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MULTIPLE MODALS CONSTRUCTION

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Abstract

Modal items of different semantic types can only be combined in a specific order. Epistemic items, for instance, cannot be embedded under deontic ones. I'll argue that this fact cannot be explained by the current semantic theories of modality. A solution to this problem will be developed in an update semantics framework. On the semantic side, a distinction will be drawn between circumstantial information about the world and information about duties, whereas I'll use Nuyts' notion of m-performativity to account for certain use of the modal items.

1 Introduction

The aim of this paper is to get a better grip on certain properties of modal items. The problem I will focus on concerns the modal combination of different semantic types.
Even though there is no general agreement on a precise definition and categorization of modality, a certain number of types have been identified and emerged as typical instances, like epistemic and deontic modality. I will concentrate on those two types and try to extend the analysis to a simple instance of evidentiality.

Both epistemic and deontic modality have generally been studied in isolation. Modal items (figure **??**) have been categorized as belonging to one or more types, as epistemic or deontic, with a certain force, on a scale from mere possible to necessary. However not much work has been devoted to the study of combinations of modal items. This contribution will try to highlight some problems inherent to these cases.

	possibility	necessity	evidential
modal verbs	may, might	must, have to	
adverbs	maybe	certainly, obligatorily	reportedly
adjectival phrases	it is possible that	it is necessary that	
verbs	to be allowed to	to be required to	
PP			according to John

Figure 1: Some modal items of English

1.1 Some data

To see what is special about these combinations, we can look at the following examples:

(1) a. Adverbs & modal verbs: $[\![epistemic]\!] > [\![deontic]\!]$
Maybe John must go to Berlin.

b. 2× adverbs: $[\![evidential]\!] > [\![deontic]\!]$
Reportedly, this rule doesn't obligatorily apply to students.

c. 2× modal verbs: $[\![epistemic]\!] > [\![deontic]\!]$
John may have to go to Berlin.

d. Modal verbs & verbs: $[\![epistemic]\!] > [\![deontic]\!]$
John might be obliged to quit the country.
e. Adjectival phrase & verb: $[\![epistemic]\!] > [\![deontic]\!]$
It is possible that John is allowed to leave.
f. PP & modal verb: $[\![evidential]\!] > [\![epistemic]\!]$
According to John, the company might fire 1.000 employees.

The inequalities indicate the relative (semantic) scope of the modal items. In (1-a) for instance, $[\![epistemic]\!] > [\![deontic]\!]$ means that the epistemic item is interpreted as having scope over the deontic item. Abstracting from the particular examples it seems that the following hypothesis can be formed:

Hypothesis 1 *If two modal items of different types are present in a grammatical sentence, they will be interpreted as having the following scope*

$$[\![evidential]\!] > [\![epistemic]\!] > [\![deontic]\!]$$

We can try to test this hypothesis by trying to produce a counterexample:

(2) a. #John must possibly go to Berlin.[1]
b. #John is allowed to certainly go to Berlin.
c. #The company might reportedly fire 1.000 employees.[2]

Those examples seem to confirm the hypothesis. However, more than a correct description of the phenomenon (given the 9 sentences...), we would like to have an explanation. The obvious and traditional way to go is to check whether it is a syntactic, semantic or pragmatic problem.

The paper will be organized as follows. In section 2, I will argue that it cannot be a purely syntactic problem; in section 3, I will review the traditional semantic analysis of modality and argue that it cannot explain adequately this phenomenon either. I will then introduce Nuyts' analysis in section 4 and show how it can be used to sketch a framework where the problems at stake are made more explicit (section 5). I will finally conclude on a cross-linguistic note.

2 Not a syntactic problem

The order of interpretation proposed in hypothesis **??** will probably look familiar to the reader. Namely, it looks like a highly simplified version of Cinque's hierarchy of adverbs and functional heads in Cinque (1999):

$$\ldots > \text{MoodP}_{\text{evidential}} > \text{ModP}_{\text{epistemic}} > \ldots > \text{ModP}_{\text{alethic}} > \ldots > \text{ModP}_{\text{volition}} > \ldots > \text{ModP}_{\text{obligation}} > \text{ModP}_{\text{ability}} > \ldots > \text{ModP}_{\text{permission}} > \ldots > \text{V}$$

One could maybe argue that the semantic ordering is derivative of this universal syntactic hierarchy. However I don't think any argument for an explanation along this line, that the hard-wiring in the syntax implies the semantic scope restrictions, sounds convincing. To understand why, here is a quote from Cinque:[3]

[1] I just claim here that the reading where *possibly* is interpreted under deontic *must* is not grammatical. The sentence seems correct with this surface syntactic structure if the epistemic adverb is "semantically moved" to have scope over the deontic modal.

[2] The reading with the evidential having scope over the epistemic modal is available and grammatical.

[3] This is however quite a selective cut of the original text! The first dots actually corresponding to "Although"...

> "...many (perhaps most) of the relative orders among functional elements may ultimately reduce to scope relations among what we can take to be different semantic operators..." Cinque (1999, p.134-135)

Although Cinque ultimately considers his hierarchy to be hard-wired in the syntax, he concedes that a great part of the explanation for the hierarchy lies in the nature of the "semantic operators" and their relative scope. Hence the hierarchy still needs to be explained in non-syntactic terms. Moreover, syntacticians with concurrent theories about the syntax of modal items, like Cormack and Smith (2002), still agree on this point as well.
It has to be stressed however that the syntactic properties of particular modal items usually do influence their combinatorial properties with other modal elements. The point I want to make here however is that the fact that epistemic modals are "never" interpreted under deontic ones cannot be explained by syntactic considerations alone. As there seems to be an agreement among synctaticians on the fact that hypothesis **??** is not a strictly syntactic phenomenon, I will gladly take over this conclusion and continue the investigation by looking at the semantics of modal expressions.

3 Truth-conditional semantics

3.1 Kratzer's possible worlds semantics

(Kratzer 1981, Kratzer 1991) offers a unified analysis of natural language modality within the framework of possible worlds semantics. The main tenet of her analysis is that modal items are not polysemous but context-sensitive. To be more precise, the modal items (like modal auxiliaries) that can be interpreted in different ways (deontically and epistemically, for instance) are context-sensitive.

Modality is a semantic domain that has to do with possibility and necessity. The quantificational force of a modal is therefore not context-sensitive, for instance *must* has universal force (necessity) whereas *may* has existential force (possibility).[4]
The context then fixes the interpretation to be given to a modal element through conversational backgrounds (the "In view of..." part of examples in (3)). Obviously (3-a) is interpreted epistemically and (3-b) deontically.

(3) a. (In view of what is know) John may go to his office.
b. (In view of what the law provides) John may go to his office.

In order to avoid some problems of simple modal logic, modals are made doubly context-dependent. They depend on two different conversational backgrounds (functions from worlds to sets of propositions): one determining the accessible worlds from the world of evaluation (modal base), the other ordering those accessible worlds (ordering source). For instance, epistemic modals depend on an epistemic modal base and a stereotypical ordering source (characterizing a 'normal' course of events) and deontic modals depend on a circumstantial modal base (characterizing the relevant facts) and a deontic ordering source.

[4]It has recently been argued in Matthewson, Rullmann and Davis (2005) that this is actually not a cross-linguistically valid generalization. Lillooet's modal enclitics would seem to have a context-dependent quantificational force.

3.2 Formalization

I will first introduce von Fintel and Iatridou's version of Kratzer's system (as formulated in von Fintel and Iatridou (2004)).

Definition 2 *Let W be a set of possible worlds.*

i) *A **proposition** p is a set of worlds, $p \in \mathfrak{P}(W)$.*

ii) *A **conversational background** is a function from worlds to sets of propositions, $f : W \rightarrow \mathfrak{P}(\mathfrak{P}(W))$.*

iii) *If a conversational background f is a **modal base**, it determines a set of accessible worlds from w by $\cap f(w)$.*

iv) *A set of propositions P determines a **strict partial order** $<_P$ as follows:*

$$\forall w', w'' : \ (w' <_P w'' \text{ iff } \ \forall p \in P \ (w'' \in p \rightarrow w' \in p) \text{ and } \exists p \in P \ (w' \in p \wedge w'' \notin p))$$

v) *A strict partial order $<_P$ determines a **selection function** max_P from set of worlds as follows:*[5]

$$\forall V \subseteq W : \ max_P(V) = \{w \in V : \ \neg \exists w' \in V : \ w' <_P w\}$$

Intuitively, the ordering source will be used to order the worlds and the selection function will select the 'best' worlds according to it. We are now ready to give the definition of a possibility and a necessity modal:

Definition 3 (Necessity and possibility modal) *In a world w, a proposition p is a **necessity** (respectively **possibility**) with respect to a modal base f and an ordering source g, i.e. $[\![must\ p]\!]^{w,f,g} = 1$ ($[\![may\ p]\!]^{w,f,g} = 1$) iff*

$$\forall w' \in max_{g(w)}(\cap f(w)) : \ w' \in p$$
$$(\exists w' \in max_{g(w)}(\cap f(w)) : \ w' \in p)$$

To summarize, all modal items are analyzed as quantifiers over possible worlds. Which worlds are to be quantified over is contextually determined: only the closest accessible worlds according to an 'ideal' are considered.

3.3 Examples

(4) (In view of what his boss ordered him) John must go to Berlin.

$$[\![must\ (\text{John goes to Berlin})]\!]^{w,f,g} = 1 \qquad \textbf{iff}$$
$$\forall w' \in max_{g(w)}(\cap f(w)) : \ w' \in (\text{John goes to Berlin})$$

Sentence (4) is interpreted deontically. In the present framework, that means that the context provides a circumstantial modal base f and a deontic ordering source g. The sentence is true if and only if in all the worlds that share the same circumstances as the base world w and where most of his duties are fulfilled, John goes to Berlin. We can now turn to an example of combination of modals.

[5] This selection function determines the closest worlds according to the 'ideal' P. As usual, this move is only harmless as long as we assume the Limit Assumption of Lewis (1973, p.19).

(5) Pedro may have to leave the country.

$$[\![\textit{may must}\ (\text{Pedro leaves the country})]\!]^{w,f_1,g_1,f_2,g_2} = 1 \textbf{ iff}$$
$$\exists w' \in max_{g_1(w)}(\cap f_1(w)) : \forall w'' \in max_{g_2(w')}(\cap f_2(w')) :$$
$$w'' \in (\text{Pedro leaves the country})$$

a. (In view of what is known) It is possible that (in view of what the law provides) it is necessary that Pedro leaves the country.
b. #(In view of what the law provides) It is possible that (in view of what is known) it is necessary that Pedro leaves the country.

The problem is to determine which conversational background is attributed to which modal. The standard reading is the one where *may* is epistemic and *have to* deontic, paraphrased as **??**. But the framework doesn't prohibit reading **??**.[6] There is no reason why we could not combine the conversational backgrounds in this way. The only straightforward solution is to stipulate that deontic modals scope under epistemic ones. This problem will, I think, be cropping up for any "modal" theory of deontic modality that treats deontic modality on a par with epistemic modality, i.e. as an accessibility relation on worlds.

3.4 Brennan's version: Back to the 70's

Another solution to the problem would be to differentiate between epistemic and deontic modals at the semantic level. This path has been explored in Brennan (1993).[7] She developed a revision of Kratzer's framework where deontic modals have their own special modal base. The starting point for this move can be found in the following quote from Kratzer (1991, p.650):

> "... the distinction between modals with circumstantial and modals with epistemic modal bases which is at the heart of our proposal may correlate with a difference in argument structure."[8]

Remember that circumstantial modal bases are "used" with deontic modals. Hence, if modal bases for deontic and epistemic modals also differ structurally, maybe we will be able to explain their combinatorial properties by this fact. The difference in argument structure referred to by Kratzer (1991) corresponds very roughly to the difference between raising and control verbs. Jackendoff (1972), for instance, develops an analysis of modal auxiliaries where epistemic and deontic modals correspond to raising verbs (or speaker-oriented adverbs) and control verbs (subject-oriented adverbs) respectively. However both types of modals are considered to

[6] It is interesting to remember that such an example was originally used in Kratzer (1978, p.144-147) to argue for an attributive conversational background (against a referential one). But notice however that making **??**'s deontic conversational background explicit in **??** doesn't even force a *deontic* > *epistemic* reading. The *epistemic* > *deontic* reading is still the only natural reading and the deontic ordering source is interpreted as g_2 (not g_1):

(i) In view of what the law provides, Pedro may have to leave the country.

Furthermore this explicit deontic conversational background outside of the epistemic scope seems to force a referential reading of the ordering source, i.e. $g_2(w') = g_2(w)$ (though not of its circumstantial modal base). On the contrary, the typical reading of **??** seems to involve a referential reading of the modal base, i.e. $f_2(w') = f_2(w) \approx f_1(w)$. This must certainly be studied in more detail. In particular this could undermine the stance of definition 2, leaving an anaphoric view à la Frank (1997) as only possibility.

[7] Brennan (1993) actually concentrates on the analysis of root modals (deontic, ability...), and is not meant to solve the problems caused by modal combinations.

[8] See Brennan (1993, p.5): "..she [Kratzer] leaves open the possibility that there are also structural differences (in argument structure, for example) between them."

belong to the same syntactic class of (modal) auxiliaries, the difference being in their respective interpretation rules.

Brennan implements this analysis within Kratzer's framework which has the consequence of changing the notion of modal base for some deontic modals, namely for those that function as control verbs. Epistemic modals and all the ordering sources remain the same and the new modal bases for deontic modals are functions of an individual and a world and yield a set of properties.[9] My interest lies not so much in the precise formalization than in the fact that an essential distinction is made between epistemic and deontic modals, therefore I will simply sketch a consequence of this framework with an example of combination of modals.

The proposed interpretation of example (5) is blocked because the sentence is semantically not well-formed. This is due to the fact that the deontic modal takes as argument the (denotation of the) intransitive verb phrase under it; however this IV is constituted of an epistemic modal and a verb phrase but, as epistemic modals are propositional operators, the sentence is uninterpretable.

(6) # Pedro may have to leave the country. (deontic > epistemic)
$[\![may_d('must_{ep}\ \lambda x.\ulcorner x\ leaves\ the\ country\urcorner')(Pedro)]\!]^{w,f_x,g} = \#$

This failure of interpretation can thus be attributed to the epistemic modal: because some of its basic properties would not be respected, epistemic modals cannot be embedded under deontic ones. The main problem with Brennan's analysis is that it only partially solves the problem of combinations of modals, i.e. only in those cases where the deontic modal is a "VP-modal" as in example (6-a). The other deontic modals, as example (6-b), are still analyzed as propositional operators along the same lines as epistemic modals. Hence, Brennan's analysis could solve the problem if sentence (6-b) could embed an epistemic modal. However, sentence (7) does sound ungrammatical and the problem doesn't seem to disappear for those deontic modals.

(7) a. Pedro must leave.
$(must^1_d[\ulcorner\lambda x.x\ leaves\urcorner])(Pedro)$
b. Tax forms have to be filled out in ink.
$must^2_d[\ulcorner Tax\ forms\ are\ filled\ out\ in\ ink\urcorner]$

(8) # Tax forms have to maybe be filled out in ink. (deontic > epistemic)

The second problem with Brennan (1993) comes to light in example (6), namely, she has to abandon the aim of a fully unified theory of modality. Even though the general idea of context-dependence is kept, Brennan has to introduce different interpretive rules for the non context-dependent parts of deontic and epistemic modals (the $must^1_d$ and $must^2_d = must_{epistemic}$ of example (6)). This goes obviously against one of the starting points and main motivation of the original framework (see Kratzer (1978, p.103)). However this distinction between deontic and epistemic modals seems to be descriptively more adequate: the two systems don't appear to be on a par. I can have uncertainties about whether someone has some obligations but I don't really know what it would amount to to have epistemic obligations. Hence I will follow Brennan in making a distinction between epistemic and deontic but I will try to give an analysis general enough to encompass the two types of deontic modals as example (7) makes it clear that those deontic forms have the same distributional properties.

[9] See Brennan (1993, p.65-68).

4 Linguistic interlude

Before turning to the formal analysis, I will briefly expose some views held by Palmer (2001) and Nuyts (2004) concerning modality. First, epistemic modality is about knowledge: but not anybody's knowledge. As Palmer (2001) puts it "...with epistemic modality speakers express their judgments about the factual status of the proposition". Therefore questions of truth could be a step too far and we should maybe opt instead for a framework that takes as a central issue the information exchange between a speaker and a hearer.

Simplifying somehow, we could say that within the standard account an epistemic possibility sentence is true if, given a set of propositions representing what is known, the sentence is compatible with this information. It can well be in some cases that the set of propositions represents the speaker's knowledge, but it would seem to be more general than Palmer's view. Nevertheless as soon as we take into account some pragmatic considerations it becomes obvious that under reasonable assumptions the two positions amount to the same. In particular, if we assume that the speaker knows the meaning of *might* and asserts truthfully "John might be home," the relevant set of propositions must be a part of the speaker's knowledge.[10] Palmer only states that "speakers express their judgments" whereas the truth-conditional account tells us under which conditions the sentence is true. However one can understand the meaning of an epistemic sentence without knowing which f and g of definition 2 are the relevant ones, i.e. without knowing its truth value. To capture this core meaning of "expressing the speaker's judgment" it seems that we should better use a framework that is able to represent the information exchange and not only the truth conditions.

To formalize the idea that the speaker expresses in an assertion his judgment about the status the embedded proposition, I will use Nuyts notion of m-performative[11] and descriptive use of modals from (Nuyts 2001, Nuyts 2004). A modal is used m-performatively if it expresses the current commitment (i.e. at utterance time) of the speaker towards the proposition expressed, and it is used descriptively if no such commitment is made (at utterance time) by the speaker about the evaluation of the embedded proposition.

(9) a. It's possible that it was raining that night.
b. It was possible that it was raining that night.
c. According to John, it's possible that it was raining that night.

In example (8-a), the speaker evaluates as possible a certain past raining-event and commits himself to this evaluation. It would be pragmatically odd for the speaker to continue by saying "but it wasn't." Sentence (8-b) doesn't involve the same commitment on the part of the speaker, that is, he doesn't have to believe at the moment of utterance that it is possible that it was raining in order to utter (8-b) truthfully (he could even know that it wasn't raining). Finally, in example (8-c) the speaker reports John's opinion and obviously doesn't have to commit himself to it.

In simple declarative clauses, modal items are usually used m-performatively, i.e. they standardly convey a commitment of the speaker. However, in a past tense declarative as (8-b) this commitment is not conveyed; this is the case too in knowledge "reports" as (8-c) but also in the antecedent of conditionals or under attitude verbs. The main point is then that some modal items can be used m-performatively and descriptively, as *possible* in (8), but that some other modal items can almost exclusively be used m-performatively.[12] Furthermore m-performative items

[10] Notice that the knowledge of the hearer cannot be taken as already containing this information, otherwise any *might*-sentence would be automatically true and as such pragmatically odd.

[11] It is actually called performative by Nuyts but was so renamed by Faller (2002) in order to avoid confusion with the speech-act notion of performativity.

[12] Epistemic modal adverbs, like *maybe*, are usually m-performative. This could well be a consequence of their

can only be used in illocutionary force bearing environments (Faller 2002, p.213). They cannot occur under negation, in the antecedent of a conditional or, for instance, under a m-performative modal item. This means that, in a sentence combining two modal items with scope $m_1 > m_2$, m_1 would be m-performative and m_2 would be descriptive.

4.1 Proposal

I want to make use of some of those ingredients in order to account for the combinational properties of modal items. The basic intuition is that it makes sense to be uncertain about some obligations whereas to have possibilities as obligations seems odd.
I will follow Brennan in making a distinction between epistemic and deontic items in the semantics (although S and VP deontic modals will be treated uniformly). This simply means that I will not treat factual information about the world and deontic information at the same level. Epistemic items will be formalized as tests on an agent's information state and deontic ones as update of the agent's to-do-list. I will then formalize Nuyts' notion of m-performativity indirectly. M-performativity will be the default interpretation of the 'highest' modal in an assertion. Hence modal items that are inherently m-performative will be anchored to the speech event and represent the speaker's commitment.

M-performative epistemic modals as *maybe* will thus have to be interpreted on a whole information state, but as deontic operators force further interpretation on the deontic domain, the combination m-performative epistemic under deontic item will result in the failure of interpretation.

5 Formal framework

I will first introduce the standard setup of update semantics (US from now on) and from that construct in a stepwise way an US system with obligations. I will finally try to render Nuyts' ideas within this framework and use it on examples of combinations of modal items.

5.1 Update semantics

Definition 4 *An US system is made of three components: a language, a set of information states, a set of update operations.*

1. *The **basic language** $\mathcal{L}_0$ is constructed as usual from a set of atomic sentences $\mathcal{P}$ and combination thereof with the connectives $\neg$ and $\wedge$, i.e. $\mathcal{P} \subseteq \mathcal{L}_0$, if $\varphi \in \mathcal{L}_0$ then $\neg\varphi \in \mathcal{L}_0$ and if φ and $\psi \in \mathcal{L}_0$ then $\varphi \wedge \psi \in \mathcal{L}_0$.*
   *The **possibility language** $\mathcal{L}_1$ is defined as follows, $\mathcal{L}_0 \subseteq \mathcal{L}_1$ and if $\varphi \in \mathcal{L}_0$ then $poss(\varphi) \in \mathcal{L}_1$.*

2. *A world/possible world/possibility is a function with domain $\mathcal{P}$ and range $\{0,1\}$, and W is the set of possible worlds. An **information state** σ is a subset of W, and let Σ be the set of information states.*

3. *The update operations are then defined as follows,*

syntactic properties.

$$\begin{aligned}
\sigma[p] &= \{w \in \sigma \mid w(p) = 1\},\\
\sigma[\neg\varphi] &= \sigma - \sigma[\varphi],\\
\sigma[\varphi \wedge \psi] &= \sigma[\varphi] \cap \sigma[\psi],\\
\sigma[poss(\varphi)] &= \sigma, \text{ if } \sigma[\varphi] \neq \emptyset \ (\emptyset \text{ otherwise}).
\end{aligned}$$

Obviously this very simple system is not conceived to talk about obligations but about knowledge. Learning that φ is the case consists in updating your information state with φ. Learning that $\neg\varphi$ is the case means removing those possibilities (i.e. possible worlds) where φ is the case from your information state. Learning that $\varphi \wedge \psi$ is learning that φ and that ψ, and finally φ is possible, $poss(\varphi)$, if learning that φ doesn't leave you with no information, i.e. some world in your information state is a φ-world.

In order to account for obligations I will adopt a method introduced by Portner (2003) and used for imperatives by Mastop (2005) in a US-framework. The main idea is to use a to-do-list to represent obligations. What is a to-do-list? It is not much than what it says, a list of sentences that we take to stand for **obligations**, the main point being that this list is a separate entity from the circumstantial information about the world. I will not deal with permissions but argue that it doesn't affect the problem at stake.

Definition 5 (Worlds and obligations)

1. *A to-do-list is a set* $\pi = \{(p, DO), (q, DO), ...\}$ *with* p, q *atomic sentences, i.e. a subset of the product* $\mathcal{P} \times \{DO\}$.

2. *A possibility is a pair of a world and a to-do-list, i.e.* (w, π). *A possibility is thus characterized by what is the case and what are the duties in it.*

Obviously this is a very crude characterization of obligations. Moreover some choices have to be explained about the formalization and the notation. Just as possibilities are functions from atomic sentences to truth values, to-do-lists could be seen as partial functions from atomic sentences to $\{DO, DON'T\}$,[13] i.e. duties and prohibitions.

(10) a. #It is allowed that you *maybe* go.
b. You must not come to my talk.
c. #You must not *maybe* come to my talk.

Example (9-a) shows that permission sentences cannot embed epistemic items either. Example (9-b) which exemplifies a prohibition behaves in the same way as an obligation when it combines with an epistemic item, see (9-c). Therefore I'll concentrate on obligations and simplify the framework correspondingly, keeping the (p, DO) notation as a reminder of this more complex structure and leaving permission aside.

(11) a. Thesis paper must be acid-free.
b. #Thesis paper must *maybe* be acid-free.
c. Junior must go to bed at 8.00.
d. #Junior must *maybe* go to bed at 8.00.

There are some other features of deontic constructions that don't seem to change the embedding properties. First, most frameworks link to-do-lists to individuals, this means the to-do-list has to be a list of atomic imperatives, as Mastop (2005), or properties, as Portner (2003). In the

[13] Mastop (2005) defines its to-do-lists using atomic imperatives, not atomic sentences.

same way as Brennan (1993), it would solve the problem for example (9-b) with an analysis of epistemic items as propositional operators. However this doesn't work for example **??** (and its ungrammatical version **??**). There, the obligation is not restricted to a particular individual (neither syntactically or semantically) and the deontic seems to scope over the whole sentence in an ought-to-be reading.[14] The combination in **??** is still odd, precisely because the concept of epistemic obligation is odd, whether it is linked to a particular individual or not.
Finally the question of the addressee (or the source/authority) of the obligation need not be a worry. Sentence **??** can be, depending on the context, used to convey that Junior_1 (age 9) has been ordered by his mother to go to bed at 8.00 or that the babysitter has been requested to see to it that Junior_2 (age 1:6) will be in bed at 8.00. Whatever interpretation is salient, its maybe-version **??** is still ungrammatical. Therefore I will only model obligations in the simplest way possible, abstracting away from who's the carrier of the obligation and who issued it.

We now have to extend our system to be able to talk about obligations. I will first extend the notion of information states, then add a new operator to the language and define its update operation.

Definition 6 (US with to-do-lists)

1. *An **information state** σ is a set of possibilities, i.e. a subset of $W \times \mathfrak{P}(\mathcal{P} \times \{DO\})$. The absurd state is the empty set $\emptyset$ and the initial state is the set of all possibilities consisting of a world and a to-do-list, $\mathbf{0} = W \times \mathfrak{P}(\mathcal{P} \times \{DO\})$*

2. *The **simple deontic language** $\mathcal{L}_2$ is defined as follows, $\mathcal{L}_1 \subseteq \mathcal{L}_2$, if $p \in \mathcal{P}$ then $!p$, $poss(!p)$ and $!poss(p) \in \mathcal{L}_2$.*

3. *The update operations are defined in the obvious way for the already given operators.*

$$\begin{array}{lcl} \sigma[!\varphi] & = & \{i \in \sigma \mid i = (w,\pi) \textit{ and } \pi[\varphi] = \pi\}, \\ \pi[\varphi] & = & \pi \cup \{(\varphi, DO)\} \end{array}$$

The update operation for $!p$ could be simplified to the equivalent $\sigma[!p] = \{i \in \sigma \mid i = (w,\pi)$ *and* $(p,DO) \in \pi\}$, but what I want to illustrate here is that ! triggers an operation on to-do-lists. To learn that p is an obligation is to add p to your information state's to-do-list.[15]. Consider a sentence of the form $poss(!p)$, that could be used to model the logical form of sentence **??**:

(12) John might have to give a talk.

$!p$ is possible in state σ, $\sigma[poss(!p)] = \sigma$, if and only if learning that p is an obligation doesn't leave you with no information, i.e. $\sigma[!p] \neq \emptyset$ which means p belongs to a possibility's to-do-list in σ. Now consider a sentence of the form $!poss(p)$:

$$\begin{array}{lcl} \sigma[!poss(p)] & = & \{i \in \sigma \mid i = (w,\pi) \textit{ and } \pi[poss(p)] = \pi\} \\ & = & \{i \in \sigma \mid i = (w,\pi) \textit{ and } \pi \cup \{(poss(p), DO)\} = \pi\} = \emptyset \end{array}$$

The interpretation of this sentence results in the absurd state as there is no such thing in the to-do-lists as the obligation of a possibility.

It is time to add the last change on the information state. So far an information state is a set of possibilities consisting of a world and a to-do-list. It characterizes the information an agent

[14] Feldman (1986).

[15] However it is an eliminative system, hence the equivalence with the simpler definition.

may have. We will add information about what other agents know. To do that we need a set of agents $\mathcal{A}$, and a particular agent $a \in \mathcal{A}$; a's information about the other agents is of the form $\mathtt{A}_a = \{\sigma_b \mid b \in \mathcal{A} - \{a\}\}$ with $\sigma_b \subseteq W \times \mathfrak{P}(\mathcal{P} \times \{DO\})$, that is, an information state according to definition 5. [16]

Definition 7 (Information state of some agent a)

1. *A possibility is a tuple of the form $i = (w, \pi, \mathtt{A}_a)$. An information state is a set of possibilities.*

2. *The new language is defined as follows, $\mathcal{L}_2 \subseteq \mathcal{L}_3$ and if $\varphi \in \mathcal{L}_2$ then $\Box_b\varphi \in \mathcal{L}_3$ for $b \in \mathcal{A}$.*

3. *The update operation for $\Box_b$, $b \in \mathcal{A}$ is:*

$$\sigma_a[\Box_b\varphi] = \{i \in \sigma_a \mid i = (w, \pi, \mathtt{A}_a) \textit{ with } \sigma_b \in \mathtt{A}_a \textit{ and } \sigma_b[\varphi] = \sigma_b\}$$

The goal of such an information state is simply to represent different kinds of information by different entities. This is however not enough to solve the ordering problem. As was already noticed, at this point the system is only able to represent the harmless combinations of epistemic over deontic modals.

5.2 Assertions and m-performativity

As already mentioned, m-performativity will be modeled as a default interpretation of assertions. The standard interpretation of a declarative sentence conveys that its content represents the speaker's belief or commitment.

Definition 8 (Assertion) *The update due to agent a's assertion of φ to agent b is modeled as follows,*

$$\sigma_b(\varphi)_a = \sigma_b[\varphi] \cap \sigma_b[\Box_a\varphi]$$

In this view, accepting a's assertion consists in accepting the content of the utterance and learning that it is also part of a's knowledge. The top level operator of a sentence $\varphi = Op[\psi]$ will thus also be bound to the speaker's information state through $\Box_a$, i.e. making the utterance m-performative.

Finally, we need to account for inherently m-performative modal items. Those items are only interpretable in illocutionary force bearing environments as assertions. A m-performative epistemic possibility modal is an operator, say *Poss*, similar to *poss* but restricted to assertions, i.e.,[17]

$$\sigma_b(\textit{Poss } \varphi)_a = \sigma_b[\Box_a \textit{poss } \varphi] \text{ if } \sigma_b[\varphi] \neq \emptyset, \ (\emptyset \text{ otherwise})^{18}$$

We can also define the m-performative deontic operator, say $!_m$, as the operator ! but restricted to assertions.

[16] A better, though more involved, way to represent this would be to allow the information state of the agent to contain other information states of the same kind. This leads to circularity but can be formalized in the framework of non-wellfounded sets.

[17] It is still unclear how to formalize this correctly, but I would prefer not to add this operator to the syntax of the language.

[18] $\sigma_b(\textit{Poss } \varphi)_a = \sigma_b[\textit{poss } \varphi] \cap \sigma_b[\Box_a \textit{poss } \varphi]$ and $\sigma_b[\textit{poss } \varphi] = \sigma_b$ if $\sigma[\varphi] \neq \emptyset$ ($\emptyset$ otherwise).

5.3 Examples

Now the system is in place, we can use it on the examples and see how the hearer interprets sentence **??**?

(13) *S*: "Maybe John must go to Berlin."

Intuitively this sentence means that some state of affairs is an epistemic possibility, namely that John has the obligation to go to Berlin. Formally it will have the following logical form: $Poss\ !p$ with the relevant interpretation of p.

$$\sigma_H(Poss(!p))_S = \sigma_H[\Box_s poss(!p)] \text{ if } \sigma[!p] \neq \emptyset$$

Hence, if the information state of the hearer contains a possibility where John has such an obligation ($\sigma[!p] \neq \emptyset$), we obtain that the hearer updates his information state with the fact that the speaker is committed to $poss(!p)$.

$$\begin{aligned} \sigma_H(Poss(!p))_S &= \{i \in \sigma_H \mid i = (w,\pi,\mathtt{A}_H) \textit{ with } \sigma_S \in \mathtt{A}_H \textit{ and } \sigma_S[poss(!p)] = \sigma_S\} \\ &= \{i \in \sigma_H \mid i = (w,\pi,\mathtt{A}_H) \textit{ with } \sigma_S \in \mathtt{A}_H \textit{ and } \sigma_S[!p] \neq \emptyset\} \end{aligned}$$

Hence the combination m-performative epistemic over descriptive deontic works fine. We can now turn to the infelicitous combinations, deontic $>$ (m-performative) epistemic, of the form $!_m Poss(p)$.

(14) *S*: #"John must *possibly go to Berlin*." (example (2-a))

$$\begin{aligned} \sigma_H(!_m Poss(p))_S &= \sigma_H[!Poss(p)] \cap \sigma_H[\Box_S !Poss(p)], \\ \text{however, } \sigma_H[!_m Poss(p)] &= \{i \in \sigma_H \mid i = (w,\pi,\mathtt{A}_H) \textit{ and } \pi[Poss(p)] = \pi\} = \emptyset \end{aligned}$$

The failure of interpretation is now caused by the fact that *Poss* cannot be interpreted outside an illocutionary force bearing environment. This must be contrasted with the explanation of the infelicity of example **??**. Failure is there due to the structure obligation (to-do-lists) whereas it is now due to the m-performativity. It would seem that, if this result is not only caused by the epistemic nature of the element, we should obtain a similar result by trying to embed a m-performative deontic item, and indeed examples in **??** involving a m-performative deontic are infelicitous.

(15) a. #Maybe, you must go now!
b. #Maybe, go now!

(16) According to John, Pete might have to go to Berlin.

Lastly, I would like to suggest that sentences containing an evidential-like element as *according to John*[19] can be integrated within this framework quite easily (using the $\Box$ operator). A sentence like (11) will just have the following logical form, $\Box_J poss(!p)$. However it would require for instance the extension of this framework by using non-wellfounded sets.

[19] Whether "according to John" should be considered a real evidential (quotative or hearsay type) is problematic. If we do so, sentence **??** would suggest that hypothesis **??** should probably be revised too.

(i) a. It might be so that, according to John it was scheduled at 18.00 but that, according to Pete it was scheduled at 19.00.
b. $[\![evidential]\!] \geqslant [\![epistemic]\!] > [\![deontic]\!]$

6 Conclusion

In this paper, I argued that the existence of certain scope properties of modal categories should be accounted for within a semantic framework. I therefore introduced an update semantics system in which the ordering $[\![epistemic]\!] > [\![deontic]\!]$ follows from the semantics and pragmatics of the modal items. Two central points of this system allow it to account for the scope order. First Brennan's distinction between deontic and epistemic items has been sharpened, following Portner (2003) and Mastop (2005), allowing us to differentiate between deontic and epistemic operators. The former operate on to-do-lists while the latter operate on circumstantial information. Second, I used Nuyts' notion of m-performativity to model Palmer's conception that with modality "...speakers express their judgments..." Some modal items can typically only be used m-performatively, that is, anchored to the speaker at the speech event, which explains why they cannot embed. These two factors were used to account for the possible and impossible combinations of deontic and epistemic items, used descriptively and m-performatively.

Of course, this framework is still quite crude and can be improved in several directions. It would seem natural, for instance, to have a more involved account of the deontic realm. The to-do-lists can only handle obligations but it should be extendable to a full (constructive) system with permission in the manner of Mastop (2005). The analysis of the relative scopes should be extended to other modalities, in particular to more typical instances of evidentiality than the one used in this paper. Finally, hypothesis **??** on the relative order of modalities must definitely be tested cross-linguistically: it would be surprising if it turned out to be a feature unique to the English language.

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FORKING PATHS AND POLARITY ITEMS LICENSING*

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Abstract

There is an elegant account, proposed by Beaver and Condoravdi (2003), that assumes that the temporal connectives *before* and *after* are converses (i.e., they are analyzed by means of a unified lexical schema), and that explains away their different logical and veridical behavior appealing to other factors. There is an elegant explanation that connects the licensing of Polarity Items to informational strengthening requirements: Polarity Items are viewed as existentials that lead to a widening of the domain of quantification, and they are predicted to be legitimate only when this widening leads to a stronger statement (roughly, in downward monotone contexts). My plan is to connect these two approaches – by proposing an amendment in the definition Beaver and Condoravdi presented for *before* and *after* that is meant to account also for their Polarity Items licensing behavior.

1 The data

It is a well-known fact that the two temporal connectives *after* and *before* appear to be converses (i.e., if (1) is true, then also (2) is true):

(1) Fred came home after Wilma left.

(2) Wilma left before Fred came home.

but, on the other hand, display different properties. In particular, they exhibit different *logical properties*: *after* expresses a relation which is neither transitive nor asymmetrical; *before* expresses a relation which is transitive and asymmetrical.[1] And they have diverging *veridical properties*: *after* constitutes a veridical operator, that is, from the truth of *A after B*, *B* may be inferred:

(3) Fred came home after Wilma left. VERIDICAL

(4) Wilma left.

Whereas *before* may be read veridically (as in (5), where the temporal clause is implied to be true); or it may receive a non-committal interpretation (as in (6), where the subordinated clause is implied to have been likely when the main clause took place); or it may assume a counterfactual reading (as in (7), where the *before*-clause is implied to be false):

(5) Fred bought a Toyota before the price went up. VERIDICAL

(6) Fred left the country before anything happened. NON-COMMITTAL

(7) Fred died before he saw his grandchildren. COUNTERFACTUAL

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[1] In this paper, I will not analyze *after* and *before* logical patterns.

And, finally, *after* and *before* differ also in their licensing properties. The temporal connective *after* does not (normally) license Polarity Items,[2] and it requires indicative mood (cf. (8) and the Italian (9) for explicit mood marking), whereas *before* does license Polarity Items, and it requires subjunctive mood (cf. (10)-(11)):

(8) * Fred left the party after *anyone* else did.

(9) Gianni fuggì dopo che Mario aveva rivelato (qualche / **alcun*) segreto.
Gianni left after that Mario had$_{IND}$ revealed (some / any) secret.

(10) Fred left the party before *anyone* else did.

(11) Gianni fuggì prima che Mario rivelasse *alcun* segreto.
Gianni left before that Mario revealed$_{SUBJ}$ any secret.

2 Standard account

The traditional account may be traced back to some remarks put forth in Anscombe (1964), and it is defended, amongst others, in Landman (1991) and Ogihara (1995). Its main feature is to posit two distinct lexical entries for the temporal connectives: in both cases, the sentences *A after/before B* are regarded as true when there is a time t verifying the main clause *A* that follows/precedes the subordinated clause *B* – but in the case of *after* the *A*-time t must follow *some B*-time t' (i.e., *after* involves existential quantification over times verifying the temporal clause); in the case of *before*, the *A*-time t must precede *all B*-times t' (i.e., *before* requires universal quantification over times verifying the temporal clause):

Landman (1991)

[[*A* after *B*]] = 1 iff $\exists$t [t$\in$*A* & $\exists$t'< t [t'$\in$*B*]]
A after B is true iff there is a time t verifying *A* and there is a time t' verifying *B*, and t follows t'. I.e., iff there is an *A*-time t that follows a *B*-time t'.

[[*A* before *B*]] = 1 iff $\exists$t [t$\in$*A* & $\forall$t'[(t'$\in$*B*) $\rightarrow$ t<t']
A before B is true iff there is a time t verifying *A* and for all times t', if t' verifies *B*, then t precedes t'. I.e., iff there is an *A*-time t that precedes all *B*-times t'.

Within this perspective, *after* and *before*'s different licensing properties immediately follow: *before*-clauses involve universal quantification – and thus they constitute downward entailing environments, that are known to be Polarity Items licensors; *after*-clauses, on the other hand, call for existential quantification over times, and thus they do not allow strengthening inferences. As for their veridicality problems, *after* turns out to be a veridical operator (since the instantiation of *B* is a necessary condition for the truth of *A after B*); whereas *before* is non-veridical (since for *A before B* to be true, *B* needs not be realized).[3] But the standard account has also some shortcomings: in particular, the apparent converseness between *before* and *after* is lost, and it is not clear how to present a compositional account of their meanings.

3 Beaver and Condoravdi (2003)

In a recent paper,[4] Beaver and Condoravdi defended a *uniform* account for the analysis of the two temporal connectives. The first step consists in the introduction of a coercion operator *earliest* – that applies to a set of times verifying a clause *C*, and that selects its left boundary (i.e., the earliest amongst all the *C*-times). Sentences of the form *A after (/ before) B* are

[2] Linebarger presented some counterexamples to this generalization. They are discussed in the Appendix.

[3] Some adjustments are needed, because otherwise any sentence with an unrealized *before*-clause is predicted to be true – independently of its likelihood. See Ogihara (1995).

[4] Beaver D. & Condoravdi C. (2003). A Uniform Analysis of *Before* and *After*.

viewed as true relatively to a time t_0 just in case there is a time t that verifies the main clause *A* and that follows (/ precedes) the *earliest* time t' that verifies the temporal clause *B*.

As it stands, the definition cannot explain *after* and *before* diverging veridical properties – since for the truth of *A before B* there must be a (earliest) time verifying *B* (that is, *before* turns out to be a veridical operator). Beaver and Condoravdi's solution is to exploit the definedness requirement associated with the coercion operator *earliest*: *earliest* must pick up the earliest amongst all the times verifying the *B*-clause. If there are no *B*-times in the evaluation world, alternative worlds are to be taken into consideration. These alternative worlds are the *historical alternatives* to an evaluation world w at a time t – *alt(w,t)* – those worlds that coincide with w up to t, and from that moment may diverge only in reasonable ways, i.e., the normal future continuations of w after t. The operator *earliest* is then defined relatively to this expanded domain of worlds.

Beaver and Condoravdi (2003)

alt(w,t) = λw'. w' is indistinguishable from w for all times t' < t;
and w' is a normal continuation of w after t.

[[*A* after (/before) *B*]]^{w}= 1 iff (∃t: <w,t>∈*A*) t > (/<) *earliest*. λt'. (∃w' ∈ alt(w,t)) <w',t'> ∈ *B*

A after (/*before*) *B* is true in w iff there is an *A*-time t that follows (/precedes) the earliest amongst the times t' for which there is an historical alternative w' to (w,t) such that <w',t'> verify *B*; i.e. iff there is an *A*-time t that follows (/precedes) the earliest *B*-time – not necessarily in the evaluation world w, but possibly in one of its historical alternative w'.

The difference between *before* and *after*'s veridical properties is couched on the asymmetry of time branching: roughly, once a time t is located (i.e., the time in which the main clause *A* holds), what is past with respect to t is fixed – and thus the set of historical alternatives to w at t is in fact reduced to the evaluation world w itself, whereas what is future with respect to t may involve different future branches, i.e., it calls for a set of historical alternative worlds.

Somehow more formally, in the evaluation of a sentence of the form *A after B*, since the historical alternatives coincide with w for all t' < t (all times t' that precede t), and since the earliest *B*-time is located before the *A*-time t, the set *alt*(w,t) is reduced to the singleton {w}, and the definition can be simplified to:

[[A after B]]^{w} = 1 iff (∃t: <w,t> ∈ *A*) t > *earliest*. λt'.<**w**,t'> ∈ *B*

For the sentence to be true, there must be an *A*-time t that follows the earliest amongst the times t' that verify *B in the evaluation world w*. Thus, for the sentence to be true, the subordinated clause *B* has to be instantiated in the evaluation world – that is, *after* is predicted to be veridical.

When we turn to *before*-sentences, the situation is different. Since the event in the *B*-clause is future with respect to the *A*-time t, historical alternatives (i.e., future branches) of w after t are activated: *B* is to be instantiated in at least one of these branches – not necessarily in the evaluation world.

[[*A* before *B*]]^{w}= 1 iff (∃t: <w,t> ∈ *A*) t < *earliest*. λt'. (∃w' ∈ alt(w,t)) <w',t'> ∈ *B*

A before B is true in a world w if and only if there is a time t such that the pair <w,t> verifies *A*, and that time t precedes the earliest amongst the times t' for which there is a historical alternative w' to w at t such that <w',t'> verifies *B*.

Thus, for instance, coming back to the counterfactual reading of *before*, the sentence in (7) is predicted to be true just in case there is a past time t in which Fred dies, and in at least one

future alternative to w at t Fred sees his grandchildren,[5] and that time t precedes the earliest amongst all the times in which he sees his grandchildren.

I think that Beaver and Condoravdi's proposal is extremely convincing, since it can explain the apparently diverging properties *after* and *before* display by means of a single lexical schema. The problem is that, in their (2003) SALT paper, *after* and *before*'s different licensing behaviour remains unaccounted for.[6]

4 The proposal

The evaluation of a *before*-clause may require considering alternative worlds; an *after*-clause is assessed with respect to the evaluation world. I propose to connect the licensing of Polarity Items precisely to this difference.

This is formally obtained by introducing an amendment to Beaver and Condoravdi's uniform definition for *after* and *before*: roughly, the time t that verifies the main clause *A* is to be ordered (as temporally following or preceding) *all the earliest B-times* (i.e., all the times t' that constitute the earliest times verifying the *B*-clause relatively to the historical continuations of <w,t>). In other words, the new "basic" definition for the temporal connectives *after* and *before* renders both subordinated clauses downward entailing contexts (because of the universal quantification over (earliest-)times), that is, Polarity Item licensing environments. In order to account for their *diverging* licensing properties, the plot is then to exploit once more the asymmetry of time branching: in the evaluation of an *A after B* sentence, since what is past with respect to a given time is fixed, the universal quantification over earliest *B*-times is in fact reduced to an ordinary existential quantification – and thus the ungrammaticality of Polarity Items in *after*-clauses is derived.

Before entering into the details and into the formal definitions, let me first sketch the idea behind the connection between the asymmetry of time branching and the licensing of Polarity Items. One of the most influential approach to the problem of PIs licensing[7] treats expressions like *any* as existential quantifiers that lead to a widening of the domain of quantification. In normal, positive contexts, such a widening would cause a loss of information.[8] In other contexts enlarging the domain brings about a strengthening of the statement made. These kinds of environments share a semantic property – Downward Entailingness – that is, they are characterized by the fact that they enable inferences from set to subsets. The idea is that Polarity Items are legitimate only when they appear in contexts in which the widening of the domain of quantification leads to a strengthening of the claim, i.e., only in downward entailing contexts. Examples of these environments are: negation, antecedents of conditionals, and *restrictors of universal quantifiers*.

What is then the connection between Polarity Item licensing (i.e., the semantic property of downward entailingness) and the asymmetry of time branching? In the derivation of the necessarily factual interpretation of *after*-sentences versus the possibly non-veridical instances of *before*-clauses, we have seen how once we locate a time t (verifying the main

[5] That is, for the sentence to be true, at the time in which Fred died it had to be possible that he had a chance to see his grandchildren. The requirement that there is at least one (possible – not necessarily real) future continuation of <w,t> in which the temporal clause gets realized (that is, the requirement on the definedness of the operator *earliest*) is meant to rule out anomalous sentences like:

(i) The 7 years-old girl died before she saw her grandchildren.

[6] In a (2004) "aggregate hand-out", Beaver and Condoravdi did present a solution for PI licensing. I analyze their proposal in the Appendix.

[7] See Kadmon and Landman (1993), Krifka (1995), Lahiri (1998) and references therein.

[8] The claim that *some/any student came* is informationally stronger if the existential quantifier ranges over a "normal" – contextually determined – domain, and it is informationally weaker if the existential quantifier ranges over an enlarged domain of individuals

clause *A*), what is past with respect to that t is instantiated in a single world-history (i.e., only the evaluation world w is taken into consideration), whereas what is future with respect to t may be realized in different, alternative branches (i.e., a set of historical alternatives is activated). Focussing now on the subordinated clause *B*, it is now straightforward to see that if *B* is to be located in the past of the *A*-time t (as in the evaluation of *A after B*), a single interval of times t'' verifying *B* in w is to be considered. If on the other hand the clause *B* is to be (possibly) realized in the future of the *A*-time t (as in the assessment of *A before B*), there might be different branches in which *B* gets instantiated, that is, there might be different intervals of times t'' in which *B* is true. And, in this latter case, there will be many left-boundaries of these *B*-intervals, that is, there will be many earliest times t' that verify *B*. This means that the evaluation of the subordinated clause *B* requires the assessment of the different forking paths that depart after the *A*-time t. And this is tantamount to saying that it involves an expansion of the domain of possible worlds against which *B* is evaluated. My claim is that Polarity Items are legitimate in *before*-clauses precisely because of this enlarging of alternatives. More formally, simply because the *B*-clause now constitutes a downward entailing environments.

Let me now present the formal definition for the uniform analysis of *after* and *before*, and then derive the ungrammaticality of Polarity Items in *after*-clause. With a rough simplification, *A before/after B* is true iff there is an *A*-time t that precedes/follows all the earliest *B*-times t'. The asymmetric nature of time-branching ensures that in the case of an *after*-sentence, there is an unique (earliest *B*-time) t'; whereas in the case of a *before*-clause, there might be different (earliest *B*-time) t' – and for *A before B* to be true, the *A*-time *t* must precede *all* times t'.

More precisely, when *A before B* is assessed, the event in the *B*-clause follows the event in the *A*-clause, and this amounts to saying that there might be many branches in which *B* is instantiated (thus, many earliest *B*-times). In order to evaluate *A before B*, we first take into consideration all the time-world pairs <w',t''> that verify *B*, for any world w' that belongs to the set of historical alternatives to w at t; and then we collect all the times t' that are the earliest amongst them. The sentence *A before B* is true in *w* iff there is an *A*-time *t* that precedes all the earliest times *t'*. In this reformulation of the definition, the temporal clause *B* constitutes a downward entailing context:

A before B

$[[A \text{ before } B]]^w = 1$ iff $\exists t\, [<w,t> \in A \;\&\; \forall t'[(t' = \textit{earliest}.\lambda t''.(\exists w' \in \text{alt}(w,t)) <w',t''> \in B) \rightarrow t < t']]$

(12) We left before *anyone* came.

$[[\text{We left before anyone came}]]^w = 1$ iff $\exists t\, [<w,t> \in [[\text{we leave}]] \;\&$
$\forall t'\, [(t' = \textit{earliest}.\, \lambda t''.\, (\exists w' \in \text{alt}(w,t))\ <w',t''> \in [[\text{someone come}]]) \rightarrow t < t']]$

= there is a time t such that we leave in w at t, and for all times t' and for all historical alternatives alt(w,t) w' s.t. t' is the earliest time in which someone come in w', t precedes t'.

The initial definition for *after*-sentences mirrors the one for *before*, with only the direction of temporal ordering reversed.

***A after B* - def. 1:**

$[[A \text{ after } B]]^w = 1$ iff $\exists t\, [<w,t> \in A \;\&\; \forall t'\, [(t' = \textit{earliest}.\, \lambda t''.\, (\exists w' \in \text{alt}(w,t)) <w',t''> \in B) \rightarrow t > t']]$

But, as Beaver and Condoravdi argued, since the *B*-times t' precede the *A*-time t, the set of historical alternatives is reduced to the evaluation world, thus the definition can be simplified:

***A after B* - def. 2:**

$[[A \text{ after } B]]^w = 1$ iff $\exists t\ [<w,t> \in A \ \&\ \forall t'\ [(t' = \textit{earliest}.\ \lambda t''.\ <\mathbf{w},t''> \in B) \rightarrow t > t']]$

Taking into consideration only a single world, if the *after*-clause is in fact instantiated in the evaluation world, there is a unique earliest time t'. Thus, there is no need to universally quantify over all the earliest *B*-times, and thus the definition can be further simplified to:

***A after B* - def. 3:**

$[[\text{A after B}]]^w = 1$ iff $\exists t\ [<w,t> \in \text{A} \ \&\ t > \textit{earliest}.\lambda t''.<w,t''> \in \text{B}]$

In this last simplified definition, the *after*-clause does not constitute anymore a downward entailing context (since the initial universal quantification over earliest *B*-times is reduced to a statement about the unique earliest *B*-time, because of the reduction of alt(w,t) to {w} itself). Thus, Polarity Items are predicted to be ungrammatical in *after*-clauses.

5 Conclusion

With a small amendment to Beaver and Condoravdi's definition for *before* and *after* sentences, it is possible to account for the phenomenon of Polarity Items licensing by means of a single lexical schema (i.e., without having to posit two different lexical entries) – that renders only *before*-clauses a context that licenses strengthening inferences, whereas *after*-clauses are predicted to create environments in which these inferences do not go through. The difference between *before* and *after* is due to the asymmetric nature of time branching – an assumption made by Beaver and Condoravdi to account for their differences in the veridical properties.

6 Appendix

6.1 Linebarger's counterexamples

Linebarger (1987) noticed how not all instances of Polarity Items in *after*-clauses lead to ungrammaticality, as witnessed by (13):

(13) He kept writing novels long after he had *any* reason to believe they would sell.

And the fact that also some *after*-clauses license Polarity Items constitutes a counterexample to my claim that (after the suitable revisions of the definition) *after*-clauses are not downward entailing contexts. But before trying to offer a solution, let me cast doubt on the existence of a clearly identifiable class of counterexamples. That is, my question becomes: is there any clear criterion to identify a class of *after*-clauses that license Polarity Items?

