drinks more [than Jacky]

* Jane smokes more than Jacky, but Robert drinks more [than Bill]

In (8) there would have been another way to fill in the missing information, namely by saying that Robert drinks more than Jane. This interpretation is ruled out by the constraint Parallelism:
As the antecedent of an anaphoric expression, choose a (logically, structurally or thematically) parallel element from the preceding clause.

The missing than-phrase of the second conjunct of (7) is parallel to the explicit than-phrase of the first conjunct. Therefore Parallelism rules out that Robert in (7) is interpreted as drinking more than Jane:

(10) ✓ Jane smokes more than Jacky, but Robert drinks more \([\text{than Jacky}]\)
    * Jane smokes more than Jacky, but Robert drinks more \([\text{than Jane}]\)

Both interpretations satisfy DOAP, but the first interpretation is parallel, the second isn’t and therefore violates Parallelism.

There is a third principle at work in the interpretation of discourse comparatives, Principle B:

(11) If two arguments of the same semantic relation are not marked as being identical, interpret them as being distinct.

This well-known principle rules out that a pronoun in object position can take the subject of the same sentence as its antecedent, unless that pronoun is a reflexive:

(12) ✓ Jacky loves herself
    * Jacky loves her \([\text{her} = \text{Jacky}]\)

Principle B is also relevant for the interpretation of the discourse comparative in the following sentence:

(13) Jane smokes more than Jacky, but Jacky drinks more.

DOAP wants the object of more to be either Jane or Jacky, not someone from outside the sentence. Parallelism requires that the anaphor and the antecedent are parallel, i.e. that Jacky is the object of more in both clauses. However, this is what Principle B rules out. The two arguments of the relation drink more cannot both be Jacky. There is a conflict between Principle B and Parallelism.

In Optimality Theory a conflict between constraints is resolved by constraint ranking. A lower constraint can be violated to allow satisfaction of a higher constraint. In OT Semantics the ranking is as follows:

(14) Principle B >> Parallelism

Principle B is maintained at the expense of Parallelism. This leads to the following interpretation of (13):

(15) ✓ Jane smokes more than Jacky, but Jacky drinks more \([\text{than Jane}]\)
    * Jane smokes more than Jacky, but Jacky drinks more \([\text{than Jacky}]\)
Even DOAP has to give way to Principle B (i.e. Principle B >> DOAP). We can see that in the following example:

(16)  Today’s match was just as difficult.

Even though DOAP requires that the missing object of just as difficult be retrieved from the same sentence, this is not the way we can construe the sentence, because that construal is ruled out by Principle B:

(17)  ✓ Today’s match was just as difficult [as yesterday’s match]
      * Today’s match was just as difficult [as today’s match]

We have to find the interpretation in a non-anaphoric way, outside the sentence, violating DOAP, but satisfying the higher-ranked Principle B. The ranking of the three constraints is as follows:

(18)  Principle B >> Parallelism, DOAP

Notice that Parallelism and DOAP are not ranked with respect to each other, because they do not conflict.

3  Reflexive comparatives as an optimal interpretive solution

How do these constraints conspire to give us the optimal interpretation for a reflexive comparative, like the one in (19)?

(19)  Every match gets more difficult.

Because this sentence is not embedded in a coordinate construction in which the first conjunct provides the explicit context, which may or may not be parallel to the second conjunct, the constraint Parallelism is not relevant here. Therefore, the constraints we can focus on are DOAP and Principle B. Consider the following examples:

(20)  * Every match gets more difficult [than the 2002 Wimbledon final]  (*DOAP)
      * Every match gets more difficult [than itself]                             (*Principle B)

DOAP rules out that the object of more difficult is identified with an object outside the sentence, as in the first interpretation in (20). This seems right for reflexive comparatives: they never take on the kind of interpretation that discourse comparatives allow. Principle B rules out that the object of the comparative is found within the sentence, i.e. that it is the subject. This seems correct too.

However, if neither of these interpretations is allowed, then the question is what interpretation is allowed. What interpretation can satisfy DOAP and still avoid a violation of Principle B? In other words, how can reflexive comparatives be reflexive in interpretation (i.e. refer back to the subject) and at the same time keep the object and the subject of the comparative sentence distinct?
Our answer is that the reflexive interpretation of the comparative satisfies both constraints because it adds ‘intensional’ indices to the arguments of the comparative and by doing so, it allows for a compromise interpretation. The (informal) compromise interpretation of sentence (19) is as follows:

\[(21) \text{Every match}_n \text{ gets more difficult than match}_{n-1} \]

The indices \(n\) and \(n-1\) here index the match for the year in which it occurs: \(\text{match}_n\) is the match in year \(n\), \(\text{match}_{n-1}\) is the match in the preceding year. (21) says that every match in year \(n\) is more difficult than the same match the year before. This seems a reasonable, although informal and partial, account of what is going on in this reflexive interpretation. It also makes clear why reflexive comparatives satisfy both DOAP and Principle B. In the interpretation of a reflexive comparative

\[(22) \text{X}_n \text{ gets A-er than X}_{n-1} \]

the two arguments \(\text{X}_n\) and \(\text{X}_{n-1}\) have the kind of anaphoric dependency that DOAP requires, because the anaphoric opportunity for interpreting the missing object is clearly seized. On the other hand, \(\text{X}_n\) and \(\text{X}_{n-1}\) are distinct for Principle B because they carry different indices. DOAP and Principle B are sensitive to slightly different types of anaphoric identities and this is a situation where we can exploit this divergence.

4 The role and nature of indices

The indices play an important role in deriving the interpretation of reflexive comparatives. The indices can be drawn from different semantic domains, but they always seem to come from an interval of ordered values. We already saw an example where the indices come from a discrete temporal sequence:

\[(23) \text{Every match}_n \text{ doesn’t get easier [than match}_{n-1}] \]

In this case the sequence is used to distinguish different matches in the Roland Gaross tennis tournament. The indices can also play a more continuous role:

\[(24) \text{Joey}_t \text{ got older [than Joey}_{t-1}] \]

While matches are played every other day or so, people get older in a continuous fashion. The indices \(t\) and \(t-1\) are taken from a continuous representation of time. In the following example, the indices come from another continuous domain, space:

\[(25) \text{Wolves}_s \text{ get bigger [than wolves}_{s-1}] \text{ as you go north from here} \]

The temporal axis is one-dimensional and the ordering is provided by the flow of time. This is different in the spatial domain, which is why we need a clause like \(\text{as you go north from here}\) to give us more information about the spatial subdomain and the direction that is used for the indexation of the arguments of \(\text{bigger}\). This clause gives a
one-dimensional subspace together with an ordering of that dimension. A one-dimensional stretch of space is also the domain of indices for the following example, but this time it is the length of the crack that gives us this dimension and the adverbial *at the north gate* that further specifies the ordering of the indices:

\[(26)\] The crack \(p\) gets wider \([\text{than crack}_{p-1}]\) at the north gate

The domain from which indices are drawn can also be scalar:

\[(27)\] The higher his stakes \([\text{than his stakes}_{h-1}]\), the lower his expectations \([\text{than his expectations}_{k-1}]\)

This is an instance of a so-called comparative conditional, a somewhat idiomatic construction in which two reflexively comparative clauses are asyndetically combined (see, e.g., Beck, 1997). There are many intricate aspects of this construction that we cannot go into here. What is important at this point is that two scales are correlated with each other in the sense that the degrees of one scale (the height of stakes) form the indices for making a reflexive comparison on the other scale (the ‘lowness’ of expectations). Because the two clauses are both based on reflexive comparatives, it is likely that one clause provides the domain for the other clause.

Perhaps even more complex are so-called multiple head comparatives (Corver, 1990; von Stechow, 1984) such as (1g), repeated below:

\[(28)\] Nowadays, more goods are carried faster.