Linebarger herself suggested that these counterexamples had in common the occurrence of an appropriate measure phrase (such as *long*). But a closer scrutiny demonstrates that the presence of a measure phrase does not constitute neither a necessary (cf. (14)) nor a sufficient condition (cf. (15)) for the licensing of Polarity Items:

(14) Some say the cuts were made after there was any real use for them.

(15) * He kept writing novels long after he retired to *any* Caribbean island.

Let me moreover notice how the more natural Italian translation of (13) would mark the subordinated clause with subjunctive mood – even if in normal *after* clauses the indicative is the only viable option:

(16) Ha continuato a scrivere racconti molto dopo che ci fosse alcuna speranza.
(He) has continued to write novels long after that cl. was_{SUBJ} any hope.

And subjunctive mood marking is related to the activation of alternative worlds. Thus, my answer is that, even if I do not have (yet) a clear explanation of the facts, it seems to me that these kinds of sentences require the consideration of alternative branches in which the subordinated clause gets realized – even if the subordinated clause is to be placed in the past of the main clause event.

6.2 Beaver & Condoravdi (2004)

In a (2004) "aggregate" hand out from a series of talks, Beaver and Condoravdi sketch a proposal to explain *before* and *after* diverging properties for what concerns Polarity Items licensing. I will first outline Beaver and Condoravdi's argument,[9] and then I will raise some objections.

Beaver and Condoravdi adopt Kai von Fintel (1999) suggestion, according to which Polarity Items are licensed if strengthening inferences are valid in contexts where all the presuppositions are satisfied. And, since the evaluation of a *before*-sentence (and an *after*-sentence) is defined only if the domain of the coercion operator *earliest* is not empty, we have to check whether strengthening inferences go through in contexts when this presupposition is met, that is, when there is at least a time verifying the subordinated temporal clause.

That is, in order to check whether (18) entails (19), and whether (20) entails (21) – i.e. to check whether *before* and *after* create a context in which strengthening inferences are valid – we have to consider a context in which (17) is taking for granted (since, if (17) is not assumed, the sentences in (19) and in (21) would turn out as undefined):

(17) At some time, Fred sang loudly.

(18) Everybody left before (=earlier than the first time) Fred sang.

(19) So, everybody left before Fred sang loudly.

(20) Everybody left after (=later than the first time) Fred sang.

(21) ≠> Everybody left after Fred sang loudly.

Beaver and Condoravdi notice how the inferences are secured in the case of a *before*-sentence, but not when *after* is involved. This is the case because in the evaluation of *A before B*, the *A*-time t is ordered with respect to the whole event represented by the subordinated clause *B*. And when an event is temporally ordered with respect to a *complete interval*, then it is temporally ordered with respect to any subpart of it (ad this warrants strengthening inferences). On the other hand, *after*-clauses are not normally ordered with respect to complete intervals (i.e., an *A*-time may follow the beginning of the *B*-event, without following the whole *B*-event), and this amounts to saying that in that case strengthening inferences are not secured.

Quite interestingly, there are some cases in which the *A*-event is in fact placed after (not just the beginning, but) the whole *B*-event. In those cases, according to Beaver and Condoravdi the coercion operator would pick up the *right* (and not the left) boundary of the interval corresponding to the *B*-clause (i.e., it would be a *latest* operator, and not an *earliest* operator). In these situations, strengthening inferences are indeed valid, and thus Polarity Items are predicted to be grammatical. And these cases would be exemplified by Linebarger's sentences:

(22) He kept writing novels long after he had any reason to believe they would sell.

[9] A cautionary remark: I am presenting what I understood of Beaver and Condoravdi's argument – but since my observations are based only on the cited hand out, I might have misunderstood what they meant.

The *A*-event ("he keeps writing novels") is to be placed not simply after the beginning of the *B*-clause, but also after its completion. This licenses strengthening inferences, thus it licenses the occurrence of *any*.

Summing up, Beaver and Condoravdi propose to connect Polarity Item licensing to contexts that warrants Strawson-like entailments (i.e., strengthening inferences, provided presuppositions are satisfied). And, in normal cases, only *before* creates such a context, whereas *after* does not. But there exist also cases in which instead of an *earliest* operator, a *latest* operator is at stake: in those cases also *after*-clauses constitute environments that license strengthening inferences, and thus Polarity Items are predicted to be grammatical, as illustrated by Linebarger's sentences.

I think that Beaver and Condoravdi's analysis is open to some objections. The first one questions their claim that the fact that a time t is temporally ordered with respect to a complete event is a sufficient condition to warrant Strawson-like entailments, and thus to license Polarity Items. Consider for instance an achievement predicate in the *B*-clause:

(23) * He kept writing novels (long) after he retired to *any* Caribbean island.

An achievement predicate describes a punctual event. In other words, we can say that the earliest time in which "he retired to X" coincide with the whole event of retiring to X. Thus, if the time t in which he keeps writing novels (i.e., in which the main clause is true) follows the earliest time in which he retired to X (i.e., in which the subordinated clause is true), then t will surely follow the whole event of his retiring to X. That is, if there is an achievement predicate in the *after*-clause, then strengthening inferences ought to go through, and Polarity Items ought to be licensed. But this is not the case, as demonstrated by the ungrammaticality of (23).

Beaver and Condoravdi must have considered such an objection, because in their hand out they take into account (23), and they highlight that: "The act of retirement is punctual. We do not get subset inferences because we are dealing with a singleton set, so the NPI in unlicensed."

But when achievement predicates appear in *before*-clauses, *any* is indeed grammatical (that is, NPI *are* licensed). So, either strengthening inferences ought to go true even if the event denoted by the predicate is punctual, or Polarity Items are not licensed in contexts when subset inferences go through:

(24) Phillip Hazell joined the fray at this time but it took him several seconds before he spotted any German aircraft
http://reality.sgiweb.org/suchyta/redbaron/2000/20000211.html

(25) Mr. Brown died, however, before he realized any of his anticipations
http://www.rootsweb.com/~nyhchs/townhistories/wilmurt.html

Moreover, there seems to be evidence that the Italian counterpart of *after* (*dopo che*) always orders the main clause event with respect to the whole, completed, *B*-event. Thus, for instance, the only reading the Italian (26) receives is that Sandro's arrival in the States follows Gennaro's departure – that is, there cannot be overlapping between the two events:

(26) Sandro è stato in America dopo che Gennaro è stato in America.
Sandro was in America after that Gennaro was in America.

Nevertheless, as witnessed by the example in (9), *after*-clauses do not license Polarity Items in Italian.

There is another problem connected to Beaver and Condoravdi's explanation for the licensing of Polarity Items in *after*-clauses. They claim that "in some cases" the coercion operator has to pick up the right boundary (i.e., the latest time) instead of the left boundary (i.e., the earliest time) of an interval of times verifying the subordinated clause. But how are we

supposed to tell when this is the case? That is, more generally, what are the criteria to set apart cases in which *after* orders the *A*-event with respect to the *earliest B*-time or with respect to the *latest B*-time?[10]

I have already argued that there are no independent criteria to identify the class of cases in which Polarity Items are legitimate in *after*-clauses (since the presence of an appropriate measure phrase modifying *after* (such as *long*) does not represent neither a necessary nor a sufficient condition – cf. the examples in (14)-(15)). Thus, Beaver and Condoravdi's account turns out to be circular: Polarity Items are licensed in some *after*-clauses because the *A*-time t is ordered with respect to the *latest B*-time t'; but the only reason I could guess for *why* the *A*-time t has to be ordered with respect to the *latest B*-time t' is simply "because a Polarity Item is grammatical".

More generally, I object to the line of explanation put forth by Beaver and Condoravdi in order to justify *before* and *after* diverging licensing properties because I think that it is a more efficient and natural move to resort to the same kind of explanation (i.e., the asymmetric nature of time branching) to account for both veridical and licensing properties. In other words, I hope to have shown that appealing to the same factor (i.e., the asymmetry of time branching) that is held responsible for *after*'s necessarily veridical reading and for *before*'s possibly non-veridical interpretation, it is straightforward to derive as well the licensing of Polarity Items only in *before*-clauses.

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[10] And why this option is not available in the case of *before*?

ALMOST THERE: THE MEANING OF *almost*

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Abstract

Modifiability by *almost* has been used as a test for the quantificational force of a DP without stating the meaning of *almost* explicitly. The aim of this paper is to give a semantics for *almost* applying across categories and to evaluate the validity of the *almost* test as a diagnosis for universal quantifiers. It is argued that *almost* is similar to other cross-categorial modifiers such as *at least* or *exactly* in referring to alternatives ordered on a scale. I propose that *almost* evaluates alternatives in which the modified expression is replaced by a value close by on the corresponding Horn scale. It is shown that a semantics for *almost* that refers to scalar alternatives derives the correct truth conditions for *almost* and explains selectional restrictions. At the same time, taking the semantics of *almost* seriously invalidates the *almost* test as a simple diagnosis for the nature of quantifiers.

1 Background: The *almost* test

Modifiability by *almost* has been used in the literature as a test for the quantificational force of a DP. At the heart of this test lies the observation hat universal quantifiers can be modified by *almost*, whereas existentials cannot:

(1) a. Almost every student passed the exam.
b. *Almost a / some student passed the exam.

Consequently, so the argument goes, if some DP whose quantificational status is unclear can be modified by *almost*, it must have universal force. So (un)modifiability by *almost* has been used as an argument in the discussion of elements for which it is notoriously unclear whether they should be analysed as universals or existentials. Carlson (1981) was the first to use the *almost* test, applying it to distinguish between NPI *any* and Free Choice *any*. He argued that, since Free Choice *any*, but not NPI *any* can be modified by *almost*, the former is a universal quantifier, whereas the later is an existential.

(2) a. Almost any student can solve this problem set. Free Choice
b. *I didn't see almost any student. NPI

Subsequently, the *almost* test has also been used to help decide the nature of so called n-words in Negative Concord languages. Zanuttini (1991) used the fact that n-words can be modified by *almost*, as illustrated in (3), to argue that n-words are universal quantifiers interpreted with wide scope over negation, rather than existentials in the scope of negation.

(3) Non ha detto quasi niente / *alcunché. (Italian, from Zanuttini, 1991)
not has said almost nothing / anything
'He said almost nothing.'

The validity of the *almost* test as a diagnosis for universal quantifiers has been questioned on empirical grounds (Partee 1986, Błaszczak 2001, Horn 2005). However, as long as the meaning

of *almost* is not explicitly stated and selectional restrictions derived from it, it remains unclear what *almost* is really sensitive to and whether the arguments based on modifiability by *almost* are valid.

The aim of this paper is to state a precise and general semantics for *almost* and evaluate the validity of *almost* as a diagnosis for universal quantifiers under this semantics. I will first critically review existing accounts of the semantics of *almost* by Sadock (1981) and Morzycki (2001), showing that neither is adequate because they do not account for the contribution the modified constituent makes to the semantic. I then go on to propose that this problem can be overcome if it is acknowledged that the semantics of *almost* is akin to that of focus-sensitive operators like *only*. A semantics for *almost* along these lines is spelled out in section 3 where I argue that *almost* refers to alternatives on a Horn scale and signifies that some alternative close by on the corresponding scale is true. Section 4 investigates the consequences of the proposed analysis of *almost* for the DP domain with particular focus on the elements to which the *almost* test has been applied, namely n-words in Negative Concord languages and NPI *any*. I conclude that (un)modifiability by *almost* does not constitute a valid test for the quantificational force of a quantifier.

2 Previous analyses of *almost*

2.1 Sadock (1981)

The first analysis of the semantics of *almost* is due to Sadock (1981). He defines *almost* as an intensional operator:

(4) $[\![\textbf{almost}]\!] = \lambda w.\lambda p_{<st>}.\ \exists w'$ [w' is not very different from w & p(w')]

Sadock further argues that an assertion of the form *almost* p is associated with the conversational implicature that p be false in the actual world. He derives this implicature via Grice's Maxim of quantity: since uttering *almost* p makes a weaker statement than uttering p (p being true in the actual world entails that there is a possible world in which p is true, but not vice versa), the hearer infers that the speaker does not believes p and thus assumes that p is false.

(5) Bill almost swam the English Channel.

So for example, the sentence in (5) asserts that there is a world not very different from the actual world in which Bill swam the English Channel, i.e. that if the actual world would be minimally different, Bill would indeed have swum the English Channel. At the same time, the use of *almost* leads to the implicature that Bill did not swim the English Channel.

However, the implicature that the proposition *almost* operates on is false is very hard to cancel (6a) and contrasts thus with other scalar implicatures, such as the inference from the use of *some* to *not all* in (6b):

(6) a. ?Not only did Bill almost swim the English Channel, he did swim it.
b. Not only did Bill eat some of the cake, he ate all of it.

Since cancelability is a central property of implicatures, this indicates that the requirement that the proposition *almost* operates on be false, is part of the truth conditions rather than an implicature (see Hitzeman (1992) and Rapp and von Stechow (1999) for more arguments against the implicature approach).

There is another problem with the truth conditions Sadock (1981) assumes: As Morzycki (2001) points out, Sadock's meaning rule in (4) might do for VP-modifying *almost*, but cannot directly be extended to DP-modifying *almost*. The problem is that it does not specify in which respect the world w', in which the proposition p holds, is allowed to vary from the actual world. For example, whereas in the correct interpretation of (7a) the p-world varies with respect to the number of non-dry plants from the actual world, according to (4) it could also vary with respect to the degree of dryness, so that (7a) is wrongly predicted to be true if every plant is minimally moist. So according to (4), (7a) could be true in the same circumstances as (7b).

(7) a. Almost every plant is dry.
b. Every plant is almost dry.

2.2 Morzycki (2001)

Morzycki (2001) tries to remedy this problem by imposing a special requirement on DP-modifying *almost* that the worlds not vary with respect to the extension of the VP.

(8) $[\![\textbf{almost}_{DP}]\!] = \lambda Q_{<<e,st>,st>}.\lambda P_{<e,st>}.\lambda w.\neg\, Q(P)(w)\ \&\ \exists w'\,[\,Q(P)(w')\ \&\ \textsc{close}(w)(w')\ \&\ \lambda x.[P(x)(w)] = \lambda x.[P(x)(w')]$

To illustrate how this addition makes sure that the p-world varies in the relevant respect and thus leads to the correct truth conditions for (7a), let us consider a toy model consisting of the two worlds w and w' and four individuals a,b,c,d. Let us assume that w' counts as close to the actual world w. Assume further that there are three plants in the actual world, a,b and c, and that c is the only plant that is not dry, thus preventing the proposition "that every plant is dry" from being true in w. Now, according to (8), the dry things in w' are the same as the dry things in w. Then the only way for w' to make "that every plant is dry" true is to assume that the "offending" plant c is not there in w', such that there are only two plants in w', a and b, and both of them are dry. This state of affairs is shown in (9).

(9)

	plants	dry	individuals
w	a b c	a b d	a b c d
w'	a b –	a b d	a b – d

While Morzycki's amendment to the meaning of *almost* modifying DP indeed ensures that the p-world varies in the relevant respect, it is itself problematic. First, the additional requirement he assumes for DP-modifying *almost* is nothing other than putting the desired result into the semantics by brute force. This also has the result that he has to assume a separate lexical entry for DP-modifying *almost*, and this runs counter to his claim of giving a unified cross-categorial semantics for *almost*. Further, the stipulation he makes derives wrong selectional restrictions. Morzycki derives the fact that existentials cannot be modified by *almost* from the requirement for DP-modifying *almost* that the worlds not vary with respect to the extension of the VP. He argues that existentials modified by *almost* are pragmatically odd, because they would require that something that is not in the NP-extension in the actual world be in the NP-extension in the p-world. For example, in the case of (10) something that is not a plant but dry in the actual world would have to be a plant in the world w' that makes "that some plant is dry" true. Such a state of affairs is again illustrated for our model in (11).

(10) #Almost some plant is dry.

(11)

	plants	dry	individuals
w	a b	c d	a b c d
w'	a b c	c d	a b c d

Since requiring that an individual changes an essential properties like being a plant across worlds is a very strange requirement, (11) is ruled out pragmatically. But according to this reasoning, negative quantifiers should also not be modifiable be *almost*, since they would require that something that is in the NP-extension in the actual world not be in the NP-extension in the p-world. To see this consider (12) and the state of affairs shown in (13).

(12) Almost no plant is dry.

(13)

	plants	dry	individuals
w	a b c	c d	a b c d
w'	a b –	c d	a b c d

In (13), c is the "offending" plant, being dry and thus preventing "that no plant is dry" from being true in w. So c cannot be a plant in a world w' that makes this proposition true. But because of the requirement that the VP-extension not vary across worlds, c will be a dry thing in w' and therefore has to be part of w'. So c has to change from a plant in w to something that is not a plant in w'. In contrast to cases where *almost* modifies a universal quantifier we cannot simply assume that the "offending" individual does not exist in w' because it has to be in the VP extension in w'.

The discussion in this section shows that accounts by Sadock (1981) and Morzycki (2001) based on intensional similarity cannot do the job. The fundamental problem they face is that they do not account for the role the modified constituent plays in the semantics of *almost*.

3 The meaning of *almost*

So how can the contribution of the modified constituent be formalised while at the same time treating *almost* as a cross-categorial modifier? Although due to the focus of this paper, I concentrate on *almost* modifying DPs, it is important to keep in mind that *almost* can modify elements of various syntactic categories:

(14)
a. John almost fell asleep during the talk. VP
b. The victim was almost dead when the police found him. AP
c. Almost every linguist has read 'Syntactic Structures'. DP
d. Bob almost never drinks alcohol. AdvP

I think we the answer can be found if one considers work on other expressions that show a similar behaviour, namely focus sensitive operators like *only* and *even*. Rooth (1985) gives a cross-categorial semantics for these expressions that accounts for the semantic contribution of the focused constituent. He proposes that these operators take an additional argument besides the proposition they operate on. The second argument is a (contextually determined) alternative set C consisting of propositions in which the focused constituent is replaced by entities of the same semantic type.

But the semantics of *almost* has a further ingredient. As has been observed by Hitzeman (1992), *almost* operates on a scale. A sentence in which *almost* modifies an expression P entails the truth of a corresponding sentence without *almost* in which P is replaced by a value close by, but lower on the scale associated with P. For example, the sentence (15) entails that n people died of the

disease, with n being close to, but smaller than 100.

(15) Almost 100 people died of the disease.

This means that the semantics of *almost* involves a special type of alternatives, namely alternatives that are ordered on a scale. There are other expressions whose semantics has been argued to involve scalar alternatives, namely expressions such as *at least, at most* or *more than*. McNally (1998) and Krifka (1999) define a semantics for these expressions that is both cross-categorial following Rooth's (1985) semantics of *only* and involves alternatives ranked on a scale.

Krifka assumes that scalar alternatives can be introduced in two ways. First, scalar alternatives can be introduced in the same way as usual focus alternatives, i.e. by an intonationally marked focus. But intonational prominence is not necessary for the introduction of scalar alternatives, because certain expressions are automatically associated with alternatives ordered on a scale (see also Chierchia (2005)). These are expressions that are part of a so called Horn scale, i.e. a scale ordered by the entailment relation such that an element of the scale entails all the elements ranked lower (Horn 1972).

To ensure that the relevant alternatives are available at the level where they are evaluated, Krifka further assumes that the scalar ordering is projected along with the focus alternatives, so that the ranking of the alternatives having the type of the focus value carries over to the alternatives at the propositional level.

For the implementation of scalar alternatives, I follow Schwarz (2005) who assumes that operators evaluating scalar alternatives have a restrictor variable ranging over scales of propositions. In the case of *almost*, the relevant alternatives are the ones which are close by on the ordered scale. I will use $\approx$ to signify the 'close by'-relation and as the corresponding restrictor variable. This leads to the following semantics for *almost*:[1]

(16) $[\![\textbf{almost}_{\approx}]\!] = \lambda w.\lambda p_{<s,t>}.\ \neg p(w)\ \&\ \exists q\ [\ q \approx p\ \&\ q(w)]$

Note that it is only required that the alternatives under consideration be close to p, but not that they are ranked lower than p. That only alternatives ranked lower can be true is ensured by the first conjunct in (16), which requires that p be false. Since p is logically entailed by alternatives ranked higher on a Horn scale, only alternatives ranked lower can be true.

To see how this semantics works, consider the sentence in (17a), in which the scale is given by the sequence of natural numbers. Let us assume for the sake of simplicity that the values that count as 'close by' are the ones within a deviation of 10% of the original value, i.e. the numbers between 90 and 110 in this case. The restrictor variable $\approx$ then denotes the set of propositions in (17b). Applying the meaning of *almost* stated in (16) derives the truth conditions (17c), which in effect say that the number of people who died of the disease is somewhere between 90 and 99. This corresponds to the meaning the sentence (17a) intuitively has.

(17) a. Almost 100 people died of the disease.
b. $\{p \mid p =$ that n people died of the disease, $90 \leq n \leq 110\}$
c. $\neg$(100 people died of the disease) & n people died of the disease, $90 \leq n \leq 110$

The occurrence of *almost* in a statement has a further consequence that becomes obvious when comparing the acceptability of (17a) to that of (18).

[1] I do not want to commit myself regarding the status of the two conjuncts as presupposition, implicature or part of the truth conditions.

(18) #Almost 102 people died of the disease.

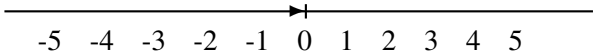
The combination of *almost* with round number words is fine, whereas *almost* combined with non-round number words sounds strange. This follows if we assume that *almost* also indicates that a more coarse-grained scale is used, similarly to the effect *approximately* has. Since the values on more coarse-grained scales correspond to round number words (Krifka t.a.), expressions that indicate a coarser granularity level show a strong preference for round number words.[2]

It is a general property of Horn scales that their direction is influenced by the utterance context (see Horn, 1972). We find this also with scales associated with *almost*, as the following example from Sadock (1981) illustrates:

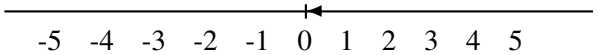
(19) It's almost 0° Celsius.

The sentence in (19) can mean two things, depending of the situation in which it is uttered. In a situation in which it is already cold, it can mean that it is getting warmer and the temperature is approaching 0° Celsius from bellow. In this case, the direction of the temperature scale is the usual from bottom to top as shown in (20a). On the other hand, if (19) is uttered in a situation in which it is getting colder, it means that the temperature is actually still above 0° Celsius. In this case, the direction of the scale is reversed (20b).

(20) a.



b.



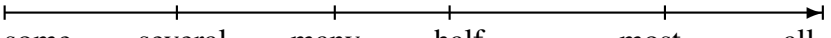
4 Implications for *almost* as a test

With the semantics of *almost* introduced in the last section at hand let us now see what we can say about the selectional restrictions *almost* exhibits in the DP domain.

4.1 *almost* and quantifiers

As argued for by Horn (1972), quantifiers form a scale ordered by entailment:

(21)



Considering this quantifier scale we can explain why certain quantifiers cannot be modified by *almost*. We observe that vague quantifiers such as *several, many* and *most* are incompatible with *almost*, while *half* and *all* are fine:

(22) a. *Almost several / many / most students passed the exam.
b. Almost half / all of the students passed the exam.

[2]This preference for round number words holds at least in the numerical domain, where the values on more coarse-grained scales correspond to multiples of the powers of ten. Things are different in the temporal domain, where the values on the minute scale for instance correspond to multiples of 15. This is reflected in the fact that *almost* is fine with these values on a minute scale:

(i) I had to wait almost 45 minutes.

As argued by Hitzeman (1992), vague quantifiers do not correspond to precise values on the scale. Consequently it is not clear what part of the scale counts as 'close by', and so the semantics of *almost* is not compatible with vague quantifiers. In contrast, *half* and *all* have a precise location on the scale and are therefore fine with *almost*.

Furthermore, recall that existentials cannot be modified by *almost*:

(23) *Almost a / some student passed the exam.

This can be attributed to the fact that existentials form the bottom of the quantifier scale. There is thus no lower value which can be part of a proposition which is both a scalar alternative and true as required by the semantics of *almost*.

There are however cases in which *almost* is fine with existentials, such as the examples in (24):

(24) a. It took me almost an hour to get here.
b. King Penguins are almost a meter high.
c. With this diet you can lose almost a pound of body fat per day.

In these cases, we are dealing with measure phrases that are associated with a dense scale. Because of the density of the scale, we can always find a value that makes a suitable scalar alternative for *almost*. In (24a) for example, there are values lower than one hour on the time scale, namely the fractions of one hour. Thus incompatibility of *almost* and existentials only holds in case of a discrete scale, where factions of a unit are not possible.

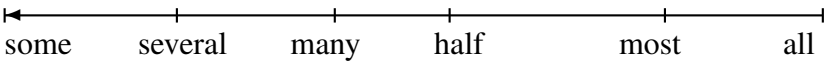
4.2 n-words modified by *almost*

But does the fact that existentials (at least if associated with a discrete scale) cannot be combined with *almost* allow conclusions on the nature of n-words in Negative Concord languages? This is presupposed by Zanuttini (1991) who used the fact that n-words can be modified by *almost*, as illustrated in (25), as a crucial argument against the assumption that n-words are existential quantifiers that occur in the scope of negation (as argued for by Laka (1990) and Ladusaw (1992), a.o.).

(25) Non ha telefonato quasi nessuno. (Italian)
not has called almost n-person
'Almost nobody called.'

It is well known that the entailment relations are reversed under negation, leading to reversal of the direction of the corresponding Horn scale. Thus the quantifier scale in negative contexts looks like (26):

(26) Quantifier scale in negative contexts:



Under negation, existentials are at the top of the scale rather than at the bottom. This means that in negative contexts there are values lower on the scale than existentials which can be part of an alternative proposition that is true. Thus *almost* is not prevented from modifying existentials as long as they are in the scope of negation and *almost* operates on the negated proposition.

I will now show that the proposed semantics of *almost* in combination with the assumption that *nessuno* is an existential quantifier also derives the correct truth conditions by illustrating this

for the Italian sentence (25). The alternative values on the quantifier scale that count as 'close by' to the existential are quantifiers like *a few, a couple* and *several*. Assuming that *almost* is interpreted with wide scope over negation, the restrictor variable ≈ denotes the following set of propositions:

(27) {that it is not the case that a few people called,
that it is not the case that a couple of people called,
that it is not the case that several people called}

(28) ¬(that it is not the case that somebody called) & ∃p [p ∈ ≈ & p]

For (25) the proposed meaning of *almost* results in the truth conditions given in (28). In combination with the denotation of the alternative set ≈ in (27), the truth conditions in effect say that somebody called, but it is not the case that more than a small number of people called. Again, this corresponds to the meaning (25) intuitively has.

Thus modifiability by *almost* does not help to decide the nature of n-words. As far as compatibility with *almost* is concerned, there is no difference between universal quantifiers interpreted with wide scope over negation and existential quantifiers interpreted in the scope of negation.

It is interesting to note that there is a parallel between existentials and possibility modals. While adjectives expressing modal possibility, corresponding to existential quantification over possible worlds, normally cannot be modified by *almost*, the negated forms of the adverbs are fine with *almost*:

(29) a. *It is almost possible to get an appointment with the dean.
b. It is almost impossible to get an appointment with the dean.

In German, the positive form of the possibility adverb (*möglich*) can also be modified by *almost* if it is in the scope of the negative marker *nicht*:

(30) a. *Es ist fast möglich einen Termin beim Dekan zu bekommen.
it is almost possible a appointment with.the dean to get
b. Es ist fast unmöglich einen Termin beim Dekan zu bekommen.
it is almost impossible a appointment with.the dean to get
c. Es ist fast nicht möglich einen Termin beim Dekan zu bekommen.
it is almost not possible a appointment with.the dean to get

So the facts concerning the compatibility of *almost* with adverbs of modal possibility confirm that existential quantifiers can be modified by *almost* as long as they are in the scope of negation.

4.3 Imcompatibility of *almost* and NPIs

This leaves the question why *almost* cannot modify NPI *any*. Since NPI *any* in English is the incarnation of the existential determiner in negative contexts and as I have just argued, existentials in negative contexts are in principle compatible with *almost*, we would expect *any* to be fine with *almost*, contrary to what we find:

(31) *I didn't see almost any student.

I believe that the imcompatibility of *almost* and NPIs should be reduced to an intervention effect, which are known since Linebarger (1980) to arise in the licensing of NPIs.

In a recent paper, Beck (t.a.) gives a semantic analysis of intervention effects occurring in wh-questions that also extends to the question at hand. Beck argues that intervention effects are due to focus interpretation, or more generally the evaluation of alternative sets. An intervention effect occurs whenever an alternative evaluating operator interferes in the evaluation of another operator involving alternatives. She states this as the General Minimality Effect, which claims that for the evaluation of alternatives introduced by an XP another operator evaluating focus alternatives cannot be skipped. This excludes constellations of the form in (32), where the $\sim$ operator (i.e. the operator evaluating focus alternatives defined by Rooth (1992)) intervenes in the evaluation of the alternatives introduced by XP_1, because it prevents the alternatives introduced by XP_1 from being passed up to the position where they could be evaluated by Op_1.

(32) *[Op_1 ... [$\sim$C [... XP_1 ...]]]

Beck (t.a.) proposes that intervention effects arising in the licensing of NPIs are also a form of the General Minimality Effect. Linebarger (1980) observed that (33a) does not have the reading (33b) where the universal quantifier takes scope in between the negation and the NPI:

(33) a. I didn't always buy anything.
b. #It is not the case that I always bought a thing.

Beck's account of NPI intervention effects builds on the analyses by Krifka (1995) and Lahiri (1998) who argue that the licensing of NPIs involves the evaluation of focus alternatives. Adopting an analysis in the style of Lahiri (1998), according to which the focus alternatives introduced by an NPI are evaluated by an operator *even* taking wide scope with respect to negation, results in a LF-representation like (34) for the unavailable reading (33b) of (33a):

(34) [even_D [$\sim$D [not [always [I bought [a thing]$_F$]]]]]

Beck argues that quantificational elements are also associated with alternatives and thus intervene in focus evaluation. Thus (34) is an instance of (32) because the intervening quantifier *always* prevents the focus alternatives introduced by the NPI from being passed up to the position where they could be evaluated by *even*. Because *even* has no alternatives to operate on the representation (34) is ruled out.

Under this analysis of intervention effects in NPI licensing, *almost* is predicted to be an intervener. The semantics of *almost* I propose crucially involves the evaluation of alternatives. The combination of *almost* and NPIs thus leads to a constellation as (32), which is excluded by the General Minimality Effect. More precisely, *almost* and the implicit *even* associated with NPIs both operate on the same set of alternatives. I illustrate this for the sentence (35) that has two possible LF-representations, depending on the scopal ordering of *almost* and negation.

(35) *I didn't see almost any student.

If *almost* is interpreted within the scope of negation we get the representation (36), where *almost* evaluates the alternatives introduced by the NPI *any student* and there are thus no alternatives left for *even*.

(36) [even_D [$\sim$D [not [almost_C [$\sim$C [I saw [a student]$_F$]]]]]

If we assume that *almost* takes wide scope with respect to negation (as we did in the case of n-words modified by *almost*) there are no alternatives for *almost* to evaluate, because the alternatives are already 'eaten up' by *even*:

(37) [almost$_C$ [∼C [even$_D$ [∼D [not [[I saw [a student]$_F$]]]]]

Thus the fact that *almost* cannot modify NPI existentials follows under the proposed analysis of *almost* as an intervention effect in the sense of Beck (t.a.). It is a consequence of the properties of NPIs, namely that the licensing of NPIs involves focus alternatives, rather than of the properties of existential quantifiers.

At this point I want to address a concern that might arise. I argued above that existential quantifiers are compatible with *almost* as long as they are in the scope of negation and *almost* operates on the negated proposition, because under negation the scale is reversed so that existentials are at the top of the quantifier scale. But negation is not the only operator leading to scale reversal, but rather scale reversal is a general property of downward entailing operators. So the analysis I presented predicts that in any kind of downward entailing context *almost* should be fine with existentials while universal quantifiers should not be compatible with *almost*. This prediction is not borne out. The following examples show that we get the same pattern under downward entailing expressions like *nobody* and *rarely* as in upward monotone contexts, with existentials being incompatible and universals being compatible with *almost*:

(38) a. *No linguist has read almost a book by Chomsky.
b. No linguist has read almost every book by Chomsky.

(39) a. *John rarely reads almost an article in the newspaper.
b. John rarely reads almost every article in the newspaper.

But recall that in the case of n-words modified by *almost*, *almost* had to take wide scope with respect to negation. If *almost* is interpreted in the scope of a downward entailing expression, the proposition *almost* operates on is an upward monoton context where the usual, non-reversed quantifier scale is used. In (38) and (39), *almost* cannot take scope over *nobody* or *rarely* and this explains why the scale associated with *almost* in these cases is not the reversed one. That (38) and (39) only have a reading with narrow scope of *almost* actually follows from Beck's (t.a.) analysis of intervention effects. If it is assumed that *almost* takes wide scope we get the LF-representations in (40). Since Beck assumes that quantificational elements like *nobody* or *rarely* also constitute interveners for focus evaluation, the representations in (40) are ruled out as instances of the General Minimality Effect.

(40) a. [almost$_C$ [∼C [no linguist [has read [a book]$_F$]]]]
b. [almost$_C$ [∼C [rarely [John reads [an article]$_F$]]]]

Because quantificational elements cannot intervene between the position *almost* is interpreted and the expression it modifies, sentential negation remains the only downward entailing operator under which existentials can be combined with *almost*.

5 Conclusions

In this paper I proposed a cross-categorial semantics for *almost* that is analogous to that of other similar cross-categorial operators such as *only*, and in particular *at least, at most* and *more than*. According to this semantics *almost* refers to alternatives on a Horn scale and signifies that some alternative close by on the corresponding scale is true. I showed that this semantics derives the correct truth conditions and explains the selectional restrictions observed for *almost* applying in the DP domain.

Given this semantics, (un)modifiability of a DP by *almost* does not tell much about the quan-

tificational nature of the DP. In particular, taking the semantics of *almost* seriously invalidates the *almost* test as a diagnosis for universal quantifiers. There is more involved than just the quantificational force of the modified DP.

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THE PRESIDENT AND THE MAN ON THE STREET: DEFINITE DESCRIPTIONS AND PROPER NAMES ACROSS POSSIBLE SITUATIONS*

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Abstract

Kripke's "modal argument" uses consideration about scope within modal contexts to show that proper names and definite descriptions must be of two different semantic types. I reexamine the data that is used to motivate Kripke's argument, and suggest that it, in fact, indicates that proper names behave exactly like a certain type of definite description, which I call "particularized" descriptions.

Many people draw a sharp contrast between the way speakers use names to talk about individuals and the way they use definite descriptions to do so. A proper name is used to pick out one specific individual. A definite description, on the other hand, provides a general formula for picking out distinct individuals in different situations. Metaphorically, a name is a tag attached to an individual, whereas a definite description is a set of instructions for finding an individual that satisfies some criterion.

This difference between names and descriptions is said to account for a well-known fact: descriptions exhibit narrow-scope readings with respect to modal operators while names do not. Here is an example in which a definite description has what is normally considered a scope ambiguity with a modal operator.

(1) Mary-Sue could have been married to the president.

Imagine (1) being uttered in a situation in which Grover Cleveland is the president. On one reading, (1) could be made true by a possible situation in which a) Grover Cleveland is married to Mary-Sue and b) Grover Cleveland is not president. This is the *wide-scope* reading of "the president" since it picks out the individual satisfying the role in the actual world, regardless of whether he satisfies it in the possibilities considered. On another reading, (1) could be true because of a possible situation in which Mary-Sue is married to someone else, say Jake, who is president in that possible situation. This is the *narrow-scope* reading of "the president" since the description picks up its referent within the possible situation considered.

Consider, by contrast, what happens if we replace the description in (1) with a proper name:

(2) Mary-Sue could have been married to Grover Cleveland.

There is no way of understanding **??** as having two different readings analogous to those of (1). Even if, as a matter of their syntax, proper names can have different scope with respect to modal

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operators, there are no different truth-conditional readings corresponding to the different scopes the name can take.

The standard picture of names and descriptions explains this difference between them. Modal operators are generally taken to quantify over different possible situations. Since names are tags linked to individuals while descriptions are instructions for finding an individual in a given situation, only the latter can pick out different individuals across different possible situations. This line of reasoning forms the basis of Kripke's famous modal argument for the claim that names cannot be semantically equivalent to descriptions (Kripke 1972).[1]

This paper centers on a simple observation: scope ambiguities between definite descriptions and modal operators are only sometimes available (or, at least, are only sometimes apparent). It turns out that the narrow-scope readings of definite descriptions within modal operators are only available when the common ground—the mutual beliefs of the conversational participants—includes the proposition that across a wide range of possible situations the descriptive content has a unique satisfier.

The the behavior of definite descriptions under modals to the contemporary debate about the semantics of proper names. I argue that the modal argument against descriptivist theories of names loses its force once we take into consideration the fact that many definite descriptions systematically fail to show narrow-scope readings. To make this point, I consider a treatment of proper names which construes them as linguistic devices akin to definite descriptions. According to this picture, both types of expressions are used to pick out individuals that satisfy some descriptive content. I show that this account accurately predicts the behavior of names with respect to modal operators.

1 Descriptions Under Modal Operators

First, we need to look at the details of the interaction of definite descriptions with modal operators. The key observation here is that definite descriptions have distinct wide- and narrow-scope readings with respect to modal operators. Although this observation plays a central role in much of the philosophical discussion of names and descriptions, there is little in the way of detailed study of the phenomenon.[2]

It will be useful to think of modal operators—like "must" and "might"—as quantifiers over possible worlds (or situations). To say that something *must* happen is to say that in all possible worlds it does happen. To say that something *can* happen is to say that there is a possible world (or situation) in which it does happen. Of course, modality comes in different flavors: modal operators may be read metaphysically, epistemically, or deontically. In this paper, I will concentrate on metaphysical modals—in keeping with much of the philosophical literature on names, descriptions, and modals.

Let's consider an example in order to get a grip on the narrow-scope readings of definite descriptions with respect to modal operators:

[1]The modal argument is widely discussed in the philosophy of language (Linsky 1983, Soames 2002, Stanley 1997).

[2]Within the semantics literature most discussion of the interaction of descriptions and modals centers around the phenomenon of modal subordination. Here is an example of modal subordination:

> A bear might come in to the cabin. The bear would eat you.

The modal in the second sentence, although universal in force, is only interpreted relative to the worlds involving the possibility mentioned in the first sentence (Roberts 1989). In this paper, I will not discuss either this phenomenon or anaphoric uses of definite descriptions like the use of "the bear" in the second sentence, which refers back to the indefinite "a bear" in the first sentence.

(3) Aristotle might not have been the teacher of Alexander.

If we read the modal as having a metaphysical force, it is natural to think that (2) is true. But since Aristotle *was* the teacher of Alexander, the sentence can only be true if the description "the teacher of Alexander" picks up its reference *under* the modal operator. In other words, "the teacher of Alexander" must pick out different individuals in the different worlds over which the modal operator quantifies. The truth of (2) is then established by the existence of a possible world in which the description "the teacher of Alexander" picks out someone besides Aristotle. In that possible world, Aristotle is not the teacher of Alexander. By contrast, the wide-scope reading of the description could not possibly be true. This is because, on the wide-scope reading, "the teacher of Alexander" picks out its referent in the actual world. But, in this case, it picks out Aristotle and the sentence would then assert that in some possible world Aristotle is not Aristotle, which is false.

Before moving on let me make a cautionary note. Sometimes the narrow-scope reading of a sentence containing a description and a modal may not be distinguishable from the wide-scope reading. If the sentence only quantifies over possible worlds across which one and the same person satisfies the description, it will be impossible to tell from the truth-conditions of the sentence whether the description within it takes narrow or wide scope. For this reason, all of my claims about when we can or cannot get a narrow-scope reading of a sentence apply only to contexts in which the different scopes have an effect on the truth-conditions of the sentence.

1.1 Role-type vs. Particularized Descriptions

Example (2) in the previous section demonstrates that some definite descriptions have narrow-scope readings under modal operators. But the modal argument, as we shall see, relies on the claim that this is *generally* true of definite descriptions and this is the claim I wish to dispute. In order to do so, I need to make a distinction between two kinds of definite descriptions, which I call *role-type* and *particularized* descriptions.

A description is a *role-type description* if it is part of the common ground that there is exactly one person (or one salient person) satisfying the descriptive content across a range of relevant metaphysically possible situations and that the satisfier sometimes varies from situation to situation.[3] Some examples of role-type descriptions are "the family lawyer," "the mayor," "the president," "the tallest pilot," and "the director." With role-type descriptions, we usually know independently of the specific conversational situation that the descriptive content is satisfied uniquely across other possible situations: It is part of general knowledge that cities generally have one mayor, countries one president, and so on. Of course, many role-type descriptions are incomplete in the sense that they need to be augmented by an implicit specification of the particular role in question—so, for instance, "the president" might be used to mean "the president of the US" or the "the president of the board of trustees." Likewise superlative descriptions, such as "the tallest man," require some domain within which they operate: "the tallest man" might mean "the tallest man in the room," or "the tallest man in the galaxy." But the basic criterion stands: a role-type description is a description for which it is part of the common ground both that the content of the (completed) description is uniquely satisfied across a wide range of possible situations and that the satisfier varies amongst these situations.

Particularized descriptions are simply those descriptions that are not role-type descriptions. The mark of a particularized description, then, is that it is *not* part of the common ground that the descriptive content has a unique but varying satisfier across a whole range of relevant meta-

[3]Note that while the number of metaphysically possible situations may be great, only certain situations are relevant when we use modals in normal speech with their metaphysical force.

physically possible situations. Descriptions whose only content consists in general properties shared by many different individuals tend to be particularized descriptions, such as, "the tall boy," "the dog," and "the loose-fitting cap." Descriptions that refer to people by their physical location or what they did at some point are also usually particularized, such as, "the man I met yesterday," "the person over there," and "the cat in the basement." The reason these descriptions count as particularized—in ordinary contexts—is that we can only know that there is a single most salient individual satisfying the descriptive content (and thus the description picks some individual out) by having some sort of knowledge particular to the narrow conversational context (e.g. for "the tall boy" we must know that there happens to be exactly one tall boy around). I might further note that particularized descriptions may also be "incomplete" in the sense that one might naturally fill out descriptions like "the tall man" with extra information such as "in this room."[4]

Whether a description counts as particularized or role-type depends upon what the common ground is. This means that corresponding to almost any particularized description there is some conceivable conversational context in which that description would count as a role-type description, and vice versa. So the distinction is not one between different types of linguistic expressions, but between different types of expression/context pairs. However, certain descriptions cast themselves more naturally as one sort or the other. When I give an example it will be clear if I mean it to be particularized or not.

It is worth noting that the role-type/particularized distinction is not the famous distinction between referential and attributive uses of descriptions introduced by Donnellan (1966). On Donnellan's scheme, roughly speaking, attributive descriptions are used to speak of whoever satisfies the predicative content of a description, whereas referential descriptions are used to refer to known individuals. Whether a definite description falls on one side or the other of Donnellan's distinction depends on how it is *used*; how it is classified according to my distinction depends, instead, upon the relationship between the common ground and the predicative content of a description. Classification according to my distinction is independent of how a description is used, and, so, is independent of how it sits with regard to Donnellan's distinction. (But there may be points of contact. For instance, when a description is used attributively the conversational participants typically assume, or pretend to, that across different epistemically or different metaphysically possible situations different individuals would satisfy the descriptive content.[5] Thus it may be that attributive uses are only possible with role-type descriptions.)

1.2 Role-type and Particularized Descriptions with Modals

Now, as we have seen, role-type descriptions allow narrow-scope readings with respect to modal operators, as in (2), repeated here:

(4) Aristotle might not have been the teacher of Alexander.

The description from **??**, "the teacher of Alexander" can easily be a role-type description since it can be part of the common ground that across a wide range of possible worlds Alexander would have had a teacher, but not necessarily the same teacher (for example, a different student of Plato might have been chosen instead to be Alexander's teacher). The question I turn to now is whether particularized descriptions exhibit the same sort of behavior with regard to modal

[4]How incomplete descriptions are dealt with is a matter of much controversy within formal semantics and philosophy of language (Soames 1986).

[5]I think one can generalize the notion of role-type and particularized descriptions to epistemically possible situations in addition to metaphysically possible ones, though I do not explore that here.

operators as role-type descriptions do.

Let's look at an example. Suppose that I went to a reception at the Met last night. At the reception, we can suppose, I talked to many different people for brief periods of time. Now, suppose that I learn that my old friend Hans was due to come to the reception but that he didn't make it because his plane was delayed. Let us suppose that for this reason it is a relevant *possibility* that Hans could have made it to the reception, and that, if this were the case, I would have talked to him all night at the reception. This possible situation, if it were actual, is one which I could aptly describe with this sentence:

(5) Hans is the person I talked to the whole time.

Now suppose that I want to express to someone at the party that I consider (3) to be a possibility. One might think that I could do this by uttering a version of (3) with a possibility modal:

(6) Hans might have been the person I talked to the whole time.

There is, however, something very odd about using **??** to express the possibility of a situation in which (3) is true (assuming there is actually no one who I talked to the whole time). Indeed, if I utter **??** at the party, I will probably confuse my audience. (I will discuss a bit later how one might try to make sense of such utterances.) This oddness is quite surprising, however. If the definite description "the person I talked to the whole time" can have scope within the modal operator, then we would expect that **??** would express the possibility of a situation within which (3) is true. Since such a situation *is* possible we would expect the utterance to be not only felicitous but also true. However, for some reason this narrow-scope reading of the description "the person I talked to the whole time" is not actually available.[6] (The wide-scope reading of the description is quite hard to get as well since there is no person in the actual situation the description could refer to.)

Let's consider another example. Suppose that throughout an entire dinner party Siegfried does not eat anything, and is unique in this regard. Suppose that I have another friend, say Siegmund, who also would not have eaten anything if he had been at the dinner. Now, suppose I say something like this:

(7) I might have enjoyed talking to the person fasting through the dinner.

It does not seem like I could mean anything but that I might have enjoyed talking to Siegfried by an utterance of (4). This is true even if it is is possible that Siegmund could have come and Siegfried not come. In this possible situation, of course, Siegmund would have been the only person fasting. Nonetheless, it does not seem like (4) can easily express the proposition that there is a possible situation in which I would have enjoyed talking to *whoever* was unique in fasting at the dinner, Siegmund, Siegfried or someone else entirely. In this respect we cannot easily get the narrow-scope of the description "the person fasting through the dinner."

We can, however, create conversational backgrounds within which "the person I talked to the whole time" has a narrow-scope reading in **??** and "the person fasting through the dinner" has a narrow-scope reading in (4). First take **??** again:

(8) Hans might have been the person I talked to the whole time.

[6] Those familiar with presuppositions may not be surprised by this, since this is, roughly speaking, *predicted* by the presuppositional theory of descriptions.

Suppose that it is part of the common ground that I generally talk to one person throughout an entire evening (because, for instance, I always start an argument with someone about politics which lasts the whole evening). In this case, I could utter **??** in order to express the proposition that if Hans had come he would have filled the role of being the person I talked to all night. However, this is a case in which "the person I talked to the whole time," which would usually be a particularized description, acts as a role-type description since it indicates a role which is uniquely filled across many relevant counterfactual situations.[7]

The situation is similar for (4). If we can take it for granted that there is usually exactly one person fasting at such dinners, or that the organizers had intended to invite exactly one person who wouldn't eat, though not any specific person, then the narrow-scope reading of (4) is available. However, without such an assumption the reading is very hard to get.

We have seen, then, that in order to get a narrow-scope reading of a definite description we need to treat it as a role-type one. Sometimes in response to an utterance the audience changes their assumptions, and, hence the common ground through the process of *accommodation* (Lewis 1983, Stalnaker 2002). This process of accommodation can lead the audience to treat a description as a role-type one even if prior to the utterance it is not part of the common ground that the description designates a role. Here is an example in which such accommodation might occur. Suppose I utter **??** when discussing a party I have just been to:

(9) If I had gotten there earlier I might have been the person in charge of hats.

My audience would not take me just to be asserting that if I had gotten to the party earlier I would, by myself, have taken charge of the hats. Rather, they must *also* assume that across a whole range of different possible ways in which the party could have transpired there would have been one person who saw to the hats. Making this assumption, through accommodation, the audience can then understand my assertion in **??** to be the assertion that if I had gotten to the party earlier I would have played the role of dealing with the hats.

To understand better the behavior of descriptions within modal operators it is worth comparing sentences with particularized descriptions with sentences containing a typical role-type description. Here is one:

(10) Adlai Stevenson could have been the president.

There is a natural reading of (5) on which the role-type description "the president" has narrow scope. It is true, for instance, if there are relevant possible worlds where Stevenson beats Eisenhower. These are worlds in which Stevenson is "the president." But that sort of reading, i.e. the narrow-scope one, is exactly the reading we do not find for **??**, (4), or **??** without choosing backgrounds in which the descriptions act as role-type ones.

These observations about the scope of particularized and role-type descriptions beg for any explanation. Unfortunately I think the details of such an explanation will take us too far afield

[7] I can only think of one other circumstance in which the description "the man I talked to the whole time" could have a non-rigid, narrow scope in an utterance of **??**. This other case is the one in which the description "the person I talked to the whole time" has already been introduced in either its definite or indefinite form in the conversation. For instance, instead of just saying **??** I might have said **??**:

(i) I could have talked to a person the whole time. Hans might have been the person I talked to the whole time.

If I utter **??** it seems that the description in the second sentence can have a narrow-scope reading, and thus the utterance might express something true. However, in this case, the definite description is anaphorically linked to the indefinite description that precedes it. I want to put aside these anaphoric uses of descriptions as they involve the description inheriting properties from the original use.

and are not pertinent in reassessing the modal argument. Unsurprisingly, I think facts like these need to be explained in terms of the theory of presuppositions. The Russellian account of definite descriptions, as far as I can tell, can give us no leverage on the different availability of the narrow- and wide-scope reading of definite descriptions within modal operators. Indeed, whether we should describe the difference in terms of scope rather than in terms of a world-variable in the description itself seems to me an open question.[8]

2 Proper Names and the Modal Argument

An extremely influential argument in the philosophy of language, Kripke's modal argument, purports to show that proper names are not semantically equivalent to definite descriptions.[9] Here is one version of the argument:

1. Definite descriptions exhibit narrow-scope readings with respect to modal operators.
2. Proper names do not exhibit narrow-scope readings with respect to modal operators.
3. The meaning of a proper name cannot be the same as that of a definite description.

The argument depends upon the sort of observations I made in the introduction to this paper. Consider, for instance, **??**, repeated here:

(11) Mary-Sue could have been married to Grover Cleveland.

The modal argument begins by suggesting that on the hypothesis that "Grover Cleveland" is really semantically equivalent to some description, "the F," one should expect to find two possible readings of **??**, corresponding to whether the description, "the F," gets its scope under the modal (finding the satisfier of the description within each possible situation) or outside the modal (picking out its actual satisfier, i.e. Grover Cleveland). However **??** does not seem to exhibit different readings of this sort. So, the argument concludes, "Grover Cleveland" cannot be equivalent to "the F."

Many have noted that the argument only shows that proper names are not semantically equivalent to those descriptions whose descriptive content allows them to pick out different objects in different possible situations. In other words, the argument shows that proper names are not equivalent to those descriptions whose descriptive content is actually capable of being satisfied by different individuals in different situations. Some descriptions do not have this property. These include descriptions whose descriptive content contains some indexical reference to the actual world. No matter what their scope is, such descriptions always pick out the same individual (they are so-called *rigidified descriptions*). In light of this qualification, we can view the modal argument as purporting to establish that, if proper names are semantically equivalent to any definite descriptions, they are semantically equivalent to rigidified descriptions like "the actual mayor."[10]

The first premise in my presentation of the modal argument above states that definite descriptions exhibit narrow-scope readings with respect to modal operators. In this paper, however, I have presented and explained a significant qualification to this claim. I have shown that only

[8] An excellent discussion of the issues involved here and the problems for the Russellian rather than presuppositional view is to be found in chapter 3 of Elbourne (2005) (in particular, pages 109-112).

[9] Three pieces that seem to understand the argument this way are Linsky (1983, ch. 7), Stanley (1997), and Soames (2002, ch. 2).

[10] Discussion of rigidified descriptions include Nelson (2002), Stanley (1997), and Soames (2002).

role-type descriptions can have narrow scope with respect to a modal operator. Thus, we need to revise our assessment of the modal argument in light of this qualification.[11]

In fact, once we recognize that definite descriptions do not *always* exhibit scope ambiguities with respect to modal operators, the modal argument loses much of its force against descriptivist accounts of names. If one assumes that descriptions always exhibit scope ambiguities, then *one* instance of a sentence containing a proper name and a modal operator that does not show a scope ambiguity will serve to demonstrate that names cannot be descriptions (except perhaps rigidified descriptions). But, once we have recognized that descriptions do not generally show scope ambiguities, we can no longer reason in this way. Many definite descriptions, such as "the man in the corner" and "the person I saw yesterday," have restrictions on what scope they can get with respect to modal operators. These descriptions belong to the large class of descriptions that are particularized in most contexts and, thus, do not exhibit narrow-scope readings in these contexts. The modal argument fails to show that proper names are not equivalent to *these* sorts of descriptions.

It's worth noting that this is a significantly larger qualification than the one in the previous section about rigidified descriptions. Descriptions like "the man in the corner" are not rigidified descriptions since they have a predicative content which different individuals can satisfy in different situations. So, the class of definite descriptions that are generally particularized includes descriptions which are not rigidified. In addition, while it's extremely hard to find real English expressions that act as rigidified descriptions ("the actual mayor" certainly doesn't), it's extremely easy to find English expressions that are usually particularized descriptions.

Another way of putting my basic point is to say that the modal argument still leaves open the possibility that names are particularized descriptions. Of course, whether a description is particularized or role-type depends upon the relationship between the common ground and the predicative content of the description. So, a name is unlikely *always* to be a particularized description, but a name might be equivalent to a definite description that has a descriptive content which makes it particularized in most contexts. This hypothesis would explain the resistance names show to taking narrow scope in most instances.

In the remainder of the paper I examine one particular descriptivist conception of names to see whether, according to this conception, names can be construed as particularized descriptions. I will also look at contexts in which, according to this descriptivist proposal, names do *not* act as particularized descriptions. By looking at these contexts we can assess whether, as the descriptivist should predict, names can sometimes get narrow scope with respect to modal operators. I will argue that—contrary to the philosophical orthodoxy—the descriptivist view does extremely well at predicting the potential scope of proper names with respect to modal operators.

3 Names as Metalinguistic Descriptions

The view that names are semantically equivalent to definite descriptions is often described as the view that names are *disguised* descriptions, since unlike real definite descriptions names do not openly show their descriptive content. This leads to the question of what the descriptive

[11] Kripke explicitly acknowledges the degree to which his argument depends on descriptions acting Russellian, and hence being able to get narrow scope (Kripke 1972). Geurts (1997) also picks up on this issue, arguing that names are like certain descriptions which always take wide scope (though he does not offer an account of *why* these descriptions take wide scope):

> The presuppositions triggered by names seem to have a decidedly stronger tendency to 'take wide scope' than some others. In this respect, too, they are on a par with other descriptively attenuate 'incomplete', definites like 'the door' or anaphoric pronouns like 'it'. (p. 18)

content of a name is. Here I will sketch one answer to this question, but I will not systematically consider alternatives.

One of the most plausible instantiations of the view that names are descriptions treats names as "metalinguistic" descriptions.[12] On this account, the meaning of a name *N* is roughly captured by the description "the bearer of *N*." We must distinguish this account of the semantics of proper names from the truism that a name *N* refers to whoever is referred to by *N*. The view that names are metalinguistic descriptions, unlike this truism, is neither trivial nor circular. We have a social practice of naming, under which one cannot bear a name just in virtue of some person using it to refer to you. So the facts about name-bearing are not mere trivial metalinguistic ones, like the fact that "jump" means jump. In fact, the metalinguistic view of names makes a very strong claim: that each proper name has the same meaning as some particular definite description.

Definite descriptions trigger presuppositions; so, if proper names are equivalent to certain definite descriptions they will also trigger presuppositions. Earlier, I suggested that definite descriptions trigger the presupposition that there is a uniquely salient individual satisfying the descriptive content. So, if a name *N* were equivalent to the description "the bearer of N," then a use of *N* would trigger the presupposition that there is a uniquely salient person bearing *N*. It seems plausible that names carry this presupposition. For when we use a proper name usually we presuppose that there is a most salient person bearing the name. Without this presupposition we could not expect our audience to understand to whom we meant to refer.

Kripke (1972) makes other powerful arguments, besides the modal argument, against the view that names are disguised descriptions. His strongest argument, to my mind, is one about speaker knowledge. Here is a version of this argument: If the name "Plato" were synonymous with the description "the author of *The Republic*" then one would think that competent users of the name would have to know—at least implicitly—that Plato is the author of *The Republic*. However, it absurd to suppose that it is a condition on semantic competence with the term "Plato" that one know that "Plato" wrote *The Republic*.

I do not think the metalinguistic view succumbs to this argument about speaker knowledge. The knowledge that a person referred to by a name bears that name may well be part of every competent speaker's grasp of the meaning of the name. The only objection to this that I can see is the claim that children are able to use proper names without having sufficient conceptual resources to grasp descriptions like "the bearer of *N*." There are a few things to be said about this. First, the conceptual capacities of very young children may be extremely sophisticated, so that the empirical claim may simply be false: children might, from their first uses of proper names, be in a position to grasp (in some sense) the descriptions associated with names.[13] Second, even if children can use proper names without grasping the descriptions associated with them, this does not mean that the adult use of proper names is not descriptive in the way I have suggested.[14] Third, it may be that children's use of proper names is in some way *parasitic* on adult usage or *deferential* to it, so that if adults did not use names as metalinguistic descriptions children would not be able to use them to refer people at all. These considerations show that the knowledge argument may not be successful against the metalinguistic view.[15]

[12]Such views have a long tradition. Kneale (1962) explicitly advocates a metalinguistic view and Burge (1973) comes close to this view, though he treats names as predicates. More recently, Geurts (1997), Katz (2001) and Bach (2002) have endorsed versions of the view that names are metalinguistic descriptions.

[13]Bloom (2001) discusses what conceptual capacities children might need to learn the meaning of names and other words.

[14]Of course many who hold a descriptive account of names will not be happy with this response because they do not think that it is possible for there to be referring devices without descriptive content. They may, however, think that children associate *different* descriptions with names from those which adult users associate with them.

[15]See the literature cited in footnote 10 for discussion of how the metalinguistic view of names might avoid other challenges from Kripke and elsewhere.

4 Names as Descriptions under Modals

Now that we have a reasonable account of the descriptive content of proper names in hand we can see whether it predicts that names are usually particularized descriptions. Recall that particularized descriptions are ones whose descriptive content is *not* commonly known to be uniquely satisfied by different individuals across a range of relevant possible circumstances. It seems to me that in most contexts metalinguistic descriptions must be particularized. For instance, it would require a very odd context to make it plausible that over an entire range of different possibilities there would always be a uniquely salient "Samuel" available, but without this being the same person in each situation. In many possible situations there is at least one person called "Samuel", but it is hard to see why there would always be one most salient such person.

In other words, metalinguistic descriptions *are* particularized definite descriptions in most contexts, since for most relevant classes of possible situations one cannot suppose there will be a different uniquely salient person satisfying the descriptive content in each situation. Supporting this view is the fact that it is quite hard to get descriptions of the form "the man bearing the name *N*" to have narrow scope under metaphysical modals. Consider this sentence:

(12) The president might not have been the man called "Havelock."

It is very hard to read "the president" in (6) as a wide-scope description while reading "the man called 'Havelock'" as a narrow-scope description—in other words it is hard to read the sentence as saying that the actual man who is now the current president might have had a different name. So, as we should expect given the conclusions I have reached, metalinguistic descriptions are extremely resistant to getting narrow scope.

Of course, in some contexts even metalinguistic descriptions will count as role-type descriptions. And in such cases, metalinguistic descriptions will be able to receive narrow-scope interpretations. Let us imagine a situation in which it is part of the common ground that there is always one, but not always the same, person bearing a particular name across different situations. Consider the name "M"—the name of the head of the British secret service in *James Bond*. "M" looks like a proper name, but if it is a proper name it is one which *can* get narrow scope with respect to modal operators:

(13) John might have become M.

The names of superheros also exhibit this behavior. Consider Batman and Superman. In different circumstances different individuals may bear the superhero-title.[16] Given this fact, it would be appropriate to talk about who *might* have been Superman or Batman. If proper names were just tags attached to particular individuals this behavior would be unexpected: We would not expect that the mere presentation of various relevant counterfactual situations across which different individuals lay claim to the same name would allow names to have narrow scope under modal operators. So names such as "M" and "Superman", unless they are somehow special, or differ in their semantic status from other proper names, provide support for the idea that names are semantically equivalent to definite descriptions, and, thus, in appropriate circumstances, can act as role-type descriptions.[17]

The metalinguistic view has many further consequences, however, and we need to see whether they are also supported by our linguistic intuitions about how proper names work. For instance,

[16] Apparently there is a series of comic books set in the future in which different individuals are Batman, Superman, etc.

[17] Some, such as Soames (2002), argue that names like these are semantically distinct from other proper names.

the view entails that names should *always* show the same potential scope as the definite descriptions that paraphrase them. Many have contested this point. The following examples, discussed in Abbott (2001), are supposed to show that names cannot be synonymous with metalinguistic descriptions:

(14) Aristotle might not have been Aristotle.

(15) Aristotle might not have been the man named "Aristotle."

The usual claim is that (8) has no true reading whereas (9) has a true reading.

It is worth pointing out, first of all, that neither sentence *easily* gets a sensible reading as a metaphysical modal assertion. This is evident from the fact that neither (8) nor (9) express the same thing as **??** nor is as obviously true:

(16) Aristotle might not have been named "Aristotle."

This fact, of course, just follows from the earlier observation that particularized descriptions like "the man named Aristotle" in (9) do not have narrow-scope readings under metaphysical modals. A sentence like (9) is not assertible just by virtue of there being a metaphysically possible world where Aristotle is not named "Aristotle." Rather getting the narrow-scope reading of the description in (9) requires the common ground to include an entire range of relevant possible situations in which the descriptive content is satisfied by different individuals.

In certain contexts, a description such as "the man named 'Aristotle'" will be a role-type one. For instance, imagine it is commonly known that Greek law ensures that one and only one person is called "Aristotle" at a single moment of time. In this case there may be different relevant possible situations in which different people are uniquely called "Aristotle" and so the description "the man named 'Aristotle'" acts as a role-type one. Then, we might have an interest in who would have been called "Aristotle" if the actual person called "Aristotle" had not been born. Consider this sentence:

(17) The person bearing the name "Aristotle" could have been a sailor. In these circumstances, it seems like it is quite easy to give the description a narrow-scope interpretation.

The crucial test for the metalinguistic descriptivist view is whether proper names also allow narrow scope in such circumstances. It is unclear what one should say about the sentence containing two proper names, (8), repeated below, when uttered in a context in which a Greek law of this sort is commonly known to be in effect. I think it is perhaps less good than the sentence yielded by replacing the proper names with two definite descriptions:

(18) The man called "Aristotle" might not have been the man called "Aristotle."

But the difference between the felicity of these two sentences is *very* subtle, and both of these sentences are rather unnatural. A better example of a potential narrow-scope use of a proper name is a variation on (10):

(19) Aristotle could have been a sailor.

If there is a Greek law stipulating that there is always one and only one Aristotle at any given time, then **??** seems like it has a reading on which the name gets narrow scope. I am not sure whether, with the narrow-scope reading, **??** is less natural than (10) or not. In general, I am not

sure where the weight of intuitions lies in these cases.[18] However, I do not think the intuitions are weighty enough to form the basis of a serious argument against the view that names are semantically equivalent to metalinguistic definite descriptions.

We should not despair over the semantics of proper names just because our judgments of critical cases are hazy. The messiness of the data is not an obstacle to understanding proper names; it is just another piece of data in its own right. The question of whether proper names are particularized descriptions might not have a determinate answer. The right hypothesis may be that names are very similar to metalinguistic descriptions, but not *exactly* the same. That is, we may have a conventionally encoded *bias* towards particularized readings of the descriptive content that names bring with them.

What is important to see is that once we restrict our attention to the relevant situations—the cases where names should, on the descriptivist view, get narrow scope—the difference between names and descriptions becomes extremely subtle. Altogether the metalinguistic view of proper names does well at predicting what scope proper names will get under modal operators. If anything, it does better than standard non-descriptivist views which do not have many resources for explaining the fact that names sometimes *do* exhibit narrow scope under modal operators.

I certainly do not intend this as a serious defense of the metalinguistic view of proper names. While the view has its attractions, I am not inclined to think it is correct—if only for the reason that it is hard to explain why, out of the whole space of possible descriptive contents that names might have, names happen to have the metalinguistic content.[19] My main point here is just that considerations of scope do not force us to treat proper names as being semantically distinct from definite descriptions.

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[18] One has to put aside the question-begging temptation—common in discussions of the modal argument—to label any narrow-scope use of a proper name as somehow special and, hence, irrelevant. The important thing to note in this context is that the narrow-scope uses of some definite descriptions, the ones which are usually particularized such as that in (10), *also* sound slightly odd.

[19] I am inclined to think linguistic usage (in speech or in the head) does not determinately fix the descriptive content of names. Thus, there is no fact of the matter about what the descriptive content of names is.

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PRESUPPOSITIONS IN PROCESSING: A CASE STUDY OF GERMAN *auch* *

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Abstract

This paper presents two experimental studies investigating the processing of presupposed content. Both studies employ the German additive particle *auch* (*too*). In the first study, participants were given a questionnaire containing bi-clausal, ambiguous sentences with 'auch' in the second clause. The presupposition introduced by *auch* was only satisfied on one of the two readings of the sentence, and this reading corresponded to a syntactically dispreferred parse of the sentence. The prospect of having the *auch*-presupposition satisfied made participants choose this syntactically dispreferred reading more frequently than in a control condition. The second study used the self-paced-reading paradigm and compared the reading times on clauses containing *auch*, which differed in whether the presupposition of *auch* was satisfied or not. Participants read the clause more slowly when the presupposition was not satisfied. It is argued that the two studies show that presuppositions play an important role in online sentence comprehension and affect the choice of syntactic analysis. Some theoretical implications of these findings for semantic theory and dynamic accounts of presuppositions as well as for theories of semantic processing are discussed.

1 Introduction

The study of presuppositions has been an important topic in both the philosophy of language and in linguistic semantics and pragmatics, but only more recently has it become a topic investigated with psycholinguistic methods. However, a lot can be gained from such investigations, both with respect to theoretical issues in presupposition theory as well as with respect to our understanding of semantic processing. In the following, I present two experimental studies focusing on the German additive particle *auch* (*too*). I argue that the results from these studies indicate that presuppositions play an important role early on in sentence comprehension processes. This, together with seeing other relevant studies in the processing literature from the viewpoint of semantic theory, opens up the possibility of testing theoretical claims with psycholinguistic methods. One conclusion suggested by the results presented here is that something like contextual updates (in the sense of update semantics) are carried out below the sentence level in actual processing, namely at the level of DPs. In addition to these theoretical conclusions, some implications for a theory of semantic processing are also discussed.

The paper is organized as follows. In the following section, I provide some background on the issues relevant to the experiments, including my theoretical assumptions about presuppositions and a few remarks about existing work on semantic processing. Section 3 presents the two experimental studies that were carried out. Section 4 discusses implications of the experimental

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results for presupposition theory and theories of semantic processing. Section 5 provides a brief summary and a conclusion.

2 Background

One might start out the enterprise of investigating presuppositions in processing by wondering whether they matter at all in online sentence comprehension. After all, they are most commonly thought of as crucially relating to the context, and at least in the experimental settings typically used in psycholinguistic work, there is no realistic context. So it is at least possible that participants in experiments more or less ignore such context related information, especially if considerations relating to presuppositions are part of very late pragmatic processes in sentence comprehension that are more like conscious reasoning. If, on the other hand, the processor automatically made use of presupposed content, we would expect that participants would not be able to ignore it. In this case, the question becomes in what ways presuppositions can affect the parsing of incoming strings of linguistic expressions, and how quickly is their content accessible to the parser. Furthermore, we would want to know whether presuppositions interact with other factors known to be relevant in parsing, and if so in what ways. In order to address these issues in more detail, I will outline my theoretical assumptions and some of the previous findings on pragmatic processing.

From a theoretical viewpoint, we are, of course, especially interested in what implications experimental results might have for semantic and pragmatic theory. In connection with this it is interesting to note that most of the theoretical frameworks for the analysis of presuppositions share a procedural view of some sort which determines how presupposed content is integrated with the contextual information (although they don't make any explicit claims about actual processing). For concreteness, I will frame the discussion in this paper in terms of Heimian update semantics (Heim 1982, Heim 1983a, Heim 1983b). This is not to say that the results presented here could not be framed in other presupposition theories. In particular, they might just as well be viewed in terms of Discourse Representation Theory (Kamp 1981), which shares most of the features relevant for our purposes with update semantics.

Presuppositions have two crucial properties: first, they are something that is taken for granted by the discourse participants. Secondly, presupposed content behaves differently from asserted content in most embedded contexts. This is at the heart of what is usually referred to as the *projection problem* (for an overview, see von Fintel 2004, Beaver 1997). In update semantics, which can be viewed as a formal implementation of the accounts for presuppositional phenomena by Stalnaker and Karttunen (Stalnaker 1973, Stalnaker 1974, Karttunen 1973, Karttunen 1974), the aspect of being taken for granted is modeled by the common ground, which is the set of worlds in which all of the beliefs that the discourse participants knowingly share are true. A sentence can only be felicitously uttered when the presuppositions that come with uttering the sentence are entailed by the common ground. The behavior of presuppositions in embedded contexts is accounted for by the way that the common ground is updated when a new utterance is made in the discourse. Under certain circumstances, presupposition failure can be remedied by a process of accommodation (Lewis 1979), in which the common ground is adjusted in such a way that it does entail the presupposition at issue.

Update semantics represents the meanings of sentences as context change potentials. More concretely, sentence meanings are understood as functions from contexts to contexts (where contexts are modeled either as sets of worlds or sets of pairs of worlds and assignment functions). One of the crucial issues in this type of theory is where or when context updates take place. Quite frequently the discussion in the literature focuses on the sentence or clause level, which seems intuitively plausible. However, in the full version of Heim's system, which in-

cludes assignment functions, updates also take place at the level of noun phrases (which are viewed as denoting atomic propositions). Furthermore, in order to account for certain facts concerning the behavior of presuppositions in embedded contexts, Heim (1983a) introduces the notions of local and global accommodation. As I will discuss in some more detail below , the issue of where updates take place is crucial for semantic processing viewed from the perspective of update semantics: if the processor is to make use of compositional semantic information, the way in which it can be used crucially depends on the point at which it has access to it.

Before turning to the discussion of the experiments, let me briefly review some existing work on presuppositions in processing. Most related work focuses on the presupposition of the definite article and follows the basic approach taken in the seminal study of Crain and Steedman (1985).[1] Looking at locally ambiguous sentences like the one in (1), they show that varying the discourse context (as in (2)) affects the way that the sentence is parsed.

(1) The psychologist told the wife that he was having trouble with...
   a. ...her husband.
   b. ...to leave her husband.

(2) a. *Complement Inducing Context*
   A psychologist was counseling a married couple. One member of the pair was fighting with him but the other one was nice to him.

   b. *Relative Inducing Context*
   A psychologist was counseling two married couples. One of the couples was fighting with him but the other one was nice to him.

In (1-a) the *that*-clause is interpreted as the complement of 'told', while in (1-b), it is a relative clause modifying *wife*. The latter reading is much harder to see due to a typical garden-path effect. The preceding contexts were varied in introducing either one or two couples, the idea being that if two couples are introduced, the definite description consisting of the noun only (*the wife*) cannot refer successfully, while the complex description consisting of the noun and the following *that*-clause analyzed as a relative clause does have a unique referent. The sentences were judged to be ungrammatical about 50 per cent of the time in a grammaticality judgment task when the context and the sentence did not match, but they were judged to be grammatical around 75 to 90 per cent of the time when the context matched. Crucially, even the garden-path in (1-b) was ameliorated by putting it in a matching context. This finding motivated Crain and Steedman to propose a principle of parsimony, which guides the selection between different syntactic parses in their parallel parsing architecture, so that the reading carrying the fewest unsatisfied presuppositions will be the preferred one. Similar techniques are used in more recent work (van Berkum, Brown and Hagoort 1999, van Berkum, Brown, Hagoort and Zwitserlood 2003). These studies all focus on definite descriptions and show effects of presuppositions indirectly in connection with structural parsing issues in particular parsing architectures. The studies presented here aim to broaden the range of triggers being studied and to look at effects of presuppositions in a more direct way. The experimental techniques used here contribute a new type of evidence for presupposition theory, where many hotly debated issues involve subtle intuitions. Furthermore, an attempt is made to integrate the experimental results into the theoretical discussion, in order to contribute to a theory of semantic processing informed by linguistic semantics.

[1] But recent work is becoming more diverse in terms of the presupposition triggers covered. See, for example, Chambers and Juan (2005) on *again* and for new work on pragmatic processing more generally (Noveck and Sperber 2004).

3 Two Experimental Studies on *auch*

How should we go about testing the potential effects of presuppositions in sentence processing? One of the standard techniques in psycholinguistics is to compare a normal or unproblematic form to a somehow deviant (or temporarily deviant seeming) form. This basic idea is applied to presuppositions in the two studies below in two ways: first, participants were shown ambiguous sentences containing *auch*, where one reading of the sentence satisfied the presupposition introduced by *auch*, whereas the other did not. The task, then, was to choose a paraphrase corresponding to the participants' understanding of the sentence. The second approach was to show unambiguous sentences with *auch* to the participants, which varied in whether the presupposition was satisfied or not. This study employed the self-paced-reading method, and participants simply had to read the sentences region by region and answer simple questions about them.

A few remarks are in order with respect to the particular choice of presupposition trigger made here. As mentioned above, the presuppositions introduced by many triggers can easily be accommodated. It certainly is a possibility to be considered that in an experimental setting participants are willing to accommodate just about any content, since the situation they are in is obviously artificial. Just compare this situation to reading an example sentence in a linguistics article. It might very well contain, say, a definite description. As a reader, there certainly is nothing odd about reading such a sentence, even if it is completely unclear and left open whether the relevant presuppositions are satisfied or not. The danger for an experimental inquiry into presuppositions in processing might be that they don't play any serious role at all, at least to the extent to which they can be accommodated without a problem. There are, however, a few presupposition triggers that are well-known to at least strongly resist accommodation (cf. Beaver and Zeevat to appear). One case in point is additive particles like *too* or German *auch*, which, roughly speaking, presuppose that there is another salient discourse entity of which the predicate in the sentence holds. If there is no such discourse entity, the utterance of the sentence will be infelicitous. This is illustrated by Kripke's famous example in (3-a) (Kripke 1991):

(3) a. John is having dinner in New York tonight too.
b. Did you know that Bill is having dinner in New York tonight?

In an out of the blue context, the sentence in (3-a) is very odd, since there is no salient individual about whom it is already known in the discourse that they are having dinner in New York tonight. And even though it is completely uncontroversial that there are many people having dinner in New York every night, this presupposition failure cannot be remedied by accommodation. The utterance of (3-a) is only felicitous when there is some individual salient in the discourse that has the relevant property, e.g. in the context of (3-b). This type of presupposition trigger then lends itself to experimental investigation, as we have more control over whether presupposition failure takes place or not, without having to worry about the possibility of accommodation.

3.1 Questionnaire Study on *auch*

3.1.1 Methods and Materials

The basic strategy for the experimental items for the first study was to construct bi-clausal, ambiguous sentences consisting of a relative clause and a main clause. One of the readings is preferred based on well-known syntactic parsing preferences. The other reading was the one that satisfied the presupposition of *auch*, which appeared in the second clause. An example is given in (4):

(4) Die Frau, die das Mädchen sah, hatte auch der Mann gesehen.
The woman-N/A who-N/A the girl-N/A saw had also the man-N seen
'The woman that (saw the girl/ the girl saw) had also been seen by the man.'[2]

The relative clause is ambiguous due to the case-marking. In German, there is a strong and extremely well-studied parsing preference for interpreting such clauses as having a subject-object (SO) order (see, among many others, Hemforth 1993, Bader and Meng 1999, Schlesewsky, Fanselow, Kliegl and Krems 2000). In the main clause, the unambiguously nominative marked subject appears in final position. It is preceded by *auch*, which most naturally associates with the subject following it (*der Mann*), yielding the presupposition that someone else had seen the woman. This presupposition is not satisfied on the syntactically preferred interpretation (SO) of the relative clause. However, the syntactically dispreferred OS-reading of the relative clause (that the girl saw the woman) *does* satisfy this presupposition.

The task for the participants then was to choose a paraphrase that best matched their understanding of the sentence. The paraphrases for (4) would have been *The man and the girl saw the woman* and *The woman saw the girl and the man saw the woman*. This choice between paraphrases amounted to a choice between the syntactically preferred interpretation and the interpretation on which the presupposition of *auch* was satisfied. As a control condition, the same sentence was used but *auch* was replaced by *vorher* (*earlier*), which does not introduce any presupposition whose satisfaction depends on the interpretation of the relative clause. Two further conditions followed the same basic idea, but had the order of the clauses reversed, with *auch* appearing in the relative clause. An example is given in (5):

(5) Die Frau sah das Mädchen, das auch den Mann gesehen hatte .
The woman-N/A saw the girl-N/A who-N/A also the man-A seen had
'The woman saw the girl that had also seen the man.' or
'The woman was seen by the girl that had also seen the man.'

In this case, the matrix clause is ambiguous, and the relative clause contains *auch*. Note that this time the noun phrase *den Mann* (*the man*) in the relative clause is unambiguously marked accusative, so that the clause can only mean that the girl saw the woman. Also note that the first two noun phrases always were of distinct genders, so that there was no ambiguity with respect to which noun phrase the relative clause was modifying. As above, the ambiguous clause had a syntactic parsing preference for an SO-order, whereas the dispreferred OS-order satisfied the presupposition introduced by *auch* (that the girl saw someone else apart from the man). A control condition was again constructed by replacing *auch* by *vorher*.

The setup resulted in a 2 X 2 design, with the presence or absence of *auch* as the first factor and clause order as the second factor. For the questionnaire, 30 sentences were constructed with versions for each of the four conditions above (plus a fifth condition for an additional pilot, which is not discussed here). Five versions of the questionnaire were created, varying sentences across conditions, so that each list contained 6 sentences per condition, resulting in a fully counterbalanced design. The questionnaire was created in HTML and made available online. The sentences were followed by disambiguated paraphrases and participants were asked to choose the paraphrase that matched their understanding of the sentence or their preferred interpreta-

[2] *N* and *A* stand for nominative and accusative respectively. Here and below, the passive is only used in the English paraphrase to keep the word order similar to the German one. Note that the sentences given here as well as the ones given for the other study below are only used for illustration purposes and were not used in the actual studies. The complete materials used in the experiments reported in this paper are accessilbe online at http://www.people.umass.edu/florian/materials.htm.

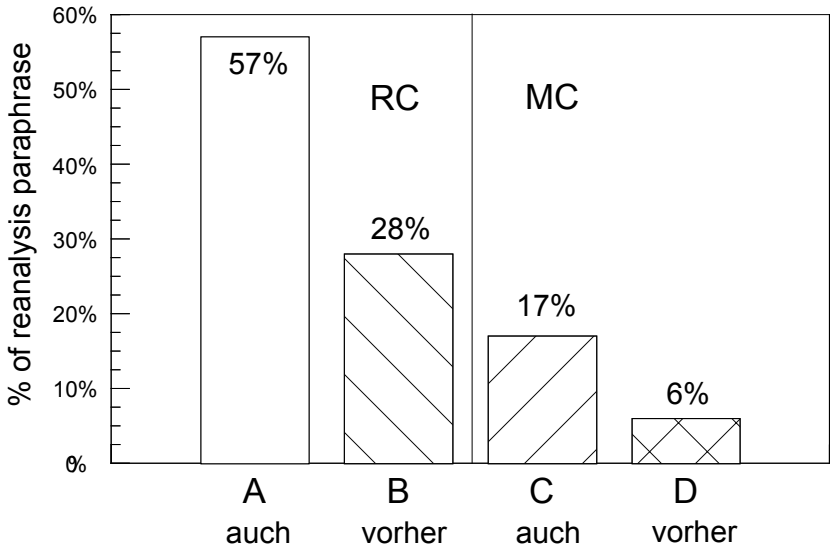

Figure 1: Percentage of OS-paraphrases per condition

tion of the sentence if more than one reading was possible. In addition to the experimental items, there were 3 items similar to the experimental ones, but preceded by a short text. Also, there were 20 unrelated filler items. Altogether, 90 native speakers of German completed the questionnaire.

3.1.2 Results

The results were analyzed with the percentage of the type of paraphrase chosen as the dependent variable, with the paraphrases corresponding to either the SO-order or the OS-order. The mean percentage of how often the OS-paraphrase was chosen is shown in Figure 3.1.2 for each condition.

The OS-interpretation was chosen more frequently in the *auch*-conditions (A and C) than in the corresponding control conditions with *vorher* (B and D). It was also chosen more frequently in general for the relative clause before matrix clause order (RC-MC) than in the matrix clause before relative clause order (MC-RC). A 2 x 2 ANOVA (*auch* vs. *vorher* and RC-MC vs. MC-RC) was performed. There was a main effect of *auch* ($F_1(1,89) = 112.3, p < .001, F_2(1,29) = 277.2, p < .001$) and a main effect of clause type ($F_1(1,89) = 183.3, p < .001, F_2(1,29) = 92.1, p < .001$). There also was an interaction between the two factors ($F_1(1,89) = 30.7, p < .001, F_2(1,29) = 37.2, p < .001$). Two-tailed t-tests were carried out to test for simple effects of *auch* for the two types of clause orders. Both effects were significant (condition A vs. B:$t_1(89) = 10.3, p < .001, t_2(29) = 13.2, p < .001$, condition C vs. D: $t_1(89) = 5.4, p < .001, t_2(29) = 7.3, p < .001$). This shows that the differences between the *auch* and *vorher* conditions are significant for each of the clause orders.

3.1.3 Discussion

The results from the questionnaire study clearly show that participants' choice of paraphrase is influenced by the presupposition introduced by *auch*. When it is present, as in conditions A and C, the otherwise dispreferred OS-paraphrase is chosen more frequently than when it is not, presumably because this order yields the *auch*-presupposition satisfied. This effect is present

and significant for both clause orders, but stronger in the RC-MC order. Altogether, the OS-paraphrase is chosen more frequently in the RC-MC order. This, together with the interaction, indicates that the effect of the presupposition interacts with other parsing factors.

One way of describing the process that readers might go through in reading these sentences is that they first commit themselves to an SO-interpretation of the ambiguous clause and then reanalyze that clause once they see that this renders the presupposition of *auch* satisfied. In the case of the ambiguous matrix clause, this reanalysis is most likely harder and involves at least one additional confounding factor: interpreting the clause initial DP as the object requires a special interpretation (e.g. as a topic), which is not supported by anything in the context. Therefore, it is altogether harder and less likely that participants will end up with the OS-interpretation for the MC-RC order, and the effect of the presupposition is smaller in the condition with this order. An interesting further result in the statistical analysis that was not mentioned above is that there was a learning effect reflected by a significant increase in the percentage of OS-paraphrases chosen for the MC-RC order in the second half of the questionnaire. For the RC-MC order, there was only a small numerical increase that was not significant. This supports the conclusion made above that it is harder to get the OS-order in the MC-RC order. Apparently, participants become more likely to choose the OS-interpretation after having been exposed to a number of these constructions and paraphrases for this clause order, whereas they start out at a fairly high level for the other clause order.

The interaction seen here between the effect of the presupposition and other parsing factors is a first indication that the issue of presupposition satisfaction plays a role in online processing, although we cannot draw any firm conclusions in this regard from an off-line questionnaire study. The study reported in the next section attempts to address this issue in a more direct way.

3.2 Self-Paced-Reading Study on *auch*

3.2.1 Methods and Materials

The second study used the self-paced-reading method to investigate the effect of presuppositions on the time people spent reading the relevant parts of the experimental sentences. For this study, the basic strategy was to present unambiguous versions of the materials in the first study, which varied in whether the presupposition of *auch* was satisfied or not. Since the effect in the questionnaire was larger for the RC-MC order, sentences using this order were used for the online study. An example illustrating the setup of the experimental items is given in (6):[3]

(6) a. Die Frau,/ die der Junge sah,/ hatte auch der Mann gesehen.
The woman-N/A who-N/A the boy-N saw had also the man-N seen
'The woman that the boy saw had also been seen by the man.'

b. Die Frau,/ die den Jungen sah,/ hatte auch der Mann gesehen.
The woman-N/A who-N/A the boy-A saw had also the man-N seen
'The woman that saw the boy had also been seen by the man.'

In the sentence in (6-a), the noun phrase in the relative clause (*der Junge, the boy*) is unambiguously marked nominative, which results in the clause having OS-order and meaning that the boy saw the woman. The main clause contains *auch*, which (again assuming that it associates with *der Mann* (*the man*)) introduces the presupposition that someone else saw the woman. Given

[3]The character '/' indicates the section breaks between the parts of the sentence that were displayed at one time in the moving-windows display (this is described in more detail below).

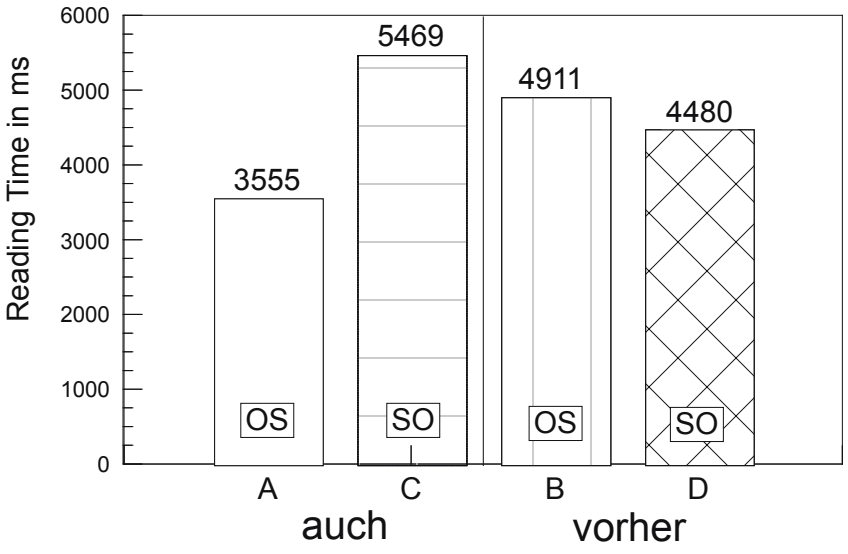

Figure 2: Reading time on final clause in ms

the meaning of the relative clause, this presupposition is satisfied. In (6-b), on the other hand, the noun phrase *den Jungen* (*the boy*) is unambiguously marked accusative, so that the clause has SO-order and can only be understood as the woman seeing the boy. The presupposition of the main clause is as in (6-a), and is therefore not satisfied by the relative clause.

As in the questionnaire study, control conditions were constructed by replacing *auch* with *vorher*. As in the first study, this resulted in a 2 x 2 design, again with the presence or absence of *auch* as the first factor and SO vs. OS-order as the second factor. The study included 24 sentences with versions in each of the four conditions. The sentences were counter-balanced across conditions in four lists. Participants only saw each sentence in one condition. The experiment was programmed using E-Prime software. The presentation order of the items was randomized. Sentences were presented using the moving-window technique. On the first screen, all characters were replaced by underscores. Participants had to press the space bar to see the first part of the sentence. When they pressed the space bar again, the first part was replaced by underscores, and the next part of the sentence was displayed. Reading times were recorded for each displayed phrase. After each sentence, a yes-no question about that sentence was presented, and participants had to push 's' to answer 'yes' and 'k' to answer 'no'. Both the responses and the response times were recorded. Apart from these experimental items, there were 72 items from unrelated experiments and 12 from a related experiment. Furthermore, there were 12 filler items. Subjects received instructions about the keys they had to press, and were told to only answer questions with 'yes' if this followed directly from the sentence in question. On average it took about 30 minutes to complete the experiment. 20 native speakers of German participated in the experiment.

3.2.2 Results

The measure of most interest was the reading times on the clause containing *auch* (or *vorher*). Their means are shown for each condition in Figure 3.2.2.

When *auch* was present (conditions A and C), the reading time in the OS condition (where the presupposition of *auch* was satisfied) was almost two seconds faster than in the SO-condition (where the presupposition was not satisfied). When *auch* was replaced by *vorher*, the SO con-

dition (D) had a small advantage over the OS condition (B). Interestingly, the *auch*-phrase was read almost 1.5 seconds faster than the *vorher* phrase in the OS-condition, but roughly one second slower in the SO-condition.

A 2x2 ANOVA revealed an interaction between the two factors ($F_1(1,19) = 26.00,\ p < .001$, $F_2(1,23) = 17.81,\ p < .001$). In addition, there was a main effect of order (SO vs. OS) ($F_1(1,19) = 11.58,\ p < .01,\ F2(1,23) = 7.88,\ p = .01$), which was dominated by the interaction. A number of t-tests were also carried out to test for simple effects of *auch* vs. *vorher* and OS vs. SO separately. The difference between conditions A and C was significant ($t_1(19) = -6.49,\ p < .001,\ t_2(23) = -4.58,\ p < .001$), which shows that there was a simple effect of SO vs. OS-order in the *auch*-conditions. There also was a significant difference between A and B ($t_1(19) = -4.72,\ p < .001,\ t_2(23) = -5.03,\ p < .001$), i.e. a simle effect of *auch* in the OS-order conditions. The difference between C and D was significant by subject and near significant by items ($t_1(19) = 3.07,\ p < .01,\ t_2(23) = 1.96,\ p = .06$), but the difference between B and D was not significant ($t_1(19) = -1.28, p = .22, t_2(23) = 1.25, p = .23$). In terms of the statistical analysis, then, the main results are the interaction between the two factors and the simple effect of order in the relative clause. The simple effect of *auch* in the OS-order conditions is of interest as well, but its interpretation is less clear as it could in principle be due to a lexical effect involving *auch* and *vorher*.

Taken together, these results show that the reading times in the *auch* conditions were strongly influenced by SO vs. OS order (corresponding to whether the presupposition is satisfied or not), while the reading times in the *vorher* conditions were only slightly influenced by this factor, and in the opposite direction.

As additional measures, the response times and the accuracy rates for the yes-no questions following the display of the sentence were also analyzed. There was a main effect of order, with the OS conditions having roughly an advantage of one second over the SO conditions. No other effects were significant. The accuracy rates differed only numerically, with an overall average of 78.5 per cent. The condition with the unsatisfied *auch* presupposition had the lowest accuracy rate (73.3 per cent).

3.2.3 Discussion

The results from the self-paced-reading study clearly show that the reading time on the final clause containing *auch* was substantially affected by whether the presupposition of *auch* was satisfied or not. This is not merely an effect of parallel order in the two clauses, as the effect was reversed in the *vorher* conditions, in which no relevant presupposition interfered.

The effect of the presupposition is rather large, at almost two seconds difference between conditions A and C. It is very likely that this is due, at least in part, to the similarity between the conditions, and the relatively demanding task of answering the yes-no questions that followed the display of the sentence. Almost all subjects reported that it was quite difficult to keep in mind who did what to whom amongst the three people talked about in each sentence. When the presupposition did not match the content of the relative clause, it must have been even harder to keep this information straight, and this may have caused rather substantial delays when reading the final part of the sentence. One particularly telling comment from one participant in this respect was that she thought there were a number of spelling mistakes in the sentences, especially with the case marking on the final DP (e.g. *der Mann* rather than *den Mann*). Apparently, the expectation raised by the presupposition of *auch* was so strong that the mismatch was perceived as a mistake.

The strong effect on the reading time suggests that the presupposed content is evaluated online,

which lends further support to the speculative conclusion that the results from the questionnaire study are based on online effects of presuppositions. This finding is consistent with previous studies on the presuppositions of definite descriptions that were mentioned above (e.g. Crain and Steedman 1985, van Berkum et al. 2003). An additional point of interest here is that the reading times for the clause containing *auch*, preceded by the relative clause that satisfied the *auch*-presupposition (condition A), were faster than the reading times for the same clause with *vorher* preceded by the same relative clause (condition B). Although the possibility that this is a lexical effect cannot be excluded at the moment, this difference could be taken to tell us something interesting about the role of presupposed content in natural language. The advantage of the *auch* condition might be that the presupposed content facilitates the integration of new content into the contextual representation by connecting new and old information.

These results of these studies have some interesting theoretical implications and may provide new approaches for empirical research on presuppositions. I turn to these points in the next two sections.

4 Theoretical Implications

Ideally, results from psycholinguistic studies can contribute to theory in two directions, which correspond to the following two questions: What do the results tell us about (the relevant part of) linguistic theory, and what can we learn from them with respect to processing theories? I will focus on the implications for semantic theory, which I turn to in the next subsection. A few brief remarks about related processing issues are made in the final part of this section.

4.1 Implications for Semantic Theory

Let us take a closer look at the example sentences in order to understand what is going on in the processing study in slightly more refined semantic terms. The example sentence for condition A, where the presupposition of *auch* is satisfied by the relative clause, is repeated in (7):

(7) a. Die Frau,/ die der Junge sah,/ hatte auch der Mann gesehen.
The woman-N/A who-N/A the boy-N saw had also the man-N seen
'The woman that the boy saw had also been seen by the man.'

b. Presupposition of *auch* in general (Heim 1992)
Φ *auch*$_i$ $[\alpha]_F$ presupposes $x_i \neq \alpha$ & $\Phi(x_i)$

c. Presupposition of *auch* in (a) (with focus on *der Mann*)
$\lambda x.$ *see* $(x, woman)$ *auch* $[the\ man]_F$ presupposes
$x_i \neq the\ man$ & $see(x_i, woman)$

As the results from the self-paced-reading study show (and as is also intuitively clear), the relative clause satisfies the presupposition characterized in (7-c). As far as the processing perspective is concerned, it appears to be the case that this is something that takes place online, since the effect shows up in the reading time on the clause that contains the presupposition trigger. This suggests the conclusion that as one is reading the part of the sentence containing *auch*, one is aware of the content of the relative clause (of course, that also matches our intuitive sense of what happens when we read). When we look at processing in terms of update semantics, this is very interesting: to evaluate the presupposition of *auch* is to check whether the context entails it (and in the case of *auch*, something it also involves something like checking whether there is

an appropriate discourse referent having the relevant property). Since the the sentence is not at all problematic in any way (neither intuitively nor in terms of the reading time results), it seems to be the case that the content of the relative clause is already part of the context by the time the final part of the sentence, which contains the presupposition trigger *auch*, is semantically processed. In other words, it looks as if the context has been updated with the sentence initial DP, including the relative clause, by the time the rest of the matrix clause is interpreted and integrated into the context.

It is plausible to assume that if this is indeed what the processor is doing, the simplest assumption is that it does so by using the grammar (more on this issue below). If we think of context updates as only taking place on the level of a sentence or a full clause, we cannot explain how the initial DP can satisfy the presupposition: If we tried to apply the context change potential of the entire sentence to the neutral context, the update would fail, since the presupposition of *auch* is not satisfied in the initial context (and no repair would work, since the presupposition of *auch* cannot be accommodated). However, as I already mentioned in section 2, in the full version of update semantics of (Heim 1983b), contexts consist of sets of pairs of worlds and assignment functions and noun phrases denote atomic propositions and hence denote context change potentials of their own. The meaning of noun phrases is as in (8), with the difference between definite and indefinite ones being captured with the Novelty Condition in (8-b)[4]:

(8) a. Let c be a context (here a set of assignment functions) and let p be an atomic formula, then, if defined:
$c+p = \{g : DOM(g) = \bigcup Dom(f)\ s.t.\ f \in c \cup \{i : x_i\ occurs\ in\ p\}$ & g *is an extension of one of the functions in c* & $g\ verifies\ p\ \}$

b. The Novelty/Familiarity Condition
c + p is only defined if for every NP_i that p contains,
if NP_i *is definite, then* $x_i \in Dom(c)$, *and*
if NP_i *is indefinite, then* $x_i \notin Dom(c)$.

With denotations such as these, the progression of updates for the sentences of condition A can proceed without a problem. First, the initial noun phrase is interpreted and its presupposition is evaluated with respect to the input context. It is not satisfied, but can be accommodated without a problem. Next, the rest of the matrix clause is interpreted, and the presupposition of *auch* is evaluated with respect to the local context. In this context it is satisfied, and the update can proceed smoothly. These steps are sketched in semi-formal terms in (9):

(9) p: The woman x that the boy saw, q: x was also seen by the man
a. c + p defined only if there is a unique woman that the boy saw
b. after accommodation:
c + p = {g: g verifies woman(x) & boy(y) & see(y)(x)} = c'
c. c' + q defined only if there is a z $\neq$ the man in c' & see(z)(x)
c' + q = {g: g verifies woman(x) & boy(y) & see(y)(x) & man(z) & see(z)(x)}

This contrasts with condition C, where the order in the relative clause has been switched around, so that even after the initial DP has become part of the context by the time the rest of the matrix clause is interpreted, the presupposition of *auch* is not satisfied, and there is no chance to accommodate it, since the presupposition of *auch* strongly resists accommodation. This problem is immediately present in processing, as reflected in the very slow reading times in that

[4]For simplicity, I restrict the formal representation of contexts to sets of assignment functions

condition.

Although there is clear evidence here that the processor deals with presupposed content online, a word of caution is in order with respect to what conclusions we can draw about how the processor goes about this. The results from the self-paced reading study are not fully conclusive with respect to the issue of whether the processor employs incremental updates using Heimian atomic propositions 'on the fly', since we are looking at the reading times for the sentence final region. It is possible that the context sensitive part of interpretation (and perhaps the compositional semantic process altogether) takes place once the entire sentence has been presented (even though this seems intuitively implausible). The slow-down in the reading time on the final region certainly is consistent with that. But even if it were the case that the integration of the content of the sentence with the context takes place at the very end of the clause, the results here show that, at that point, the procedural steps it goes through must be very much like the ones sketched in (9).

Therefore the results of the experiments presented here contribute a new kind of evidence to the theoretical discussion. They show that the processor goes about interpreting a sentence in steps very much like those assumed by dynamic semantic theories. If we continue to assume that the processor does this by using the system supplied by the grammar, working out the details of a theory of semantic processing based on something like update semantics should make further experimentally testable predictions, which can help us to broaden the empirical foundation of semantic analyses of presuppositions. One possible follow-up to the current study would remedy the problem of the critical region being the final region by breaking up the regions into smaller chunks and by adding a continuation. This could be done by employing sentences such as the following:

(10) The woman/ who saw the boy/ also saw/ the man/ yesterday/ on her way to work.

In addition to these considerations about the online study, we should also note the relevance of the findings of the questionnaire study in this respect. Assuming a model of the syntactic parser that only pursues one structural analysis at the time, we find a remarkable amount of effort put into reanalysis of the relative clause that already had been previously parsed with an SO-order, which is revised in order to satisfy the presupposition. The fact that this revision is even considered indicates that the meaning of the relative clause is already accessible to the parser at the time it encounters the presupposition.

4.2 Implications for Processing Theories

Let us now turn to some considerations about what the results reported here mean for a theory of semantic processing. At this point, we aren't anywhere close to having a realistic idea of how compositional semantic processing takes place. One central question, of course, is at what point the processor actually goes through steps of semantic composition and at what point the content of the currently processed linguistic unit is integrated with the information present in the context (which crucially should involve the evaluation of presuppositions with respect to that context). Modulo the caveat about the possible conclusions of the present studies concerning the issue of whether the processor goes through the steps of updating the context on the fly' or whether it does so at a later point, a viable hypothesis can be constructed from what has been said here: Apart from the level of full clauses, where we obviously are dealing with propositional units, updates also take place at the level of noun phrases. This amounts to a straightforward extension of update semantics to the theory of processing. Whether or not this can be upheld, it is the simplest assumption that the processor makes use of the system supplied

by the grammar, and it has the advantage of making predictions that should, at least in principle, be experimentally testable. Hopefully, this will also enable us to investigate further theoretical issues in presupposition theory in new ways.

Apart from these issues related immediately to semantic processing, the studies might also contribute to more general architectural questions in processing theory, although I can only make some brief remarks about these here. Let me just mention one particularly interesting point, namely that the results from the questionnaire study are most likely problematic for a simple version of a parallel parsing architecture along the lines of the one proposed by Crain and Steedman (1985). The idea in this work is that when the processor deals with an ambiguous structure, it considers all possible structures at the same time, with some structures being filtered out by certain principles. One central principle that they assume to account for the data mentioned above in (1) is the principle of parsimony, which only keeps those interpretations that have the fewest presuppositions violated. One of the more intriguing aspects of the questionnaire study discussed here was the interaction of how often subjects would choose the syntactically dispreferred structure (to have the presupposition of *auch* satisfied) with the order the clauses appeared in (which affected whether the matrix clause or the relative clause was ambiguous). If people were considering both interpretations of the ambiguous clauses at the same time, and then would choose one of them based on which one has the fewest presupposition violations, we would expect that they would choose the reading on which the *auch*-presupposition is violated more often (in the MC-RC condition with *auch*, they chose it only 17 per cent of the time, and even in the RC-MC order condition, they chose it only 57 per cent of the time). Furthermore, we would not expect that the two clause orders would differ so drastically in this respect.

5 Conclusion

I have argued that the results from the studies reported here suggest that the processor has access to and makes use of presupposed content in online processing and employs something like context updates at the level of noun phrases. In a sense, this means taking the 'dynamic' aspect of dynamic semantics quite literally by claiming that the linguistic processor employs dynamic updates in the process of interpreting a sentence compositionally. Bringing our theoretical frameworks and processing theories closer together in this way has the advantage of being temptingly simple. Whether or not this turns out to be realistic in the long run, it should enable us to come up with straightforward predictions that we can test in further work. This opens up the possibility of extending the empirical foundation for work in theoretical semantics and of addressing central issues in presupposition theory that often involve disputes about the intuitive status of presupposed content. Investigating these issues in a more direct empirical way will make an important contribution to the theoretical discussion. Once we have a better understanding of what kind of effects related to presuppositions there are in processing, we can hope to address more sophisticated questions in presupposition theory (e.g. the issue of local and global accommodation) in new ways.

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WORD-MEANING AND SENTENCE-INTERNAL PRESUPPOSITION*

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Abstract

The German causal preposition *durch* ('by', 'through') poses a challenge to formal-semantic analyses applying strict compositionality. To deal with this challenge, a formalism which builds on recent important developments in Discourse Representation Theory is developed, including a more elaborate analysis of presuppositional phenomena as well as the integration into the theory of unification as a mode of composition. It is argued that that the observed unificational phenomena belong in the realm of pragmatics, providing an argument for presuppositional phenomena at a sentence- and word-internal level.

1 Introduction

There is a growing insight in the formal-semantic literature that not all linguistic phenomena can or should be expected to adhere to principles of strict compositionality (cf. e.g. Sailer 2004). In this paper, I will try to add further substance to such a view. The argument is supported by data involving causative and inchoative predicates used in combination with the German causal preposition *durch* ('durch'). The discussion centres around the status of the abstract element CAUSE. I will focus on what is the origin of CAUSE in identical complex semantic structures which can be argued to be differently composed.

Many of the formalisms introduced to handle phenomena which are taken to be problematic for strict compositionality, involve some sort of unification (Bouma 2006). Here, unification will also be of some importance. The data discussed in this article has, however, to my knowledge hardly been looked at from a unification perspective. Another contribution of the paper concerns the mechanisms argued to provide the means for an adequate analysis of the phenomena in question. These are argued to be of a pragmatic nature in the case of *durch*, involving presuppositional phenomena at a sentence- and word-internal level.

The paper is structured as follows: first, I present the intuitions behind the challenge of trying to build a compositional semantics for the combination of causal-instrumental *durch*-phrases with both causative and inchoative predicates (section 2). Second, after a brief discussion of some proposed solutions (section 3), I turn to my own analysis (section 4), which is held in a Discourse Representation Theory bottom-up formalism (Kamp 2001), applying unification as a mode of composition (Bende-Farkas and Kamp 2001, Sæbø to appear). Then, I turn to a discussion of how the unificational analysis can be restated in terms of presupposition verification and accommodation (section 5). The paper concludes with a brief outlook on further applications of the formalism presented here (section 6).

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2 The variant problem

Certain kinds of adverbials do not only modify a predicate, they may also (radically) alter its properties. In this paper, I will mainly look at adverbials headed by the German causal-instrumental preposition *durch*, which have both these properties.[1] This twofold behaviour is seen as a challenge to strict compositionality and alternative ways of formalising the semantics of *durch* will be considered. In this section, the data concerning *durch* will be discussed. I will refer to *durch*'s syntactic complement as its semantic internal argument, and the modified phrase as *durch*'s semantic external argument. Syntactically, the *durch*-phrase can be adjoined to verbal, adjectival and nominal phrases. Only the two former syntactic configurations will appear here.

The function of causal-instrumental *durch* is to specify the causing event in a causal relation between events, as exemplified in (1)-(2).