As is the case for reflexive comparatives in general, these comparatives are characterized by the unavailability of an explicit *than*-clause or *than*-phrase (Hendriks, 1994). If we assume that each comparative morpheme introduces its own scale, multiple head comparatives introduce at least two scales which are correlated with each other. In (1g), the first scale expresses amounts of goods being carried and the second scale the speed by which these goods are carried. Although we will not go into the details of the construction, the two instances of comparison may be as follows:

\[(29)\] Nowadays, \([\text{more goods}_a [\text{than goods}_{a-1}]]\), are carried faster \([\text{than goods}_{a-1}]\)

Comparative conditionals express two independent instances of comparison and hence introduce two independent scales, which are directly correlated. In contrast, multiple head comparatives seem to express two dependent instances of comparison, as can be seen from the informal representation in (29). We may speculate that the two scales introduced in this construction are only indirectly correlated with each other in the sense that each scale separately correlates with the same third, in this case temporal, scale. The independence of this temporal scale might prevent the interpretation of this construction from getting stuck in a spiral of infinite regress.

Another question is what it means to use an index on the argument of a comparison. What do we mean by *match\(_a\)*, for example? We can see the nouns as a kind of individual concepts (in the Montegovian sense), namely as functions that give you a referent for a particular time or world index. In (23), for example, *match\(_a\)* and *match\(_{a-1}\)* give
instantiations of the predicate match at different indices. In (24) the temporal indices yield different stages (in the Carlsonian sense) of the individual Joey: Joeyₜ is the temporal slice of Joey at time t and Joeyₜ₋₁ is a temporal slice of that same individual at an earlier moment of time. In the same way we can get spatial stages of kinds, as in example (25), where the indexation of the bare kind-denoting plural wolves gives us a spatial partition of the kind along a segment of the axis of latitude. In (26) the spatial indices give us cross-sections of the crack along its major dimension.

Three factors play an important role in determining the kind of interpretation that a reflexive comparative receives: lexical semantics, world knowledge and adverbial modifiers. Take the noun eindexamen ‘final exam’ in the Dutch example (1b):

(30) Elk jaar worden de eindexamens gemakkelijker dan eindexamens₋₁
    Each year get the final exams easier than final exams
    ‘The final exams get easier each year’

We know that an exam is an event that occurs only once and when it occurs it is either easy or difficult, but it doesn’t get easier while we are doing the exam. This means that we are not comparing stages of individual exams, but different exams (or instances of an event type). This interpretation is strengthened by the adverbial elk jaar ‘each year’.

The progression in the German example (1c), repeated here, is not temporal, but spatial:

(31) Die lockere Stadt schloss sich enger und enger um ihn, sie saugte ihn in sich hinein. Der Lärm wuchs, höher schienen sich die Häuser zu wachsen, grauer wurden ihre Fassaden, eiliger liefen die Menschen.

The character from whose perspective the story is told is not standing at a particular place while around him the houses are growing, changing colour, moving closer. He is moving from one part of town to another, with different features. The indices are not temporal, but they are spatial, determined by the path that the character is following. The temporal construal is ruled out because of what we know about towns: fixed configurations of houses and streets that cannot suddenly change over time. Within a town the heights, distances and colours of houses are different and therefore the spatial dimension can give us a domain for comparison on which to build the kind of reflexive comparatives that we see in (31).

We also have knowledge about kinds. The bare plural wolves in (25) refers to a kind of animal with members of different sizes geographically distributed. It makes sense to imagine a mapping from spatial positions to different wolves and to compare those wolves on a scale of size. It does not make sense to imagine a mapping from spatial positions to a particular wolf, showing its variation in size.

Our knowledge of the shape of objects and object parts is illustrated in (26). A crack is an object with a major axis (its length) and minor axes (its width and its depth). The width of a crack can show variation. Cracks form slowly (unless there is an earthquake), so that the spatial construal of (26) is much more likely than the temporal one.
5 Comparative paths

We started this paper with a distinction between different types of comparatives:

(32) a. X is easier than Y.
    b. X is easier.
    c. X gets easier.

In the first two comparative constructions two entities X and Y are compared on a scale of easiness. The difference between the first two constructions is that (32a) makes the reference object of the comparison explicit, whereas (32b) does not. Our reflexive comparative in (32c) does not involve two different entities, but one entity X being positioned with respect to itself at two different indices i and j, i.e. as changing. This distinction between a relation between two entities or a change of one entity can be schematically illustrated as follows:

(33) X is easier (than Y)
          ... ----Y-----X----->  (relation on a scale)

X gets easier
          ... ----Xi-----Xj----->   (change on a scale)

This fundamental distinction is also seen in the spatial domain. Take the adverb *east*. This adverb can be used to describe where one object is with respect to another object (34a), but it can also describe where something is going (34b):

(34) a. The balloon is east of the house.
    b. The balloon is going east.