(1) *Ein Polizist wurde durch einen Schuss aus der eigenen Dienstwaffe getötet.*
(A policeman was through a shot from the own service weapon killed.)
'A policeman was killed by a shot from his own service weapon.'

(2) *Durch bloßes Handauflegen versetzte sie den Sowjetmenschen in Glückseligkeit.*
(Through mere laying-on-of-hands transferred she the Soviet individual in blessedness)
'By a mere laying-on-of-hands she could induce a state of bliss in the Soviet individual.'

In (1), the causative predicate *töten* ('kill') is used. I will assume that the semantics of *töten* involves a causal relation between two events, one of which is the caused event, a transition of an individual to a state of being dead, and one of which is the causing event of this transition. The causing event is not specified in any way, concerning e.g. how the transition was brought about. I will thus refer to such causatives as *manner-neutral* causatives.

In (1), it can be seen in what way the contribution of the *durch*-phrase specifies the causing event: it is stated that the policeman was killed by *a shot from his own service weapon*. Thus, the *durch*-phrase specifies the manner of the causing event. A simplified semantic representation for *einen Polizisten töten* ('to kill a policeman'), could be as in (3), p representing the policeman, e_2 the caused transition and e_1 the causing event:

(3) $\lambda e_1 \exists e_2 [\text{BECOME}(tot(p))(e_2) \wedge \text{CAUSE}(e_2)(e_1)]$

Analysing a causative this way means that the *durch*-phrase only specifies e_1 in (3), contributing nothing else to the formula. Thus, a preliminary semantics of *durch* only needs to involve an identity relation between events, where the event of the *durch*-phrase is identified with the unspecified causing event of the causative predicate.

Common to the occurences of *durch*-phrases with causative predicates is that the adverbial *durch*-phrase only seems to modify the predicate it is adjoined to, adding some conditions or restrictions (cf. Chung and Ladusaw 2004) to it (cf. (7) on page 319).

However, in addition to occuring with causative predicates, *durch* can also be used with inchoatives as illustrated in (4)-(5).

[1] In addition, *durch* has spatial, temporal and agentive uses.

(4) *Ohnesorg starb durch einen gezielten Schuss.*
(Ohnesorg died through an accurate shot)
'Ohnesorg died through an accurate shot.'

(5) *Der Verlust an Vielfalt und Eigeninitiative ist durch die Verstaatlichung*
(the loss of diversity and one's-own-initiative has through the nationalisation
gesellschaftlicher Bedürfnisse in Schweden entstanden.
social.GENITIVE needs in Sweden emerged)
'The loss of variety and initiative has resulted from the state taking over responsibility for social needs in Sweden.'

For inchoative predicates like *sterben* ('die') as in (4), I assume a semantics as in (6), i.e. without an underlying CAUSE:

(6) $\lambda y \lambda e_2 \, \text{BECOME}(tot(y))(e_2)$

However, in the case of an example like (4), it is desirable to postulate a semantics after composition with *durch* like in (3), including a CAUSE and adding a specification for the causing event e_1: An accurate shot is the cause of Ohnesorg's death. The examples in (1) and (4) could be given a common semantic representation as indicated in (7):

(7) $\lambda e_1 \exists e_2 [\text{BECOME}(tot(p))(e_2) \wedge \text{CAUSE}(e_2)(e_1) \wedge \text{SHOOT}(e_1)]$

This means that the semantics of an inchoative predicate like *sterben*, which is not specified for a cause, and involves no agent, can be included in an expression where the resultant state expressed in *sterben* is caused to occur by some event, as with *töten*. If the event included in the *durch*-phrase is modified such that it is obvious that it is a deliberately performed event (e.g. by an adjective such as *accurate*), a CAUSE analysis seems as justified for (4) as for (1). In fact, sentence (4) makes stronger claims about agentivity and intentionality than (1). It is in the sense of adding a CAUSE-relation and the implication of an agent that the *durch*-adverbial is claimed to radically alter the predicate *sterben*.

However, the CAUSE element in the semantic representations for (1) and (4) must have different sources on the semantic representations assumed for causatives and inchoatives here. In (1) it originates in the predicate, whereas in (4) its source cannot be the predicate. But this would seem to enforce an assumption that, in the latter case, *durch* may introduce a CAUSE element of its own, it being the most plausible other candidate for such an introduction (see also section 3). After all, if the semantic representation of a sentence which contains a non-causative predicate is assumed to contain a CAUSE element, the source of this CAUSE cannot be the predicate itself. Under the assumption that we are not dealing with two CAUSE elements when *durch* is combined with a causative predicate, potentially yielding an interpretation of indirect causation in a CAUSE-TO-CAUSE-relation, this would seem to force us to postulate the existence of two different lexical items *durch*: one of which is used in combination with causatives, and one of which is used with inchoatives and other non-causative predicates, which do not include a CAUSE element on their own. I will refer to this as the *variant problem*.

But handling two different lexical items *durch* is clearly counterintuitive. The contribution of *durch* is much the same in the two cases, it specifies the causing event in a causal relation. To assume two lexical items *durch* to be able to represent both (1) and (4) as in (7) is not very desirable. The main motivation of the assumption of such an ambiguity would seem to lie in the restrictions of the formalism. It is thus preferable to look for ways to give a unified analysis of the two combinations in question.

3 Alternative approaches

There exist approaches which could be seen as avoiding the variant problem. I will briefly dicuss two of these. It should be added that in these approaches, the semantics of *durch* is not discussed. A first alternative would be to assume a principle of *temporal coherence* as in Wunderlich (1997, p. 36). This way a CAUSE can enter into semantic composition whenever there is a constellation where a process (immediately) precedes a resultant state, where the predicate BECOME occurs. This way, the CAUSE element occurs as a result of the combination of a BECOME element in the representation for inchoatives like *sterben* in (6) and the event of the shot, introduced by the *durch*-phrase. This means that *durch* itself does not need to contain a CAUSE element for sentences with either inchoative or causative matrix verbs to come out much the same when combined with *durch*.

Another alternative would be to, somewhat simplified, assume that every change involves a CAUSE at some level, under the assumption that "even if no specific causing entity or action is expressed, something must be responsible for the change of state in the affected entity" (Härtl 2003, p. 899 ff.). Härtl assumes that the presence of a CHANGE relation may motivate the introduction of a CAUSE relation whereever relevant.

However, I think there are some facts concerning *durch* which render these approaches less attractive for the current purposes. In addition to the combinatorial possibilities of casual-instrumental *durch* briefly discussed in section 2, *durch* may also be combined with stative predicates, as in (8):

(8) *Auch der durch diese Haltung hohe Luftwiderstand kann auf längeren Strecken*
(Also the through this posture high air resistance may on longer distances
ganz schön schlauchen.
quite much scrounge)
'The high air resistance due to this posture may put you through the mill over longer distances.'

In cases like (8), one gets an interpretation where the state expressed in the lexical anchor, *hoch* ('high'), is the resultant state of the eventuality expressed in the internal argument of *durch*, *Haltung* ('posture').[2] If the *durch*-phrase is left out, as illustrated in (9), the stative *hoch* should not be interpreted as a resultant state as such – though this could be achieved by focussing *hoch*, introducing a set of alternatives which are related to *high* through scales or negation:

(9) *der hohe Luftwiderstand*
(the high air resistance)
'the high air resistance'

It can be concluded that *durch* has a similar effect here as with inchoatives. A CAUSE can be assumed to be present in examples such as (8), and *durch*'s internal argument expresses the causing event in the causing relation.

If one were to follow the above approaches, one would be left in a situation where the reinterpretation needed to achieve a plausible semantic representation (including a change of state and a cause relation), would be without any obvious triggers, since no change is present in the first hand.

I think an intuitively more plausible analysis can be achieved if we allow *durch* to introduce

[2] *Haltung* is an abstract noun, which has both a stative and an eventive reading. It has an eventive, intergressive (Egg 1995) reading in contexts where the position has to be upheld deliberately, as in (8).

the CAUSE element. This CAUSE element would be the driving force of reinterpretation. If a CAUSE relation is present, one would expect a stative predicate to be reinterpreted as being a resultant state (Kratzer 2006). The reinterpretation of the stative predicate would thus follow automatically from the presence of the CAUSE element in *durch*, as in standard counterfactual analyses.[3]

In light of examples such as (8) and the reinterpretational effects of *durch* in general, it seems reasonable to assume a CAUSE-predicate to be included in the semantics of *durch*.[4] In the next section, I will turn to a possible solution of the variant problem described in section 2, i.e. how this quality of *durch* can be retained for all its causal and instrumental uses, in such a way that one can deal in a compositional manner with the fact that *durch* includes a CAUSE-predicate which is not always needed or wanted, as with causatives.

4 A unificational analysis

In what follows, I will present a compositional analysis of *durch*-adjuncts within Discourse Representation Theory (DRT) which avoids the assumption of lexical ambiguity between one *durch* variant including a CAUSE element and another without it.

I think it is fairly obvious that on standard strict compositional analyses, it is a considerable challenge to provide a general semantic analysis for *durch* in combination with all the above predicate types: causatives, inchoatives and statives. One is left in a situation where one either has to explain how the CAUSE of *durch* and the CAUSE of a causative are combined into one, or how a CAUSE element emerges with an inchoative or a stative predicate.

4.1 DRT bottom-up unification-based construction

The analysis I base my own approach on is in some respects based on Sæbø (to appear), where *by*-adjuncts in English are analysed. However, my approach differs from the one in Sæbø's paper in several points, starting from the fact that my analysis of causation is based on events, and not propositions. This is partly due to another difference between *durch* and *by*. Whereas the internal argument of *durch* is an event noun, the one of the *by*-phrases in Sæbø's paper is a VP: *He killed him by shooting him in the back.*

I should add that in the formal analysis to be presented in this section, I will not consider tense or aspect and only to a limited degree voice, i.e. the details I discuss will mostly be limited to the VP level, assuming a Kratzer (1996) analysis of Voice. This means that a sentence like (10) will be assigned the simplified syntactic structure indicated in figure 1 on page 322. I assume that the *durch*-phrase is adjoined at VP level, below any possible agents.

(10) *Der Polizist tötete einen Verbrecher durch einen Schuss.*
(the policeman killed a criminal through a shot)
'The policeman killed a criminal with a shot.'

Sæbø uses unification as a mode of composition within DRT to get a compositionally sound analysis of *by*-adjuncts in English. This is a fairly recent development within DRT, Bende-Farkas and Kamp (2001) being the first to my knowledge to advocate such an approach, although it is a such no radical shift within DRT.

[3] A further argument in favour of including a CAUSE-relation in *durch* is the fact that any internal arguments of *durch* of the semantic type of entities have to be reinterpreted as being an event, which would be expected since CAUSE is a relation between two events.

[4] A similar argument may be made with respect to anticausatives, cf. Solstad (forthcoming).

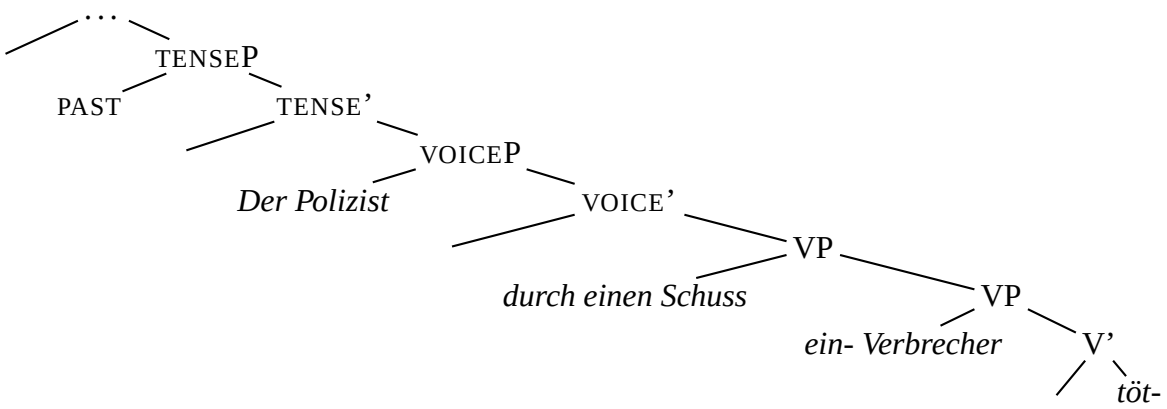


Figure 1: Simplified syntactic structure for the sentence *Der Polizist tötete einen Verbrecher durch einen Schuss*

Intuitively, the idea of formalising what is going on when combining *durch* with causatives or inchoatives in terms of unification, makes sense: the causative predicate and the *durch*-phrase describe one and the same event. The information they contribute should somehow be unified. If *durch* includes a CAUSE, unification might be used to formalise the fact that this CAUSE isn't added to the CAUSE of a causative.

There is as yet no coherent formalisation of all aspects relevant to the analysis promoted here, and many details will be left out. Though the derivation for two example sentences will be shown, the exact construction principles will only be discussed informally, but hopefully precisely enough to give a rough idea of the framework. As in Kamp (2001), a bottom-up compositional DRT analysis is applied, where Sæbø (to appear) was concerned only with the more general unificational principles of *by*-phrases with the gerunds they modify. The reader is referred to Kamp (2001, especially pp. 221-231) for more details concerning the formalisation.

The following general format, called a *semantic node representation*, is used for the semantic information attached to the tree nodes:[5]

(11) $\left\langle \overbrace{\left\{ \left\langle \text{Variable}, \boxed{\text{Constraint}}, \text{Binding condition} \right\rangle \right\}}^{\text{STORE}}, \boxed{\text{CONTENT}} \right\rangle$

The semantic node representation is a pair consisting of a CONTENT and a STORE element. The content representation is always a Discourse Representation Structure (DRS), whereas the STORE contains a set of one or more elements, each consisting of a triple of a variable, a constraint and a binding condition. The binding condition provides information on the possible bindings of a variable, and the constraint adds to this, often by stating the semantic content of the variable, e.g. as gender features necessary for the correct binding of pronouns. The motivation for dividing a semantic representation in STORE and CONTENT, as opposed to just having a main DRS, is that many of the variables which are introduced in (bottom-up) composition cannot be bound right away. A storage mechanism is needed.

I turn next to the composition of the semantics of (10), repeated as (12) for convenience:

[5] As will be obvious from the division in a STORE and a CONTENT part of the representation, Kamp's (2001) paper relies strongly on the seminal paper by van der Sandt (1992), dealing with presuppositional phenomena in DRT. Some aspects of van der Sandt's paper will be briefly discussed in section 5.

(12) Der Polizist tötete einen Verbrecher durch einen Schuss.
'The policeman killed a criminal with a shot.'

The representation of the lexical head of the VP, the causative predicate *töten*, is as follows:

(13)
$$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\begin{array}{l}\text{CAUSE}(e_2)(e_1)\\ e_1 \subseteq t_{loc}\end{array}}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle t_{loc}, \qquad\qquad\qquad\quad , \text{loc.t.}\rangle \end{array}\right\}, \begin{array}{|l|} \hline \\ \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(dead(y))(e_2) \\ \text{PATIENT}(y)(e_2) \\ \hline \end{array} \right\rangle$$

The CONTENT part to the right belongs to the invariant part of the semantics of the item in question, i.e. the information which will be part of the main DRS at the end of the update process. Following Kamp and Rossdeutscher (1994), it is referred to as the *lexical anchor* since it is the matrix verb of the sentence. Concerning the nominal arguments of the verb, only the semantic role of PATIENT is included in the representation, under the assumption that the AGENT appears outside the VP in a VOICE phrase projection, cf. the structure given in figure 1 on page 322. The predicate introduces three variables in the store, one for each of the two events, and one for temporal location. The variable for temporal location will be ignored in the following, with the exception of the final DRS.

The binding condition INDEF provides the information that the variables can, but need not enter binding relations with other variables. Importantly, when binding occurs, it is assumed that variables and constraints are unified. A variable with a INDEF binding condition will eventually be existentially bound at the relevant level.[6] As in the case of the location time variable, the binding condition of this variable will not be of any concern here. More binding conditions will be discussed below.

As was mentioned above, the constraints in the STORE part include information which is necessary for the correct binding of the variables. Thus, $\text{CAUSE}(e_2)(e_1)$ occuring in both STORE and CONTENT does not mean that the semantics of the verb includes two CAUSE relation, but simply reflects the fact that this information is needed to be able to tell the two variables apart, since the relate differently to the CAUSE predicate. Technically, it would be possible to leave out the CAUSE relation in the content part, under the assumption that all information in the store will enter the content at some stage in the derivation. However, I include it there to indicate that it is an invariable part of the semantics of the verb. In the end, only constraint conditions for STORE variables which are not already present in the CONTENT part will enter it. Thus, no multiplication of conditions should occur.

Durch is represented as in (14) on page 323. Kamp (2001) has nothing to say about prepositional adjuncts, but I think it is rather uncontroversial to assume that *durch* on its own has no content, since it is not a lexical anchor:

(14)
$$\left\langle \left\{ \begin{array}{l} \langle e_3, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda_1\rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda_2\rangle, \end{array}\right\}, \begin{array}{|c|} \hline \quad\quad \\ \hline \\ \\ \hline \end{array} \right\rangle$$

[6]For indefinite noun phrases, this level seems to be the topmost, CP-level of the sentence. Exactly where the binding of eventuality variables takes place, is not a settled matter (Kamp 2001, p. 288, fn. 20). It is reasonable to assume that eventuality variables are existentially bound no later than at the level of aspectual projections, though. This issue does, however, not affect the underlying principles of the present analysis.

(14) basically states that *durch* itself adds no content to the DRS, but that it involves a causal relation between two events. Here, a third binding condition, λ, is introduced. The binding condition λ indicates that the variable needs to enter a binding relation. In this paper, variables with λ binding conditions will be bound by variables with INDEF binding conditions, resulting in a variable with another INDEF condition. Variables with INDEF binding conditions will eventually be existentially bound, as discussed briefly above. I have opted for using λ to illustrate the fact that these variables need to be bound, as opposed to the INDEF variables, although abstraction as such is not involved. The subscripted numbers on λ_1 and λ_2 indicate the binding order of the two variables involved in *durch*. They are included to ensure the right binding order of the event variables in the CAUSE relation. This has its motivation in the fact that what modifies a predicate such as *töten* in example (12) on page 323, is a *durch*-**phrase**. Thus, the internal argument of *durch*, corresponding to the syntactic complement of the preposition, will be bound first, since this will already be present in the *durch*-phrase before it is adjoined to a VP.

For the internal argument of *durch*, the event noun *ein- Schuss*, the following representation is assumed:

(15)
$$\left\langle \left\{ \begin{array}{l} \langle e_5 \,, \boxed{\text{SHOOT}(e_5)} \,, \text{indef.} \rangle, \\ \langle w \,, \boxed{\text{AGENT}(w)(e_5)} \,, \text{indef.} \rangle, \end{array} \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The nominalisation derived from the predicate *schießen* ('shoot') is assumed to include the semantic role of an agent, but not that of a patient, since shooting events without patients are easily imaginable. The event expressed in *ein- Schuss* also needs to include a location time, but this will be ignored in the following.

The representation in (16) is the result of combining the representations for *durch* and *ein-Schuss*. The variable e_5 will bind e_3, resulting in a INDEF binding condition for the unified variable from the representations in (14) and (15). It is as such of no importance whether the variable e_5 in the representation of *ein- Schuss* or e_3 of *durch* is retained for the causing event:

(16)
$$\left\langle \left\{ \begin{array}{l} \langle e_3 \,, \boxed{\begin{array}{l}\text{CAUSE}(e_4)(e_3) \\ \text{SHOOT}(e_3)\end{array}} \,, \text{indef.} \rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)} \,, \lambda_2 \rangle, \\ \langle w \,, \boxed{\text{AGENT}(w)(e_3)} \,, \text{indef.} \rangle, \end{array} \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The representation of the two noun phrases, *der Polizist* ('the policeman') and *ein Verbrecher* ('a criminal') is as illustrated for *ein Verbrecher* in (17). They only differ in their binding condition, which is DEF in the case of the definite noun phrase, *der Polizist*.[7]

(17)
$$\left\langle \left\{ \langle u \,, \boxed{\text{CRIMINAL}(u)} \,, \text{indef.} \rangle \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The VP *einen Verbrecher töten* ('kill a criminal'), which is modified by the *durch*-phrase, is

[7] In order to keep representations as simple as possible, the agent argument, *der Polizist*, will only occur in the final representation of sentence (12), cf. (21) on page 326.

represented as:

(18) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

The internal argument of *töten* gets a 'placeholder' inserted in the CONTENT DRS, whereas the content of the variable inserted in the DRS is specified along with the variable's binding conditions in the STORE part. Combining the VP with the *durch*-phrase, *einen Verbrecher durch einen Schuss töten,* the following representation emerges before binding applies:

(19) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_3, \boxed{\begin{array}{l} \text{CAUSE}(e_4)(e_3) \\ \text{SHOOT}(e_3) \end{array}}, \text{indef.}\rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

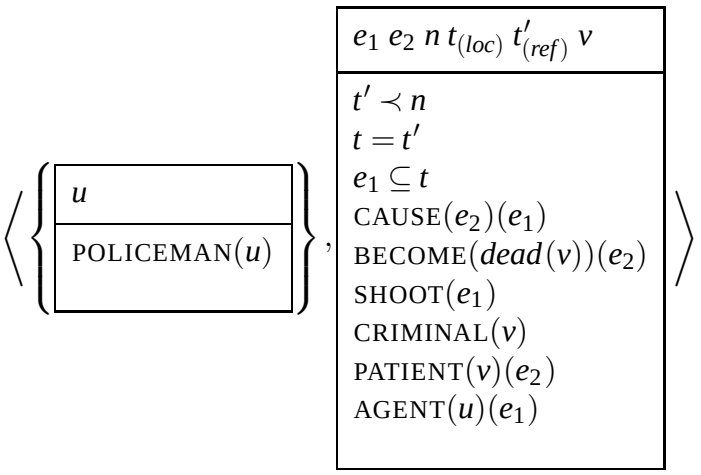
Next, e_2 will bind e_4. Needless to say, the variable types have to correspond for a binding to take place. Taking the constraints into consideration, which also have to match, e_4 cannot be bound by e_1 which could be a possible match, looking only at the binding conditions: they are simply not in the same argument positions for CAUSE. The variable e_4 represents a caused event, whereas e_1 represents a causing event.

Next e_1 and e_3 will be unified. This is not a binding in the sense of the binding which takes place between e_4 and e_2, which is a necessary binding, where e_4 not being bound would lead to an unresolved DRS. The variables e_1 and e_3 will be unified under the assumption that one should unify all variables which are a possible match. This soultion might overgenerate, but I will not go into this here.

In addition, the constraints of the variables entering into binding relations will be merged, resulting in the preliminary representation in (20), before indefinites are existentially bound and enter the content part:

(20) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\begin{array}{l} \text{CAUSE}(e_2)(e_1) \\ \text{SHOOT}(e_1) \end{array}}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

The indefinites enter the DRS in accordance with the binding condition for indefinites. The result after existential binding of variables with INDEF binding conditions can be seen in (21):

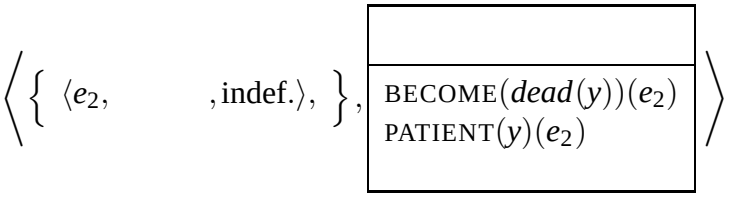
(21) 

The left part of the representation, consisting of $\{< \{u\}, \{\text{policeman}(u)\} >\}$ is a presupposition, the noun phrase *Der Polizist* being definite. It has to be verified in a broader context or accommodated.

I will now turn to the analysis of inchoative predicates such as in (4), repeated as (22) for convenience. I will only look at the steps of the derivation differing from the previous example:

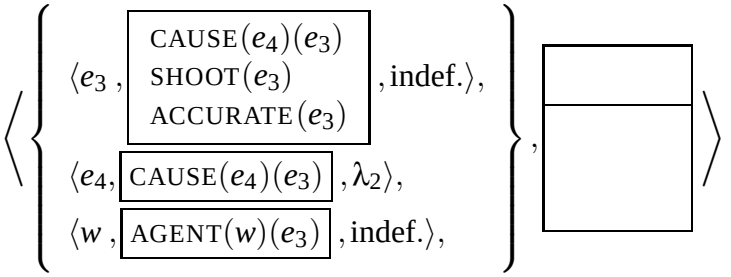
(22) *Ohnesorg starb durch einen gezielten Schuss.*
'Ohnesorg died through an accurate shot.'

Sterben is represented as in (23):

(23) 

The representation of *sterben* differs from that of *töten* in (13) in two respects: First, *sterben* includes only one event. Second, *sterben* is not specified for any causal relation, and thus has no constraint for e_2 (although it could be specified as involving a resulant state).

Durch einen gezielten Schuss ('through an accurate shot') is represented in (24), simplifying the semantics of *gezielt* ('accurate'):

(24) 

When combining the representation in (23) (with the addition of the proper name *Ohnesorg*) with (24), the result is the representation in (25), before binding applies:[8]

[8]The binding condition of the variable *o*, PROPER NAME, has similar properties to the DEF condition.

(25)
$$\left\langle \left\{ \begin{array}{l} \langle e_2, \quad\quad , \text{indef.}\rangle, \\ \langle e_3 , \boxed{\begin{array}{l}\text{CAUSE}(e_4)(e_3)\\ \text{SHOOT}(e_3)\\ \text{ACCURATE}(e_3)\end{array}} , \text{indef.}\rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)} , \lambda_2\rangle, \\ \langle o, \boxed{\text{OHNESORG}(o)} , \text{prop.name}\rangle, \\ \langle w , \boxed{\text{AGENT}(w)(e_3)} , \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \\ \hline \text{BECOME}(\textit{dead}(o))(e_2)\\ \text{PATIENT}(o)(e_2)\end{array}} \right\rangle$$

The variable e_2 will bind e_4, adding the constraint $\text{CAUSE}(e_2)(e_3)$ to the variable e_2. Binding will be able to take place because there is nothing preventing it from taking place. Finally, the indefinites enter the DRS, resulting in the following representation for sentence (22), which should be compared to the one in (21) on page 326.

(26)
$$\left\langle \left\{ \boxed{\begin{array}{|l} o \\ \hline \text{OHNESORG}(o) \end{array}} \right\}, \boxed{\begin{array}{|l} e_2\ e_3\ w\ n\ t_{(loc)}\ t'_{(ref)} \\ \hline t' \prec n \\ t = t' \\ e_3 \subseteq t \\ \text{CAUSE}(e_2)(e_3) \\ \text{BECOME}(\textit{dead}(o))(e_2) \\ \text{SHOOT}(e_3) \\ \text{ACCURATE}(e_3) \\ \text{PATIENT}(o)(e_2) \\ \text{AGENT}(w)(e_3) \end{array}} \right\rangle$$

These two derivations give the same result for the semantic composition for *töten* and *sterben* in combination with *durch*, cf. the representation in (21) on page 326. The event nominal *Schuss* introduces an agent of its own, and *durch* contributes the causal relation. This is all added in a compositonal fashion to the semantics of *sterben*.

5 The semantics of *durch* as presupposition verification and accommodation

In the above analysis, the semantics of *durch* was claimed to be characterised by an empty CONTENT part. *Durch* was said to *involve* a causal relation, however. In this section, I will attempt to specify how this involvement may be understood. Given the fact that the formalism which is applied here was introduced by van der Sandt (1992) and further developed by Kamp (2001) to handle presuppositional phenomena, an obvious question is: Could the causal relation in *durch* be described as a presupposition? And what would the implications for presupposition theory be? I will only be able to give a partial answer to the latter question here.

I would like to argue that the treatment of *durch* presented abouve does indeed amount to analysing the implicit CAUSE element of *durch* as an *intrasentential* presupposition. A *durch*-phrase can be said to *assert* the event included therein and *presuppose* that this event is a cause of some other event. The common basis for generally assumed mechanisms for presuppositional behaviour and the compositional unification-based analysis of *durch* is as follows: When combined with causatives, *durch* seems to lack a meaning of its own. This is due to the unification of the CAUSE of *durch* with the CAUSE of the predicate, which is parallel to presupposition

verification. In combination with inchoatives, however, *durch* does seem to make a greater contribution, where a CAUSE predicate is introduced by the causal preposition itself. Here, a parallel to context accommodation can be observed. And finally, with statives, the contribution of the *durch*-phrase to the complex semantic formula seems to be even greater, leading to a reinterpretation of the state as being a resultant state.

Importantly, a pragmatic account of the combinatorial potential of *durch* can capture some further properties of the preposition which have previously been ignored or not correctly identified. Two additional pragmatic mechanisms involved are *bridging* and *acceptability*. In (8), repeated here for convenience as (27), bridging (in the wider sense of Bittner (2001) can be argued to take place, where the CAUSE associated with the preposition forces a reinterpretation of the state described in the predicate *hoch* ('high') as being a caused resultant state:[9]

(27) *Auch der durch diese Haltung hohe Luftwiderstand kann auf längeren Strecken ganz schön schlauchen.*
'The high air resistance due to this posture may put you through the mill over longer distances.'

In (28), it can be seen that claims made in the literature that *durch* generally cannot be combined with manner-specific causatives (Härtl 2001) are not correct:

(28) a. ??*Er wurde durch einen Schuss erschossen.*
(He was through a shot shot dead)
'He was shot dead by a shot'
b. *Er wurde durch einen Genickschuss erschossen.*
(He was through a shot-to-the-neck shot dead)
'He was shot dead with a shot to the neck.'

The well-formedness of such combinations should not be explained by reference to the semantics of *durch*. A more general account of the distribution in (28) is achieved by assuming that composition is restrained by a general pragmatic mechanism of acceptability as described by van der Sandt (1992, pp. 367 ff.). The verb *erschießen* ('shoot dead') is a *manner-specific* causative predicate, where the causing event is specified as being a shooting event. Modifying a predicate such as *erschießen* ('shoot dead') by an adjunct like *durch einen Schuss* ('with a shot') as in (28a) is uninformative and thus unacceptable. The adjunct contains no information which is not included in the predicate. However, a specification such as *durch einen* ***Genick****schuss* ('with a shot to the neck') as in (28b) renders the adjunct more specific than the shooting event described in the predicate, adding to the content. A shot to the neck describes not only a shooting event, but also specifies the direction of the shot. Thus, the distribution of *durch*-phrases in combination with manner-specific causatives does not have to be accounted for by reference to the semantics of durch itself, but can be seen as fully determined by acceptability restrictions.

It should be emphasised that in the above examples, all pragmatic mechanisms assumed to account for the compositional behaviour of *durch* apply purely sentence-internally. What is more, the presupposition resolution which has been argued for here, occurs at a word-internal level, involving a decomposition of the semantics of lexical items by means of the predicates CAUSE and BECOME. Thus, the above approach can be said to truly involve lexical pragmatics (Blutner 2004), where not only the pragmatic aspects of some lexical items are discussed, but lexical composition itself is viewed as being pragmatic in nature.

It might be questioned whether this is really a kind of presupposition. At this point, I have

[9] This is standardly described as *coercion* in the semantic literature on aspect.

nothing much to say in my defence, this part of the article indeed being work in progress. It is however, not straightforward to establish this relation, since many of the normally applied tests for presuppositions are not applicable in the case of *durch*. The pragmatic mechanisms which are argued to be relevant here, apply at word-level, whereas most presuppositional phenomena which have been treated in the literature, belong to the sentence-level. They can only be evaluated at the top-most CP-level and often only apply intersententially. But the resolution of the CAUSE-presupposition of *durch* can be argued to occur at VP-level, before the topmost eventuality is existentially closed. Thus, traditional tests involving e.g. embeddedness do not make much sense in the case of word-internal pragmatics.

Also of relevance to this point, since the presupposition justification of durch applies at a word-internal level, effects involving global, local or intermediate accommodation (Beaver and Zeevat to appear) are not expected, either.

One test which does seem to be more or less straightforwardly applicable, though, is the negation test, which involves a non-entailing context, in which a presupposition should still be true:

(29) *Er starb nicht durch einen gezielten Schuss.*
(He died not through an accurate shot)
'He did not die through an accurate shot.'

It does not make sense to consider the truth of CAUSE alone, but it can be observed that the CAUSE of *durch* does seem to survive negation: The most obvious interpretation of (29) is one where the person in question dies, but where the cause of his death is not an accurate shot, i.e. the negation has narrow scope over the *durch*-adjunct. Importantly, (29) is interpreted as claiming that there was a cause for the person's death, but that the reason was not an accurate shot.[10]

Summing up, the above arguments indicate that a presuppositional analysis of *durch* is plausible and that the consequence of this is an extension of the phenomena and linguistic levels for which presuppositions seem to be relevant. In the next section, I will briefly discuss the generality of the above approach discussing some further data.

6 Outlook

An approach as sketched above has applications beyond the analysis of *durch*. First, unification as a mode of composition has been applied in an analysis of the semantics of *by* in English (Sæbø to appear). Second, there are causal prepositions in other languages which show a similar behaviour to *durch*. In English, *through* can also be combined with both causative and inchoative predicates. More interestingly, given the close relationship between English *through* and German *durch*, a language more remotely related to German such as Bulgarian also has a preposition which combines with causatives and inchoatives, *ot* ('from'):

(30) a. *Toj be ubit ot tri kurshuma.*
(He was killed from three bullets)
'He was killed with three shots.'
b. *Toj sagina ot tri kurshuma.*
(He died from three bullets)
'He died from three shots.'

[10] It is possible to get a sentential negation reading of *nicht* ('not') in (29), but it is rather dispreffered in (29). The reason for this could be that it does not make sense to add a causal adjunct like *by a shot* if one wants to express that a person did not die (cf. Solstad forthcoming).

Third, there are other types of adverbial modification, where the above analysis can be applied plausibly, as illustrated in (31):[11]

(31) a. *Sie ging in das Haus hinein.*
(She went in the house inside)
'She went into the house.'
b. *Sie ging in das Haus.*
'She went into the house.'
c. *Sie ging hinein.*
'She went inside.'

In (31a) the adverbials *in das Haus* ('into the house') and *hinein* ('inside' in addition to viewpoint information) specify a single path of movement. They are not interpreted as describing two paths which are combined. There is a double specification of an *in* movement (i.e. *into* as opposed to *out of*), both in the preposition *in* and in the *hinein* element. In addition, directionality is specified twice: in the combination of the preposition with accusative case, as well as in the *hinein* element. As can be seen from (31b)-(31c), either of the advberbials in (31a) can occur without the other. In the spirit of the analysis presented here, the *hinein* element would be assumed to carry the presupposition that there is an object into which movement takes place. In (31a) this presupposition is sentence-internally verified, whereas it will have to be verified in a wider context or accommodated in (31c). The information on directionality and inwards movement of the two adverbials is unified whenever they both occur.

In sum, these data suggest that the presuppositional analyses of Kamp (2001) and van der Sandt (1992) in combination with unification-based composition can be suitably applied in analysing lexical items other than e.g. particles and factive verbs, which are often analysed in terms of presuppositions.

7 Conclusion

In this paper, it was argued that an analysis applying strict compositionality is not always a viable option. The varying compositional impact of German adverbials headed by the causal-instrumental preposition *durch* was argued to be better rendered in a unificational framework. It was further argued that pragmatic mechanisms are important in describing the combinatorial distribution of some lexical items, and that what seems to be unification may be argued to be rather word-internal presuppositional phenomena.

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[11] Thanks are due to Christopher Habel for pointing my attention to this example.

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WHY *A FEW*? AND WHY NOT **A MANY*? [*]

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Abstract

The expressions *few* and *a few* are typically considered to be separate quantifiers. I challenge this assumption, showing that with the appropriate definition of *few*, *a few* can be derived compositionally as *a* + *few*. The core of the analysis is a proposal that *few* has a denotation as a one-place predicate which incorporates a negation operator. From this, argument interpretations can be derived for expressions such as *few students* and *a few students*, differing only in the scope of negation. I show that this approach adequately captures the interpretive differences between *few* and *a few*. I further show that other such pairs are blocked by a constraint against the vacuous application of *a*.

1 Introduction

The starting point for the present paper is the often-overlooked contrast exemplified below:

(1) a. Few students came to the party.
b. A few students came to the party.

(2) a. Many students came to the party.
b. *A many students came to the party.

The expressions *few* and *many* have long been recognized as problematic for treatments of quantification, on account of their vagueness and context dependence (or even ambiguity), and their resistance to classification on the standard dimension of strong versus weak (Milsark 1974; Barwise & Cooper 1981; Westerståhl 1985; Keenan & Stavi 1986; Lappin 1988, 2000; Partee 1989; Herburger 1997).

But one idiosyncrasy of *few* that has received little serious attention (though see Kayne 2005) is that it forms a pair with the superficially similar expression *a few*, the only such pair in the English count noun quantifier system. In particular, while *few* and *many* otherwise exhibit very similar properties, there is no **a many* in parallel to *a few*.

My goal in this paper is to present some interesting facts and contrasts relating to the semantics of *few* and *a few*, to show that, despite their differences, *a few* can be derived from *few*, and finally to address why *a few* does not have a counterpart in **a many*. I also discuss some broader implications for the semantics of *few* and *many*, and of the indefinite article.

1.1 Does *a few* = *a* + *few*?

It is not immediately clear that *a few* should receive a compositional treatment at all. And in particular, it is not obvious that *a few* is composed of the *a* in *a student* plus the *few* in *few students*. Within basic accounts of generalized quantifiers (e.g., Keenan & Stavi 1986) as

[*] My thanks to Bill McClure for his encouragement and guidance in pursuing this research, to Bob Fiengo, Rachel Szekely and Erika Troseth for valuable comments, and to the audience at Sinn und Bedeutung 10 for helpful questions and discussion. All errors are of course my own.

well as introductory semantics texts (e.g., Gamut 1990), the standard if unspoken assumption would seem to be that *a few* is an idiom, that is, a fixed, unanalyzable unit.

But on closer examination, it is clear that *a few* does not always function as a unit: *a* and *few* may be separated by an adverb (as in (3)) or, more interestingly, by an adjective modifying the head noun (as in (4)):

(3) a. A very few students got perfect scores on the test.
b. An incredibly few collectors have the good fortune to own one.

(4) a. A lucky few students will get fellowships.
b. We spent a happy few days at John's house in the country.

The conclusion must be that *a few* is composed of an independent *a* and *few* which combine in the syntax; in light of this, a compositional semantic treatment is desirable as well.

1.2 Outline of the paper

The organization of the paper is the following. I begin in Section 2 by presenting some facts in the semantics of *few* and *a few* that must be captured by a compositional account. In Section 3, I introduce two further properties of *few* that will prove crucial to the present analysis. Section 4 is the core of the paper, where I present a proposal regarding the semantics of *few* and the derivation of *a few*. In Section 5, I address the obvious question that arises: why *a few* does not have a counterpart in **a many*. I summarize in Section 6 with some conclusions and questions for further study.

2 The Interpretation of *Few* and *A Few*

2.1 Basic facts

Considering again examples (1a) and (1b), it can be observed that these sentences have overlapping truth conditions: Both are true if some small but unspecified number of students attended the party. But from there, the interpretations of *few* and *a few* diverge.

Specifically, diagnostics such as those proposed by Horn (1989, 2003) show that *few* is defined by its upper bound. That is, *few* means <u>at most</u> some maximum value. Thus for example "few students came to the party" can be followed felicitously by "in fact, hardly any did" and so forth, but not by "in fact, many did" or the like, evidence that the former but not the latter are encompassed within the possible interpretations of *few*:

(5) a. Few students came to the party; in fact, hardly any/almost none/only one did.
b. Few students came to the party; in fact, *many/*lots/*dozens did.

Likewise, (6) can only mean that I'm surprised that <u>more</u> students did not come to the party:

(6) I'm surprised that few students came to the party.

Furthermore, although speakers' intuitions differ with regards to this point, similar diagnostics show that *few* can even be *none*. Thus suppose I make you the bet in (7). If it later turns out that <u>no</u> students come to the party in question, it would seem that I have won the bet.

(7) I'll bet you that few students will come to the party.

Few is therefore monotone decreasing in its right argument, as seen by the validity of the entailment in (8a), and thus licenses negative polarity items, as in (8b):

(8) a. Few students in the class own cars. $\Rightarrow$ Few students in the class own red cars.
b. Few students in the class have <u>ever</u> owned a car.

A few, by comparison, has essentially mirror image semantics relative to *few*. *A few* is defined by its lower bound. It is existential (in that it must be non-zero), and marginally allows an "at least" reading, similar to the cardinal numbers. Thus for example "a few students came to the party" can be continued with "in fact, many did," but not with "in fact, none did" or "in fact, one did":

(9) a. A few students came to the party; in fact, many/lots/dozens/over twenty did.
b. A few students came to the party; in fact, *none/*one/(?) two did.

Similarly, (10) seems to mean that I am surprised that <u>any</u> students at all came to the party (or perhaps that I am surprised that some particular students attended, a point that I will not address here).

(10) I'm surprised that a few students came to the party.

On its "at least" reading, *a few* is therefore monotone increasing (as seen in (11a)), and thus does not license negative polarity items (as in (11b)):

(11) a. A few students in the class own red cars. ⇒ A few students in the class own cars.
b. *A few students in the class have <u>ever</u> owned a car.

Finally, for completeness, I consider also *many*, which will be relevant below. As seen through the contrasts in (12), *many* is lower bounded like *a few*, but of course specifies a larger number of individuals:

(12) a. Many students came to the party; in fact, dozens/hundreds did.
b. Many students came to the party; in fact, *none/*one/*a few did.

Within a generalized quantifier framework (Barwise & Cooper 1981), the above facts might as a first approximation be summed up by the expressions in (13) as the denotations of *few*, *a few* and *many*.

(13) a. $[\![\text{few}]\!] = \lambda P\lambda Q(|P \cap Q| \leq n$, where n is some small number)
b. $[\![\text{a few}]\!] = \lambda P\lambda Q(|P \cap Q| \geq$ m, where m is some small number $\geq 2)$
c. $[\![\text{many}]\!] = \lambda P\lambda Q(|P \cap Q| \geq p$, where p is some large number)

But this approach does not provide an account of the relationship of *a few* to *few*. Nor is it apparent why *a few* does not have a counterpart in **a many*.

2.2 Some additional complexities

Beyond these issues, there are some further subtleties that the expressions in (13) do not adequately capture. As is now well known, the semantics of *few* is notoriously difficult to specify precisely (Partee 1989). In some contexts, *few* would appear to have a proportional interpretation. For example, the intuition seems to be that *few Americans* in (14a) could refer to a larger number of individuals than *few senators* in (14b), which in turn could be a larger number than *few students in my class* in (14c) (assuming a class of ten students or so).

(14) a. Few Americans voted for Ralph Nader in 2004.
b. Few senators supported the bill.
c. Few students in my class solved the problem.

In fact, (14a) is clearly true – and perfectly felicitous – in a situation where one hundred thousand Americans (out of millions) voted for Nader in 2004. These facts could be readily be captured by giving *few* proportional semantics, so that *few N* is interpreted as "a small proportion of the Ns."

But the situation is not as simple as this: In other contexts, *few* has a purely cardinal interpretation, where *few N* could be paraphrased as "a small number of Ns." On this reading, *few N* could even be all of the Ns. Thus for example (15) could best be paraphrased as "a small number of truly qualified candidates applied," rather than "a small proportion of all qualified candidates applied."

(15) Few truly qualified candidates applied for the position.

In fact, (15) could be judged true if there were only a small number of really qualified candidates (perhaps because the job requirements were particularly onerous), and all of them applied.

Likewise, (16), an example from Partee (1989), could be true if there were only a small number of faculty children in 1980, and all of them were at the picnic.

(16) There were few faculty children at the 1980 picnic.

The possibility of a cardinal reading for *few* is particularly clear when it appears in object position. Thus (17) means that my reasons are small in number, not that of all such reasons I subscribe to only a small proportion.

(17) I have few reasons to trust John.

Along with its difficult-to-specify interpretation, *few* also exhibits inconsistent formal properties. On the most simple test, namely allowability in *there*-insertion contexts (Milsark 1974), *few* can be classified as weak, patterning with other weak determiners such as *some* or *no*:

(18) There are few cars in the parking lot.

But as is well known, *few* does not possess the properties characteristic of prototypical weak determiners (Barwise & Cooper 1981; Lappin 1988, 2000; Partee 1989). One such property is symmetry. As an example of symmetry, the two sentences in (19a) are logically equivalent. But it is not as clear that the equivalence in (19b) holds, and it is obvious that the one in (19c) does not:

(19) a. Some students are anarchists. ⇔ Some anarchists are students.
b. ?Few students are anarchists. ⇔ Few anarchists are students.
c. Few women are great-grandmothers. ⇔ Few great-grandmothers are women.

Similar issues arise with other characteristic properties of weak determiners, such as intersection and persistence/antipersistence (upward/downward monotonicity in a determiner's left argument).

Finally, *few* does not even appear to possess the property of conservativity, long argued to be a universal characteristic of natural language determiners (Barwise & Cooper 1981). Thus consider (20), based on a well-known example from Westerståhl (1985).

(20) Few Americans have won the Nobel Prize in Physics.

The number of Americans who have won the Nobel Physics prize – and certainly the proportion – is without doubt small. Nevertheless, on one reading, (20) could be judged false if Americans make up a large proportion of the winners. But if the cardinality of the predicate is factored into the truth conditions of a sentence such as this, conservativity does not obtain.

Importantly, the interpretation of *a few* is largely free of these complexities. To start with, *a few* is purely cardinal. Regardless of the context or the nominal expression with which it combines, *a few* specifies a small number of individuals in an absolute sense. Thus (21a-c) could all be judged true if a handful of individuals within the domain (*Americans*, *senators* or *students in my class*) satisfied the predicate:

(21) a. A few Americans voted for Ralph Nader in 2004.
b. A few senators supported the bill.
c. A few students in my class solved the problem.

Furthermore, in a situation in which one hundred thousand Americans voted for Nader in 2004, (21a) is pragmatically odd if not actually untrue, evidence that *a few* does not exhibit the proportionality that I have shown is characteristic of *few*.

A few, like *few*, can be classified as weak, as seen by the acceptability of (22a). But unlike *few*, it displays the characteristic properties of this class, such as symmetry, as seen by the equivalence in (22b):

(22) a. There are a few cars in the parking lot.
b. A few senators are anarchists. ⇔ A few anarchists are senators.

Finally, *a few* is clearly conservative; for example, the truth or falsity of (23) cannot depend on the total number of prize winners.

(23) A few Americans have won the Nobel Prize in Physics.

In short, *a few* is altogether a better-behaved expression than *few*. Any attempt to establish a compositional relationship between the two must capture this fact.

3 Two Crucial Properties

In this section, I introduce two further properties of *few* (and in parallel, *many*) that will serve as the starting point for the analysis to follow.

3.1 *Few* and *many* are adjectives

Within a standard generalized quantifier framework (Barwise & Cooper 1981), all noun phrases are uniformly represented as objects of semantic type ⟨⟨e,t⟩,t⟩, such that "quantificational determiners" – including *few* and *many* – must have the semantic type ⟨⟨e,t⟩, ⟨⟨e,t⟩,t⟩⟩. But this uniform approach has been challenged in other frameworks which distinguish indefinites from truly quantificational expressions, holding that the former are not inherently quantificational (Kamp 1981; Heim 1982; Landman 2004).

While the status of *few* and *many* with regards to this dichotomy is not completely clear (an issue which itself merits further investigation), in one respect there is clear evidence that these terms do not always have the semantics of determiners which produce generalized quantifiers: In many respects, *few* and *many* exhibit the morphological properties and syntactic distribution of adjectives rather than determiners (Hoeksema 1983; Partee 1989; Kayne 2005).

To begin with the most basic facts, both *few* and *many* pattern with adjectives in having comparative and superlative forms:

(24) fewer, fewest; more, most (cf. taller, tallest)

Both may combine with degree modifiers:

(25) so few/many; too few/many; very few/many (cf. so/too/very tall)

Both may appear in predicative position:

(26) His good qualities are few/many (cf. numerous/evident/remarkable)

Both may be sequenced after determiners other than *a*:

(27) a. The few/many advantages of his theory (cf. the important advantages)
b. His few/many friends (cf. his close friends)
c. Those few/many students who understood the problem (cf. those smart students…)

Finally, perhaps the most convincing evidence, both may be conjoined with other adjectives:

(28) a. Study shows few – and small – inheritances for baby boomers.
b. Precious and few are the moments we two can share.
c. … the many and complex processes involved in the development of an organism…

Since *few* and *many* exhibit the morphosyntactic behavior of adjectives, it is also desirable to represent them semantically as adjectives (i.e., noun modifiers), rather than as determiners. (For a related proposal, see Partee 1989, where *few* and *many* in their cardinal interpretations are associated with adjectival semantics.) Such an approach aligns these expressions within the broader treatment of indefinites as not inherently quantificational. In particular, this view of *few* and *many* finds a parallel in recent semantic analyses of cardinal numbers as noun modifiers lacking in quantificational force (Link 1983; Krifka 1999; Ionin & Matushansky 2004; Landman 2004).

3.2 *Few* is negative

A second crucial fact about *few* is that it is negative. This is in one sense an obvious point, and certainly not a new one. As early as Barwise & Cooper (1981) we find the proposal that *few* can be defined as "not many":

(29) Semantic Postulate: $[\![\text{few}]\!] = \neg\, [\![\text{many}]\!]$

More recently, McNally (1998) proposes that *few* is equivalent to a variant of *many* which has the morphosyntactic licensing condition that it appear within the scope of clausal negation.

But not all accounts have treated *few* as explicitly negative. An alternate approach is to represent *few* and *many* as opposites, related as ≤ is related to >. Thus for example Partee (1989) proposes the following as a first approximation of the semantics of *few* and *many* in their cardinal interpretations:

(30) $[\![\text{few N}]\!] = \{X: |X \cap N| \leq n\}$, where n is some small number
$[\![\text{many N}]\!] = \{X: |X \cap N| > n\}$, where n is some large number

Lappin (1988, 2000) similarly remarks that the denotation of *few* can be obtained from that of *many* by replacing > with ≤ in the relevant formula.

Now, it is not immediately apparent that the distinction between Partee's and Lappin's approach (*few* and *many* as opposites) and that of Barwise & Cooper and McNally (*few* as the negation of *many*) is an important one. After all, there is an obvious equivalence between the two, stemming from the equivalence of a formula of the form $|X \cap N| \leq n$ to one of the form $\neg|X \cap N| > n$. Thus we can of course move transparently from one type of definition to the other. But on another level, the difference between these two approaches is a more fundamental one. In the expressions in (30), *few* and *many* are of equal status; either one can be viewed as the opposite of the other. But with semantics such as Barwise & Cooper's (29), *many* is the primary term, while *few* is derived from it. Or to put this differently, the denotation of *few* includes an additional element that is not present in that of *many*, namely a negation operator. This is a basic asymmetry between the two expressions, which we might predict would have syntactic or semantic consequences. Thus it seems to matter which of these two approaches to *few* we choose.

I would like to argue that there is ample evidence that *few* is in fact negative, and should be represented as such. As a first point of support, the syntactic distribution of *few* parallels that of explicitly negative expressions. On standard tests for negativity (e.g., Klima 1964), *few* patterns with overtly negative quantifiers such as *no*, rather than positive quantifiers such as *some* or *many*. For example, *few*, like *no*, takes *either* rather than *too* tags:

(31) a. Some men like Brussels sprouts, and some women do, ✓too/*either. (POS)
b. Many men like Brussels sprouts, and many women do, ✓too/*either. (POS)
c. No men like Brussels sprouts, and no women do, *too/✓either. (NEG)
d. Few men like Brussels sprouts, and few women do, *too/✓either. (NEG)

Few is also similar to *no* and other negative expressions in being somewhat awkward in object position, at least in colloquial speech. In either case, the most natural way to express the same proposition would be by means of an explicit negator higher in the clause:

(32) a. ?He has no books. ➔ He doesn't have any books.
b. ?He has few books. ➔ He doesn't have many books.

Perhaps the most compelling evidence that the representation of *few* contains a negative component is provided by the existence of so-called "split scope" readings (Jacobs 1980) when it appears in the scope of an intensional verb or modal operator. For example, the most natural reading of (33a) is roughly that given by the paraphrase in (33b), where negation is interpreted outside the scope of the verb *need*, while *many reasons* is interpreted as within its scope. This is distinct from the narrow scope or *de dicto* reading in (33c), where both negation and *many reasons* are within the scope of *need*, and which could be paraphrased as "to fire you, they need it to be the case that they have not many (i.e. a small number of) reasons." It is also distinct from the true wide scope or *de re* interpretation in (33d), where both negation and *many reasons* scope outside of *need*, and which could be paraphrased as "to fire you, there are not many (specific) reasons such that they need them."

(33) a. They need few reasons to fire you.
b. "to fire you, it is not the case that they need many reasons"
$\neg$ > need > many reasons
c. "to fire you, they need there to be not many reasons"
need > $\neg$ > many reasons
d. "to fire you, there are not many (specific) reasons such that they need them"
$\neg$ > many reasons > need

Similarly, (34a) could be best paraphrased by (34b), where negation outscopes the modal operator, which in turn outscopes *many reasons*:

(34) a. You can have few reasons to doubt my story.
b. "it is not possible that you have many reasons…."
$\neg$ > $\Diamond$> many reasons

In light of these facts, as well as the previously discussed distributional patterns, I propose that at the level of logical form, *few* must be decomposed into a negation operator and a positive term.

4 The Semantics of *Few* and the Derivation of *A Few* (Or: Why *A Few*?)

In this section, I build on the conclusions of the previous discussion with a proposal for the formal semantics of *few*, which I show addresses many of the difficulties discussed above, and also allows *a few* to be derived in a compositional manner.

4.1 *Few*

I begin with the lattice theoretic framework of Link (1983), in which the domain of individuals is extended to include plural individuals formed as the sums over sets of atomic individuals. Within this framework, the cardinal numbers may be represented as follows (e.g. Landman 2004):

(35) $[\![\text{three}]\!] = \lambda x\,[|x|=3]$

Here, *three* is defined as a one-place cardinality predicate, that is, an expression of type ⟨e,t⟩.

I propose that a similar approach can be applied to *few* and *many*, the primary difference being that these terms require a contextual component to their interpretations. My proposal for the semantics of *many* and *few* is given in formal terms in (36):

(36) a. $[\![\text{many}]\!] = \lambda x[\text{large}^C(|x|)]$
b. $[\![\text{few}]\!] = \lambda x[\neg\text{large}^C(|x|)]$

Here large^C is a contextually defined value that may reflect the size of the domain of quantification, contextual information, prior expectations, and perhaps other factors. To paraphrase (36) in less formal language, *few* and *many* thus denote sets of (plural) individuals of (contextually specified) small or large cardinality, respectively.

I further follow Link (1983) in introducing the pluralization operator *, defined as follows for any one-place predicate P:

(37) $*P = \{x \in D : \exists Z \subseteq P: x = \sqcup Z\}$, where $\sqcup Z$ is the sum of the elements in Z

With this in place, *few* and *many* may combine with a plural noun such as *students* by intersective modification, giving the following for *few*:

(38) $[\![\text{few students}_{\langle e,t\rangle}]\!] = [\![\text{few}]\!] \cap [\![\text{students}]\!]$
$= \lambda x[\neg\text{large}^C(|x|) \,\&\, *\text{student}(x)]$

The resulting expression is again of semantic type ⟨e,t⟩, a one-place predicate or set of plural individuals (cf. previous non-quantificational treatments of indefinites, e.g. McNally 1998; de Swart 2001; Landman 2004; among other). Beyond this, I assume that the plural morphology on the noun restricts the denotation of *few students* to proper plural (i.e., non-atomic) individuals; that morphological pluralization can have this effect is seen through the contrast in (39), where (39a) must refer to a single student, while (39b) must be two or more:

(39) a. some student
b. some students

The advantages of this approach to the semantics of *few* and *many* are several. First and most obviously, the vagueness and context-sensitivity of their interpretations can be accounted for. In particular, both cardinal and proportional readings of *few* can be obtained with the appropriate choice of large^C, as can the "reverse" reading available for examples such as (20). Secondly, the non-determiner-like properties of *few* – notably lack of conservativity – receive an explanation: *Few* is not a determiner, and so it is not surprising that it does not behave like one.

It should be mentioned that there are two important questions that I am not addressing here, the first being precisely how large^C receives its value within a particular context, and the second being whether the denotations of *few* and *many* should reference the same or different values. There is much of interest to pursue here, but the definitions in (36) are sufficient for the present purposes.

An issue that must be addressed in this sort of treatment is that, within a classical generalized quantifier framework, an expression of type ⟨e,t⟩ such as (38) is not the appropriate type to appear in argument position. Within "adjectival" theories of indefinites, the standard approach to resolving this issue is to invoke a shift to type ⟨⟨e,t⟩,t⟩, an operation that has come to be known as existential closure (Partee 1986; de Swart 2001; Landman 2004). I follow this approach here, using the following definition of existential closure:

(40) Existential closure (EC)
For any one-place predicate P:
$EC(P) = \lambda Q \exists x[P(x) \,\&\, Q(x)]$

I further propose that under existential closure, the negation operator in the underlying semantic representation of *few* is able to detach and take higher scope, above the existential operator. The necessity of such an operation is separately motivated by the existence of split scope readings, discussed in Section 3.2 above, which provide evidence that the negative component of *few* is able to take separate scope from the remainder of the expression (though I should note that the precise mechanism by which this occurs requires further investigation).

(41) $[\![\text{few students}_{\langle\langle e,t\rangle,t\rangle}]\!] = \lambda Q \neg\exists x[\ \text{large}^C(|x|) \,\&\, {}^*\text{student}(x) \,\&\, Q(x)]$

To paraphrase (41), *few students* at the generalized quantifier level denotes the set of sets (properties) that do not contain an element of large cardinality composed of students, but that may contain a small plural individual composed of students, an atomic member of the set *student*, or no elements of the set *student* at all. This seems to capture the meaning of *few* as it was outlined above; it also correctly follows from (41) that *few* is monotone decreasing.

4.2 *A few*

With the analysis I have proposed above for *few*, the derivation of *a few* – the primary objective of this paper – is now straightforward.

As a first step, it is necessary to take a position on the semantics of the indefinite article *a*. While one standard approach would be to say that *a* introduces existential quantification, here I will again follow recent theories of indefinites as non-quantificational (e.g. Heim 1982; Landman 2004), and propose that the existential force of an expression such as *a student* (or for that matter, *a few students*) originates externally, again via an operation of existential closure. As a first approximation (to be revised below), we could therefore view *a* as a modifier (type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$) which is semantically vacuous.

Under this view, the semantics of an expression such as *a few students* at the set level (type $\langle e,t\rangle$) can now be derived in one of two ways. As the first option, *few* may first combine with *students* as above, with *a* then applying to the resulting combination:

(42) $[\![\text{students}]\!] = \lambda x[{}^*\text{student}(x)]$
$[\![\text{few students}_{\langle e,t\rangle}]\!] = \lambda x[\neg\text{large}^C(|x|) \,\&\, {}^*\text{student}(x)]$
$[\![\text{a few students}_{\langle e,t\rangle}]\!] = \lambda x[\neg\text{large}^C(|x|) \,\&\, {}^*\text{student}(x)]$

In this version of the derivation, *a few* is not a constituent. While this might initially seem counterintuitive, this option is necessary to account for the possibility of positioning a noun modifier between *a* and *few*, as in *a lucky few students*.

As the second option, *a* may first combine with *few*, with the resulting expression then combining with *students*:

(43) $[\![\text{few}]\!] = \lambda x[\neg\text{large}^C(|x|)]$
$[\![\text{a few}]\!] = \lambda x[\neg\text{large}^C(|x|)]$
$[\![\text{a few students}_{\langle e,t\rangle}]\!] = \lambda x[\neg\text{large}^C(|x|) \,\&\, {}^*\text{student}(x)]$

Here the constituency of *a few* has been restored, a welcome outcome from an intuitive point of view; this option will prove necessary below.

In either case, existential closure may apply to the resulting set expression to yield a generalized quantifier interpretation. Importantly, in this case, I propose that the presence of the indefinite article *a* blocks the raising of the negator over the existential operator, as occurs in (41). As evidence that *a* may have this effect, note that a similar pattern is seen when the overt negator *not* appears within the scope of *a*. For example, (44a) must mean that some students solved the problem; it cannot be true in the case where no students did so, as would be the case if the negator had scope over the existential operator. In this, (44a) contrasts directly with (44b), where negation has sentential scope, and which is clearly true in the case where there were no problem-solvers.

(44) a. A not large number of students solved the problem.
b. It is not the case that a large number of students solved the problem.

I propose that a similar pattern obtains in the case of *a few*. This gives (45) as the derivation of the generalized quantifier interpretation of *a few students*:

(45) $[\![\text{a few students}_{\langle\langle e,t\rangle,t\rangle}]\!] = \text{EC}([\![\text{a few students}_{\langle e,t\rangle}]\!])$
$= \lambda Q \exists x[\neg \text{large}^C(|x|) \,\&\, {}^*\text{student}(x) \,\&\, Q(x)]$

To express this less formally, *a few students* is interpreted as the set of sets (properties) that contain a plural individual of not-large cardinality made up of students.

Thus the *a* of *a few* does have a semantic contribution, namely to ensure wide scope for the existential operator (that is, to maintain the ordering $\exists\neg$ rather than $\neg\exists$).

Before proceeding, it should be noted that the expression in (45) accurately captures the semantics of *a few* as discussed in Section 2 above.

First, the "at least" interpretation of *a few* falls out from the semantics of the existential operator: If there is some large plural student individual *y* within the denotation of the predicate Q, there also must be a not-large plural student individual *y'* (an individual part of *y*) within its denotation. This in turn establishes that *a few* is monotone increasing, as demonstrated above.

Second, regardless of how large^C is interpreted in a given context, the existential in (45) is only guaranteed to pick out the minimal element of the set *few students*, namely an element of cardinality two. This means that the proportionality or context dependence inherent to *few* is not passed along to *a few*. Thus with this analysis we have captured the fact that *a few*, unlike *few*, has a purely cardinal interpretation, and thus patterns consistently with weak determiners.

In short, the present analysis of *few* allows a compositional derivation of *a few*, and provides a neat account for the interpretive differences between the two.

In turn, facts relating to *a few* provide further support for the proposal that the denotation of *few* must include a negation operator. To see this, consider the expressions in (46):

(46) a. Not every student solved the problem.
b. Not many students solved the problem.
c. Not a student solved the problem.
d. Not five minutes later, the professor walked in.
e. Not a few students solved the problem.

We have here a puzzling contrast. In (46a-d), *not* + quantifier + N specifies a number of individuals smaller than would be specified by quantifier + N. Thus *not every student* is less than every student, *not many students* is less than many students, *not five minutes later* is less than five minutes later, and so forth. But oddly, in (46e) *not a few students* means more than a few students.

Under the present proposal, an explanation suggests itself: In *not a few students*, the negator in *few* is able to cancel with *not*. To capture this formally, I begin with the standard assumption that *not* is interpreted logically as the negation operator:

(47) $[\![\text{not}]\!] = \neg$

Then the denotation of *not a few students* can be derived as follows:

(48) $[\![\text{a few}]\!] = \lambda x[\neg \text{large}^C(|x|)]$

$[\![\text{not a few}]\!] = \lambda x \neg [\neg \text{large}^C(|x|)]$
$= \lambda x[\text{large}^C(|x|)]$

$[\![\text{not a few students}_{\langle e,t\rangle}]\!] = \lambda x[\text{large}^C(|x|) \,\&\, *\text{student}(x)]$

$[\![\text{not a few students}_{\langle\langle e,t\rangle,t\rangle}]\!] = \lambda Q \exists x[\text{large}^C(|x|) \,\&\, *\text{student}(x) \,\&\, Q(x)]$

This can be paraphrased as the set of sets (properties) that contain a plural individual of large cardinality composed of students. We can compare this back to the denotation of *a few students*, which references "a plural individual of not-large cardinality," to see that this gets the facts right, giving us an interpretation of *not a few* that is more than *a few*. Importantly, if we had not derived *a few* from *few*, as proposed, and if we had not specified that *few* incorporates a negation operator, it is not clear how we could approach capturing the facts in (46).

5 Constraints on the Distribution of *A* (Or: Why Not **A Many*?)

An obvious question arises from the preceding discussion, which can be simply stated as follows: "Why is there no *a many*?" If the indefinite article *a* is able to combine with a set of plural individuals such as *few* or *few students*, we would predict that this process would be more widespread. But of course examples such as the following are bad:

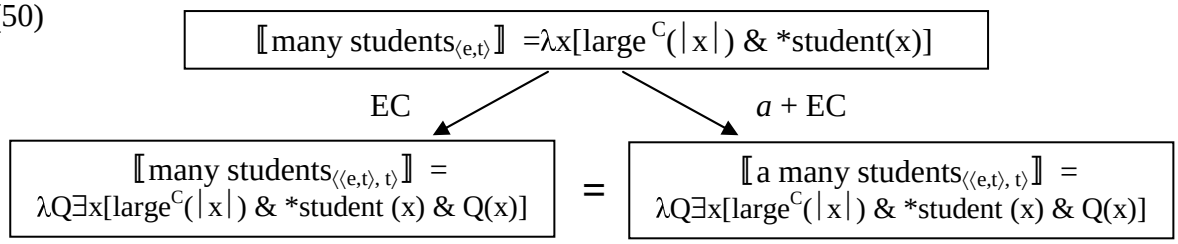
(49) a. *An every student came to the party.
b. *A most students came to the party.
c. *A many students came to the party.
d. *A three students came to the party.

Now, there is a relatively simple explanation for the ungrammaticality of (49a-b). *Every student* and *most students* are presumably interpretable only at the generalized quantifier level (type $\langle\langle e,t\rangle,t\rangle$), not the appropriate type to combine with *a*.

But (49c-d) are more problematic for the present account. Under the theory proposed here, expressions such as *many students* and *three students* – like *few students* – have interpretations at the level of sets (type $\langle e,t\rangle$). But this implies that they should be able to combine with *a*, which in fact they do not.

In addressing this issue, note first that from the set *many students*, either existential closure alone or the application of *a* followed by existential closure would produce the same generalized quantifier. This is illustrated in (50):

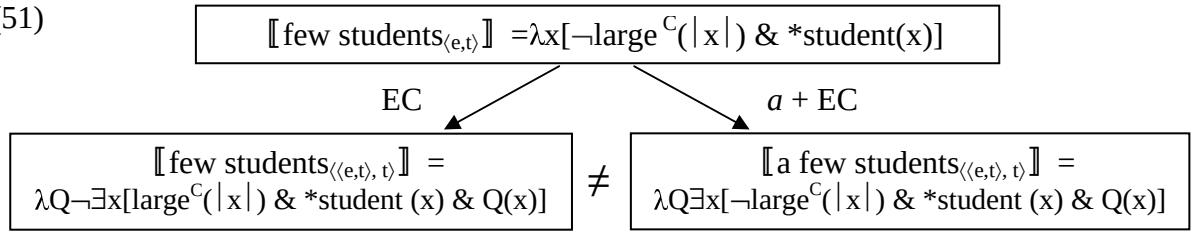
(50)



Thus in the case of a nominal expression containing *many*, *a* does not make a semantic contribution beyond that which obtains through a non-lexical operation of existential closure alone. And the same point could be made for expressions involving the cardinal numbers, such as *three students*.

This contrasts directly with the case of *few*. The diagram in (51) recaps the material presented in the previous section. As is seen here, from the set *few students*, two different generalized quantifiers may be formed: a monotone decreasing expression derived via existential closure (namely *few students*), and a monotone increasing expression derived via the application of *a* followed by existential closure (namely *a few students*).

(51)



In light of these observations, I propose the following generalization: The distribution of *a* is limited by a requirement that *a*, when present, make a semantic contribution. This constraint effectively blocks the derivation of **a many students* or **a three students*, since in these cases *a* would not do any semantic "work" for us. However, it is not invoked in the case of *few*, since the generalized quantifiers *few students* and *a few students* have different semantics.

Thus here we see the source of the uniqueness of the pair *few*/*a few*: *Few* is the only lexically simple quantifying expression of the appropriate semantic type whose interpretation is such that the application of *a* is not vacuous; this follows from the presence of the negation operator, which allows for two different scope relationships between existential operator and negator.

6 Conclusions and Further Questions

In this paper, I have proposed an analysis of *few* as a one-place predicate that incorporates a negation operator. I have shown that this approach allows the compositional derivation of *a few* as *a* + *few*, and accurately captures the differences in interpretation and formal properties between expressions such as *few students* and *a few students*. I have further shown that parallel expressions such as **a many* and **a five* can be blocked by a constraint against the vacuous application of *a*.

In concluding, I will mention several further questions that arise from this analysis. The first relates to an apparent exception to the above-described restriction on the distribution of *a*: While *a* cannot directly precede *many* or the cardinal numbers, this is possible if a modifier intervenes (Ionin & Matushansky 2004; Kayne 2005):

(52) *(A) great many students came to the party.

(53) a. *(A) lucky five students will win fellowships.
b. It cost me *(a) whole ten dollars.
c. *(An) incredible ten thousand soldiers died in the battle.

What is particularly interesting about these cases is that *a* is not just allowed, it is required. For example, *a lucky five students* is fine, but *lucky five students* is not allowed. One possible explanation is that *a* is required here for some independent (e.g., syntactic) reason, in which case the existence of these constructions would be further evidence that *a* may combine with a plural expression. A second possibility is based on the observation that, in their requirement for an overt indefinite article, expressions such as *great many students* or *lucky five students*

show precisely the behavior of singular count nouns such as *student*, raising the question of whether they could in some respect be singular.

Finally, this paper began with a particular contrast between *few* and *many*. There are several other puzzling contrasts of this nature that also would benefit from further investigation. For example (Kayne 2005):

(54) a. He visits every few/*many days.
b. Another few/*many students won fellowships.
c. The same few/*many students always get the best scores.

One approach would be to explore whether the present account of *a few* versus **a many* could be extended to capture these facts as well. However, there is one fact that suggests a different analysis will be required: With respect to combination with *a*, the cardinal numbers pattern with *many* rather than *few*, but in the constructions in (54), they pattern with *few* (e.g., such that *every five days* is entirely acceptable). I must leave this question as a topic for future research.

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QUANTIFICATIONAL READINGS OF INDEFINITES WITH FOCUSED CREATION VERBS*

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Abstract

This paper looks at sentences with "quantificational indefinites," discussed by Diesing (1992) and others. I propose that these sentences generate sets of alternatives of the form {p, not p and it's possible that p}, which restrict the quantification by an extension of familiar focus principles. For example, in the sentence *I usually read a book about slugs* (on the relevant reading), *usually* quantifies over pairs <x,t> such that x is a book about slugs, t is a time interval, and one alternative is true from the set {I read x at t, I can but do not read x at t}. In addition to accounting for a well-known contrast between creation and non-creation verbs, this also explains a second contrast that Diesing's analysis cannot account for.

1 "Quantificational" Readings of Indefinites

1.1 The relevant reading

The central data for this paper involves the availability or unavailability of a certain reading of indefinite objects in English sentences. This kind of reading comes up in sentences with adverbial quantifiers such as *usually*, and can be brought out most clearly in examples like (1).

(1) I usually love a sonata by Dittersdorf. [Diesing (1992): 113]

The salient reading of (1) is, roughly, that in most cases when I hear a sonata by Dittersdorf, I love it. I'll follow Diesing (1992) and others in referring to this kind of reading of an indefinite object as a "quantificational" reading. The key property of this reading is that the adverb seems to be quantifying (in some sense) over individuals that satisfy the description in the indefinite. For example, in (1), *usually* is quantifying in some sense over sonatas by Dittersdorf.

1.2 First contrast: creation vs. non-creation verbs

Diesing observes that a quantificational reading is possible with verbs like *read* but not with creation verbs like *write*. That is, while (2) allows two readings, (3) only allows one.

(2) I usually read a book about slugs.
(i) ≈ [On Tuesdays] What I usually do is read a book about slugs.
(ii) ≈ When I encounter a book about slugs, I usually read it.

* I'd like to give special thanks to Irene Heim and Kai von Fintel for their extensive discussion and guidance. I'd also like to thank Marcelo Ferreira, Danny Fox, Sabine Iatridou, Polly Jacobson, Roger Schwarzschild, my classmates in the fall 2004 workshop course at MIT, the MIT Syntax/Semantics Reading Group, and the audience at Sinn und Bedeutung for useful comments and discussion.

(3) I usually write a book about slugs.
(i) ≈ [In the summer] What I usually do is write a book about slugs.
(ii) ≠ When I encounter a book about slugs, I usually write it
/ I'm usually the one who wrote it

I will assume, following Diesing and others, that the difference between the two readings has to do with whether the indefinite object serves as part of the first argument of the quantifier (the restrictor) or the second (the nuclear scope). In quantificational readings (ii), the indefinite somehow serves as the restrictor, with the rest of the clause serving as the nuclear scope. In existential readings (i), on the other hand, the restrictor comes from elsewhere (in some cases from context) and the whole clause is the nuclear scope.

1.3 Diesing's approach: a preexistence requirement

Diesing tries to account for the contrast in (2)-(3) by introducing a preexistence requirement on indefinites in restrictors. This in effect restricts the quantification in these sentences on the quantificational reading (but not the existential reading) to preexisting books about slugs, that is, books that exist before the reading or writing is done to them. With a verb like *read*, a quantificational reading is still allowed, because in any case it only makes sense to read books that are already written. With a creation verb like *write*, however, this renders the quantificational reading nonsensical, since it only makes sense to write books that *aren't* already written. This account correctly predicts that quantificational readings are impossible with creation verbs, and seems to have a fair amount of intuitive appeal; nevertheless I'll show that it's empirically inadequate.

1.4 Problem for preexistence: FOCUSED creation verbs

The problem with a preexistence approach is that it also rules out the sentences in (4), on the indicated readings. These have contrastive focus on a verb of creation.[1]

(4) (a) I usually [HANDwrite]$_{FOC}$ a book about slugs.
= When I write a book about slugs, I usually do it by hand.

(b) I usually [KNIT]$_{FOC}$ a scarf.
= When I make a scarf, I usually do it by knitting.

For example, (4.b) clearly quantifies in some sense over a set of scarves, saying that I knit most of them (as opposed to, say, crocheting them). Since *knit* is a creation verb, the quantification must be over scarves that don't exist until after the knitting has occurred, which should be impossible on the preexistence view.

1.5 Outline of paper

This paper will be structured as follows: In Sections 2-3, I'll lay out some assumptions about adverbial quantifiers and quantificational indefinites. Then in Section 4 I'll show how sentences with focused creation verbs like (4) can be derived using independently motivated principles of focus and quantification. In Section 5, I'll extend these principles in a new way to apply to quantificational readings without contrastive focus, giving intuitively correct truth conditions for these sentences. In Sections 6-7, I'll show how this captures the original contrast between creation and non-creation verbs in sentences like (2)-(3).

[1] The focus literature contains many examples with focused verbs, of course, including some that happen to be creation verbs, but I haven't seen this particular issue about Diesing's predictions pointed out.

2 Preliminary Assumptions

2.1 Contribution of aspect

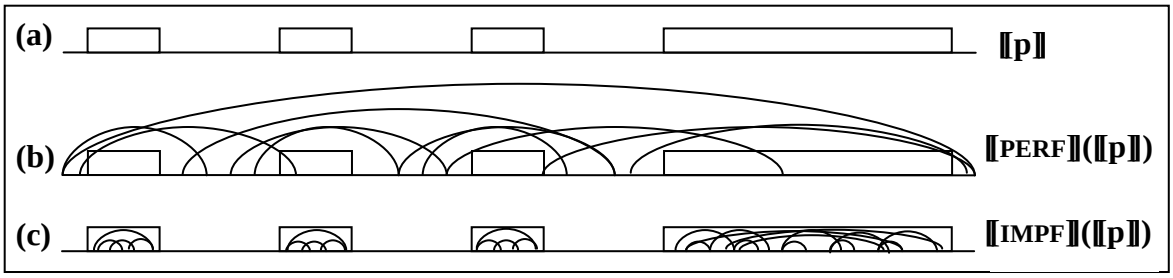
One assumption I'll make is that tensed clauses always have either perfective or imperfective aspect. The aspect morphemes will be abbreviated PERF and IMPF, respectively, and their lexical entries are given in (5).[2]

(5) (a) $[\![\text{PERF}]\!] = [\lambda f_{<i,t>} . [\lambda t . \exists t'[t' \subseteq_{int} t \text{ and } f(t')=1]]]$

(b) $[\![\text{IMPF}]\!] = [\lambda f_{<i,t>} . [\lambda t . \exists t'[t' \supseteq_{int} t \text{ and } f(t')=1]]]$
[where $\subseteq_{int}$ and $\supseteq_{int}$ represent the sub- and superinterval relations]

In effect, PERF takes a set of intervals and yields the set containing those intervals plus all of their superintervals; IMPF does the same thing except that it adds the subintervals. This is shown pictorially in (6).

(6) Effect of perfective and imperfective aspect



2.2 Basic use of *usually* / *always*

I assume that on its basic reading, *usually* is a quantifier over times, construed as intervals. For example, I analyze the sentences in (7) as having the truth conditions given in (7'). (I take the *when*-clause to have imperfective aspect and the main clause to have perfective aspect.)

(7) (a) When it's raining I usually call my mother.
(b) When it's raining I always call my mother.

(7') [[(a)/(b)]] = [Given some relevant time span T] for most/all intervals t such that $t \subseteq_{int} T$ AND t is a maximal interval at which it's raining, there is some subinterval t' of t such that I call my mother at t'.
≈ during most /all periods of rain, I call my mother at some point

2.3 Maximal intervals

In (7') there's a reference to "maximal intervals" at which it's raining.[3] This is important for the following reason: suppose that we counted all intervals of rain, that is, not only the intervals where it starts raining, rains for a while, and then stops, but the subintervals of those as well. Then we would be quantifying over a set of intervals that looked like (8.b).

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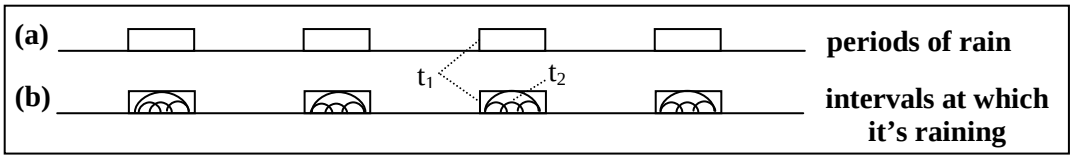
[2] I'm ignoring the "imperfective paradox" (see, e.g., Landman 1992, Portner 1998, and Parsons 1990).
[3] I'm assuming that *when* makes no truth conditional contribution. Johnston (1994) argues against this; but in any case the quantification has to somehow be restricted to maximal intervals in this kind of example.

(8) Intervals of rain



Now consider the intervals marked t_1 and t_2. For (7.b) to be true, for one thing I would have to call my mother at some subinterval of t_1. Then for another thing I would have to call my mother at some subinterval of t_2. When this is repeated for all the intervals illustrated in (8.b), the result is that I have to call my mother at multiple overlapping intervals – an infinite number of them, if we assume that time is dense. Intuitively, though, the sentence only requires that I call my mother once during each entire period of rain (when it starts, rains for a while, and then stops) – i.e., the intervals in (8.a).

2.4 The first lexical entry for *usually*

A lexical entry for the basic meaning of *usually* that will yield the truth conditions in (7') is given below in (9). Basic meanings for other temporal quantifiers such as *always* and *rarely* would be exactly parallel. I've included the "relevant time span" as a parameter.[4]

(9) $[\![\text{usually}_1]\!]^T = [\lambda p_{<i,t>} . [\lambda q_{<i,t>} .$ For most times $t \in \text{Max}(T^p \cap p_S), q(t)=1]]$

$= [\lambda p . [\lambda q . | \text{Max}(T^p \cap p_S) \cap q_S\} |$ is a sufficiently large fraction of $| \text{Max}(T^p \cap p_S) |]]$

The requirement that intervals be maximal is enforced in (9) using an operator Max, which is defined in (10).

(10) Definition of Max:
For any set of intervals S, $\text{Max}(S) = \{t: t \in S$ and $\sim\exists t'[t \subset_{int} t'$ and $t' \in S\}$,
where $\subset_{int}$ is the proper subinterval relation

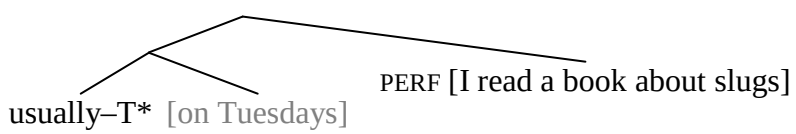
Informally, (9) says that, given a relevant time span T, *usually* takes two sets of intervals as arguments (where p_S is the restrictor and q_S is the nuclear scope); the resulting sentence is true just in case, counting only subintervals of T, most of the members of p_S that are maximal in the sense defined in (10) are also members of q_S.

2.5 Example of an indefinite object with *usually*$_1$: the existential reading

To see how the lexical entry for *usually* in (9) works, consider (11.a) on its existential reading (i). Assuming that the interpreted structure is (11.b), the predicted meaning is as in (11.c). (I also assume that T* stands for "these days" and the restriction *on Tuesdays* comes from context.)

(11) (a) I usually read a book about slugs. [=(2)]
reading (i) ≈ [On Tuesdays] What I usually do is read a book about slugs.

(b) **LF:**



[4] For a function of type $<\alpha,t>$, f_S = the set characterized by f (though sometimes I'll use sets and their characteristic functions interchangeably). T^p is the power set of T, that is, the set of sets of points in time that are part of T. This includes non-intervals, but intersecting this with p_S will yield only intervals.

(c) **Meaning:**
⟦(11.a)⟧ = 1 iff for most maximal intervals t that are subintervals of T* and are on Tuesday (i.e., entire Tuesdays within T*), there is some subinterval of t at which I read a book about slugs.

There are two points to notice about (11). First, the perfective aspect (PERF) is crucial because without it the reading of each book would have to last all day. With the perfective aspect, a Tuesday only needs to be a superinterval of some time when I read a book about slugs to satisfy the quantification. Second, each Tuesday only counts once: for example, if I were to read four books about slugs some Tuesday, that wouldn't get me off the hook for the rest of the month.

3 More Assumptions

3.1 Unselective binding

I assume that adverbs like *usually* and *always* have a second lexical entry which is responsible for quantificational readings of indefinites. This second meaning is produced by extending the basic meaning in (9) to quantify over something other than just times. This is a version of the unselective binding approach to adverbial quantification (Lewis 1975). On this general view, there are various possibilities as to what the adverb could quantify over. Probably the simplest option is for it to quantify over individuals, but Percus (1999) shows that this is wrong. One crucial example he discusses is (12).

(12) [Context: Ursula is the subject of an experiment where blue-eyed bears walk in front of her one at a time, and she's supposed to judge whether each bear is intelligent.]

Ursula usually knew whether a blue-eyed bear was intelligent.
[Percus (1999): (17)]

If each bear only walked out once, then (12) would be equivalent to saying that for most of the bears, Ursula knew whether they were intelligent. That might lead us to think that the adverb is quantifying over individuals. But judgments change if we consider the possibility that a single bear could walk out more than once. In that case, it would be possible for Ursula to know for most *bears* whether they were intelligent and yet not know for most *trials* whether the bear in that trial was intelligent. (This would happen if the few bears whose intelligence she was unsure of came out many times while the many bears whose intelligence she was sure of came out few times.) Percus observes that in this kind of scenario, (12) is interpreted as quantifying over trials rather than bears. This means that the adverb can't be quantifying over individuals, and so I'll follow Percus in rejecting that analysis.

Given that the second meaning of adverbs can't quantify over individuals, I'll assume instead that it quantifies over pairs <x,t> of individuals and times. Again, this second meaning is an extension of the basic meaning in (9), which just quantifies over times. In (13) I give an example that will use this second lexical entry, deriving the meaning given in (13.b-c). The truth conditions given in (13) are only a first pass, though. In particular, at this point they turn out to be equivalent to quantifying over individuals, in effect ignoring the time part of the pairs; but this will change once other ingredients of the analysis are added in.

(13) (a) I usually / always love a sonata by Dittersdorf.

(b) = [Given a relevant time span T] 1 iff for most / all pairs <x,t>
such that x is a sonata by Dittersdorf and t is maximal, I love x at t.

(c) = [Given a relevant time span T] 1 iff for most / all pairs <x,T>
such that x is a sonata by Dittersdorf (where T is the entire relevant time span),
I love x at T.

= 1 iff I love most /all sonatas by Dittersdorf within the relevant time span T.

Again, the truth conditions given in (13.b-c) are only preliminary. Specifically, the step from (b) to (c) will become invalid once I adopt the crucial assumption in Section 5.

3.2 A second lexical entry for *usually*

A second lexical entry for *usually* that will yield the truth conditions in (13) is given in (14). Secondary meanings for other adverbs such as *always* and *rarely* would again be parallel.

(14) $[\![\text{usually}_2]\!]^T = [\lambda P_{<e,it>} . [\lambda Q_{<e,it>} .$ For most pairs <x,t> such that $t \in \text{Max}(T^p \cap P(x)_S)$, $Q(x)(t)=1]$], where Max is defined as in (10) above.

Informally, (14) says that, given a relevant time span T, *usually* takes two sets of pairs of individuals and times (where P_S is the restrictor and Q_S is the nuclear scope); the resulting sentence is true just in case, counting only subintervals of T, most of the members <x,t> of P_S such that t is maximal with respect to x are also members of Q_S. To be a maximal member of P_S "with respect to x" is just to be a maximal member of $P(x)_S$, which is to say maximality is defined separately for each individual x in the pairs <x,t>.

3.3 The restriction

An additional assumption is needed to allow an indefinite object to be the restrictor argument of a quantifier. In particular, indefinites have to be able to denote sets of pairs of individuals and times. To accomplish this, I'll assume that an indefinite such as *a book about slugs* has the meaning shown in (15.a), corresponding to the meaning for the indefinite determiner *a* in (15.b). This is in addition to its normal existential meaning, whether that involves existential quantification, choice functions, or something else. Of course it's a somewhat ad hoc move to give indefinites this secondary meaning, but anyone claiming that quantificational indefinites are part of the restrictor of quantifiers would need to make some assumption about how this comes about, and this is one way of doing that.

(15) (a) $[\![a_2 \text{ book about slugs}]\!] = [\lambda x . [\lambda t . \exists t' [x \text{ is a book about slugs at } t']]]$

= {<x,t>: x is a book about slugs at some time t'}

(b) $[\![a_2]\!] = [\lambda P_{<e, it>} . [\lambda x . [\lambda t . \exists t' [P(x)(t') = 1]]]]$

Informally, this says that *a book about slugs*, on its second meaning, denotes the set of pairs <x,t> such that x is a book about slugs and t is any time whatsoever.

An obvious question to ask is why the existential quantifier over times t' is introduced in (15). It would seem much more natural to say that *a book about slugs* simply denotes the set of pairs <x,t> such that x is a book about slugs *at t*. The reason I can't do this is that it would effectively reintroduce Diesing's preexistence requirement. (In fact, it would impose an even stronger requirement). We have already seen that this would incorrectly rule out sentences with focused creation verbs such as (4).

3.4 The nuclear scope

Finally, I need to assume that the remaining part of the clause under *usually* – for example, *I read* – can be the nuclear scope. The meaning needed is given in (16). This can be achieved by movement of the indefinite object and abstraction over the trace, or some other means.

(16) $[\![\text{I read } \_\_]\!] = [\lambda x . [\lambda t . \text{I read x at t}]]$

$= \{<x,t>: \text{I read x at t}\}$

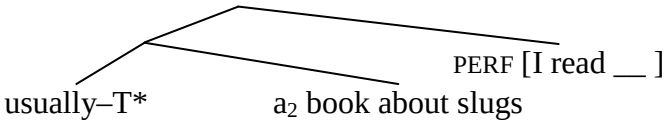
This just says that *I read* __ denotes the set of pairs <x,t> such that I read x at t.

3.5 Example of an indefinite object with *usually*$_2$: the quantificational reading

With these assumptions in place, we can now see how a sentence with a quantificational indefinite is derived. I assume that (17.a) has the structure in (17.b), so the predicted meaning is as in (17.c-d).

(17) (a) I usually read a book about slugs. [=(2)]
reading (ii) ≈ When I encounter a book about slugs, I usually read it.

(b) **LF:**



(c) **Meaning:**
$[\![(17.a)]\!] = [\![\text{usually}_2]\!]^{T^*} ([\![a_2 \text{ book about slugs}]\!]) ([\![\text{PERF} [\text{I read } \_\_]]\!])$
$= [\![\text{usually}_2]\!]^{T^*} ([\lambda x . [\lambda t . \exists t' [x \text{ is a book about slugs at } t']]])$
$([\lambda x . [\lambda t . \exists t'[t' \subseteq_{int} t \text{ and I read x at } t']])$

= 1 iff for most <x,t> such that x is a book about slugs at some t',
t is a subinterval of T*, and t is maximal (in the relevant sense),
there is some subinterval of t at which I read x.

(d) = 1 iff for most <x,T*> such that x is a book about slugs at some t',
there is some subinterval of T* at which I read x.

= 1 iff I read most books about slugs during T*.

Again, once the final parts of my analysis are added, the step from (c) to (d) will be invalid.

4 Introducing Focus Sensitivity

4.1 The focus restriction

It has been observed that focus plays a special role in restricting quantification (see, e.g., Rooth 1985 and von Fintel 1994). The principle in effect is roughly that in (18).

(18) Focus restriction:
Domains of quantification are restricted to cases where one focus alternative is true.

I'll make this clearer using an example. Consider the sentence in (19).

(19) John usually shaves [in the SHOWER]$_{FOC}$.

What (19) seems to mean is that usually when John shaves, he's in the shower. That is, the quantification is restricted to times when John shaves. Let's assume that the alternatives to *in*

the shower are {in the shower, at the sink}. For simplicity, let's also assume that there are just seven relevant times, t_1, t_2, … t_7. Now suppose the facts are as follows: John shaves in the shower at t_1, t_2, and t_3, and he shaves at the sink at t_4. He doesn't shave at all, either in the shower or at the sink, at t_5, t_6, or t_7. Now we can construct the domain of quantification in steps. The first step is to give the set of alternatives for each of the relevant times $t_1 - t_7$, as shown in (20).

(20) Step 1:

t_1: {John shaves in the shower at t_1, John shaves at the sink at t_1}
t_2: {John shaves in the shower at t_2, John shaves at the sink at t_2}
t_3: {John shaves in the shower at t_3, John shaves at the sink at t_3}
t_4: {John shaves in the shower at t_4, John shaves at the sink at t_4}
t_5: {John shaves in the shower at t_5, John shaves at the sink at t_5}
t_6: {John shaves in the shower at t_6, John shaves at the sink at t_6}
t_7: {John shaves in the shower at t_7, John shaves at the sink at t_7}

The second step is to check, for each time t_i, whether either of the alternatives are true. Given the facts assumed above, the result is as in (21), where the true alternatives are in bold and underlined.

(21) Step 2:

t_1: {**John shaves in the shower at t_1**, John shaves at the sink at t_1}
t_2: {**John shaves in the shower at t_2**, John shaves at the sink at t_2}
t_3: {**John shaves in the shower at t_3**, John shaves at the sink at t_3}
t_4: {John shaves in the shower at t_4, **John shaves at the sink at t_4**}
~~t_5: {John shaves in the shower at t_5, John shaves at the sink at t_5}~~
~~t_6: {John shaves in the shower at t_6, John shaves at the sink at t_6}~~
~~t_7: {John shaves in the shower at t_7, John shaves at the sink at t_7}~~

This is where the focus restriction from (18) comes in: since there's no true alternative for times t_5, t_6, or t_7, they are eliminated from the domain of quantification, leaving only t_1, t_2, t_3, and t_4. This means that three out of four cases satisfy the quantification, so sentence (19) is correctly predicted to be true in the context given. Notice that if all seven times were included in the domain, only three out of seven cases would satisfy the quantification and the sentence would be predicted to be false.

4.2 Applying the focus restriction to quantificational indefinites

Now let's see how the focus restriction applies in a more complicated case. Consider (22).

(22) I usually $[\text{KNIT}]_{\text{FOC}}$ a scarf. [=(4.b)]
≈ When I make a scarf, I usually do it by knitting.

Let's assume for simplicity that there are just four relevant scarves, s_1, s_2, s_3, and s_4, and four relevant times, t_1, t_2, t_3, and t_4 (where these times don't overlap). Let's also assume that the relevant alternatives to *knit* are {knit, crochet, sew}. Now suppose the facts are as follows: I knitted s_1 during t_1, s_2 during t_2, and s_3 during t_3; I sewed s_4 during t_4; and I didn't make any other relevant scarves during the relevant times. Again we can construct the domain of quantification in steps. The first step is to include all possible pairs of books and times and give the set of alternatives for each, as shown in (23).

(23) Step 1:

$\langle s_1,t_1 \rangle$: { I knit s_1 at t_1, I crochet s_1 at t_1, I sew s_1 at t_1 }
$\langle s_1,t_2 \rangle$: { I knit s_1 at t_2, I crochet s_1 at t_2, I sew s_1 at t_2 }

<s_1,t_3>: { I knit s_1 at t_3, I crochet s_1 at t_3, I sew s_1 at t_3 }
<s_1,t_4>: { I knit s_1 at t_4, I crochet s_1 at t_4, I sew s_1 at t_4 }

<s_2,t_1>: { I knit s_2 at t_1, I crochet s_2 at t_1, I sew s_2 at t_1 }
<s_2,t_2>: { I knit s_2 at t_2, I crochet s_2 at t_2, I sew s_2 at t_2 }
<s_2,t_3>: { I knit s_2 at t_3, I crochet s_2 at t_3, I sew s_2 at t_3 }
<s_2,t_4>: { I knit s_2 at t_4, I crochet s_2 at t_4, I sew s_2 at t_4 }

<s_3,t_1>: { I knit s_3 at t_1, I crochet s_3 at t_1, I sew s_3 at t_1 }
<s_3,t_2>: { I knit s_3 at t_2, I crochet s_3 at t_2, I sew s_3 at t_2 }
<s_3,t_3>: { I knit s_3 at t_3, I crochet s_3 at t_3, I sew s_3 at t_3 }
<s_3,t_4>: { I knit s_3 at t_4, I crochet s_3 at t_4, I sew s_3 at t_4 }

<s_4,t_1>: { I knit s_4 at t_1, I crochet s_4 at t_1, I sew s_4 at t_1 }
<s_4,t_2>: { I knit s_4 at t_2, I crochet s_4 at t_2, I sew s_4 at t_2 }
<s_4,t_3>: { I knit s_4 at t_3, I crochet s_4 at t_3, I sew s_4 at t_3 }
<s_4,t_4>: { I knit s_4 at t_4, I crochet s_4 at t_4, I sew s_4 at t_4 }

The second step is to check for each pair whether any of the alternatives are true. The result is shown in (24), with true alternatives in bold and underlined.

(24) Step 2:

<s_1,t_1>: { **I knit s_1 at t_1**, I crochet s_1 at t_1, I sew s_1 at t_1 }
~~<s_1,t_2>: { I knit s_1 at t_2, I crochet s_1 at t_2, I sew s_1 at t_2 }~~
~~<s_1,t_3>: { I knit s_1 at t_3, I crochet s_1 at t_3, I sew s_1 at t_3 }~~
~~<s_1,t_4>: { I knit s_1 at t_4, I crochet s_1 at t_4, I sew s_1 at t_4 }~~

~~<s_2,t_1>: { I knit s_2 at t_1, I crochet s_2 at t_1, I sew s_2 at t_1 }~~
<s_2,t_2>: { **I knit s_2 at t_2**, I crochet s_2 at t_2, I sew s_2 at t_2 }
~~<s_2,t_3>: { I knit s_2 at t_3, I crochet s_2 at t_3, I sew s_2 at t_3 }~~
~~<s_2,t_4>: { I knit s_2 at t_4, I crochet s_2 at t_4, I sew s_2 at t_4 }~~

~~<s_3,t_1>: { I knit s_3 at t_1, I crochet s_3 at t_1, I sew s_3 at t_1 }~~
~~<s_3,t_2>: { I knit s_3 at t_2, I crochet s_3 at t_2, I sew s_3 at t_2 }~~
<s_3,t_3>: { **I knit s_3 at t_3**, I crochet s_3 at t_3, I sew s_3 at t_3 }
~~<s_3,t_4>: { I knit s_3 at t_4, I crochet s_3 at t_4, I sew s_3 at t_4 }~~

~~<s_4,t_1>: { I knit s_4 at t_1, I crochet s_4 at t_1, I sew s_4 at t_1 }~~
~~<s_4,t_2>: { I knit s_4 at t_2, I crochet s_4 at t_2, I sew s_4 at t_2 }~~
~~<s_4,t_3>: { I knit s_4 at t_3, I crochet s_4 at t_3, I sew s_4 at t_3 }~~
<s_4,t_4>: { I knit s_4 at t_4, I crochet s_4 at t_4, **I sew s_4 at t_4** }

The pairs with no true alternatives are eliminated, leaving just the four pairs shown in (25).

(25) Result:

<s_1,t_1>: { **I knit s_1 at t_1**, I crochet s_1 at t_1, I sew s_1 at t_1 }
<s_2,t_2>: { **I knit s_2 at t_2**, I crochet s_2 at t_2, I sew s_2 at t_2 }
<s_3,t_3>: { **I knit s_3 at t_3**, I crochet s_3 at t_3, I sew s_3 at t_3 }
<s_4,t_4>: { I knit s_4 at t_4, I crochet s_4 at t_4, **I sew s_4 at t_4** }

It turns out that three out of four cases satisfy the quantification, so sentence (22) is correctly predicted to be true in the context given. Again, notice that if all 16 pairs were included in the domain, then only three out of 16 cases would satisfy the quantification and the sentence would be predicted to be false.

The reader can verify that this result generalizes to sentences with contrastive focus on other constituents such as the subject in (26) or the adverbial modifier in (27).

(26) $[I]_{FOC}$ usually knit a scarf.
≈ when someone knits a scarf, I'm usually the one who does it.

(27) I usually knit a scarf [when it's RAINING]$_{FOC}$.
≈ when I knit a scarf, it's usually raining.

5 Extending Focus Sensitivity

I propose that in general, sentences with quantificational indefinites such as (28) are subject to a restriction parallel to the focus restriction, even when there is no narrow focus on the verb or another constituent.

(28) I usually read a book about slugs. [=(2)]
reading (ii) ≈ When I encounter a book about slugs, I usually read it.

Informally speaking, what I propose is that a sentence like (28) is interpreted as if *read* were focused, but the alternatives to read were {read, fail to read}. This is formulated as a principle in (29).[5]

(29) Principle of default focus: For the purposes of principle (18), if a sentence S has no overt contrastive focus, it's taken to have the alternative set {S, FAIL-TO S}, where FAIL-TO p = NOT p and POSSIBLE p = ~p & ◊p

This principle involves an operator "FAIL-TO," which is essentially negation plus a possibility modal. The modality involved is something like opportunity. Using Kratzer's semantics for modals (Kratzer 1977, 1991), this means that the modal base is restricted to worlds where all the facts up to the specified point in time are the same as in the actual world. Requirements of a deontic or other nature also need to be included so that, for example, seeing a book about slugs in the window of a closed bookstore doesn't count as an opportunity to read it, even if it would be possible to get the book by smashing the window. Formally, though, FAIL-TO just includes propositional negation and a possibility modal.

Now we can see how the principle of default focus in (29) works, using (28) as an example. As before, let's assume for simplicity that there are just four relevant books about slugs, b_1, b_2, b_3, and b_4, and four relevant times, t_1, t_2, t_3, and t_4. Now suppose that I had the opportunity to read b_1 at t_1, b_2 at t_2, b_3 at t_3, and b_4 at t_4. I actually read b_1 at t_1, b_2 at t_2, and b_3 at t_3, and I didn't read or have the opportunity to read any other relevant books at relevant times. We can construct the domain of quantification as before, except that the alternatives are generated by the principle of default focus in (29). The first step is to list all the possible pairs of books and times, with their alternatives, as shown in (30).

(30) Step 1:

$\langle b_1,t_1\rangle$: { I read b_1 at t_1, I FAIL-TO read b_1 at t_1 }
$\langle b_1,t_2\rangle$: { I read b_1 at t_2, I FAIL-TO read b_1 at t_2 }
$\langle b_1,t_3\rangle$: { I read b_1 at t_3, I FAIL-TO read b_1 at t_3 }
$\langle b_1,t_4\rangle$: { I read b_1 at t_4, I FAIL-TO read b_1 at t_4 }

$\langle b_2,t_1\rangle$: { I read b_2 at t_1, I FAIL-TO read b_2 at t_1 }
$\langle b_2,t_2\rangle$: { I read b_2 at t_2, I FAIL-TO read b_2 at t_2 }
$\langle b_2,t_3\rangle$: { I read b_2 at t_3, I FAIL-TO read b_2 at t_3 }
$\langle b_2,t_4\rangle$: { I read b_2 at t_4, I FAIL-TO read b_2 at t_4 }

[5] Principle (29) is reminiscent of Johnston's (1994) idea that for a case to count in quantification, it must be "a fair question" whether the nuclear scope holds of that case. (29) could also be seen as a modification of Ahn's (2005) idea that the minimal restriction of a quantifier consists of the disjunction of the "polar alternatives" of the nuclear scope.

<b_3,t_1>: { I read b_3 at t_1, I FAIL-TO read b_3 at t_1 }
<b_3,t_2>: { I read b_3 at t_2, I FAIL-TO read b_3 at t_2 }
<b_3,t_3>: { I read b_3 at t_3, I FAIL-TO read b_3 at t_3 }
<b_3,t_4>: { I read b_3 at t_4, I FAIL-TO read b_3 at t_4 }

<b_4,t_1>: { I read b_4 at t_1, I FAIL-TO read b_4 at t_1 }
<b_4,t_2>: { I read b_4 at t_2, I FAIL-TO read b_4 at t_2 }
<b_4,t_3>: { I read b_4 at t_3, I FAIL-TO read b_4 at t_3 }
<b_4,t_4>: { I read b_4 at t_4, I FAIL-TO read b_4 at t_4 }

The second step, checking each pair for true alternatives, is shown in (31).

(31) Step 2:

<b_1,t_1>: { **I read b_1 at t_1**, I FAIL-TO read b_1 at t_1 }
~~<b_1,t_2>: { I read b_1 at t_2, I FAIL-TO read b_1 at t_2 }~~
~~<b_1,t_3>: { I read b_1 at t_3, I FAIL-TO read b_1 at t_3 }~~
~~<b_1,t_4>: { I read b_1 at t_4, I FAIL-TO read b_1 at t_4 }~~

~~<b_2,t_1>: { I read b_2 at t_1, I FAIL-TO read b_2 at t_1 }~~
<b_2,t_2>: { **I read b_2 at t_2**, I FAIL-TO read b_2 at t_2 }
~~<b_2,t_3>: { I read b_2 at t_3, I FAIL-TO read b_2 at t_3 }~~
~~<b_2,t_4>: { I read b_2 at t_4, I FAIL-TO read b_2 at t_4 }~~

~~<b_3,t_1>: { I read b_3 at t_1, I FAIL-TO read b_3 at t_1 }~~
~~<b_3,t_2>: { I read b_3 at t_2, I FAIL-TO read b_3 at t_2 }~~
<b_3,t_3>: { **I read b_3 at t_3**, I FAIL-TO read b_3 at t_3 }
~~<b_3,t_4>: { I read b_3 at t_4, I FAIL-TO read b_3 at t_4 }~~

~~<b_4,t_1>: { I read b_4 at t_1, I FAIL-TO read b_4 at t_1 }~~
~~<b_4,t_2>: { I read b_4 at t_2, I FAIL-TO read b_4 at t_2 }~~
~~<b_4,t_3>: { I read b_4 at t_3, I FAIL-TO read b_4 at t_3 }~~
<b_4,t_4>: { I read b_4 at t_4, **I FAIL-TO read b_4 at t_4** }

The resulting domain is just the four pairs shown in (32).

(32) Result:

<b_1,t_1>: { **I read b_1 at t_1**, I FAIL-TO read b_1 at t_1 }
<b_2,t_2>: { **I read b_2 at t_2**, I FAIL-TO read b_2 at t_2 }
<b_3,t_3>: { **I read b_3 at t_3**, I FAIL-TO read b_3 at t_3 }
<b_4,t_4>: { I read b_4 at t_4, **I FAIL-TO read b_4 at t_4** }

As with the previous example, three out of these four pairs satisfy the quantification, so (28) is correctly predicted to be true in the context given. Once again, if all 16 pairs were included, the sentence would incorrectly be predicted to be false.

More generally, when the principles of focus restriction (18) and default focus (29) are added to the assumptions from Section 3, sentence (28) is predicted to have the meaning shown in (33) below. Note that in (33), T* is the entire relevant interval of time, and **FR** is standing in for the focus restriction (that is, in this case it stands for the set of pairs <x,t> such that I had the opportunity to read x at t).