The first example concerns a relation, the second a change:

(35) X is east (of Y)
          ... ----Y-----X----->  (relative position in a spatial dimension)

X goes east
          ... ----Xi-----Xj----->   (change of position in a spatial dimension)

The spatial dimension could be the west-east axis.

In order to better understand the semantics of reflexive comparatives we can draw on the semantics of space and more specifically on the notion of path (see Zwarts 2004 and references cited there). For our purposes a path can be understood in an intuitive way as a directed stretch of space, the way something is moving or extending through space. Let us assume for concreteness sake that a path is a function from a finite sequence of indices to spatial positions. If \([i,j]\) is the interval of indices, then the initial position of a path \(p\) can be denoted as \(p(i)\), the endpoint as \(p(j)\).

A directional adverb like *east* in (34b) can be interpreted as a set of paths going east. As a rough definition we might take:
In the context of a sentence, a path functions as the trajectory of the theme of the sentence, the object that moves along the path. Moving along a path implies being at subsequent positions of the path at subsequent moments of time. This means that we identify the indices of the path as temporal indices and the positions corresponding to those indices as locations of a moving theme. We can formalize this in terms of a structure-preserving mapping \( f \) from a time interval to the indices of the path. A theme traverses a path \( p \) over a temporal interval \( t \) if and only if at every \( t \in t \), this theme is located at \( p(f(t)) \). The balloon in (34b) is going east if there is a path \( p \) in the set in (36) that forms the sequence of positions occupied by the balloon over an interval \( t \). This implies that the balloon is going east if its final position is east of its initial position. In other words, a change of position of an object is defined in terms of how two positions of that object relate to each other.

In the same way as we have spatial paths, we can talk about scalar or comparative paths, the kind of changes that objects undergo with respect to an underlying scalar domain. Reflexive comparatives, like easier in (32c) denote such scalar paths:

(37) \( \llbracket \text{easier} \rrbracket = \{ p : p(j) > p(i) \text{ on the scale of easiness} \} \)

Easier denotes the set of paths going towards the open end of the scale of easiness. Like a spatial path, a scalar path is a sequence of points, but this time the points are degrees on a scale. Notice that again the path is defined in terms of an underlying relation between degrees. When an entity traverses the scalar path over an interval \( t \), then at the end of the interval it is easier than at the beginning. This captures the reflexive relation on which our analysis of comparatives is based.

Not all reflexive comparatives involve a temporal change, as we saw. Sentence (1e), here repeated as (38), has two readings:

(38) The crack gets wider at the north gate.

In the temporal reading the width of the crack changes over time at one particular point, namely at the north gate. In the non-temporal reading the width of the crack increases along the its major dimension. Both readings involve reflexive comparatives and hence comparative paths:

(39) \( \llbracket \text{wider} \rrbracket = \{ p : p(j) > p(i) \text{ on the scale of width} \} \)

What differs is how the indices of the path are embedded. In the temporal reading, \( f \) maps moments of time to the indices of the path, but in the non-temporal reading \( f \) takes positions along the major dimension of the crack as its domain. We line up the length of the crack with a path \( p \) from (39) in such a way that one end of the crack corresponds to \( i \) and the other end to \( j \) and hence one end of the crack is wider than the otherend.

More examples could be added, but the general idea is clear. The scales that underlie the interpretation of comparatives allow for scalar relations (\( X \) is A-er (than \( Y \)) and scalar
paths (X gets A-er). Every comparative path involves a comparison, and hence a
relation, between its starting point and its end point, defined with respect to some
(temporal, spatial, scalar) interval.

6 Conclusion

We have shown that a particular type of comparatives, that we called reflexive
comparatives, can be understood as the optimal outcome of a conflict between two
general constraints on the arguments of a semantic relation. This outcome allows an
object to be compared with itself, but with respect to different temporal, spatial or scalar
indices. Reflexive comparison is the basis of the definition of a particular kind of
comparative scalar paths that show a strong analogy with the kind of paths that underlie
the interpretation of directional expressions.

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