(33) $[\![$I usually$_2$ read a$_2$ book about slugs$]\!]$ = $[\![$(28)$]\!]$

= $[\![\text{usually}_2]\!]^{T^*}$ ($[\![$a$_2$ book about slugs$]\!] \cap$ **FR**) ($[\![$PERF[I read (__)]$]\!]$)

= 1 iff for most <x,t> such that x is a book about slugs (at some t'), t $\subseteq_{int}$ T,
and t is a maximal interval at which I have the opportunity to read x,
I read x at some subinterval of t.

Note that this is no longer equivalent to quantifying over books because the maximal intervals of opportunity can, and normally will, be smaller than T.

Informally, then, the relevant reading of (28) can be paraphrased as, "Usually, when I have the opportunity to read a particular book about slugs, I read it." Recall that the paraphrase given to it earlier was, "Usually, when I encounter a book about slugs, I read it." This makes sense given that the opportunity to read a book normally involves encountering it somehow.

Similarly, my proposal predicts that sentence (1), *I usually love a sonata by Dittersdorf*, can be paraphrased as, "Usually, when I have the opportunity to love a sonata by Dittersdorf, I love it." The paraphrase given earlier was, "Usually, when I hear a sonata by Dittersdorf, I love it." This again makes sense because loving a sonata normally requires hearing it. Parallel predictions are made for other examples with quantificational indefinites.

6 Predictions of the Analysis

In this section, I'll show how my proposal accounts for the two crucial contrasts discussed at the beginning, between creation and non-creation verbs on the one hand, and between focused and unfocused creation verbs on the other.

6.1 Creation verbs vs. non-creation verbs

Recall that a quantificational reading of an indefinite is not available in sentences like (34).

(34) I usually write a book about slugs. [=(3)]
≠ When I encounter a book about slugs, I usually write it
/ I'm usually the one who wrote it

To see how my proposal accounts for this fact, consider what would have to be the case for a particular pair <x,t> to be included in the domain of quantification for *usually*. First, x must be a book about slugs. Second, t must be a time at which I had the opportunity to write x. But consider this: for any interval in the actual world when a person has the time, resources, and so on to write a book about slugs (that is, some book or other), there will normally be many different compatible worlds where they write a book as a result of this opportunity. These possible books might be very different from each other: they could include different facts or events, be different lengths, have different writing styles, and so on. So in order to have the opportunity to write a particular book, it needs to be possible to individuate that book out of this vast class of possible alternative books. Put another way, there needs to be a way to tell which different possible books should be thought of as the same book, and which ones should be thought of as different books. There's no reason to believe that the context will generally provide this, however, and I suggest that in most cases it doesn't. When this happens, it will simply not be possible to resolve the domain of quantification, and so the relevant reading of the sentence will not be available. In other words, a quantificational reading is unavailable for the indefinite in (34) because the example doesn't give enough contextual information to individuate the relevant possible books.

6.2 The freelance writer context

I've argued that the reason quantificational indefinites are not generally possible with creation verbs is that context doesn't generally provide enough information to individuate possible books. By the same token, though, if we could set up a context where the relevant books that someone had the opportunity to write were sufficiently individuated, then a quantificational reading should be possible with a creation verb such as *write*. This prediction is borne out, as seen by (35). Similar examples can be constructed with other verbs of creation.

(35) [Context: I'm a freelance writer who gets requests from clients to write books, articles, and so on to various specifications.]

I usually write a book about slugs.
= When I get a request for a book about slugs, I usually take the job.

In this case, it's clear that when I get a request to write a book, that counts as an opportunity to write a specific book. That is, possible books from different worlds count as the same book just in case they were written in response to the same request.

Notice that if we adopted Diesing's view using a preexistence requirement (putting aside its problems for a moment), the only way to explain examples like (35) would be to say that in such contexts, books can count as "existing" for the purposes of the preexistence requirement before they're actually written. This may or may not be a problem depending on how one's theory deals with the host of issues relating to existence, incomplete objects, and possible individuals in general.[6] However, it should be noted that my proposal accounts for examples like (35) in a way that is independent of any particular view of these issues.

6.3 Focused vs. unfocused creation verbs

Recall that when a creation verb is focused as in (36), the natural reading is parallel to other examples of quantificational indefinites.

(36) I usually $[\text{KNIT}]_{\text{FOC}}$ a scarf. [=(4.b)]
= When I make a scarf, I usually do it by knitting.

An account like Diesing's, using a preexistence requirement, incorrectly predicts that this reading should be unavailable. My proposal, on the other hand, straightforwardly accounts for sentences like (36) because in this case, a set of salient alternatives to the focused item must be available – for example, {knit, crochet, sew}. This means that the normal focus restriction (18) applies without the default focus principle (29), so the problem of determining what counts as an opportunity to knit a particular scarf doesn't arise.

7 Conclusions

My proposal about quantificational indefinites has two main ingredients. The first ingredient is the idea that quantification is restricted by focus alternatives, adopted from work by Rooth, von Fintel, and others and set forth as principle (18). The second ingredient is the principle of default focus in (29), which provides sets of default alternatives of the form {p, FAIL-TO p} to sentences with quantificational indefinites. Once these default alternatives are present, the focus restriction can apply in the normal way. Since FAIL-TO has a modal component, the result is that quantificational indefinites come with a certain kind of modal restriction, which seems to capture the intuitive truth conditions of the relevant sentences.

Besides giving a plausible semantics for quantificational indefinites, this proposal explains why they behave differently with creation verbs than with non-creation verbs. I assume that in these sentences, the objects being quantified over are pairs <x,t> of individuals and times. The crucial restriction involves modality, which makes it necessary to determine how to identify individuals across worlds, and it's typically difficult to do this in contexts involving creation verbs. Therefore quantificational readings of indefinites are normally impossible with creation verbs. On the other hand, there are some contexts involving creation verbs that do include enough information about how to identify individuals across worlds, in which case a quantificational reading is possible.

[6] For some recent discussion, see, e.g., von Stechow (2001).

Finally, my proposal explains why quantificational readings of indefinites are possible when the verb is focused, regardless of whether or not it's a creation verb. This is because the verb has focus alternatives of its own, so the default alternatives of the form {p, FAIL-TO p} are never generated. This takes away the modal component and the resultant problem of identifying individuals across worlds.

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FEATURE-PLACING, LOCALIZABILITY, AND THE SEMANTICS OF EXISTENTIAL SENTENCES

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1 Introduction

Many analyses of existential sentences have focused attention on determining which of its elements constitutes the logical subject and predicate, and this has proven to be a not uncontroversial topic of research. Some, from both syntactic and semantic points of view, have argued that *there* is a subject (cf. Williams 1994) others that it is a predicate (cf. Moro 1997). Similarly, some have argued that the associate NP is a logical subject, others that it is a predicate (Higginbotham 1987).

One logical possibility that has not (to my knowledge) been pursued in the linguistics literature is that these statements are not of the form subject-predicate, a possibility that has been taken up in the philosophical literature by P.F. Strawson (1959)[2]. He claims that there are such statements and that their form is simpler than that of subject-predicate statements because it does not, and cannot, involve an expression that makes reference to an individual. Not involving reference to an individual, these sentences are therefore are made true by different means than a subject-predicate statement whose truth, in the simplest cases, depends on the denotation of the subject being a member of the denotation of the predicate. Of interest from the point of view of the present discussion is his claim that existential statements are examples of this kind of statement, which he calls a *feature-placing statement*. The truth of a statement of the form *feature-placer* requires that something with the set of features denoted by the associate NP exist at the location or coordinates expressed by the placer. In an existential sentence we can take the associate NP as the feature-denoting expression and the coda-XP as the placer.

(1) There is a man$_{\text{associate NP/feature-denoting NP}}$ in the garden$_{\text{coda XP/placer}}$.

[1] I would like to thank Robert Fiengo for his comments and discussion of the ideas presented here, as well as to the audiences at SuB 10 and the CUNY Syntax Supper.

[2] It seems to me that the *thetic judgment* of Brentano and Marty (and later Kuroda) is a related notion to the one I am about to introduce, not in the least because it assumes that subject-predicate is not the only kind of statement, and that existential sentences are of an alternate form. However, there are important differences between Strawson's *feature–placing statement* and the thetic judgement. A full discussion of this issue is impossible here, but I note that the sentence types that authors such as Kuroda (1972) claim to be used to make thetic judgments are of a substantially wider class than those being claimed here to be of the form feature-placer. For Kuroda (1972), generic sentences and (certain) copular sentences are assumed to be thetic, in addition to existential sentences. Both of these are outside the scope of what is being claimed here for feature-placing statements. See Ladusaw (1994) for another discussion of Brentano and Kuroda's work with respect to the semantics of existential sentences.

2 What are features?

According to Strawson, features are those characteristics that make something a member of a kind, without the additional information required to re-identify a particular individual of the kind. He explains the difference between expressions that denote features and referential expressions by discussing two possible scenarios in what he calls "the naming game".

> Playing the naming game may be compared with one of the earliest things which children do with language – when they utter the general name for a kind of thing in the presence of a thing of that kind, saying 'duck' when there is a duck, 'ball' when there is a ball, etc . . . But now what of the criteria of reidentification? Does the concept of the cat-feature include a basis for this? If so, what is the substance of the phrase 'a basis for criteria'? Is it not merely an attempt to persuade us that there is a difference, where there is none, between the concept of the cat-feature and the sortal universal, cat? This is the crucial question. I think the answer to it is as follows. The concept of cat-feature does indeed provide a basis for the idea of reidentification of particular cats. For that concept includes the idea of a characteristic shape, of a characteristic pattern for the occupation of space; and this idea leads naturally enough to that of a continuous path traced through space and time by such a characteristic pattern; and this idea in its turn provides the core of the idea of particular-identity for basic particulars. But this is not to say that the possession of the concept of the cat-feature entails the possession of this idea. Operating with the idea of reidentifiable particular cats, we distinguish between the case in which a particular cat appears, departs and reappears, and the case in which a particular cat appears and departs and a different cat appears. But one could play the naming game without making this distinction. Someone playing the naming game can correctly say 'More cat' or 'Cat again' in both cases; but someone operating with the idea of particular cats would be in error if he said 'Another cat' in the first case or 'The same cat again' in the second. The decisive conceptual step to cat-particulars is taken when the case of 'more cat' or 'cat again' is subdivided into the case of 'another cat' and the case of 'the same cat again'. [Strawson (1959) p. 206-208]

Given this description, it is possible to understand in what sense Strawson considers feature-denoting expressions and feature-placing statements to be different and also simpler than those that contain identifying reference to an individual. The claim is that making identifying reference to an individual requires something above and beyond registering that an individual is an example of a kind. By examining some well-known properties of the associate NP in existential sentences (as will be done below), the correspondence between the expressions allowed as the associate NP and Strawson's notion of feature will become clear and will allow me to further define and formalize the notions of feature and feature-placing.

2.1 The definiteness effect

It is a well-known property of existential sentences that the associate NP may not be a definite NP, a fact widely discussed in the literature under the heading of the *definiteness effect*[3].

[3] I will not discuss the so-called *list existentials* here (e.g. A: *What is there in the fridge for dinner?* B: *Well, there's the leftover beef stroganoff*), or other environments where a definite NP is fine in the existential construction. Some of these will require another treatment. Other environments seem to be cases (like superlatives) where in spite of the definite morphology an indefinite interpretation seems to obtain (e.g. *There's the cutest little bunny in the garden*.). See Abott (1997), Rando and Napoli (1978), among others, for discussion.

(2) There is a man in the garden.
(3) *There is the man/John/the king of France in the garden.

If we consider the existential sentence to disallow (in the associate position) an expression that makes identifying reference to an individual, the restriction on definite NPs in this position becomes clearer. The following discussion will provide further support for this understanding of the definiteness effect and begin to formalize a constraint that disallows these DPs.

2.2 Heim (1987): Questions from existential sentences

Based on the unavailability of pronouns in existential sentences, Heim (1987) proposes that individual variables count as strong NPs (i.e., they trigger the definiteness effect) and proposes that the following constraint is operative in existential sentences:

(4) *There is you in the garden.

(5) *There-be *x*, when *x* is an individual variable.

This constraint is in line with what has been proposed here with regards to the ban on expressions that introduce individuals into the discourse, and her supporting evidence also provides support for that claim. This evidence concerns *wh*-questions, constructions that involve movement of the *wh*-operator or entire *wh*-phrase; this movement has been held to leave behind a variable in the position of the moved element at some level of representation. Assuming that individual variables are excluded from *there*-contexts, how can we explain the grammaticality of the following example? (Heim discusses the full range of *wh*-phrases; I will limit my discussion to *what* for brevity.)

(6) What is there in Austin?

Of the *wh*-phrases one might examine, *what* is certainly one that is likely to involve an individual variable in the position of the moved element. After all, this is the case in other *what*-questions, like *what are you holding?* The content of such a question might be represented as the *x* such that *you are holding x*. Is this the case for the *what*-question in the existential case above? Heim suggests that it is not, and I agree. In the case above, one suitable answer could be:

(7) There are lots of restaurants and places to hear live music.

A person using the question above need not be looking for a particular item(s). After all, there are many things in Austin, so the person is probably not looking for *the thing that there is in Austin*. Instead, they are interested in the *kinds of things* that there are[4]. For this reason, Heim argues that here *what* should not be analyzed as *which x* but as *such an x*, that is, the variable left behind would not be ranging over individuals but over kinds. Following the treatment of *such* by Carlson (1977), she suggests that *such an N* is interpreted in *wh*-questions as *of kind x*. That is, the existential sentence *what is there in Austin* corresponds to something like:

(8) There are/is such stuff/such things/such a thing in Austin.

The interpretation of *wh*-questions provides evidence in support of an analysis that takes the definiteness effect to be explained as a ban on expressions that introduce individuals in the associate NP position of existential sentences. Importantly, it also aligns the behavior and interpretation of the associate NP with that of kinds. Before moving to formalize these notions, consider an example that makes a similar point: *one*-anaphora.

[4] Again, I am abstracting away from the list reading, another possible answer to the question *what is there in Austin*? A list-reading response could be something like the following: *There's that movie theater where they let you bring in beer, the restaurant where we met your cousin, etc.*

2.3 *One*-anaphora

As discussed by Heim (1987), bound variable anaphora is not allowed in existential sentences. One kind of anaphora that works in these sentences, however, is *one*-anaphora. As is well-known, *one*-anaphora makes a connection not to the entire NP but only the noun head and optionally its modifiers. For example:

(9) Mary has a green shirt and Jane has one, too.

Here, *one* is substituting for the N' and not the entire NP, that is, Jane is understood to have a shirt *of the same kind*, namely a green one, and not *the same shirt* as Mary. *One*-anaphora is thus not a connection with a referential NP. As mentioned, unlike bound variable anaphora, *one*-anaphora is possible in existential sentences:

(10) There is a man asleep and there is one sick, too.
(11) *There is a man asleep and there is he/him sick, too.

The fact that *one*-anaphora is available in *there*-sentences supports the idea that the associate NP is feature-denoting, where features are like kinds, in a way to be made precise.

2.4 Quantification and the strong-weak distinction

Milsark (1974) observed that cardinal and strong quantificational NPs differ in their ability to be licensed in an existential sentence, cardinal quantifiers being licensed while strong quantifiers are not. Examples like (14), however, which have also been noted in the literature, show that the ban on strong quantificational NPs is not absolute.

(12) There are three/few/many/several/some cats in the garden.
(13) *There is/are most/every/each cat(s) in the garden.
(14) There is every kind of wine at this shop.

In order to understand the difference between (13) and (14) let us first discuss the case of (12) with respect to the idea of feature-placing. In the feature-placing statement, I claim that the contribution of the cardinal quantifier is to indicate *how many times the features denoted by the NP must be (successfully) placed in that location in order to satisfy the truth conditions of the sentence*, i.e., *there are several cats in the garden* is true only if there are *several* things with the cat-feature(s) in the garden. Now, what of the ungrammaticality of (13)? On its usual interpretation the quantifier *every* ranges over the set of individuals corresponding to the head noun, and its truth conditions are fulfilled if every individual N in the set is a member of the denotation of the predicate; in feature-placing terms, one might say the truth conditions contributed by *every* are satisfied if every member of the set was placed at the location specified by the placer. Remember, however, that based on the definiteness-effect facts as well as those observed for *wh*-questions by Heim (1987), it has been proposed that the NP in existential sentences does not introduce individuals into the discourse, only kinds. Therefore, a strong quantificational determiner that ranges over individuals, for example, the determiner that would take (13) to mean *every individual cat*, is therefore not grammatical in this position. A quantificational determiner that ranges over not individuals but kinds, however, as in (11), is fine. Note also that to the extent that the NP in (13) can be interpreted as *every kind of cat*, it is also felicitous.

The present analysis, then, leads one to the conclusion that the strong-weak distinction as originally formulated should be recast in terms of individuals and kinds. Those expressions that are allowable in the associate NP position of an existential sentence denote, or quantify over, kinds. Those that are not denote, or quantify over, individuals. Theoretically speaking, this is a desideratum; it allows us to provide a uniform account of why both definite and

strong quantificational NPs (in the relevant interpretations) are disallowed in existential sentences.

2.5 Presupposition

Before moving on, it is necessary to address another influential account of the strong-weak distinction in existential sentences that relies on presupposition. Zucchi (1995) points out that the class of NPs that is banned from existential sentences coincides with the class of NPs that are presuppositional. Therefore, the definiteness effect in existential sentences can be captured by positing a felicity condition that requires the NP associate to be non-presuppositional. This requirement is also in line with the fact that the existential sentence is an assertion of the existence and hence incompatible with the presupposition of existence.

This approach in many ways is in line with the semantics of the associate NP that will proposed here, in that the class of NPs that denote features seems to coincide with the class which is not presuppositional. One problem for a purely presuppositional approach to the strong-weak distinction in existential sentences, however, is the existence of cases, like (14), in which "presuppositional" determiners are fine in this context. For this reason, an approach that takes the strong-weak distinction to be a result not of a condition on the presuppositional qualities of NP but on its semantic form may be preferred.

2.6 Formalization of features and kinds

So far it has been claimed that the position of the associate NP in existential sentences is reserved for nominal expressions that are feature-denoting and therefore do not introduce individuals. This can be stated formally as follows: The requirement for a feature-denoting NP equates to the requirement for a set-denoting NP, i.e., an expression of type <e,t>, *where the set contains features, not individuals* (i.e., although set-denoting, they are not properties, the prototypical predicate expression). As shown above, this move is in line with the interpretation of NPs that can appear in this position, and allows for a reformulation of the strong-weak distinction. The idea that the associate NP is set-denoting has also been proposed and defended by McNally (1998) and Landman (2004).

Is this NP in a predicate position? Is it a predicate?

Having claimed that the associate NP is a set-denoting expression, the question now arises as to whether it should also be considered a predicate NP. Unlike Higginbotham (1987), but in line with Landman (2004), I do not take this expression, although set-denoting, to be a predicate. The reason that I do not is because unlike Higginbotham (1987), who takes the expletive *there* to be a subject, I do not take this expression to be associated with a subject (and nor do I take it to be the subject of some higher predicate, as in McNally 1998). This hypothesis is in line with Strawson's claim that the sentence is not of the form subject-predicate, and in fact, Landman (2004) provides evidence against the claim that these are predicates. As he points out, although the associate NP observes many of the same restrictions that a predicate NP does (ban on quantificational NPs, the narrow scope restriction), definite NPs, which are licensed in predicate position, are banned in the position of the associate NP. Furthermore, I take it that the associate NP denotes a set of features, not a set of individuals, which is what a predicate/property denotes. The NP associate is thus a kind-denoting NP, with kind-denoting in this account being equivalent to set-denoting where the set is a set of features.

Summary:

- The associate NP is an expression of type <e,t>, i.e., set-denoting
- It denotes a set of features (not individuals)

- The associate may not presuppose the existence of individuals (vs. kinds)
- The associate is not a predicate (not a subject, either)
- The strong-weak distinction can be reformulated as a distinction between individuals and kinds

3 What are placers?

The second part of the equation in a feature-placing statement is the placer. I take the expressions that are allowed in the coda position, PPs like *in the garden* and APs like *sick*, to be placers, and take the truth of a feature-placing statement to depend on whether there is something with feature denoted by the NP is at the coordinates denoted by the placer.

At this point, however, it is necessary to address the fact that an existential sentence can perfectly well stand with no coda XP, as in sentences like *there is a Santa Claus*. In such cases, I take it that a default location is interpreted: either the universe (or world, depending on the semantics that is to be adopted) or in the contextually salient situation or location. In the sentence *there is a Santa Claus*, for example, the location defaults to the actual world. In the sentence *there is a problem*, the location seems to default to the salient situation.

(15) There is a Santa Claus.
(16) There is a problem.

In the following section I will discuss how the idea of placing can help us understand the restrictions on the items that occupy coda position.

3.1 The predicate restriction

The predicate restriction (or stage-level / individual-level distinction) that is found in this position then depends, on this account, on whether the item can be successfully used as a placer.

(17) There is a man in the garden. predicate restriction
(18) *There is a man fat.

Of course, some of the items (PPs) we find in this position are more obviously locational than others (APs). Although other options might be pursued, I will argue here that there is reason to believe that, although it is more obvious in the PP cases than in the AP cases, the expressions in the coda-XP position are, in a relevant sense, items that can locate other items, and thus can be considered placers.

It seems that one property of things that are coordinate denoting is that they themselves can be located with respect to another location. This property, which I will call *localizability*, seems to distinguish among the predicates that are and are not felicitous as the coda in existential sentences. I formalize these notions below:

(19) A predicate can *localize* something if and only if the property it denotes is *localizable*.
(i.e., a thing which *localizes* something must itself be *localizable*)

(20) Only predicates that are localizable are licensed in the coda of the existential construction.

There is some evidence that the codas allowed in the existential construction are localizable. For example:

Predicates that are felicitous in the coda allow for further spatial modification

(21) There is a man sick in the next room.
(22) There is a man available at the Phoenix office/on the 4th week of every month.
(23) *There is a wall red in certain patches.
(24) *There is a man tall in the garden.

Similarly, predicates that are felicitous in the coda naturally allow for *where* questions

(25) There is a man sick.
(26) Where is there a man sick?
(27) There is a man available.
(28) Where is there a man available?
(29) *There is a wall red.
(30) *Where is there a wall red?
(31) *There is a man tall.
(32) *Where is there a man tall?

As a further example of the ability of a predicate that *locates* to be *localized*, notice the differing behavior of the names of the properties denoted by certain localizing predicates in the associate NP position.

(33) There is a man sick. > There is (a) sickness in New York.
(34) There is a man available. > There is availability on Sunday.
(35) *There is a wall red. > There is red(ness) on the wall.
(36) The wall is red. =There is a patch/spot of red on the wall.
(37) *There is a man tall. > *There is tallness in Sweden.

While the correspondence between properties (e.g. *tall*) and their names (e.g. *tallness*) is admittedly not always precise (cf. Chomsky 1970), the above are examples where names of the properties denoted by predicates that are licit in the coda of existential sentences that may be localized as the associate NP in an existential sentence, whereas names of properties that are illicit in the coda either may not stand as the associate or else must be interpreted as spatially defined.

Also note that the interpretation of the predicate *sick* which is available in (36) is the sense that may be localized, as in *John is sick at home with the flu*. Its other interpretation, as in **John is sick in the head at home*, is not available. It is only the first interpretation that may *be localized* and is able *to locate* the feature denoted by the NP associate.

Finally, whether or not the particular formulation of location-sensitivity given above is accepted, the idea that there is a locative element to existential sentences has been advanced by authors starting at least with Lyons (1967), Kuno (1971), Clark (1978) and Freeze (1992). In this sense, an approach that defines the coda restriction in terms of an ability to be spatially localized also provides a way of characterizing this locative content (without recourse to the notion that the expletive subject itself is locational).

4 Sentential semantics of feature-placing sentences

I have suggested so far that that assertion in a feature-placing sentence is accomplished by some combination of a set-denoting NP and a syntactically optional (but I argue semantically necessary) coordinate-denoting expression. Therefore, the logical form of these sentences would be something like:

(38) [**f**eature **p**osition]

This form is different in important respects from the usual form assumed for existential sentences in that it assumes neither existential quantification over an individual nor an

existential predicate (*there-be*). Furthermore, the logical form consists of a single clause, not three. This will become important in considering the scope facts for existential sentences.

However, if the associate NP in the existential construction does not introduce individuals into the discourse, and the logical form of existential sentences contains no existential quantification or no existential predicate how does their existential import arise? I would like to suggest that the existential import of these sentences arises from the content of their truth conditions rather than the content of their logical form. So, instead of the logical form containing an existential quantifier or existential predicate, the truth conditions that require that an item with a set of features at a location exists. These statements are made true or false, then, by virtue of the required set of features existing at the coordinates denoted by the coda. Below the two different proposals for the semantics of these sentences are compared:

Feature-placing analysis

(39) A sentence of the form [f p] is true iff there is an x that has f at p.

"Standard"analysis

(40) A sentence of the form [there exists an x], [x is a man] and [x is in the garden] is true iff there is an x, x is a man, and x is in the garden.

In the proposed semantics, then, there is an asymmetry between the logical form of the sentence and the truth conditional content of the statement. The existential import is located in the truth conditions and not the logical form (whereas in the traditional view, these two are symmetrical: both sides contain an existential clause). From the point of view of the interpretation of existential sentences, namely, that they assert existence and do not presuppose it, and in concert with the presupposition facts mentioned above, I would argue that moving the requirement for existence into the truth conditional content seems to better reflect the interpretation of these sentences, which do not imply existence as part of their meaning but assert it on the occasion of their use.

In fact, adopting the analysis outlined above for existential sentences enables us to account for some of their notable properties beyond those already discussed.

4.1 Copular sentence vs. existential sentences

The similarities between copular and existential sentences have long been noted, with some arguing that the form of the existential is transformationally related to the copular sentence.

(41) A man is in the garden.
(42) There is a man in the garden.

Given what I have said about feature-placing sentences in opposition to subject-predicate sentences the analysis predicts, however, that these sentences are of a different logical form, even if they are truth-conditionally equivalent (and I agree that they are). The copular sentence is of the form subject-predicate while the existential sentence is not. What evidence is there in support of the position that their logical forms differ?

In order to bring out the differences between copular sentences with indefinite NP subjects and existential sentences, let us look at some well-known scope facts: The associate NP in existential sentences takes narrow scope with respect to operators such as negation. This is not the case in copular sentences. The copular sentence below, for example, when negated, can be interpreted as saying that a certain winged horse is not in the garden. This is not the case in the existential sentence and suggests that there is an existential quantifier present in the logical form of the one (the copular sentence) and not in the other (the existential sentence).

(43) There is a winged horse in the garden.

(44) There isn't a winged horse in the garden.
(45) A winged horse is in the garden.
(46) A winged horse isn't in the garden.

These facts also provide support for the current analysis of the logical form of these sentences, which is mono-clausal, against their usual analysis, which takes them to be tripartite structures. Given a tripartite structure, it is not clear why only widest scope is possible for negation. Given a single clause, there is not another option.

(47) There is not a winged horse in the garden.
(48) ¬[**f** winged horse **p** in the garden]
(49) ¬ [there exists an x], (*¬) [x is a winged horse] and (*¬) [x is in the garden]

=It is not the case that there is a winged horse in the garden.

≠There is something such that it is not a winged horse in the garden.

≠There is a winged horse such that it is not in the garden.

4.2 More anaphora[5]

The above discussion of Heim (1987) regarding the unavailability of pronouns in existential sentences can also be extended to accommodate sentences like the following:

(50) There is a man and his wife in the garden.

As in the case of *wh*-questions discussed above, an account of the pronominal anaphora in the sentence above does not demand an individual variable, but may be accomplished with a variable that ranges over sets of features, i.e., kinds[6]. After all, the sentence above does not refer to a specific man and his wife; the truth conditions merely require that a man and his wife be found in the garden.

For another case of anaphoric connection, consider the following examples from Partee:

(51) I have lost ten marbles and found all but one. It might be under the couch.
(52) I have lost ten marbles and found nine of them. #It might be under the couch.

The sentence in (52) illustrates that conversational salience or logical inference is not enough to guarantee the possibility of pronominal reference. The expression the pronoun is anaphoric to must be available in the content of the discourse. Now, given the fact that the present approach claims no individuals are introduced into the discourse in the logical form of existential sentences, what can be said about the pronominal reference in the following sentences?

(53) There is a man in the garden. He is wearing pajamas.

Whereas I am claiming that the logical form of existential sentences does not introduce individuals into the discourse, the truth conditions of an existential sentence like that in (54) require that a man exist at the coordinates expressed by the placer. It is to this man that the pronoun refers. This cannot technically, then, be considered a case of anaphora. Instead, we must assume that the pronoun above is *deictic* to the individual required by the truth conditions of the existential sentence.

There is some reason to believe that this approach to the pronominal reference above is correct. Take, for example the form of denials of existential statements:

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[5] I would like to thank Harriet Taber for first bringing the facts in (50) to my attention as well as Daniel Rothschild, in the audience at SuB 10, for making me aware of the relevance of the Partee facts.
[6] It need not necessarily be assumed that anaphoric connection is accomplished via binding: cf. Fiengo and May 1994 for arguments against the binding approach to anaphora.

(54) There is a man in the garden.
(55) #No, he's not. (=No, there isn't a man in the garden)
(56) No, he's not. (=No, he's in the *kitchen*, not the *garden*.)

As (54-57) show, although a statement of the form feature-placer may be felicitously followed by a statement containing a pronominal subject that takes as its referent the individual required to satisfy the truth conditions of a feature-placing statement, it is not felicitous to follow a feature-placing statement with a sentence that contains the same pronominal subject and an a denial of the original statement. This is because in order to deny the original statement you must take its truth conditions to be unfulfilled; the denial of the original statement, therefore, asserts that the pronoun has no referent (at that location). In (57), however, only a partial denial is stated: the existence of the referent of the pronoun is not in question, only his location. Thus, pronominal reference is felicitous in such a case.

5 Concluding remarks

In conclusion, let us return briefly to the debate about which constituent is the existential sentence constitutes the proper subject or predicate. By adopting an account of existential sentences in terms of feature-placing, it is possible to supercede such discussion while providing a principled (and straightforward) reason for these sentences' special surface form, that is, for why they appear with an expletive subject.

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DEALING WITH ALTERNATIVES*

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Abstract

Traditionally, pure additive particles and scalar additive particles are both characterised by an existential presupposition. They differ insofar as the set of alternatives that is built is unordered for the former, and ordered for the latter, which carry the so-called scalar presupposition. As a result, the two characterisations cannot be cumulated, an impossibility that is at odds with the fact that several languages exhibit this combination of readings for a single item. The discussion of Italian *neanche* '(n)either/(not) even', an item that can both be additive and scalar, allows us to expose the connection between the oppositions nonordered vs ordered set of alternatives and verified vs accommodated existential presupposition by adding content to the traditional view that the set of alternatives is made up of 'relevant' items in the context. The question of how to characterise this item is set against the backdrop of a more general discussion of the network of additive particles found in Italian.

1 Introduction

Adding PURE ADDITIVE and SCALAR-ADDITIVE particles to an utterance makes a clear difference to its interpretation, but exactly how to capture this difference is a matter still open to debate. It is customary to assign to pure additive and scalar-additive particles a pragmatic content which mainly takes the form of felicity constraints. Accordingly, these particles have in common an EXISTENTIAL PRESUPPOSITION (Karttunen and Peters 1979, König 1991), i.e. the associate (Krifka 1998) is understood as a member of a class of alternative individuals or actions containing at least another member.

They differ in at least two respects, both concerning the set constituted by the associate and its alternatives. First, pure additive particles such as *either* are assumed to have an unstructured set of alternatives. Mary's turning down the offer is neither more nor less unexpected than Jane's in example (1a). On the contrary, scalar-additive particles such as *even* are assumed to impose an order on the set of alternatives. This is called the SCALAR PRESUPPOSITION. Olga's not accepting in (1b) is understood as less probable/ likely/ expected/ informative than somebody else's.

(1) a. Mary turned down the offer and Jane didn't accept either.
b. Even Olga didn't accept.

A second traditional assumption is that only scalar-additive particles can accommodate their alternatives. Pure additive particles must verify their existential presupposition in the context (Zeevat 1992), see the contrast in (2).

*Thanks to Francesca Tovena, Jacques Jayez and Piermarco Cannarsa for valuable discussions. Results reported in the text are part of ongoing research.

(2) a. ??Also Mary came.
b. Jane came. Also Mary came.
c. Even Mary came.

The discussion of Italian *neanche*, an item that can both be additive and scalar, allows us to expose the connection between the two oppositions nonordered vs ordered set and verified vs accommodated presupposition by adding content to the traditional view that the set of alternatives is made up of 'relevant' items which can be checked in the context.

A first factor that opens the way to the possibility of having both readings is the fact that an item does not impose a specific strategy for satisfying the existential presupposition shared by additive and scalar items, namely verification or accommodation. Another factor contributing to the same possibility is that, as far as the item itself is concerned, no specific structure is required to be detected on the class of alternatives.

It is important to notice that the type of accommodation that is relevant for the additive scalar particles under consideration is not the classic conversational case whereby a sentence like *I will be late because I have to drive my sister to the dentist* is interpreted under the precondition of admitting as backgrounded information my having a sister when such a piece of information had not been previously provided. In the case at hand, first, there is no flavour of having, at a given time, to update a previous belief state, and second, the sentence does not contain a description of what has to be accommodated, which is to say of the alternatives. Thus, it is somewhat different also from the classical lexical case of accommodation, whereby a verb such as *stop* in a sentence like *He stopped smoking* triggers the presupposition of a change of state and the *V-ing* expression constrains what has to be accommodated. In the present case, there is no similar direct constraint and what is available is information mainly on the associate, which is to say on the entity with respect to which something can get its status of alternative and thereby be accommodated. In (Tovena 2005a) it has been proposed that imposing an order is a way of constraining the possible increase of information triggered by the additive nature of the item in the absence of overt antecedents. Thus, accommodated alternatives are not taken to be individually 'as much contextually relevant as' verified ones. Equal status in a discourse has to be gained, if ever, thanks to an explicit subsequent increase of information.

The paper is organised as follows. Aspects of the hypothesis of a connection between the strategy for satisfying the existential presupposition and the readings are presented in section 2 relatively to *neanche*. Section 3 aims at spelling out features of the picture that has emerged. Next, the hypothesis is tested on purely additive and purely scalar items, showing how different choices can be specified for different items and result in different combinations. Section 4 discusses some items that require the existential presupposition to be verified in the context. Section 5 deals with items that accommodate. Then, in section 6, we will show how the line of discussion taken in the paper allows us to integrate in the picture the case of an item that is evaluative in the sense of (König 1991), but that can work also as scalar. Section 7 summarises.

2 Underspecified strategy: *neanche*

2.1 The item

Neanche is an Italian adverb that exhibits additive (3) and scalar (4) interpretations.

(3) Non ha mangiato la mela e neanche la pera
s/he didn't eat the apple, neither the pear

(4) Non ha mangiato neanche il caviale
s/he didn't even eat caviar

The two interpretations do not correlate with distributive differences, a fact that provides evidence in favour of a unified analysis and goes against postulating some form of lexical split for *neanche*. More support for this line of analysis comes from the observation that such a combination of readings for a single lexical form is not unusual, cf. (König 1991).

Historically, *neanche* originates from the combination of a negative conjunction and the positive additive adverb *anche* 'also'. It occurs in negative clauses only, cf. (5)–(7).

(5) ∗Ha mangiato la mela e neanche la pera
s/he ate the apple and NEANCHE the pear

(6) ∗Non ha mangiato la mela e ha assaggiato neanche la pera
s/he didn't eat the apple and tried NEANCHE the pear

(7) ∗Ha mangiato neanche il caviale
s/he ate NEANCHE caviar

Let us point out that in Italian, there are two more items besides *neanche* that, roughly speaking, have similar distributions and interpretations, at least for the purposes of this paper. One item is *neppure*, which also originates from the fusion of a negative component with a positive additive adverb (*pure* 'also'), and the other is *nemmeno*. We focus on *neanche* because its positive component is standardly not emotionally loaded.

Exploiting the proposal put forth in (Tovena 2005a) for *neppure*, we characterise *neanche* and its siblings as particles specialised in adding negative information. This function requires that parallel information of negative nature be conveyed by an antecedent/the context and by the clause that hosts the particle. Items performing this function can be found in various languages, see for instance the English item *either* and French *non plus*. The specific syntactico-semantic properties of such items, which is to say the issue of the lexicalisation of the function in a particular language, is an independent question, albeit closely connected. Tovena (2005b) has provided clear evidence in favour of an analysis of *neanche* and its siblings as negative concord (NC) words. For instance, they contribute sentential negation from preverbal position (8). As it is standard for the NC system of Italian, the verbal form following the NC-word must not be negated (9). This type of lexicalisation warrants that the clause in which it occurs is always negative since either *neanche* belongs to a negative concord chain or it expresses negation on its own.

(8) Neanche il caviale era di suo gradimento
not even caviar was fine for her/him

(9) ∗Neanche Daniele non ha fatto i compiti
NEANCHE Daniele didn't do the homework

The fact that *neanche* is interpreted as negative in self-standing occurrences and fragment answers, cf. (10), provides evidence specifically against a characterisation as a negative polarity item (NPI). NPIs are never allowed in this context with their polarity sensitive reading, see *alcunché* 'anything' and *anybody* in (11).

(10) a. Daniele non verrà, e Luisa? Neanche lei.
Daniele will not come, and Luisa? Neither

b. Ha mangiato almeno il caviale? Neanche quello.
did s/he eat caviar at least? Not even that

(11) a. Cosa fa? ∗Alcunché.
what does s/he do? ALCUNCHÉ
b. Who will come? #Anybody. (≠ nobody)

Furthermore, *neanche* is not 'licensed' in traditional NPI licensing contexts such as under negative predicates (12a), in questions (12b), in conditionals (12c), in concessive contexts such as *troppo* Adj (too) as in (12d).

(12) a. ∗Dubito che abbia mangiato neanche la pera
I doubt s/he ate NEANCHE the pear
b. ∗Ha mangiato neanche la pera?
did s/he eat NEANCHE the pear?
c. ∗Se mangia neanche la pera, la situazione è grave
if s/he eats NEANCHE the pear, it is a serious situation
d. ∗Sembra troppo stanco per fare neanche i compiti
he seems too tired to do NEANCHE the homework

2.2 Two readings

Example (3) provides a clear case of additive reading, under the assumption that apples and pears are not ordered. The associate in (4) is traditionally viewed as more sophisticate/ exquisite/rare/ expensive than much other food, in short as ranking high in some classification. Hence it suites the intended scalar reading.

Consider now a situation where ranking is not lexically/culturally marked but information about a relevant order may be provided in the context. The background we are going to use all along is the following: Marzia, April, May, June and Julia are students who sat the same exam. Their names are listed giving the least gifted person first and the most gifted last.

Scenario 1: Marzia, April, May and June didn't pass

Consider the sentences in (13) and (14). Agent *a* may use either of them to communicate information on the situation to agent *b*.

(13) Non sono passate Marzia, June, April e non è passata neanche May.
Marzia, June and April didn't pass, neither did May

(14) Non è passata neanche June.
even June didn't pass

Despite the difference in their asserted content, both (13) and (14) convey the information that Marzia, April, May and June failed the exam. How does *b* get it? Directly in (13), where all the alternatives are overtly provided and the set can be freely 'scrambled', see its equivalent in (15). Indirectly in (14), by exploiting the understanding that the girls are not equally gifted and their performances are going to reflect this situation. This leads to the interpretation whereby the girl who is mentioned is the cleverest among those who didn't pass.

(15) Non sono passate Marzia, April, May e non è passata neanche June.
Marzia, April and May didn't pass, neither did June

2.2.1 Computing the set of alternatives

Given the proposition $\alpha(\beta)$ expressed by sentence S where *neanche* occurrs with β as its associate, the existential presupposition that characterises additive items is traditionally given as in (16).

(16) $\exists y[\alpha(y) \wedge y \neq \beta]$

This presupposition is meant to express the general understanding that the associate is viewed as a member of a class, that is the set of alternatives. On the one hand, the value for y must be comparable to the associate in some respect. For instance, in (3) one considers names of people, and food in (4). On the other hand, α is thought of as something that takes an object of the same type as β as an argument and returns a proposition true in the context as it does with β.

There are at least two problematic issues to consider. First, proposing a general treatment for β is not an easy task, because *neanche*, as many other particles, can take associates of various types, e.g. NPs, VPs, PPs, etc. We won't pursue this side of the investigation in the paper. Second, α may not be directly available, either because *neanche* and its associate occur in an elliptic structure so that the host clause does not provide enough content, cf. (17)[1], or because there is no overt antecedent against which to check what gets into α, cf. (18).

(17) La vittima non ha incontrato Luisa. E neanche Daniele.
the victim did not meet Luisa. And she didn't meet Daniele either
the victim did not meet Luisa. And neither did Daniele

(18) La festa è stata un disastro. Sembra che alle due non fosse ancora venuto neanche Daniele.
the party was a complete failure. It seems that by 2 a.m. not even Daniele had showed up yet

Furthermore, $\alpha(\beta)$ and $\alpha(y)$ may be true although α cannot be made to correspond to identical lexical material in the host clause and the antecedent clause, as noted for *either* by Rullmann (2003), cf. (19).

(19) Luisa ha respinto la nostra offerta. Neanche Daniele ha accettato.
Luisa rejected our offer. Daniele didn't accept either

Traditionally, the set of alternatives triggered by an alternative inducing operator is defined following the treatment proposed by Rooth for focus operators. Rooth (1992) has claimed that the set of alternatives for the associate β of a focus operator, the focus semantic value of β in his terminology, is a set that contains both its ordinary semantic value, i.e. the denotation of the associate itself, and at least one element distinct from it, roughly speaking. More precisely, alternatives are considered with respect to the host clause, thus we are interested in the focus value of a clause, which is to say that we consider the set containing the proposition expressed by this clause as well as the propositions obtained by replacing focus marked material with alternatives of the same type. However, in the following we may, at times, sloppily talk of the set of alternatives as if made up of β and its alternates.

Rooth further claims that the focus semantic value considered in a specific case is a 'relevant' subset of the focus semantic value of the clause, constrained by contextual information. For instance, in our particular setting the property 'girl' or 'human being' can be derived from the

[1] It is true that in the general case discourse defuses this problem.

lexical content of the associate and be used to build its focus semantic value. Context can restrict the set of possible alternatives obtained in this way, so we can also consider properties like 'student' and 'sitting the exam' in our setting. Most importantly, the propositional function expressed by the host clause, here 'did not pass' is also used.

This is Rooth's C set. We will call it ALT_{β} because we think that it is built getting all one can get from β but that the role of α has not been fully appreciated and that the set may be further constrained by it. Indeed, the restriction effect of context is stronger when linked to overt information available in the co-text. We propose that ALT_{β} is what one can initially get with the associate and the host clause. It might contain contrasting alternatives. But verification of the existential presupposition in the context always results in double checking the set that is possibly reduced and gets (temporarily) closed. At this point, α too will have given us all it can contribute. We will call ALT_{β}^{α} the resulting set.

Therefore, two cases have to be distinguished. In the case of satisfaction by verification, the associate is argumentatively the upper bound of any subset of ALT_{β} whose members are entailed by the context and end up in ALT_{β}^{α}. Thereby, the associate actually is the greatest element in ALT_{β}^{α} from the vantage point of argumentation, we come back to this point at the end of the section. The definition of upper bound is recalled in (20). It is worth noticing that this notion requires X to have at least another member besides x.

(20) Let X be a partially ordered set and $\geq$ an order in it. Let $x \in$ X. Let Y $\subset$ X.
x is an upper bound for Y iff $\forall y, y \in$ Y, $x \geq y$.

On the other hand, if no verification takes place, ALT_{β}, or presumably a subset of it, would have to be accommodated. In such a situation, using an order is the best way of building an ALT_{β}^{α} that is fit for potential future increases of information. This is because the associate is the only member which is provided, therefore it is the only one that can bear the burden of the construction of the set and is assigned the role of scalar endpoint. Thus, in the case of satisfaction by accommodation, ALT_{β}^{α} has the associate as it sole member and the extra bit of information that has to be accommodated is the constraint that the associate is a maximal element. As a matter of fact, it is 'the' maximal element. No other alternatives have to be accommodated specifically. The definition of maximal element, recalled in (21), makes it clear that this notion does not require nor warrant the existence of one or more members in X besides the associate.

(21) Let X be a partially ordered set, $\geq$ an order, and $x \in$ X.
x is a maximal element in X iff
$\forall y, y \in$ X, $y \geq x \rightarrow y = x$

The type of ALT_{β}^{α} that we get in this second case works as a label for the class of equivalence of the subsets of ALT_{β} that are candidate for the role of actual set of alternatives in every situation as long as no more information is available. Speaker and hearer may even entertain different options. No specific subset of ALT_{β} is selected as information that is accommodated, i.e. when building ALT_{β}^{α} an agent does not commit herself to a position stronger that what can be warranted and does not run the risk of having to retract. At the same time, information is incremented all the same.

Summing up, ALT_{β} is made of potential alternatives. ALT_{β}^{α} is the actual set of alternatives. It seems plausible to treat ALT_{β} as the product of the focus component of a particle and ALT_{β}^{α} as the product of the (pure and scalar) additive component. This hypothesis will not be tested in the following, but it may help to formulate a characterisation for the evaluative particle discussed

in section 6.

In a short aside, we note that extra complications come from the fact that 'contradicting' information may be subsequently added to what contributed by ALT_β and ALT_β^α to a discourse, but a retraction indicator of some kind must be used, for instance *neanche* is repeated in (22). However, such a revision is more easily done when *neanche* is used as an additive particle than as a scalar one, see the marginal status of sequencing in the micro discourse proposed in (23).

(22) Non c'era Luisa e neanche Daniele. E neanche Gianni, adesso che ci penso.
Luisa was not there, neither was Daniele. Neither Gianni, I recall it now.

(23) Figurati che fiasco, non c'era neanche Luisa. ? E neanche Daniele.
Just think of the flop, not even Luisa was there. And not even Daniele.

We can make sense of this situation if we recall that ALT_β^α is built extensionally, so that in (22) the revision amounts to reopening the set and adding one extra element without further consequences for the structure of the collection. In the case where alternatives are accommodated, on the contrary, revision involves computing the set afresh, because it is the new element that has to work as scalar endpoint and the scale must include the previous associate.

Finally, we should also cash in the effect that comes from the argumentative purpose of sentences containing additive and scalar particles. The argumentative goal provides a perspective on ALT_β^α that translates in a relevance based (partial) ordering that is always imposed on ALT_β^α at the discourse level. Extending to *neanche* the claim made in (Tovena 2005a) about *neppure*[2], we say that in uttering a sentence containing *neanche*:

- The speaker signals that the piece of information added via the host clause is going to lead to modifications in the information state that would not occur without such an addition.
- The modification has a particular discoursive function, therefore the presence of *neanche* triggers a search for a discourse goal by the hearer.
- The particle marks the piece of information as precisely the one that was missing to get the intended effect.

The piece of information provided via the associate is maximally useful/relevant for the argumentative goal in the scalar as well as in the additive cases.

2.2.2 The additive reading

Let us go back to our examples (13) and (14). In our setting, $ALT_\beta^\alpha = \{$Marzia, April, May, June$\}$ or rather $<$Marzia, April, May, June$>$.

We have assumed that to get the additive reading, the alternatives are identified using the associate and the content of the host clause in an anaphora-like way (van der Sandt 1992). The existential presupposition is satisfied only by verification, i.e. if and only if the proposition expressed by the host sentence with an alternative substituted for the associate follows from the context.

It is worth emphasising that in (3), where no order is perceived, as well as in (15), where a contextually given order was assumed, the associate is treated on a par with the alternatives. It is the context that provides overt information supporting the move from one member to the other required to build the set of alternatives ALT_β^α.

The behaviour of additive *neanche* is captured by condition (24).

[2]Analogous considerations can be found in proposals put forth by (Merin 2003, Van Rooy 2003).

(24) **constraints on** *neanche*
(i) ALT_{β}^{α} can be a partially ordered set
(ii) ALT_{β}^{α} is always argumentatively partially ordered
(iii) the associate of *neanche* is argumentatively the maximal element in ALT_{β}^{α}
(iv) if ALT_{β}^{α} is ordered, the associate the maximal element in it, because this order must be compatible with the argumentative order.

Summing up, a first case is that of (3) where there are overt antecedents, no perceived order, and *neanche* gets an additive reading. A second case is exemplified by (15). Here we observe the presence of overt antecedents but this time *neanche* can get a scalar reading. This is so because ALT_{β}^{α} happens to be a chain due to information provided in the setting. This possibility is allowed by (24iv). Analogously, in (25) we find overt antecedents and a scalar reading, since ALT_{β}^{α} happens to be totally ordered because of lexical information. Cultural information may also be taken into consideration for establishing an order, see (26). Example (26) shows that for an order to be perceived it is not necessary that the antecedent clause is entailed by the host clause.[3]

(25) Non ha studiato questo capitolo, e non l'ha neanche letto
He didn't study this chapter and he did not even read it

(26) Non ci ha ringraziato e non ci ha neanche salutato
He didn't say 'thanks' and did not even say 'hello' to us

2.2.3 The scalar reading

Examples (15) and (25)–(26) show that the scalar reading can emerge in the presence of overt antecedent(s) if an order is perceived in the set of antecedents. Well formedness is not affected by (non-)perception.

The next case to consider is that of (14), where there are no overt antecedents and *neanche* gets a scalar reading. Given the information provided in the background, we know that in our setting ALT_{β} is a chain. The possibility for *neanche* of having a scalar reading in this case is also captured because condition (24iv) is sensitive to the structure of ALT_{β}.

Suppose now that the background is not overtly stated. If there are no antecedents, the class is still constrained via information on the discoursive role of the associate, but α and information coming from β cannot be used for verifying the existential presupposition. Here is where the change in the strategy for satisfying this presupposition is needed. The only way of bringing in relevant candidates for a set of alternatives, i.e. of controlling the move from the associate to some alternative(s), is by reasoning by abduction on (24iv) and the fact that no alternatives are provided in the context. The associate is required to be an upper bound for a potential subset ALT_{β}^{α} but several such subsets can be envisaged. It is the greatest element of a partial order. For instance, example (14) per se is compatible also with a scenario where the names are ordered by luck, good shape, likelihood to succeed, etc. Several sets of alternatives might be entertained as the result of accommodating different ordering relations. Indeed, different agents may entertain different options in the same context, a situation that need not lead to a break down in communication because the crucial role of the associate is shared by them all. The possibility of conceiving different scales is covered by the current analysis, where the set of alternatives is defined only intensionally whenever the existential presupposition is not satisfied by verification.

[3]Thanks to Manfred Krifka for pointing this out.

2.3 Unconventional scales

The fact that the information contributed has to be maximally relevant for a specific goal, and not in absolute terms, makes it possible to account for scalar cases where the associate is not a standard scale endpoint, see (27). Given the physical or mental shape of the athlete, it was possible for her to win the semifinals and possibly the finals. When it comes to evaluating her performance, information that she did not make it to the final is more relevant than knowing that she didn't win it.

(27) Non ha vinto neppure la semifinale!
s/he did not win even the semifinals

The scale under consideration is not the one made up by the steps of a traditional tournament, but the one made by the levels the athlete could have reached.

3 Tacking stock on additive particles

In short, the key idea is that a particle that has an additive reading must verify the existential presupposition. Italian *anche*, English *either* and *also* are all well behaved members of this class.

As a first point, we record this aspect of the behaviour common to all additive particles as a constraint, in (28). This constraint is standardly met by verifying the existential presupposition and evaluating the impact of the particle at the discourse level.

(28) Constraint 1 on additive particles
The set of alternatives ALT_{β}^{α} of an additive particle is not ordered directly by the particle, but argumentatively the associate is understood as the maximal element in it.

Next, we have noted that a lexical item may allow the possibility of taking into consideration the structure of the set of which the associate is maximal even if it does not impose specific requirements on it. This is to say that the presence of an order may be visible even when the order is not required. However, if there is an order, the associate is the greatest upper bound, and as such it could help in reconstructing the set when there are no overt antecedents. Hence, an ordering relation is taken into consideration to control the satisfaction of the existential presupposition by accommodation.

Neanche leaves unspecified the strategy for satisfying the existential presupposition. This can be satisfied by verification in context or by accommodation by working out the composition of the set of alternatives from the associate, which is the maximal element.

The possibility of accommodating correlates with the crucial role that the associate plays when the set of alternatives is constituted. We record this point as a constraint, in (29).

(29) Constraint 2 on additive particles
ALT_{β}^{α} is an ordered set $\Leftrightarrow$ the associate is the greatest upper bound for it.

The constraint in (29) is shared by *neanche* and all additive-scalar particles.

Finally, let us observe that ALT_{β}^{α} can be totally ordered in two cases: (i) when ALT_{β} is totally ordered due to contingent facts, and (ii) when the associate is required to be the upper bound for ALT_{β}^{α}, although the order is not always total. The latter is the scalar case. The former is discussed in the second half of the next section.

4 Specific strategy–verification: *anche, also*

In the case of well behaved additive particles such as *also*, we have just said in the previous section that the associate is a maximal element in order to satisfy its argumentative/discoursive function, but that the existence of antecedents, due to the existential presupposition, does not come with the requirement of an order. The existential presupposition is an independent requirement and its satisfaction does not involve imposing or even just appealing to any ordering relation. The same applies to Italian *anche*, with the only difference that this item is not equally 'blindly' well behaved, as we will see shortly.

It is then important to establish two points with certainty. First, we must know whether it is indeed the case that verification of the existential presupposition always takes place with additive particles. In order to test this, we can check if antecedents are always present in the preceding co-text, as usually claimed. A preliminary corpus-based study on *anche* confirms this claim and reveals that exceptions are rare and tolerated only when the context provides an unambiguous and usually unique alternative. Two possible cases are recorded.

1. The alternative is a widely known public figure particularly salient at the time the sentence is produced. Since the alternatives are identified in an anaphora-like way on extralinguistic material only, the success of the operation is uncertain and the felicity of the utterance decades fairly rapidly. At the time (30) was printed on a newspaper as the first sentence of an article, the antecedent, i.e. the death of the Pope, was in everybody's mind. Just a few months later the sentence may already sound awkward.

   (30) Anche il principe Ranieri di Monaco, 81 anni, è morto [...]. (IM7-4-2005)
   also Prince Ranieri of Monaco, aged 81, has died

2. The antecedent is the speaker, and this seems to apply to direct or reported speech. Example (31) is made of the title, the subtitle and the beginning of the first paragraph of an article from a newspaper. It contains an instance of this phenomenon with *neppure* (1), an instance with *anche* (2), and a regular additive use of *neppure* (3).

   (31) (1) **Neppure la Fiat** vuole l'intervento dello Stato
   «L'azienda non è interessata», dice **Maroni** dopo l'incontro con Marchionne.
   (2) **Anche i vertici della Fiat** sarebbero contrari all'ingresso dello Stato nel capitale della multinazionale dell'auto. A riferirlo è stato ieri il **ministro Maroni**, dopo l'incontro con l'amministratore delegato del gruppo, Sergio Marchionne, a Palazzo Chigi: un intervento dello Stato nel capitale Fiat, ha detto il ministro, sarebbe «inutile, dannoso e, lo dico da stasera, non gradito. (3) Su questo intervento oltre a **non essere d'accordo il governo** non lo è infatti **neppure Fiat**».(IM10-2-2005)[4]

   (1) Fiat does not want the intervention of the state either
   Maroni says [...]
   (2) Fiat's top management too would be against the State taking a stake in the capital of the multinational car manufacturer. It is the minister Maroni who said this yesterday, [...]
   (3) Concerning this intervention, besides the unwillingness of the government, there is also that of Fiat.

[4] Numbers have been added to ease reference.

We conclude that it is indeed the case that plain additive particles require the verification of the existential presupposition in context.[5]

Second, it is important to have a way of telling apart items that leave the strategy underspecified, like *neanche*, from additive items that must always verify the existential presupposition but can still have emphatic scalar readings due to the contingent fact that ALT_β happens to be totally ordered, like *anche*. As discriminating test, we propose to use the case of a gap in an order. Only the latter type of particles are compatible with a scenario where the chain ALT_β^α has a gap relatively to the chain in ALT_β, because the antecedent tells us where the gap is. On the contrary, scalar inferences used by scalar items to work out possible sets ALT_β^α from the associate alone are built monotonically.

Consider the usual background.

Scenario 2: Suppose it has just been disclosed that May, June and Julia passed the exam. The exam was very difficult and not many people were expected to pass.

Surprise can be expressed with scalar *perfino* (positive *even*) and stressed *anche*, see (32)–(33). Mutatis mutandis, surprise can be expressed with *neanche*, see (34).

(32) Perfino MAY è passata?
did even May pass?

(33) ANCHE MAY è passata?
did even May pass?

(34) Non è stata bocciata neanche MAY?
did May not fail either?

Scenario 3: Suppose instead that June also failed. (Recall that we are dealing with pragmatic scales.)

In this scenario, *May* is the maximal element in ALT_β^α and the structure of this set preserves the order of the chain in ALT_β of which *May* is an upper bound. The specificity of the case is that the new chain, i.e. ALT_β^α, is a subset of that present in ALT_β. In this case, only *anche* can still be used, see (35)–(37).

(35) #Perfino MAY è passata?
did even May pass?

(36) ANCHE MAY è passata?
did even May pass?

(37) #Non è stata bocciata neanche MAY?
did May not fail NEANCHE?

The contrast can be exlained as follows. *Anche* obtains ALT_β^α by verification. It is sensitive to whether there is an order on ALT_β^α, which is necessarily external to the operation of building the set. The comparison with the order on ALT_β can also be done independently. On the contrary, the composition of ALT_β^α predicted with *perfino* (and *neanche* in the scalar reading) by using the associate as maximal is incompatible with information coming from the context in (35) and (37). Indeed, *perfino* works out candidate sets ALT_β^α using the associate in this way because the existential presupposition it triggers has to be accommodated. Inferences drawn from the associate are monotone. The stumbling block is the gap represented by June's failure which

[5]The third possibility recorded is a case of cataphora.

cannot be predicted from the succes of May.

Summing up, *anche* is subject to condition (38). The fact that the existence of overt antecedents must be verified is recorded in constraint (38iv). The option of viewing the associate as maximal in ALT_β^α—other than on argumentative ground—is not overtly stated, which may be another reason why the existential presupposition cannot be accommodated.

(38) **constraints on** *anche*
(i) ALT_β^α can be partially ordered
(ii) ALT_β^α is always argumentatively partially ordered
(iii) the associate is argumentatively the maximal element in ALT_β^α
(iv) $|ALT_\beta^\alpha| > 1$ is verified in context
(v) if ALT_β^α is ordered, this order must be compatible with the argumentative order.

The difference between *also* and *anche* is then that a well behaved additive item like *also* works as if the status of greatest element of the associate must be ascribed only to the argumentative purpose it serves, and requires ALT_β^α to be unordered in all other respects. Instead, *anche* can make do with a set ALT_β^α that is ordered for independent reasons, as long as such an order is compatible with the argumentative ordering, as stated by condition (38v). Hence, a scalar reading is possible, but it is parasitic on an independently ordered domain. Apparently *also* is replaced by a specialised item when ALT_β^α is ordered.

5 Specific strategy–accommodation: *perfino, even*

Well behaved scalar items such as *perfino* and *even* always allow one to accommodate the existential presupposition, hence the associate always has to be viewed as the greatest upper bound in ALT_β^α as well as a maximal element.

Perfino is subject to condition (39).

(39) **constraints on** *perfino*
(i) ALT_β is partially ordered
(ii) ALT_β^α is always argumentatively ordered with the associate as its maximal element
(iii) the associate is a maximal element in ALT_β
(iv) the associate is the greatest element in ALT_β^α
(v) ALT_β^α is accommodated in context

5.1 Accommodation and contextually available resources

Constraint (39v) says that the existential presupposition has to be accommodated. However, scalar items are compatible with the presence of overt antecedents.

(40) Luisa ha incontrato il direttore e persino il presidente
Luisa met the director and even the president

We propose that the two strategies for satisfying the existential presupposition may be independently triggered and are expected to converge when overt antecedents of scalar particles are available. This may seem an uneconomical choice that goes against the idea that accommodation is a rescue strategy. Evidence in favour of a double attempt, comes from the existence of 'exceptional' additive readings of well behaved scalar items, such as Fauconnier's famous ex-

ample (41) concerning French *même* 'even'. In (41), and in the Italian corresponding sentence (42), the set of overt candidates for the role of antecedent does not exhibit a salient order, as confirmed by the possibility of commuting the elements.

(41) Georges a bu un peu de vin, un peu de cognac, un peu de rhum, un peu de calva et même un peu d'armagnac. (Fauconnier 1976, 17)
Georges drank a little wine, a little cognac, a little rum, a little calvados, and even a little armagnac

(42) Giorgio ha bevuto un po' di vino, un po' di cognac, un po' di rum, un po' di calvados e perfino un po' di armagnac.

When there is an overt but apparently unordered set of antecedents, the double attempt results in a bleached form of the scalar reading. On the one hand, particles try to verify their presuppositions in the context and, as a result, an independent additive reading can emerge. On the other hand, if no salient order is perceived, a scalar reading can still be built by accommodating an order based on quantities, since the associate is the last element of a sequence.

6 Evaluative (scalar-like) items: *addirittura*

The last item we are going to discuss in this paper is the Italian positive particle *addirittura*, which can be rendered only partly by English *even*. This item would presumably fit in the class that (König 1991) has labelled as evaluative items, as it takes an associate that must be perceived as ranking high.

Consider (43). It can be used in contexts where several people pulled strings, in which case it is equivalent to *perfino*, see (44), and translates as *even*.

(43) Per ottenere questo posto si è fatto raccomandare addirittura dal vescovo.
to get this job he got even the bishop to pull strings for him

(44) Per ottenere questo posto si è fatto raccomandare perfino dal vescovo.
to get this job he got even the bishop to pull strings for him

However, (43) is compatible also with a situation where the bishop is the only person who pulled strings, in which case tha sentence is not equivalent to (44) and the English rendering with *even* is no longer suitable. A better rendering is provided in (45), for which literal translations in Italian are given in (46).

(45) The bishop himself pulled strings for him to get him this job

(46) Per fargli ottenere questo posto, lo ha raccomandato il vescovo $\left\{ \begin{array}{l} \text{in persona} \\ \text{medesimo} \end{array} \right.$

ALT_β is viewed as the product of the focus component of a particle. The fact that a sentence containing *addirittura* can be used felicitously in a context where the proposition it expresses does not hold for a permutation of the associate, means that *addirittura* does not trigger a presupposition of existence. ALT_β^α might not be computed. Hence the associate can be characterised as a maximal element in ALT_β but it is not necessarily the upper bound of one of its subsets. Further evidence supporting this characterisation comes from example (47), where the bishop is considered to rank high on the scale of influential people but the indefinite article requires him to be one among several, which is still compatible with a situation where only one person

pulled strings.

(47) Per ottenere questo posto si è fatto raccomandare { addirittura da un vescovo / ∗da un vescovo in persona / ∗da un vescovo medesimo }
to get this job he got nothing less than a bishop to pull strings for him

Constraints imposed by *addirittura* concern the associate, as recorded in (48). The conditional form of (48iii) paves the way to a scalar reading but does not have to be matched with an existential presupposition

(48) **constraints on** *addirittura*
(i) ALT_β is a partially ordered set
(ii) the associate is a maximal element in ALT_β
(iii) if ALT_β^α can be computed, i.e. if $|ALT_\beta| > 1$ in context, then the associate is the upper bound of at least one of its subsets.

The need for constraint (48iii) is exposed by the contrast in (49). The presence of suitable antecedents triggers the computation of ALT_β^α, but all overt alternatives must rank lower than the associate.

(49) a. Per ottenere questo posto si è fatto raccomandare dal prete e addirittura dal vescovo
to get this job he got the priest and even the bishop to pull strings for him
b. *Per ottenere questo posto si è fatto raccomandare dal vescovo e addirittura dal prete
he got the bishop and even the priest to pull strings for him

7 Summary

We have discussed how the scalar and additive readings of *neanche* result from different ways of satisfying the existential presupposition in the absence of specific constraints on two choice points which are the structure of the set of alternatives and the strategy to adopt to satisfy such a presupposition.

Next, the behaviour of several items has been characterised as corresponding to different combinations of choices. When verification of the existential presupposition is required, the additive reading emerges, but the scalar reading is possible as parasitic on a set of alternatives that is ordered for independent reasons. This is the case of *anche*. When accommodation is selected, scalar readings are always possible. This is the case of *perfino*.

In order to develop a network of items, we have also exploited the different consequences that the use of the two notions of maximal and of upper bound have on the minimal cardinality of the set of alternatives. In this way, the evaluative and at times scalar item *addirittura* can also find its place.

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RUSSIAN PREDICATE CLEFTS: TENSIONS BETWEEN SEMANTICS AND PRAGMATICS*

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Abstract

Russian predicate cleft constructions have the surprising property of being associated with adversative clauses of the opposite polarity. I argue that clefts are associated with adversative clauses because they have the semantics of S-Topics in Büring's (1997, 2000) sense of the term. It is shown that the polarity of the adversative clause is obligatorily opposed to that of the cleft because the use of a cleft gives rise to a relevance-based pragmatic scale. The ordering principle according to which these scales are organized is relevance to the question-under-discussion.

1 Introduction

VP-fronting constructions have been attested in a wide variety of languages, including Haitian Creole, Yiddish, Swedish, Norwegian, Catalan, Brazilian Portuguese, Hebrew and Russian. Russian predicate clefts are constructions where the infinitival verb is presposed and its tensed copy is pronounced in situ. The present paper is devoted to exploring the semantics, pragmatics and discourse function of Russian predicate clefts (RPCs). The main puzzle that this paper addresses is the association of RPCs with adversative clauses of the opposite polarity. It is argued that the association of clefts with adversative clauses is due to the fact that clefts are S-Topic constructions in Büring's (1997) sense of the term S-Topic[1]. S-Topics have a special discourse strategy associated with them; this strategy consists of implicating the relevance of a set of questions that are sisters to the question dominating the sentence containing the S-Topic. It is shown that clefts are associated with clauses of the opposite polarity because, by using a cleft, the speaker makes salient a relevance-based scale based on relevance to the question-under-discussion. In the concessive clause, the lower value on the scale is affirmed; in the adversative clause, it is denied that a higher value on the scale holds, hence the crossed polarity pattern.

The paper is organized as follows. Section 1 is the introduction. In section 2, contexts in which clefts are used and their association with adversative clauses are discussed. Section 3 is concerned with the intonational properties of clefts. In section 4, Büring's theory of S-Topics is introduced and a case is made for analyzing RPCs as S-Topic constructions. A compositional analysis of RPCs is provided. In section 5, it is argued that the association of clefts with adversative clauses of the opposite polarity is due to the fact that clefts have discourse function of implicating the relevance of a particular question that is sister to the question dominating the predicate cleft and the overt or implicit adversative clause provides an answer to this question. It is shown that the opposite polarity pattern is due to the fact that the use of a cleft gives rise to a pragmatic scale. In Section 6, it is argued that the use of an

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[1] It needs to be noted here that Büring (1997) uses the term S-Topics (or sentential topics) and Büring (2000) uses the term "contrastive topics" in reference to the same phenomenon.

RPC gives rise to a conventional implicature that some proposition Q that is stronger on the relevance-based scale than the proposition P given rise to by the cleft does not hold. It is also shown that when the adversative clause is not overt the speaker conveys its content through a particularized conversational implicature. In section 7, the analysis is summarized.

2 The Data

The concessive clause in (1b), 'as far as reading it, he reads it', is an example of an RPC.

(1) a. Is he reading the book?
b. Čitat' -to eë on čitaet, no ne ponimaet.
read$_{INF}$ TO it$_{FEM.ACC}$ he reads but not understands
'As far as reading it, he reads it, but he does not understand it.'

The speaker of (1b) uses the RPC construction in order to indicate that some other topic[2] than the one addressed by the predicate cleft is more relevant in the given context. The more relevant topic of whether or not the referent of 'he' understands what he is reading is addressed in the adversative clause.

(2) a. Is she keeping in touch?
b. Ona pišet, no zvonit' ne zvonit.
she writes but call$_{INF}$ not calls
'She writes but, as far as calling, she does not call.'

In (2b), the cleft occurs in the adversative clause; the more relevant topic is her not calling. The topic addressed by the RPC is always contrasted with some other topic; the speaker uses the RPC to indicate which topic is the most relevant one in the given discourse situation.

In the default case, the cleft is associated with an overt adversative clause. As will be argued below, in certain contexts, the content of the adversative clause may be conveyed through an implicature. Concerning the role of the topic particle *to*, it needs to be noted that its presence is never obligatory; *to* may encliticize to the preposed verb to mark it as discourse-old in the sense of having been evoked in the prior discourse, as in (1b).

2.1 Contexts of Use

RPCs, being instances of preposing constructions, cannot be uttered out of the blue. The predicate cleft in (3) below cannot be uttered in response to a question like, "what's new?"

(3) Begat'-to ona begala, a v magazin ne xodila.
run$_{INF}$ TO she ran but in store$_{MASC.ACC}$ not went
'As far as running, she ran, but she didn't go to the store.'

(3) can be uttered in response to either of the following questions.

(4) Did she go to the store ?
(5) Did she run?
(6) Has she done everything she planned to?

The verb that is preposed in the predicate cleft may but need not be given.

(3) is a felicitous answer to the question in (6) if both interlocutors know that running and going to the store are on her "to do" list. In Ward and Birner's (2001) terms, (3) may be

[2] The term "topic" is not used in the technical sense in section 2.

felicitously uttered in response to either of the questions in (4-6) if 'running' and 'going to the store' are in poset relation as alternate members of the inferred poset "her 'to do' list ."

Next, consider the dialogue in (7) in a context where swimming is not something the referent of 'she' is wont to do.

(7) a. What did she do today?
b. # Plavat' ona plavala, no v magazin ne xodila.
swim$_{INF}$ she swam but in store $_{MASC.ACC}$ not went
'As far as swimming, she swam but she didn't go to the store.'

Preposing the verb for "to swim" is infelicitous in this context because swimming is not a member of the inferred poset "activities she is likely to engage in." If the predicate cleft construction is not used, the response is felicitous, as (7c) demonstrates.

c. Ona plavala, no v magazin ne xodila.
she swam but in store $_{MASC.ACC}$ not went
'She went swimming but she did not go to the store.'

2.2 The association of RPCs with adversative clauses

The RPC is either associated with an overt adversative clause or the content of the adversative clause is conveyed through an implicature.

(8) Speaker A:
a. What did she do today?
Speaker B:
b. # Guljat' ona guljala.
walk$_{INF}$ she walked
'As far as going for a walk, she went for a walk.'

Even if A and B know that going for a walk is on the list of activities she is likely to engage in, B's response is infelicitous. In contrast to VP-preposing constructions of the topicalization variety, the predicate cleft in (8b) can not be used to affirm an open proposition, "she did / did not go for a walk."[3] The RPC has discourse function of indicating that some other topic is more relevant in the given context. An RPC may be used without an adversative clause *if the interlocutors share enough information for the hearer to be able to compute the speaker's implicature that otherwise would have been overtly expressed in the adversative clause.*

Whenever a predicate cleft occurs on its own, there is a strong implicature to the effect that there is an issue that the speaker views as more relevant than the one addressed in the monoclausal predicate cleft construction.

(9) a. Did they move to their new office?
b. Pereexat'-to oni pereexali.
move$_{INF}$ TO they moved
'As far as moving, they moved.'

Possible Implicature: but they haven't renovated it.

The implicature that the predicate cleft gives rise to is a conversational implicature, as will be discussed in more detail below.

[3] One of the discourse functions of English VP-preposing constructions is affirming a speaker's belief in an open proposition that is salient in the previous discourse (Ward, 1990).
(i) Mary said she would go to Boston, and go to Boston she did.

3 Intonation Facts

In this section, it will be demonstrated that a particular intonational contour is associated with RPCs, which will be instrumental in accounting for the association of RPCs with adversative clauses.

(10) a. Who bought the tomatoes?
b. # Kupit' pomidory ona kupila, no salat ne sdelala.
buy$_{INF}$ tomatoes$_{ACC}$ she bought but salad not made$_{PERF}$
'She bought the tomatoes but she hasn't made a salad.'

In (10b), the NP 'she' receives focus because of its status as new information. The only felicitous pronunciation of (10b) is the one where the main pitch accent falls on 'bought', as in (11b).

(11) a. Did she buy tomatoes?
b. Kupit' pomidory ona kupila, no salat ne sdelala.
buy$_{INF}$ tomatoes$_{ACC}$ she bought but salad not make$_{PERF}$
'She bought the tomatoes but she hasn't made a salad.'

Next, consider the intonation pattern associated with RPCs.

(12) a. Does he know her address?
b. Znat' on ego ne znaet, no poiskat' možet.
know$_{INF}$ he it$_{MASC.ACC}$ not knows but search$_{PERF.INF}$ can
'He doesn't know it but he can look for it.'

Figure 1 below shows that in (12b) the preposed verb 'know' receives a LH* accent; the in-situ tensed verb 'know' also receives a LH* accent, which is the main pitch accent of the sentence. The verb 'can' in the adversative clause receives a L* accent.

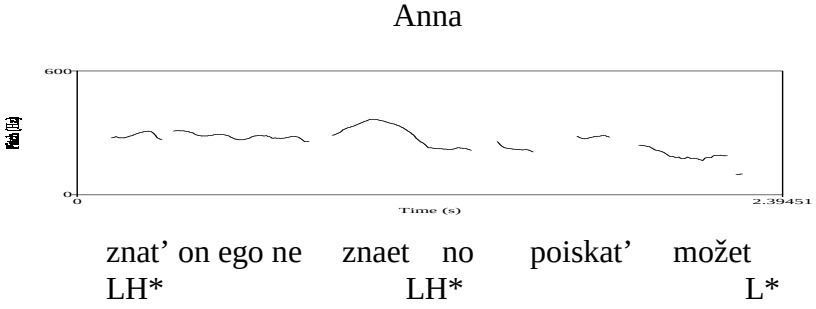


Figure 1. RPC

A variety of RPCs was recorded, and this particular intonation pattern obtained in all of them. It was found that there is a special tune associated with RPCs: a LH* accent on the fronted infinitival verb, followed by a high plateau, followed by a LH* accent on the in-situ tensed verb, followed by a high plateau, followed by a L* accent on the focused phrase in the adversative clause.

It needs to be noted here that the LH* accent on the preposed verb is due to the fact that a preposed phrase always receives a LH* accent in Russian. A variety of constructions where a phrase was preposed were recorded and the preposed phrase was invariably marked by a LH* accent. However, the LH* accent on the in situ tensed verb is unexpected. Incidentally, contrastive topics, or S-topics in Büring's terms, are marked by a LH* accent in Russian as well. In (13b) below, the NP *Anja* functions as an S-topic, as will become clear from the discussion of S-topics in the next section. The NP *Anja* is marked by a LH* accent.

(13) a: What did the women wear ?
b: Anja byla v dublënke.
Anja was in coat
'Anja wore a coat.'

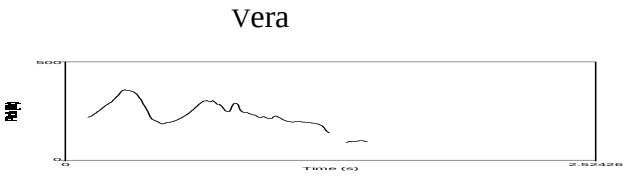


Figure 2. S-topic

The intonation contour associated with the RPC and the association of RPCs with adversative clauses will be accounted for by demonstrating that these properties follow from the fact that RPCs are S-Topic constructions in Büring's (1997) sense of the term.

4 Büring's Theory of S-Topics and the S-Topic Discourse Strategy

Büring (1997) introduces the notion of S-Topics to account for the coherence of discourses where one of the interlocutors provides a partial or even a seemingly unrelated answer to his addressee's question.

(14) Speaker A:
a. What book would Fritz buy?
Speaker B:
b. Well, I would buy *The Hotel New Hampshire*. (Büring 1997:66).
L*H

The L*H accent on the "I" in B's response is obligatory in order for it to be a felicitous response to A's question. On the face of it, the Focus value of the answer does not match the meaning of the question. While the question in (14) denotes a set of propositions of the type, "Fritz would buy Y," the focus value of the answer is, "I would buy Y." The dialogue in (14) is coherent because B's response is appropriate with respect to the Discourse-topic that is defined as a set of propositions that are informative with respect to the Common Ground. Propositions of the type, "X would buy Y," are informative with respect to the Common Ground. In, "X would buy Y," the topic as well as the focus introduces a set of alternatives. The Topic value of (14b) can be represented as a set of questions that obligatorily includes the original question, "What book would Fritz buy?" Questions in the topic value are formed by replacing the S-Topic with an alternative and questioning the focus of the original sentence containing the S-Topic, as in (15).

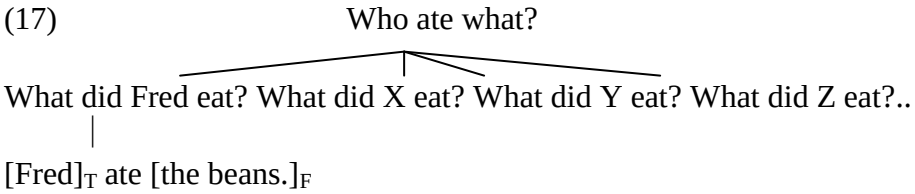
(15) {What book would I buy?, What book would Fritz buy?, What book would Mary buy?…} (Büring 1997:66-67).

In order for the utterance of a sentence containing an S-Topic to be felicitous, one of the answers to one of the questions in the topic value needs to be under discussion. In (14), the question, "What book would Fritz buy?" is under discussion prior to the utterance of the sentence containing the S-topic. This ensures that the sentence containing the S-Topic is informative with respect to the Common Ground. The use of an S-Topic is felicitous only if at least one of the alternatives to it is under discussion.

The use of an S-Topic indicates the following discourse strategy. In the discourse tree (d-tree) framework used in Büring (2000), the use of a sentence containing an S-Topic implicates the existence of a set of questions that are sisters to the question immediately dominating the sentence containing the S-topic.

(16) a. What did Fred eat?
b. $[\text{Fred}]_T$ ate the $[\text{beans.}]_F$
L*H

(17)



The use of the sentence in (16b) indicates a discourse strategy in the sense of implicating the relevance of questions that are sisters to the question immediately dominating the sentence, "Fred ate the beans." The generalized conversational implicature associated with the use of (16b) is that other people ate other foods (Büring 2000:4-7).

4.1 RPCs as S-Topic constructions

In this section, it will be argued that RPCs are S-Topic constructions in Büring's (1997, 2000) sense of the term. The following conditions need to be fulfilled in order for a construction to be classified as an S-Topic construction.

1) Phonologically, an S-Topic is obligatorily marked by a topic accent, and this accent must be different from the focus accent. As discussed in section 2, in the RPC, the in-situ tensed verb is obligatorily marked by a LH* accent that is distinct from the focus accent.

2) The use of a sentence containing an S-Topic is associated with a strategy of implicating that questions in the topic value of the S-Topic sentence are relevant. This is precisely the strategy that the use of an RPC indicates.

(18) Emu xotelos' blesnut' i obratitsja k dame na eë rodnom jazyke. Čitat'-to po-bolgarski on čital – kirillica ! – i daže pri ètom koe-čto ponimal, no ustnaja živaja reč' nikak ne poddavalas' ponimaniu: taratorjat.

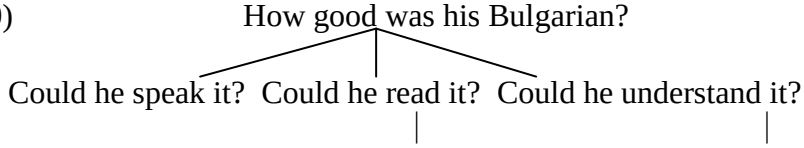
'He wanted to impress the lady by speaking to her in her native language. As far as reading Bulgarian, he could read it – they used the Cyrillic alphabet! -- and he even understood some of what he was reading, but the spoken language he couldn't understand – they were speaking too fast'. (Mamedov, Milkin, The Sea Stories. 2003).

In (18), the underlined predicate cleft cannot occur without being followed by an adversative clause, as (19) illustrates.

(19) Emu xotelos' blesnut' i obratitsja k dame na eë rodnom jazyke. # Čitat'-to po-bolgarski on čital – kirillica ! – i daže pri ètom koe-čto ponimal.

The use of the RPC in (18) implicates that a question different from the one addressed by the RPC is the most relevant one in the given discourse, namely, the protagonist's command of spoken Bulgarian. As the discourse tree in (20) illustrates, this question is addressed in the adversative clause and is sister to the question immediately dominating the predicate cleft.

(20) How good was his Bulgarian?



as far as reading Bulgarian, he could read it... but the spoken language he couldn't understand...

3) In order for the use of a sentence containing an S-Topic to be felicitous, one of the questions in the topic value of the S-Topic sentence needs to be under discussion. The use of an S-Topic is possible only if at least one of the alternatives to it is under discussion. In (18), the question, "Could he speak Bulgarian?" is under discussion prior to the utterance of the cleft because in the discourse preceding the cleft it is mentioned that the protagonist wanted to speak to the lady in Bulgarian.

4.2 RPCs as S-Topic constructions: a formal account

First, it needs to be determined what phrase in the RPC can be analyzed as an S-topic. Both the preposed infinitival verb and its in situ tensed copy are marked by the LH* topic accent. As demonstrated, topicalized phrases are marked by LH* in Russian. If the preposed verb alone were construed as an S-topic, it would be puzzling why its in situ tensed copy obligatorily bears the LH* topic accent as well. The in situ tensed verb has the status of being given, thus its being marked with the LH* topic accent must convey some additional meaning. This meaning is that of being an S-topic; the tensed verb in situ will be analyzed as an S-topic in Büring's sense of the term.

In Büring's framework, the S-topic introduces a set of alternatives. In the case of RPCs, the verb in situ is an S-Topic that introduces a set of alternatives. Crucially, the adversative clause associated with the cleft is a member of this set. This is due to the fact that the use of a predicate cleft is associated with a strategy of implicating that a set of questions that are sisters to the question immediately dominating the cleft is relevant; the adversative clause is an answer to one of these questions.

Consider how this would work on the following constructed example.

(21) Čitat' Maša čitaet, no ne ponimaet.
read$_{INF}$ Masha read but not understand
'As far as reading, Masha reads but she does not understand what she is reading.'

(22) As far as reading, Masha [reads]$_T$ but she does not [understand]$_F$

The focus on the verb "understand" introduces a set of alternatives. The focus value of (22) is given in (23).

(23) {read Masha read but not understand, read Masha read but not write...}

The Topic value of (22) is a set of such sets with alternatives to the S-Topic. Consider Büring's interpretation rule (50) in the Appendix for deriving the topic value of a sentence in which one phrase is topic-marked and another one is focus-marked. By rule (50), the topic value of (22) is as in (24):

(24) {{read Masha read but not understand, read Masha read but not write...}, {sing Masha sing but not understand, sing Masha sing but not write...}}

Consider Büring's (1997) interpretation rule for deriving the topic value of a sentence given in (51) in the Appendix. By the rule in (51), the topic value of (22) is as follows.

$[[22]]^t$ = λP. ∃H [H∈ ALT (read') & H(Masha) & P = λp. ∃Q [Q∈ ALT (understand') & H∈ ALT (understand') & p = ¬Q (Masha)]]

4.3 The compositional analysis of RPCs

Abels' (2001) syntactic analysis of RPCs will be adopted here. Abels (2001) argues for the movement analyses of RPCs, with both copies of the verb being phonetically realized.

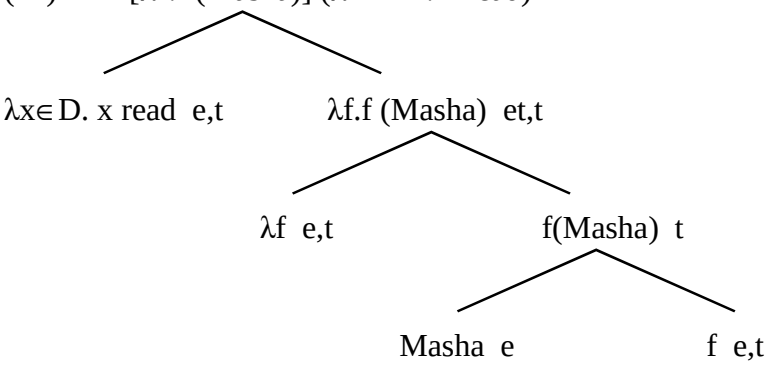
(25) $[_{CP}\ldots\ [_{XP}\ [_{VP}\ldots V_{inf}\ldots]\ldots[$-*to*...$[_{IP}\ldots V_{fin}\ldots]]]$ (Abels, 2001, p. 10).

Next, consider a constructed RPC in (26) and its semantic derivation in (27) below.

(26) Čitat' Maša čitaet.
read$_{INF}$ Masha reads
'As far as reading, Masha reads.'

In my semantic analysis, I am ignoring the difference between the infinitival verb and the tensed verb. In (27) below, first, the function f that is a trace of the moved VP combines with the NP "Masha." Then lambda abstraction over f takes place. After that, the infinitival verb is combined with the product of the lambda abstraction, which results in the RPC meaning on top of the tree.

(27) [λf.f (Masha)] (λx ∈ D. x read)



The truth conditions of the sentence in (26) are as in (28).

(28) [λf.f (Masha)] (λx ∈ D. x read) = 1 iff Masha reads.

In the tree in (27), I provided a compositional analysis of the RPC in which the verb "read" is used intransitively. It needs to be noted here that my analysis would have to be elaborated to account for RPCs with transitive verbs in which the direct object may either be preposed as part of the preposed VP or, alternatively, is scrambled out of the VP, with the VP being subsequently preposed.

5 Why RPCs are Associated with Adversative Clauses

As demonstrated, RPCs have discourse function of S-Topics -- the use of an RPC indicates a strategy that consists of implicating the relevance of questions in the topic value of the cleft. In addition, the speaker of a cleft indicates the sub-strategy that consists of indicating which specific question among the questions in the topic value of the cleft is relevant in the given discourse. As previously argued, the adversative clause can be implicated rather than overt if the following condition holds.

(29) *The interlocutors share enough information for the hearer to be able to compute the speaker's implicature that otherwise would have been overtly expressed in the adversative clause.*

When contextual information is not sufficient for the addressee to infer from the context the question whose relevance is implicated by the use of an RPC, the speaker uses an overt adversative clause that provides an answer to this question. When the addressee is able to infer the question and the answer to it from the context, the content of the adversative clause providing the answer may be expressed through a conversational implicature.

5.1 The crossed polarity pattern and pragmatic scales

Whenever an RPC is followed by an overt adversative clause, the polarity of the adversative clause is the opposite of that of the cleft (e.g., (1), (2), (18)).

The following constructed examples demonstrate that violating the crossed polarity pattern requirement leads to deviance.

(30) a. Did she buy tomatoes?
b. * Kupit' pomidory ona kupila, a ogurtsy u neë byli.
buy$_{INF}$ tomatoes$_{ACC}$ she bought but cucumbers$_{ACC}$ at her were
'She bought the tomatoes but the cucumbers she already had.'
c. Kupit' pomidory ona kupila, a ogurtsy ne kupila.
buy$_{INF}$ tomatoes$_{ACC}$ she bought but cucumbers$_{ACC}$ not bought
'She bought the tomatoes but the cucumbers she didn't buy.'

The contrast between (30b) and (30c) demonstrates that the reason why the RPC in (30b) is deviant is that the crossed polarity pattern requirement is violated.

Next, consider an RPC where both the clause containing the cleft and the adversative clause have negative polarity.

(31) a. Has she answered the email?
b. * Otvetit' ona ne otvetila, no u neë ne bylo vremeni.
answer$_{INF}$ she not answered but at her not was time
'She didn't answer the email but she didn't have time.'

If a predicate cleft is not followed by an overt adversative clause, it gives rise to an implicature of the opposite polarity, as (32) illustrates.

(32) Context: A and B know that Mary is not sure if she should write to John or not.
Speaker A:
a. Did Mary write John a letter?
Speaker B:
b. Napisat'-to pis'mo ona napisala.
write$_{INF}$ TO letter she wrote
'As far as writing the letter, she wrote it.'

Implicature: the speaker does not know if Mary sent the letter.

In accounting for the crossed polarity pattern, I would like to adopt Lee's (2002) insight that the use of CT (or S-topic, in Büring's terms) gives rise to a scale. According to Lee (2002), the use of a CT predicate gives rise to a Horn scale; event descriptions are ordered on the scale based on degree of accessibility to the ultimate goal in the relevant series of events.

However, the notion of accessibility to the ultimate goal in the relevant series of events is too narrow to account for the types of scales RPCs may give rise to. While in Korean predicate clefts, only stage-level predicates may be used, in RPCs, individual-level predicates may be used as well. Moreover, RPCs give rise to scales that are not entailment-based. A constructed example in (33) illustrates that the use of an RPC gives rise to a pragmatic scale.

(33) Context: A and B are trying to decide if Miss Clark or Mary would be a better French tutor for their son. A knows nothing about either of the two candidates, and B knows that Miss Clark has a degree in French but doesn't like French and that Mary loves French but is incompetent.

Speaker A:
a. Would Miss Clark be a good tutor?
Speaker B:
b. Znat' francuskij ona znaet, no ne lubit.
know$_{INF}$ French she know but not love
'As far as knowing French, she knows it, but she doesn't like it.'

The pragmatic scale relevant for (33) is as in (34).

(34) <love French, know French>

The question under discussion (QUD)[4] that the RPC in (33b) addresses is, "Would Miss Clark be a good tutor?" If speaker B were to follow up his utterance with, "I think that she would make a good tutor," he would sound contradictory. A natural continuation of (33b) is, "So I don't think she would make a good tutor." This is evidence to the effect that B's response conveys a negative answer to the QUD – "no, Miss Clark wouldn't be a good tutor." The concessive and adversative clauses of B's reply in (33) constitute two parts of his answer to the QUD. The concessive clause containing the cleft provides an inconclusive answer to the QUD. It is the adversative clause that implicates the negative answer to the QUD that speaker B wishes to convey. These intuitions about the exchange in (33) are reflected in the scale in (34). "Love French" is stronger than "know French" on the pragmatic scale based on *relevance to the QUD*.

Next, consider the dialogue in (35) that takes place in the same context as the one in (33).

(35) Speaker A:
a. Would Mary be a good tutor?
Speaker B:
b. Lubit' francuskij ona lubit, no počti ne znaet.
love $_{INF}$ French she love but almost not knows
'As far as liking French, she likes it, but she hardly knows it.'

As in (33), in (35), B's response may not be felicitously followed up with, "I think that she would make a good tutor." B's response conveys a negative answer to the QUD, "Would Mary be a good tutor?" The exchange in (35) gives rise to the following scale.

(36) <know French, love French>

"Know French" is ranked higher than "love French" because the concessive clause in which "love French" is affirmed does not answer the QUD conclusively. In other words, "know French" is ranked higher because its denial provides a conclusive answer to the QUD that speaker B wishes to convey.

The following dialogue illustrates that pragmatic scales that RPCs give rise to are based on relevance as it is perceived by the speaker of the cleft, not necessarily as perceived by both interlocutors.

Assume that the dialogue below takes place in the same context as the one in (33).

[4] In the pragmatic literature, the term QUD is often used in reference to different phenomena. In the present paper, I am using the term QUD in reference to the either explicit or implicit question that is the most salient one during a given stage in the conversational exchange. Büring (2000) uses the term "question-under-discussion" in reference to the same phenomenon.

(37) Speaker A:
a. Does Mary like French ?
Speaker B:
b. # Znat' francuskij ona ne znaet, no lubit.
know$_{INF}$ French she not know but love
'As far as knowing French, she doesn't know it, but she loves it.'

(37b') shows that if an RPC construction is not used, this response is fine.

b': Ona francuskij ne znaet, no lubit.
she French not know but love
'She doesn't know French but she loves it.'

The dialogue in (37) illustrates that the adversative clause in the RPC cannot contain an answer to an overt immediate QUD; only the clause containing the cleft can answer an immediate QUD. Thus B's response in (37) would have been felicitous as an answer to a question, "Does Mary know French?" As it stands, the exchange in (37) is infelicitous because, as it was previously argued, discourse function of RPCs is indicating that a different question (or topic) than the one addressed in the concessive clause is the more relevant one. The more relevant topic is addressed in the overt or implicated adversative clause. In (37), speaker B's use of the cleft in response to A's question suggests that he considers some topic other than Mary's liking French more relevant in the given context. Speaker B appears to contradict himself when he ends up addressing the subject of Mary's loving French in the adversative clause, hence the infelicity of (37b). In a nutshell, (37) illustrates that the speaker of the RPC is the one indicating to the addressee which topic he considers more relevant. Thus the pragmatic scale that the use of an RPC gives rise to is based on relevance to the QUD *as perceived by the* speaker *of the cleft.*

As far as the crossed polarity pattern between the cleft and the adversative clause is concerned, it needs to be noted that this requirement is pragmatic rather than semantic, as will be illustrated below. Consider the RPC in (38), where both clauses have positive polarity.

(38) Prijti ona prišla, no pozdno.
come$_{INF.}$ she came but late
'She came over, but she came over late.'

In (38), both the cleft and the adversative clause have positive polarity. The adversative clause contains an elided VP "came"; "came late" is an alternative to "came," which is the S-topic. The overt adversative clause "but late" introduces a new question in the topic value, namely, "Was she on time ?" and provides a negative answer to this question. The relevant pragmatic scale is given in (39):

(39) <come over on time, come over>

The adversative clause gives rise to the implicature, "she did not come over on time." Thus it is implicated that the higher value on the scale does not hold. In (38), the polarity of the relevant scalar implicature is opposed to that of the concessive clause; the scalar implicature rather than the overt adversative clause satisfies the crossed polarity pattern.

To summarize, RPCs are associated with clauses of the opposite polarity for the following reason. The use of an RPC introduces a pragmatic scale, and the concessive clause affirms a lower value on the scale, while the adversative clause denies that a higher value holds. This observation is formalized in (40).

(40) *The proposition given rise to by the RPC containing an S-topic predicate P is contrasted with an either overt or implicit adversative proposition "'but' ¬ Q" for*

positive clefts and "'but' Q" for negative clefts, with predicate Q being stronger than P on the relevance-based pragmatic scale that the speaker's use of the RPC gives rise to.

It needs to be noted here that an RPC may either be followed by an adversative clause or, in some cases, it may be preceded by a concessive clause and may occur in the adversative clause, as in (41).

(41) Ona francuskij znaet, no lubit' ne lubit.
she French know but $love_{INF}$ not loves
'She knows French but, as far as loving it, she doesn't love it.'

If an RPC occurs in the adversative clause, it has the same discourse function as an RPC occurring in the concessive clause. An RPC occurring in the adversative clause indicates the sub-strategy associated with RPCs, i.e., it indicates which specific question in the topic value of the RPC is the most relevant one in the given discourse. By using the predicate cleft in the adversative clause, the speaker indicates that the question dominating the cleft is the most relevant one in the given discourse. The answer to this question is contrasted with the answer to the question dominating the concessive clause preceding the cleft. The use of (41) gives rise to the scale where "loving French" is ranked higher than "knowing French." In light of the fact that an RPC can occur in the adversative clause, the condition in (40) needs to be modified to the one in (42).

(42) *The RPC containing an S-topic predicate may occur either in the concessive or adversative clause. The concessive proposition given rise to by the clause containing predicate P or ¬P is contrasted with the adversative propositions "'but' ¬ Q" or "'but' Q," respectively, with predicate Q being stronger than P on the relevance-based pragmatic scale that the speaker's use of the RPC gives rise to.*

6 Conventional and Conversational Implicatures Generated by the RPC

By the condition in (42), the utterance of the RPC gives rise to the implicature that some predicate Q that is stronger than predicate P employed in the cleft does not hold. This is the *conventional* implicature associated with RPCs. From this it follows that the predicate whose truth is affirmed or denied in the RPC cannot be the maximal value on the scale the RPC gives rise to. Consider a case where using in the cleft the strongest item on the relevant scale leads to infelicity.

(43) SpeakerA:
a. How good is his Bulgarian ?
Speaker B:
b. # Znat' on ego v soveršenstve znaet.
$know_{INF}$ he it in perfection know
'As far as knowing Bulgarian, he knows it perfectly.'

Speaker C
c. Znat' on ego znaet.
$know_{INF}$ he it know
'As far as knowing Bulgarian, he knows it.'

A's question and B's infelicitous response in (43b) give rise to the following scale that the two interlocutors share.

(44) < know Bulgarian perfectly, know Bulgarian moderately well, know Bulgarian badly>

B's response in (43) would have been felicitous without the modifier "perfectly." The modifier "perfectly" cannot be used because the RPC in (43b) ends up affirming the highest value on the scale in (44) -- "know Bulgarian perfectly."

In contrast, C's response in (43c) is felicitous and may implicate that the referent of 'he' knows Bulgarian but does not like it, in which case C's utterance of the cleft would give rise to the scale in (45).

(45) <like Bulgarian, know Bulgarian>

When an RPC is associated with an overt adversative clause, the clause containing the RPC affirms proposition P and gives rise to the conventional implicature that some proposition Q that is higher on the relevant scale does not hold. This implicature is non-cancelable.

(46) Given that P is the content of the RPC, the RPC generates the following *conventional* implicature:

"'¬ Q' for some Q that is stronger than P on the relevance-based pragmatic scale."

When the speaker utters the adversative clause, the hearer learns the exact content of Q. Thus the utterance of (43c) generates the conventional implicature that some higher value than "know Bulgarian" does not hold and the conversational implicature, "he does not like Bulgarian." If the speaker of (43c) were not sure that his addressee would be able to compute this implicature, he would have followed up the cleft with an overt adversative clause, "but he does not like Bulgarian." Because the speaker of the cleft is often unsure that the hearer can infer the content of the scale that his use of a given RPC generates, the speaker often utters rather than merely implicates the adversative clause.

The speaker of a cleft may convey the content of the adversative clause through a *particularized conversational implicature* (PCI), given that his addressee has sufficient information to compute its content. (47) illustrates how this implicature is computed.

(47) Context: A and B know that Mary is thinking about sending John a letter but is unsure if she should send it.
Speaker A:
a. Did Mary write John a letter?
Speaker B:
b. Napisat'-to pis'mo ona napisala.
write$_{INF}$ TO letter she write
'As far as writing the letter, she wrote it.'

Implicature: the speaker does not know if Mary sent the letter.

(48) Computing the Implicature:

While providing a direct answer to A's question, B employed a marked construction. By Levinson's (2000) M Heuristic, "what is said in an abnormal way isn't normal" (Levinson, p. 38). B would not have used a marked construction unless he intended to convey some additional meaning, this meaning being that, apart from the writing of the letter, some of Mary's actions are relevant in the given discourse. By Levinson's (2000) Q-principle, if B were in a position to make a more informative statement about actions that Mary performed, he would have done so. By Grice's (1975) maxim of Relevance, since B did not make such a statement, yet implicated the relevance of Mary's actions, he must have intended to convey the meaning that he is unsure if Mary performed some other relevant action(s). The interlocutors share the knowledge that sending the letter is a relevant action. B's utterance of (47b) gives rise to the ignorance implicature that B is unsure if Mary sent the letter.

In (47), initially, the QUD is, “Did Mary write John a letter?” By using an RPC, speaker B shifts the QUD to a broader QUD, “Did Mary contact John?” B’s use of the RPC in (47) and the implicature it generates give rise to the following pragmatic scale.

(49) <send the letter, write the letter>

The cleft asserts the weaker value on this scale; however, it does not provide a satisfactory answer to the broader QUD. Whether or not the stronger value on the scale -- “send the letter” -- actually holds is more relevant to the broader QUD. If it does not hold, a negative answer to the broader QUD would be conveyed and vice versa. If speaker A believed that B knew for a fact whether or not Mary sent the letter, he would have taken B’s utterance to convey the PCI, “Mary did not send the letter.”

The conversational implicature the cleft gives rise to is particularized rather than generalized because it is entirely context-dependent. Thus, if (47b) were uttered in a context where A and B shared the knowledge that the postal service is unreliable, the utterance of (47b) would have generated the implicature, “the speaker does not know if the letter will be delivered.”

7 Conclusion

The main puzzle that was addressed here was the association of clefts with adversative clauses of the opposite polarity. It was argued that the association of clefts with adversative clauses is due to the fact that clefts are S-Topic constructions. The speaker of the cleft implicates the relevance of a set questions in the topic value of the cleft and indicates which specific question in this set is relevant in the given discourse. Typically, a cleft is associated with an overt adversative clause that addresses the more relevant question. Alternatively, the content of the adversative clause may be implicated if the interlocutors share enough information for the hearer to be able to compute the speaker’s conversational implicature that otherwise would have been overtly expressed in the adversative clause.

As far as the opposed polarity pattern is concerned, it was argued that it arises because the use of an RPC gives rise to a relevance-based scale. The concessive clause affirms a lower value on this scale and the higher value is denied in the adversative clause. The use of an RPC conventionally implicates that some proposition that is stronger on the relevance-based scale than the one given rise to by the cleft does not hold.

While a substantial amount of work has been done in neo-Gricean pragmatics on exploring the maxims of Quantity and Quality, the maxim of Relevance is the least studied and the least understood of Grice’s maxims. (Relevance theory is based on the notion of relevance that is radically different from the maxim that was originally proposed by Grice). In the light of some observations concerning the generation of implicatures that were made in this paper, I would like to briefly suggest a way of formalizing the maxim of Relevance within the question under discussion framework (Roberts, 1996) [5]. The maxim of Relevance may be conceived of as demanding relevance to the QUD. The mechanism behind generating a Relevance implicature is that a speaker flouts the maxim of Relevance because his utterance does not address the QUD, or addresses it indirectly or partially. However, the implicature that the speaker conveys through producing this utterance does address the QUD directly; thus the speaker obeys the maxim of Relevance at the level of the implicature that the utterance gives rise to.

[5] It needs to be noted here that the idea to make a connection between Relevance and the question under discussion is implicit in van Rooj (2003), who proposes to rank answers to a salient question in terms of informativity and relevance to the question.

Appendix

Topic semantic value:

(50) $[[\text{HANS}_T \text{ IS COMING}_F]]^t = \{\{Ch, Lh\}, \{Cf, Lf\}, \{Cm, Lm\}\}$

(L = is leaving)

The topic value of (50) may be represented as follows using λ-notation:

(51) $[[50]]^t = \lambda P.\ \exists x\ [x \in \text{ALT (hans)} \ \&\ P = \lambda p.\ \exists Q\ [Q \in \text{ALT (is-coming)} \ \&\ p=Q(x)]]$

(based on Büring 1997, pp. 78-79).

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DECOMPOSING PATH SHAPES: ABOUT AN INTERPLAY OF MANNER OF MOTION AND 'THE PATH'*

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Abstract

In this paper we will develop a formal conceptual model of how the path in a motion situation interacts with the semantic analysis of so called 'motion shape verbs' like 'wackeln' ('wobble'), a subclass of the so called 'manner of motion verbs'. Central to this model will be the distinction between two concepts of motion: *translational* motion and *nontranslational motion*, which has no inherent translational component but puts emphasis on describing specific *Motion Shape Patterns*. We will define and algorithmically describe a theory of *Path Shape Decomposition* that aims at algorithmically deriving the translational vs. nontranslational distinction from the shape of the path. To account for object internal motion, we additionally introduce Bounding Box encapsulation, which yields a topological division of inner and outer movement. Finally we demonstrate how the outcome of such a technical decomposition can be used in modelling a Path Superimposition scenario like 'Peter wackelt über die Straße'.

1 Introduction

Compared to path, not much research has been done concerning a formalization of manner of motion. Research in manner of motion has not yet reached a status of formal modelling. It is even unclear what the role of manner information in semantic modelling should be: decompositional semantic approaches do not assign manner an important role in word meaning modelling: formal abbreviations like '… & MOD_{MOVE} & …' have not cared about further details. In formal semantic representations (e. g. (1), from Kaufmann (1995, p. 225f)), however, the *only* visible difference in meaning lies hidden in the manner information, which has not been formally elaborated:

(1) a. $\lambda P \lambda x \lambda s[\text{GEH}_P(x) \& \text{MOVE}_P(x) \& P(x)](s)$
b. $\lambda P \lambda x \lambda s[\text{SPRING}_P(x) \& \text{MOVE}_P(x) \& P(x)](s)$

The division between the two motion concepts of GO and MOVE, however, is widely accepted; Talmy (1983, 1985) and Jackendoff (1991) elaborate this division. Habel (1999) summarizes this unsymmetry in the state of the art as follows: "Während räumliche Konzepte – etwa durch das PATH-Konzept (Jackendoff 1990) – in systematischer Weise in die semantische Beschreibung von Verben der Fortbewegung eingehen, *fehlt eine entsprechende systematische Einbeziehung räumlicher Konzepte in der lexikalisch-sematischen Analyse der anderen Bewegungsverben bisher weitgehend.* (p. 106) [While spatial concepts like the PATH concepts enter into semantic modelling of motion verbs in a systematical way, there is no systematic theory of

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other motion verbs including spatial concepts so far. Translation by author, emphasis added.]". With his analysis of German 'drehen' ('turn'), Habel (1999) presents one first step towards an analysis of the sub-class 'manner of motion verbs'.

Levin (1993, p. 264ff) lists *manner of motion verbs* in her 'verb classes' collection; and Levin and Rappaport Hovav (1995) further investigate the distinction between GO and MOVE as concepts. They define MOVE as motion without necessary change of location. Yet what – besides syntactic behaviour, which is a central criterion in Levin (1993) – acts as central feature for this category, what is common to all these verbs? In other words, what makes a verb a 'manner of motion' verb? And, finally, what is the semantic impact of manner of motion?

Maienborn (1994) presents a regularity that explains why sentences like (2-a) are much better than sentences like (2-b): Verbs are able to temporally behave like a translational motion verb and thus subcategorize a path argument.

(2) a. Peter wackelt über die Straße. (Peter is wobbling over the road)
b.???Anja liest in die Küche. (Anja is reading into the kitchen)

A selectional restriction for this effect lies in the connection to contextual and world knowledge: "Das in Frage stehende Prädikat muss auf eine essentielle Eigenschaft der Fortbewegung Bezug nehmen" [The predicate in question has to refer to an essential characteristic of translational motion.] (Maienborn (1994), p. 240). However, Maienborn does not offer a formal model. We will come back to this with a sketch how to apply our model in section 4.

1.1 Path Shape Verbs

Modelling manner of movement can be grouped into at least three components, all containing several conceptual dimensions:[1] (A) path shape (in which way does the motion relate to the space it is living in); (B) physical parameters of space and time (contact with surfaces, the influence and omnipresence of gravity, speed of motion); (C) an agentive-intensional component, attitudes, and many other parameters (like 'psychological state of figure in motion' – cf. 'gubagguba' in the Language Luganda ('trudge for a long distance with a sad event ahead'), example from Dimitrova-Vulchanova and Martinez (2005)). Consider Dimitrova-Vulchanova and Martinez (2005) for a recent empirical elaboration of dimensions of manner modelling. Based on their classification, one might sketch a Modular Conceptual Space as in (3):

(3) $\Big\langle \langle_{\text{PATH}}$ path shape, grain level of specification[2], $\dots \rangle$,
$\langle_{\text{OBJECT}}$ $\pm$ANIMATE, $\pm$USEOFLIMBS, orientation, intension, attitudes, $\dots \rangle$,
$\pm$TRANSLATIONAL, $\pm$ROTATIONAL, $\pm$DEFORMATIONAL, speed, $\dots \Big\rangle$

In the current paper we will approach the question how manner of motion information can be described. How can it be anchored to semantics, to conceptual knowledge, to situation representation, and, finally, to the lexicon? And what is the role of the path in this game? We will narrow down the problem onto one of the dimensions: We suggest, while restricting ourselves to an elaboration of Path Shape, that manner of motion verbs express significant micro-variation

[1] These dimensions can be modelled as a Modular Conceptual Space, as Geuder and Weisgeber (2006) define it. This offers the advantage that for each module ('domain') the most suitable architecture can be chosen locally. Modules together with intermodule communication establish a Modular Conceptual Space.

[2] As van der Zee and Nikanne (2005) define it: There are three grain levels of Path Shape specification, grain 0: no focus on path shape like in 'go', grain 1: focus on global path shape as in 'curve', grain 2: focus on local path shape as in 'zigzzag'.

on the path involved. We define, in a pretheoretical fashion:

Definition 1 (motion shape verbs) *motion shape verbs (class* MOM*) are those verbs of motion which give more information about details of the motion going on than just starting point, via points and ending point of a path. They need not be specified for a change of place.*

Note that this class is orthogonal to what is often called *verbs of locomotion* (see, for example, Eschenbach et al (2000)); and in our case it is definitely not meant to be a basis for categorization – since we assume scales of increasing informativeness of manner representations, as in ⟨'go' $<^*$ 'fahren' ('drive'), 'fliegen' ('fly') $<^*$ 'wackeln' ('wobble')⟩, where $<^*$ is a suitable measure.

Examples for motion shape verbs are: 'crawl', 'creep', 'wobble', 'shiver', and many others. A subclass is the class of pure *Path Shape Verbs* like 'spiral', 'curve', 'zigzag'.

Consider, as an example, (4):[3]

(4) 30 Tonnen Waren wackeln auf den Köpfen von rund 650 Lastenträgern auf
30 tons of goods are wobbling on the heads of about 650 carriers on
Bergpfaden in Richtung Marktplatz.
mountain paths towards market place.
(http://www.spiegel.de/wissenschaft/mensch/0,1518,360820,00.html, 17.6.2005)

The theme of the motion situation given in (1) ('30 Tonnen Waren') is being transported along an atelic (unbounded) path with specified Via ('auf Bergpfaden') and Direction ('in Richtung Marktplatz'). The verb 'wackeln', however, does not basically express translational movement but a *movement shape*: while fixed at a position, the theme moves in a defined cyclic pattern with a defined speed.

Finally, how should meanings of verbs like 'wackeln' and the combination with a path-PP be lexicalized? In the course of this paper, we will argue that a path can be divided into cyclic patterns and a translational component and that linguistically, the translational components refer to (intended) motion from a source *a* to a goal *b* as expressed in PPs, while the cyclic patterns refer to manner-of-movement information as expressed in path shape verbs and -adverbs. In the following sections we will first see which hints and answers current research is offering, we will then analyse the connection between motion and path shape. In a next step we will formally introduce *Path Shape Decomposition*, starting from a discussion of technical requirements. We will demonstrate that the *shape of a path* is the result of merging a translational source-goal component (e. g. as expressed in the path-PP) and a number of what we call *movement shape patterns* (normally implicitly expressed in manner-verbs or -adverbs). Finally we will discuss some case studies and provide examples for lexical entries. [4]

1.2 Decomposing Motion

Engelberg (2000) argues in favour of an analysis assuming two parallel subevents, and presents linguistic as well as psychological evidence. He calls manner of motion verbs *Zweibewe-*

[3] We have tried to give English translations for all German examples. These glosses, however, do not in all cases provide a 1:1 mapping of sense. Also, judgements of examples cannot be directly transferred here.

[4] Note, additionally, that our notion of Path Shape is different from, but not contradictory to, what Zwarts (2006) calls 'event Shape': his proposal is to include a Path notion into the lexical meaning of verbs like 'enter' and prepositions like 'into' such that the pairwise similarity between both in spatial terms is reflected in a parallel construction of the lexical entry. Doing so, however, he remains on a grain level which does not affect what we call 'motion shape'.

gungsverben (≈ *dual movement verbs*)[5]: he assumes two movements taking place simultaneously in the same event: a *translational movement* and, relative to that, an *eigenmovement of the participant*. He assumes these two subevents as central components of the semantic structure. Put in Path Shape analytical terms: there is a relation between translational motion along a path on the one hand and cyclic motion patterns performed by the object on the other. Path Shape Decomposition can here be taken as a formal account to more formally describe this interplay by linking the path shape patterns to subevent descriptions in order to see which is the influence of both subevents onto the resulting Path Shape.

Shaw, Flascher and Mace (1994, p. 485f) report the observation that subjects decompose observed motion. The motion of a rolling wheel is recognized as a decomposition of a *translation* of the middle point and a *rotation* of another point round the middle point. Therefore the authors claim that decomposition of the event leads to a more basic way of describing a complex motion event. This finding backs our approach, since we believe that path decomposition enables us not only to describe and represent motion events as a whole, but also that most basic patterns of a complex motion are conceptually linked to the meaning of manner of motion verbs.

Musto et al (2000) report the empirical finding that when subjects observe moving dots on a screen and after it draw the path how they remember it, performance increases (or even overgeneralizes) when subjects recognize certain patterns in the path. This, again, supports our argument that decomposing the Path is an efficient way of analysing the informational content of Path motion situations.

To conlude: A translational and a cyclic nontranslational motion component can be present within the same verb. This results in a complex path shape: Whenever in a motion event the path is significantly not neutral (grain 0), the path shape can be decomposed into a sum of more simple Path Shape Patterns which are linked to the meaning of manner verbs and -adverbs. In the following we will finally present the Path Shape Decomposition framework. We will see how a Path Shape decomposition is used to form the link to lexical modelling of motion shape verbs.

2 Path Shape Decomposition

In this chapter we will develop a formal conceptual model of how the path in a motion situation interacts with the semantic analysis of motion shape verbs. Central to this model will be the distinction between two concepts of motion. – The first is a concept of *translational* motion. This component can be modelled by a suitable path theory, as has been proposed in various approaches in literature, and as we are also modelling in other current work (Weisgerber forthcoming). The second motion concept has no inherent translational component but puts emphasis on describing specific *motion patterns*. The latter cannot be described by current path theories: semantic path theories are not designed to represent path in a granularity that is both fine enough to represent a motion in all its details, and technically equipped to account for cyclic path shapes that emerge from this motion.

In order to account for this problem we will decide on a pointwise path definition that allows for a fine grained focus. We will define and algorithmically describe a theory of *Path Shape Decomposition* that aims at algorithmically deriving the translational vs. nontranslational distinction from the shape of the path.

[5] all terms originally German, English terms suggested by the author of this paper

2.1 Introducing the model

To start with we define the distinction between *translational* and *nontranslational movement*:

Definition 2 (translational vs. nontranslational movement) *Let, preformally, a* ***place*** *be a 'possible location for an object in space'. We call a movement a* ***translational movement*** *if it is a movement of an object on a path starting at a source and ending at a goal (→'change of location') and no place is visited more than once. We call a movement a* ***nontranslational movement*** *if it is a movement pattern with no source and goal defined, where the object repeatedly returns to a place or a position after a short finite time.*[6]

Take, for example, 'go' as a translational movement: an object moves on a path from a source *a* to a goal *b*; and take 'wobble' as an example for a nontranslational movement: an object starts moving at a position *a* and passes by this position regularly after some finite time. Many verbs, however, express both components (e. g.'jump', 'walk'), and some verbs are able to change between expressing translational or nontranslational movement depending on the context and the reference system (e. g. 'turn' is , by the definitoin given, undecided between being translational or nontranslational). Therefore, this distinction of translational vs. nontranslational is no basis for different verb categories. Consider, as an example, sentence (5):

(5) Der Käse rollte zum Bahnhof. (The cheese rolled to the station)

This 'roll'-situation includes two kinds of movement: first, there is a a circular rotation pattern – an object rotates with contact to the ground (the core meaning of 'rollen') –, and second, there is a translational movement, which is introduced by the goal-PP. Since both motions are linear within time, they can be added up, yielding a sine shaped path for every point of the moving object.

Central for our analysis is the following fact, that obviously follows from both geometry and functional analysis:

Fact 1 (Path Shape Decomposability) *Every sequence of subsequent positions can be decomposed into a finite number of cyclic patterns and an optional translational component.*[7]

Linguistically, the translational components refer to (intended) motion from a source *a* to a goal *b* and the cyclic patterns refer to manner of movement information. In Satellite-framed languages[8] the first is 'normally' expressed in PPs, while the second is 'normally' expressed in manner of motion verbs and -adverbs – however, this linking can be realized in various variants.

[6]The expression 'after a short finite time' reminds of the unavoidable pragmatical influence of the notion of space and time in the reference system, which can be seen in the unprototypicality of the use of 'wobble' in 'imagine a planet that wobbles between two suns with a frequency of some 100.000 years'.

[7]The mapping between rotations as circles and their representation as sinus functions is a common mathematical notion. That means, a complex motion shape (in rotation interpretation) can be converted into a complex sine function. Using Fourier Analysis, this can be decomposed into basic sine functions with amplitude and frequency, which corresponds to radius and rotation speed of a circle

Note in this context that 'cyclic patterns' is not specified for another aspect of shape yet: both the abrupt change of direction in 'zigzag' and the more rotational shape in 'swing' or 'circle' is subsumed here. Fourier analysis, on the other hand, can extract a sine in one single step, whereas a zigzag yields infinite combination of sine functions. This may be taken seriously as a hint that from a physical point o view zigzagging is not a natural basic object motion pattern. Indeed, zigzagging in real world tends to be eihter round-edged or an alternating sequence of straight-line motions intervals and turn-on-position motions, hence it is, physically, not one basic motion pattern. However, consider Zee (2000) for an investigation of the sharp edge feature in zigzagging.

[8]following the Talmy-classification, although this classification raises some unanswered questions.

Path Shape Decomposability and the fact that motion pattern information is expressed by words, i. e. is part of their lexical meaning, implies that there are two possible directions of mapping to be modelled: they can be subsumed as *linguistic analysis* and *linguistic generation* (cf. fig. 1). The *lingusitic analysis* direction is a mapping of linguistic motion situation descriptions to a

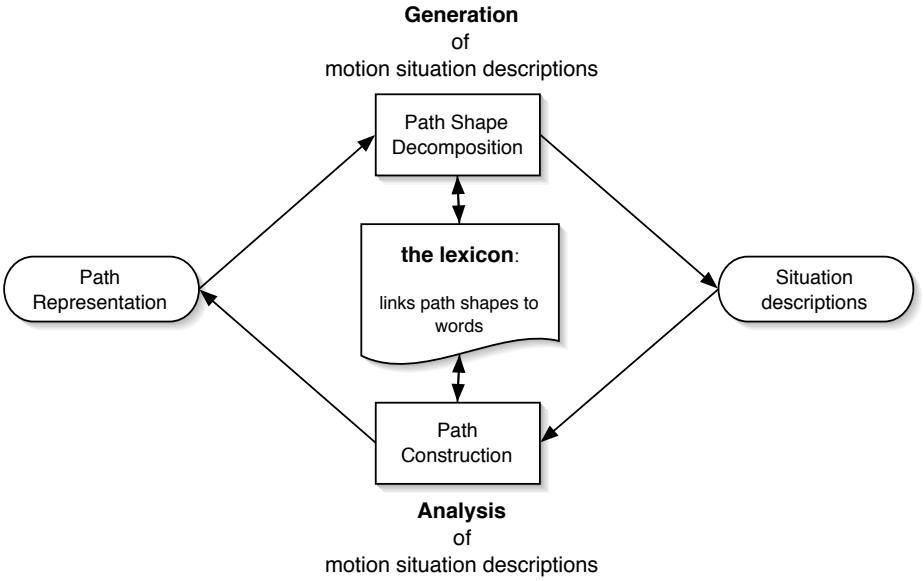


Figure 1: Two directions of PSD

model representation of the path and manner patterns involved. This direction requires a lexicon which links path shape building blocks to words and a theory that allows mounting these parts together to yield a path shape representing the situation. For a given sentence like 'Peter wobbles from *a* to *b*', an algorithm will produce a path-geometric analysis of the situation described. The *linguistic generation* direction, on the other hand, describes the reverse process: it is a mapping of a physically given path representation to language. Given a formal graphical description of the path shape, the algorithm generates a sentence that describes the situation as linguistic output, using both path and manner expressions. The latter direction is both algorithmically and linguistically of high complexity: the algorithmical part consists of decomposing the path in parts which are each linked to words in the lexicon, and the linguistic part generates natural language output. Due to finiteness of space in the current paper we will not discuss the latter part here.

2.2 Defining the toolkit

Technically, the model we suggest operates on a *simulation level* of situation representation, called σ level, whose task it is to build physical models of the situation, according to the knowledge provided by semantic and conceptual levels, and to judge the physical (im)possibility of a situation described in the actual world settings. This level can be seen as the interface between conceptual and world knowledge about physical space.

Similar to Zwarts (2004b), who suggests a path algebra defining path as "a starting point, an end point, and points inbetween on which the path imposes an ordering [...] defined as continuous functions from the real unit interval $[0, 1]$ to positions in some model of space", we define the *path* as a sequence of location-relations between a moving theme and a background object.[9]

[9] This definition offers the advantage that inserting and deleting path points – as is done when increasing and

Definition 3 (σ-Path) *A **Path** in the σ-world is a chain of points, two of which are designated as starting point and end point:*

$$\textsc{Path} = \Big\{ x_i \in \textsc{Pos}, i \in [0..1] \subset \boldsymbol{Q} : \\ \textsc{Neighbour}(x_i, x_j)\,\&\,\textsc{Neighbour}(x_j, x_k) \textit{ iff} \\ i < j < k \wedge \neg\exists x, y : i < x < j < y < k \wedge x_0 = \textit{`starting point'} \wedge x_1 = \textit{`end point'} \Big\}.$$

2.3 The Lexical Entries

In the path generation algorithm, which starts out from linguistic input and ends with printing out a path shape, this connection is algorithmically represented as a step 'link word meaning to path representation ←use← lexicon'; and in the Path Shape Decomposition algorithm it would be the step 'linguistic generation [from path shape snippets] ←use← lexicon'. That assigns a key role to lexical entries: they are the central data structure that bidirectionally links path shape to language. Let us shortly give two examples: German 'wackeln' ('wobble') and 'to spiral'.

(6) a.
$$\begin{bmatrix} \text{'wackeln'} \\ \vdots \\ \textsc{Path Shape} \\ \begin{bmatrix} +\textsc{Rotational} \\ \text{AmplitudeRange} = \ldots \\ \text{FrequencyRange} = \ldots \end{bmatrix} \\ \vdots \end{bmatrix}$$
, b.
$$\begin{bmatrix} \text{'spiral'} \\ \vdots \\ \textsc{Path Shape} \\ \begin{bmatrix} +\textsc{Rotational} \\ \text{AmplitudeRange} = \ldots \\ \text{FrequencyRange} = \ldots \end{bmatrix} \\ \begin{bmatrix} +\textsc{Translational} \end{bmatrix} \\ \vdots \end{bmatrix}$$

The excerpt from a lexical entry for the item 'wackeln' shows the link between Path Shape Snippet and Lexicon. The Path Shape that belongs to the (spatial) meaning of 'wackeln' can be defined in terms of a range of possible Amplitude values and a range of possible frequency values, which together yields a sine shaped Path snippet. Furthermore 'wackeln' is purely +ROTATIONAL, that means it is not translational and hence does not offer a slot for a PP as an argument. This yields path superimposition.

The verb 'to spiral', a Path Shape verb, is an interesting case, since it is the 'prototype' for a combination of a translational and a rotational component. Note that there are many ways to compose the translational with the rotational component: it depends on the angle between the plane of the rotation and the direction of the translation – hence, the verb is underspecified for this distinction: all constellations are good evidences of 'spiral'. If the translation is orthogonal to the plane of the circular component, we get a 'cylindrical' spiral (as in 'spiralling up around the pilar'), and if they are in the same plane, we either get a standard spiral (as in 'spiralling towards the sun') or a translation where the object is performing circles. Consider Zee (2000) and Zwarts (2004a) for an in-depth analysis of 'to spiral'.

decreasing granularity, respectively – only means rewriting two neighbour pairs, which is of little algorithmic complexity. Additionally, one can assume replacement functions 'starting point → source' and 'end point → goal' dependent on the decision if the path is telic (as in 'arrive') or atelic (as in 'approach'). We do not elaborate on that – see, for instance, Zwarts (2004b), Verkuyl (1993) and Verkuyl and Zwarts (1992) for an elaboration of aspect and (a)telic path.

2.4 The Algorithm

Having defined a toolbox and having defined the structure of the lexical entries that we assume, we are finally ready to dive into the center of the path shape decomposition approach: the algorithm.

The *Path Generation Algorithm* is given in figure 2. The input is a linguistic representation of a motion scenario. This representation is linguistically decomposed by standard syntactic and semantic tools. In this process all word meanings are looked up in the lexicon, which contains path representation patterns for motion vocabulary. Words are linked to path representation patterns. These patterns to path are linked to the path, which is gradually built up stepwise. The whole process is called recursively, along the recursive structure of the linguistic decomposition tree. The recursion ends when the whole sentence is analysed and at the same time the whole path is built. The output is the path shape that belongs to the sentence which has been put in.

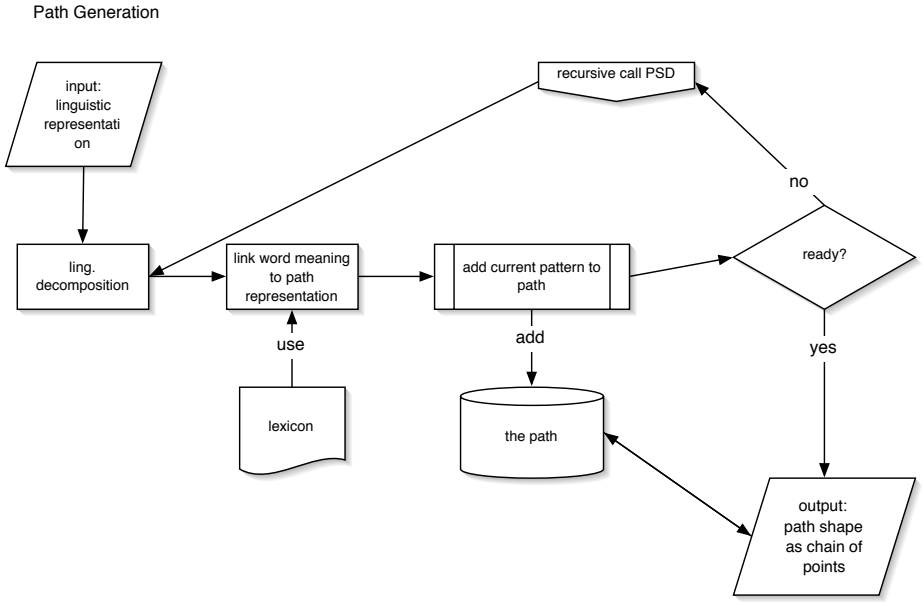


Figure 2: Path Generation Algorithm

2.5 Conclusion

This section has been the 'inventive' part of the paper. We have argued that in motion situations the path can always be decomposed in a number of rotation patterns and one optional translation (Path Shape Decomposability). We have defined, as a toolkit, the σ-world and a notion of path as chain of points. Finally, we have proposed the Path Generation Algorithm, which models the Linguistic Analysis direction. The duty of the Applications section 4 will then be to make clear how this information is dealt with in concrete by the algorithms. Before, however, we have to address a class of cases that has not been addressed so long: motion situations including rotation and deformation, as well as other cases of object internal motion.

3 Higher dimensional object representation: the Bounding Box.

While in a majority of situations involving path the relevant positions of the whole object can be modelled as points (which directly fits into the pointwise definition of path, as in 'Peter went to Trondheim'), things are different in cases where deformation or rotation are involved (as in 'Maria bent forward', 'Peter turned round'). In these cases, the object does not only move as a whole along a path, but subject to its physical architecture, it undergoes shape changes and orientation changes. Furthermore, a 'translational' and a manner component can be present within the same verb. It need not be the case that both components are fully lexically specified – consider 'springen', 'hüpfen' ('jump'), cf. discussion on *pairs* in Dimitrova-Vulchanova and Weisgerber (in process).

3.1 Rotation.

(7) a. The record is turning.
b. ??The record is turning towards the door.
c. ??Peter is turning.
d. Peter is turning towards the door.

Although each point of the object moves on a path in the course of the rotation, the object as a whole does not change position. Even if we consider a real translational movement of the single points of the record, the reading as change of position remains semantically bad (as in (7-b)) – this is due to the fact that there is no outstanding point which gives the record an implicit main axis.

Another problem mentioned above becomes visible in (7-d): 'turn' either is purely rotational or it is both tranlational androtational, i.e. there is an optional translation involved in the meaning of turn. We will come back to this case (and for an in-depth elaboration of rotation consider Habel (1999).)

3.2 Deformation.

(8) a. Maria bent out of the window.
b. Maria bent to front.

In (8-a) two aspects interfere: one part of Maria changes its position moving on a path from inside through the window to outside; another part of Maria, however, does not change position: even if most parts of Maria are outside, we still recognize Maria as inside the window. We claim this effect is both a matter of the focus we put on the different body parts – as long as Marias feet are inside and Maria is standing on her feet, the position 'inside' is assigned to the whole of Maria – and a matter of which chain of changes of positions lead to the actual position – all of Maria was inside before the movement, and she will end up inside again after the bending process. The same effect remains more implicit in (8-b), where a part of Maria moves to a front position while Marias overall position in space remains unchanged. Finally, there is additional semantic evidence for an analysis where (8-a) does not describe a change of place: The bending situations behave like states, and changes of state can be added separately – consider (9).

(9) a. Maria bent out of the window for three hours / * in three hours.
b. *Maria bent out of the window and back again.
c. Maria bent out of the window, and then she fell out of the window.

This fact will strengthen our analysis that the location of the motion event is, with no change, inside the room – although parts of the object (Mary) are located outside the window.

3.3 Internal vs. External: Encapsulation in the Bounding Box

These cases of 'object internal' motion lead to a granularity where we have to treat the dimensionality of the object as greater than zero (i. e. 'point'). In the case of deformation, single points of the object are able to perform motion relative to the whole – this object-internal motion depends on the physical character of the object. The increase in the dimensionality of the object influences the modelling of the interplay of object and path: A topological division of movement inside the object and movement outside the object arises. This division is a key to ambiguity effects arising from the fact that it is not always clear where, relative to the object, a movement is located: it is, therefore, not obvious which is the reference frame of a movement.

All of this implies that the model has to account for such cases – in other words, the model needs an object representation tool. Can this be formalized without the cost of unbearably high complexity? Let us answer this question in two steps: At first, we show that an additional modelling of object internal movement is possible with finite effort. This is due to the following:

Fact 2 *If an object changes its shape (internal deformation) without infinitely increasing its volume, then the process of extension is a finite process in all dimensions: in the extreme case, all available volume extends along one single dimension – the object has changed into approximately a line of finite length, and cannot extend any more. Hence, if the possible deformation is finite on all dimensions, all possible deformations can be described as* ***patterns****, i. e. the process stops after some time or returns to a known former state.*

The second step is that we distinguish between 'inside' and 'outside' of objects: We assume a *Bounding Box* as a model of the object in the σ-world. The Bounding Box 'wraps' (encapsulates) the entire object and thus clearly defines a border between inside and outside:

Definition 4 (Object Encapsulation: Bounding Box) *A* ***Bounding Box*** *BB of an object O in the σ-world is a cohesive cover of points, which encloses the object O:*

$$\mathrm{BB}(O) := \Big\{ x_{i,j} \in \mathrm{POS}, i, j \in [0..1] :$$

(i) $x_{i,j}$ represents a point of the object and has a neighbour that does not belong to the object or (ii) there is a plane through $x_{i,j}$ such that more than 2 neighbours of $x_{i,j}$ lying on that plane represent object points. $\Big\}$

This set is constructed recursively. A model of an object O in the σ-world involves exactly one active ***Bounding Box*** *$BB(O)$ in each context and point of time. This Bounding Box divides the* ***inside*** *from the* ***outside****.*[10]

[10] Encapsulating the object in a Bounding Box is our model's way to deal with cases that involve *vagueness*. Vagueness can appear in several cases – we would like to mention only the cases of object shape vagueness (in a class of objects it is difficult to define which is the exact extension of the object, e. g., where exactly does a cloud end?) and region vagueness (e. g., 'flowers *in* the vase' or 'apples *in* the bowl', cf. the seminal work about language and cognition of spatial prepositions by Herskovits (1986)). It is central to our notion of Bounding Box that we will put vagueness into bounds rather than analyse it away or eliminate it: At a given point of time, the Bounding Box does not equal but approximate the size of the object, and thus stands for the object to allow further reasoning with the situation. That means that vagueness is shifted to the process of assigning the Bounding Box: the more vague the object shape, the more context, pragmatics and reasoning enters into the process of Bounding Box assignment.[11]

We now apply the topological division of inside and outside to the relation between object and movement:

Definition 5 (Object Internal vs. -External Movement) *The division of movement into translational and nontranslational movement is applicable in a recursive way: the Bounding Box representing the object makes up a reference system, in which translational and nontranslational movement can take place again. Movement inside the Bounding Box is called* ***object internal movement****, while the movement of the Bounding Box relative to a larger reference system is called* ***external movement****.*

Note that due to the recursivity the notion of Bounding Box induces a reference system with inside and outside in all cases. Take, for example 'The stain on the record moves to the left'. The Bounding Box of 'the stain' is now in focus, it is moving on a path that itself is located inside the Bounding Box of the record. That means that, relative to the record, there is no movement of the stain (it is fixed to the surface), relative to the outside world, the movement of the record is internal (the record remains fixed at its place as whole) and the motion of the stain is external (it is being transported along a path). Since this division is triggered by the Bounding Box, which is set dynamically due to both the verb's lexical entry and influences of the context, it becomes clear once more that this division cannot be a basis for a stable verb categorization (as we have discussed above).

It is common to all physical objects in real world that they are located at one place due to environment forces. Gravity, which creates contact between an object and the ground, can be argued to be the instantiation of 'support'. This physical fact directly enters into our Bounding Box framework: There is a subset of Bounding Box points that are involved in contact to another supporting object due to environmental forces. We call this set of points the *fixation plane* of the Bounding Box. The fixation plane anchors the Bounding Box to the space it is "living" in. Note that the fixation plane needs not be flat – its shape is influenced by the shape of the supporting ground.

Let us now go back to two examples of situations, repeated here as (10-a) and (10-b), and see what effects can occur within the Bounding Box framework.

(10) a. Maria bent out of the window.
b. Peter turned to the left.

As we have argued above, (10-a) does not describe a change of place but an internal movement. No external movement of an object on a path is taking place here. This is modelled with the help of the Bounding Box of the object 'Maria': While Maria is moving parts of her body out of the window, the Bounding Box representing a model of the object Maria has to extend to cover the whole object. The place of the Bounding Box, its position in space, remains unchanged, since the *fixation plane* is stable: Maria is standing on her feet. The fact that bending is object internal, finally, is a feature of the verb 'bend': in the lexical entry of 'bend' the feature +INTERNAL must be present, and no path slot. Example (10-b) concerns change of orientation. The shape of the object Peter evokes an internal orientation axis: Peter has a 'front' and a 'back'. The verb 'turn' has the meaning of a change of the absolute direction of this orientation. This makes the example ambiguous in that without context we cannot infer if the turning is internal (turn on a point) or external (move on a circled path). This ambiguity is a regular one – it has to be fixed in the verb entry as ±EXTERNAL. In the external case the *fixation plane* of the Bounding Box of the object 'Peter' moves on a circled path, whereas in the internal case, the *fixation plane* remains at a fixed position and the movement takes place inside the Bounding Box. What about the PP? In both cases, external and internal, a path PP can be present ('turn into Tägermoos

road' vs. 'turn to the left'). Syntactically that means that the verb allows for a PP in each case, and the lexical entry of the verb has to decide on the meaning of the PP: in the external case, the PP is linked to a (circled) path, whereas in the internal case, the PP is linked to the direction of the orientation vector.

Finally, of what help can a bounding box be in the path superimposition case? Consider

(11) Peter zittert über die Straße (Peter is shivering over the road).

Again, the Bounding Box defines a reference system. When talking about situations, one cannot switch reference system, therefore it is impossible to mention inside- and outside-information together in the same clause.[12] So, how does inner information get to outside? An enfocus-strategy makes the Bounding Box more narrow (i. e. change the referency system) as to make inner motion visible to the outside as motion of the whole Bounding Box. Consider 'zittert über die Straße' (to be discussed later): If the shivering affects outer path shape, then it has become a shivering of the whole Bounding Box. The motion of the Bounding Box is what is superimposed in the end.[13]

4 Degree of influence, Maienborn's 'temporary motion verbs', and λP

Maienborn (1994) deals with cases where verbs that lexically do not provide a path slot are combined with path-PPs. Consider the following examples (taken from Maienborn) – all of these verbs are no change of location verbs; and only some of them are (manner of) motion verbs.

(12) a. Ein Motorrad *knattert* über die Landstraße. (A motorbike *crackles* over the road)
b. Der Hochgeschwindigkeitszug *dröhnt* durch den Tunnel. (The high speed train *booms/drones* through the tunnel)
c. Das Motorrad *jault* durch die Stadt. (The motorbike *whines* through the city)
d. Gunda *turnt* über den Sessel. (Gunda *does-gymnastics* over the armchair)
e. Gunda *hampelt* in die Küche. (Gunda *(actively wobble around)* into the kitchen)
f. Das Kleinkind *wackelt* in die Sandkuhle. (The small child *wobbles* into the sandbox)

(13) *Gunda liest in die Küche. (Gunda is reading into the kitchen)

How does, semantically, the path anchor to the meaning of the verb? Maienborn (1994) argues against a notion of pure modification and proposes instead a mechanism where the verb becomes a *temporary motion verb*. This meachanism is triggered by the path-PP.

As can be seen in (13), however, this mechanism needs to be restricted: "Das in Frage stehende Prädikat muss auf eine essentielle Eigenschaft der Fortbewegung Bezug nehmen" [The predicate in question has to refer to an essential characteristic of translational motion.] (Maienborn (1994), p. 240).

In the case of manner of motion verbs, path shape analysis can be of some help: If a verb encodes information about any kind of motion and if this motion is not purely internal but has a visible effect onto the resulting path, it is possible to semantically superimpose this motion

[12] cf. Bohnemeyer (2003) for an empirical crosslinguistic investigation how many motion path information can be encoded in one clause

[13] However, this is not completely trivial (see also discussion on 'wackeln'). Which point of the object defines the path that I recognise as 'zigzag'? Imagine the objects is fixed to the carrier and therefore only wobbles with its upper end. We define: the greatest existent amplitude is taken as the amplitude of the pattern motion.

on a path introduced by a PP, and reversely, to treat the PP temporarily as an argument of the situation representation. Compare:

(14) a. Peter wackelte über die Straße. (Peter was wobbling over the road)
b. ?Peter zitterte über die Straße. (Peter was shaking over the road)
c.???Peter fror über die Straße. (Peter be-cold-V_{fin} over the road)

Interpretation: The movement induced by the manner pattern must have an influence on the translation movement: 'wobbling' and 'over the road' must interact.[14] (14-b) is another evidence for that: There is one possible reading of (14-b) where the effect of shaking is visible in Peters movement. The more of the pattern motion effect is visible, the better the sentence. Hence, the amplitude of the pattern-motion is significant for meaning distinction: ⟨'wackeln' > 'schwingen' > 'zittern' > 'vibrieren'⟩.

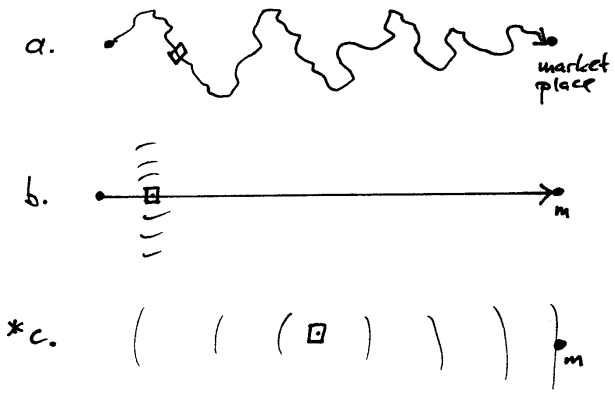
In the case of sound emission verbs, one has to 'dive deeper into context' – but, in the end, the same claim holds, when we assume the causation relation: the motion on the path produces the sound emission, a 'trace of sound' can be recognized for a while. But this has to be elaborated in depth at another place.

Finally, consider once more (4) repeated as (15) – which seems to contradict Maienborns thesis that a verb can provide a λP slot whenever it wants to:

(15) 30 Tonnen Waren wackeln auf den Köpfen von rund 650 Lastenträgern auf
30 tons of goods are wobbling on the heads of about 650 carriers on
Bergpfaden in Richtung Marktplatz.
mountain paths towards market place.

Here, the combination of the rotational pattern part and a Path-PP cannot yield translational reading ((16).c is out as an interpretation of (15)). That should be taken as a sign for the non-existence of a λP slot in the verb. Path Shape Superimposition is the only remaining possible interpretation: the pattern motion is superimposed on a path, hence it is not itself the path.

(16)



[14]This effect has been called *Path Superimposition*. "Superimposition is a graphics term meaning the placement of an image on top of an already-existing image, usually to add to the overall image effect, but also sometimes to conceal something (such as when a different face is superimposed over the original face in a photograph). [en.wikipedia.org/wiki/Superimposition]".

5 Conclusion: Path Shape Decomposition and Manner Modelling

(Modified) manner of motion verbs yield one single complex path of motion. With the help of the Path Shape Decomposition framework we presented, this path can be seen as consisting of two kinds of components: iterated rotational patterns and one translational part. These are linked to the lexical meaning of manner verbs and -adverbs: Motion Shape Patterns are in most cases linked to 'manner' information, while the translational component is often expressed by the Path-PP or direction adverbs. In order to account for object internal motion, we additionally introduced Bounding Box Encapsulation, which yields a topological division of inside and putside-movement. As an application, we discussed the 'wobble over the road'-case and related cases and presented an explanation for Maienborns path-superimposition effect .

We are aware of the fact that many details have to been added to the framework. Many facets are in preparation, and others are considered to be projects of 'further work'.

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DON'T NEGATE IMPERATIVES!
IMPERATIVES AND THE SEMANTICS OF NEGATIVE MARKERS

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Abstract

Languages cross-linguistically differ with respect to whether they accept or ban True Negative Imperatives (TNIs). In this paper I show that this ban follows from three generally accepted assumptions: (i) the fact that the operator that encodes the illocutionary force of an imperative universally takes scope from C°; (ii) the fact that this operator may not be operated on by a negative operator and (iii) the Head Movement Constraint (an instance of Relativized Minimality). In my paper I argue that languages differ too with respect to both the syntactic status (head/phrasal) and the semantic value (negative/non-negative) of their negative markers. Given these difference across languages and the analysis of TNIs based on the three above mentioned assumptions, two typological generalisations can be predicted: (i) every language with an overt negative marker X° that is semantically negative bans TNIs; and (ii) every language that bans TNIs exhibits an overt negative marker X°. I demonstrate in my paper that both typological predictions are born out.

1 Introduction

This paper is about the fact that not every language accepts so-called True Negative Imperatives (TNIs).[1] TNIs are exemplified in (1) and (2) for Dutch and Polish respectively. In Dutch, in main clauses the finite verb precedes the negative marker *niet*. In imperative clauses the negation can also follow the finite imperative verb without yielding ungrammaticality. Polish also accepts TNIs: both in regular negative indicative clauses and in imperative clauses, the negative marker *nie* immediately precedes the finite verb.

(1) a. Jij slaapt *niet* — Dutch
You sleep NEG
'You don't sleep'

b. Slaap!
Sleep!
'Sleep'

b. Slaap *niet*! — (TNI)
Sleep NEG!
'Don't sleep!'

(2) a. (Ty) *nie* pracujesz — Polish
You NEG work.2SG
'You don't work!'

b. Pracuj!
Work.2SG.IMP
'Work!'

[1] Terminology due to Zanuttini (1994)

c. *Nie* pracuj! (TNI)
NEG work.2SG.IMP
'Don't work!'

Things are different however in a language like Spanish, as illustrated in (3). In Spanish the negative marker *no* always occurs in preverbal position. However, if the verb has an imperative form, it may not be combined with this negative marker. Spanish does not allow TNIs. In order to express the illocutionary force of an imperative[2], the imperative verb must be replaced by a subjunctive. Such constructions are called Surrogate Negative Imperatives (SNIs).

(3) a. Tu *no* lees Spanish
NEG read.2SG
'You don't read'

b. ¡Lee!
Read.2SG.IMP
'Read!'

c. *¡*No* lee! (*TNI)
NEG read.2SG.IMP
'Don't read'

d. ¡*No* leas! (SNI)
NEG read.2SG.SUBJ
'Don't read'

In this paper I address two questions: (i) how can this ban on TNIs in languages such as Spanish be explained? And (ii) how does the observed cross-linguistic variation follow?

The outline of the paper is as follows: in section 2 I discuss three previous analyses of the ban on TNIs. In section 3 I discuss some relevant semantic and syntactic properties of negative markers and in section 4 I demonstrate by means of a survey of different languages that the properties described in section 3 are related to the acceptance of TNIs. In section 5, I present my analysis for all language groups that have been discussed. In section 6, I show that the analysis presented in section 5 makes some correct predictions regarding the development of Negative Concord and the acceptance of TNIs in Romance languages. Finally, Section 7 concludes.

2 Previous analyses

2.1 Rivero (1994), Rivero & Terzi (1995)

Rivero (1994) and Rivero & Terzi (1995) assume that the clausal structure always has the structural relations in (4).

(4) CP > NegP > IP > VP

Then the difference between Slavic languages (which generally allow TNIs) and Romance languages (that generally disallow them) concerns the position where imperative force is induced in the sentence. This is either IP (expressed by movement of V_{imp} to I°) or CP (expressed by verbal movement to C°). Now the difference between Slavic and Romance languages falls out immediately: if the Neg° position is filled by an overt element, i.e. by a

[2] Negative sentences with the illocutionary force of an imperative are often referred to as prohibitives.

negative marker, then verbal movement from I° to C° is no longer allowed, given the Head Movement Constraint (Travis (1984)). Hence Slavic languages, such as Polish allow TNIs, whereas Romance languages, such as Spanish, where the verb moves to C°, do not (see (5)).

(5) a. [$_{NegP}$ [$_{Neg°}$ *Nie*] [$_{IP}$ [$_{I°}$ pracuj$_{[IMP]i}$] [$_{VP}$ t$_i$]]] Polish
NEG work.2SG.IMP
'Don't work!'

b. *[$_{CP}$ [$_{C°}$ Lee$_{[IMP]i}$] [$_{NegP}$ [$_{Neg°}$ *no*] [$_{IP}$ [$_{I°}$ t$_i$] [$_{VP}$ t$_i$]]]] Spanish
NEG read.2SG.IMP
'Don't read!'

Rivero's and Rivero & Terzi's analysis faces two serious problems. The first problem is that it is unclear why in Romance languages the negative marker is not allowed to clitisize onto V_{imp} so that they move together to C° as a unit, a point already addressed by Han (2001). Rizzi (1982) argues that in constructions such as (6), consisting of a participle or an infinitive, the subject occupies a Spec,IP position and the auxiliary moves to C°. In case of negation, the negation then joins the verb to move to C°. Rizzi refers to these structures as Aux-to-Comp constructions.

(6) a. [[$_{C°}$ avendo] Gianni fatto questio][3] Italian
having Gianni done this
'Gianni having done this, …'

b. [[$_{C°}$ *non* avendo] Gianni fatto questio]
NEG having Gianni done this
'Gianni having not done this, …'

If in the cases above *non* is allowed to attach to V_{part}/V_{inf}, it is unclear why this movement would not be allowed in the case of V_{imp}.[4]

The second problem is that in the structure in (5)a the operator that encodes the illocutionary force of an imperative is c-commanded by the negation. It has already been noted by Frege (1892) and Lee (1988) that negation cannot operate on the illocutionary force of the sentence, but only on its propositional content (a negative assertion remains an assertion, a negative question remains a question, and a negative command has to remain a command). Hence, in Rivero and Terzi's analyses for Slavic languages either negation takes scope from too a high position, or the imperative operator takes scope from too a low position.

2.2 Zanuttini (1997)

Zanuttini (1997) distinguishes different kinds of negative markers basing herself on a number of Romance dialects (mostly from Northern Italy). She argues that negative head markers (X°) that can negate a clause by themselves are actually lexically ambiguous between two different lexical items, which are often phonologically identical. For instances she claims that in Italian the negative marker *non* is lexically ambiguous between *non*-1, which may occur only in clauses with the illocutionary force of an imperative, and *non*-2, which may appear in

[3] Example taken from Rizzi (1982)

[4] Rivero and Terzi argue that in these cases the $V_{part/inf}$ does not raise to C°, but to a position lower than Neg° and that the subject is in a position even below. This analysis seems to be contradicted by the fact that (*non*) *avendo* may even precede speaker-oriented adverbs such as *evidamente* ('evidently'), which occupy a position higher than NegP (as pointed out by Cinque (1999) and repeated in Han (2001)).

all other clauses. Furthermore, Zanuttini proposes that *non*-1 subcategorizes a MoodP, whereas *non*-2 does not:

(7) a. [$_{NegP}$ *non*-1 [$_{MoodP}$ … [$_{VP}$]]] imperative clauses
b. [$_{NegP}$ *non*-2 … [$_{VP}$]] other clauses

The ban on TNIs can now be accounted for as follows. Imperative verbs are often morphologically defective, indicating that they lack a particular [MOOD] feature. As a result, the [MOOD] feature on Mood° cannot be checked and the sentence becomes ungrammatical. In other clauses, e.g. indicatives, there is no MoodP selected, and thus the sentence is grammatical, as shown in (8).

(8) a. *[NegP *Non*-1 [$_{MoodP}$ [$_{Mood°[Mood]}$ telefona$_{[IMP]i}$] a Gianni [$_{VP}$ t$_i$]]] Italian
└— x—┘
NEG call.2SG.IMP to Gianni
'Don't call Gianni!'

b. [Io [NegP *non*-2 telefono$_i$ a Gianni [$_{VP}$ t$_i$]]]
I NEG call.1SG to Gianni
'I don't call Gianni'

Still, this analysis suffers from two problems. First, the lexical distinction between *non-1* and *non-2* seems not well motivated. Although Zanuttini motivates this claim by arguing that languages that have two distinct negative markers are often sensitive to mood distinctions in the verbal paradigm (cf. Sadock & Zwicky (1985)), it is not clear why languages universally have to exhibit two negative markers. It could even be the case that the motivation for a second negative marker (found in languages such as Hungarian, Albanian and Greek) is because the regular negative marker could not be combined with an imperative. Such a motivation would lead to circularity.

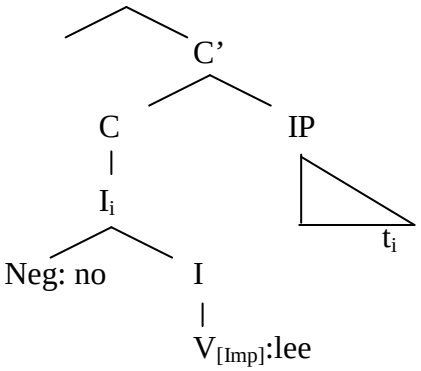
Second, the prediction that this analysis makes is too strong. It is unclear why the analysis does not hold for Slavic languages, such as Polish, which has a negative head marker *nie* that negates a clause by itself and allows TNIs. Moreover, one may even find Romance varieties, which allow TNIs. Old Italian (9) is an example.

(9) *Ni* ti tormenta di questo! Old Italian
NEG yourself torment.2SG.IMP of this
'Don't torment yourself with this!'

2.3 Han (2001)

Han (2001) argues that the ban on TNIs does not follow from syntactic requirements that have been violated, but from a semantic violation: the imperative operator (i.e. the operator that encodes the illocutionary force of an imperative, *Op*$_{IMP}$ hereafter) may not be in the scope of negation. *Op*$_{IMP}$ is realised by moving a feature [IMP] on V$_{imp}$ to C° . Han takes negation in Romance languages to head a projection somewhere high in the IP domain. Hence, negation head-adjoins first to V$_{imp}$, and then as a unit they move further to C°. As a result *Op*$_{IMP}$ remains in the c-command domain of negation, which violates the constraint that negation may only operate on the propositional content of the clause. The structure (10) is thus ill formed.

(10) * Spanish



Under this analysis, it becomes immediately clear why in languages like Dutch TNIs are allowed. In those languages negation does not form a unit with V_{imp} and V_{imp} raises across negation to C°, as shown in (11).

(11) $[_{CP}$ slaap$_{[Imp]i}$ $[_{NegP/VP}$ *niet* $t_i]]$ Dutch

For Slavic languages Han assumes that V_{imp} does not move to C°. Consequently, this would mean that V_{imp} remains under the scope of negation (as the negative marker is a syntactic head in those languages, V_{imp} cannot move across it). However, Han argues that in those cases the feature [IMP] moves out of V_{imp} and moves to C°. Thus, Op_{IMP} outscopes negation, as demonstrated in (12) for Polish.

(12) $[_{CP}$ $[IMP]_i$ $[_{NegP}$ *nie* $[_{IP}$ pracuj$_i$ $]]]$ Polish

The fact that Han allows feature movement for the Slavic languages seems to contradict the analysis for Romance languages, since it remains unclear why this feature movement would not be possible in Romance languages. Apart from this problem, Han assumes that the negative marker (in the languages discussed) is always the carrier of semantic negation. In the following section I demonstrate that this is not always the case.

3 Semantic and syntactic properties of negative markers

In this section I discuss some semantic properties of negative markers. I present arguments that show that negative markers differ cross-linguistically with respect to their semantic contents. In some languages, such as Spanish and Italian, I argue the negative marker is the phonological realisation of a negative operator. In other languages, such as Polish and Czech, I argue that the negative marker is semantically vacuous, but has a syntactic requirement that it needs to stand in an Agree relation with a negative operator, which may be left phonologically abstract. The section concludes with a few remarks about the syntactic status of negative markers.

3.1 Strict vs. Non-strict NC languages

The term *Negative Concord (NC)* refers to the phenomenon in which two negative elements yield only one semantic negation. The set of NC languages falls apart in two classes: Strict NC languages and Non-strict NC languages. In Strict NC languages the negative marker may both follow or precede n-words[5] as is demonstrated for Czech in (13). In Non-strict NC languages the negative marker may only precede n-words. An example of a Non-strict NC language is Italian (14).

[5] Terminilogy due to Laka (1990), Giannakidou (2002).

(13) Strict NC:

a. Milan *(*ne*)vidi *nikoho* — Czech
Milan NEG.saw n-body
'Milan didn't see anybody'

b. Dnes *(*ne*)volá *nikdo*
Today NEG.calls n-body
'Today nobody calls'

c. Dnes *nikdo* *(*ne*)volá
Today n-body NEG.calls
'Today nobody calls'

(14) Non-strict NC:

a. Gianni *(*non*) ha telefonato a *nessuno* — Italian
Gianni NEG has called to n-body
'Gianni didn't call anybody'

b. Ieri *(*non*) ha telefonato *nessuno*
Yesterday NEG has called n-body
'Yesterday nobody called'

c. Ieri *nessuno* (**non*) ha telefonato (a *nessuno*)
Yesterday n-body NEG has called to n-body
'Yesterday nobody called anybody'

In Zeijlstra (2004) I argue that NC is a form of multiple Agree (cf. Ura (1996), Hiraiwa (2001, 2005)) between a negative operator that carries an interpretable negative feature [iNEG] and elements that carry an uninterpretable negative feature [uNEG]. Sentence (14)a can thus be analysed as (15), where *nessuno*'s [uNEG] feature is checked against *non*'s [iNEG] feature.[6]

(15) [$_{TP}$ Gianni [$_{NegP}$ *non*$_{[iNEG]}$ ha telefonato a *nessuno*$_{[\sout{uNEG}]}$]]

Given the assumption that n-words are analysed as semantically non-negative indefinites that carry a feature [uNEG] (cf. Ladusaw (1992), Brown (1999), Zeijlstra (2004)), it follows that the negative operator must c-command them in order to yield the correct readings. Consequently, it means that if the negative marker carries a feature [iNEG] no n-word is allowed to precede it (and still yield an NC reading).

However, in Strict NC languages such as Czech, the negative marker may be preceded by an n-word. Consequently, this negative marker cannot be the phonological realisation of the negative operator. It then follows that the negative marker itself carries [uNEG] and that it has its [uNEG] feature checked by an abstract negative operator *Op*$_{\neg}$, as shown in (16).[7]

(16) Dnes *Op*$_{\neg[iNEG]}$ *nikdo*$_{[uNEG]}$ *ne*volá$_{[uNEG]}$ — Czech
Today n-body NEG.calls
'Today nobody calls'.

The [uNEG]/[iNEG] distinction exactly explains the Strict NC vs. Non-strict NC pattern that one finds amongst NC languages. Thus I argue that negative markers in Non-strict NC

[6] Note that here a feature checking mechanism is adopted in which checking may take place between a higher interpretable and a lower uninterpretable feature (cf. Adger (2003))

[7] Note that this analysis requires that an abstract *Op*$_{\neg}$ is also available in Non-strict NC languages, for instance in constructions such as (14)a.

languages, like Italian *non* and Spanish *no*, carry a feature [iNEG], whereas negative markers in Strict NC languages, such as Czech *ne* and Polish *nie*, carry a feature [uNEG].

3.2 Further evidence

I now present some further evidence for the assumption that the difference between Strict and Non-strict NC languages reduces to the semantic value of their negative markers. First it can be shown that negation behaves differently in Strict and Non-strict NC languages with respect to the scope of quantifying DPs. This is shown in (17). Although Czech *moc* ('much') dominates the negative marker, it is outscoped by negation. This reading is however not obtained in a similar construction in Italian, where *molto* ('much') remains in the scope of negation. This is a further indication that Italian *non*, contrary to Czech *ne*, is a phonological realisation of $Op_{\neg}$.

(17) a. Milan moc *ne*jedl — Czech
Milan much NEG.eat.PERF
¬ > much: 'Milan hasn't eaten much'
*much > ¬: 'There is much that Milan didn't eat'

b. Molto *non* ha mangiato Gianni — Italian
Much NEG has eaten Gianni
*¬ > much: 'Gianni hasn't eaten much'
much > ¬: 'There is much that Gianni didn't eat'

Second, in some Strict NC languages the negative marker may be left out if it is preceded by an n-word, something to be expected on functional grounds if the negative marker carries [uNEG] (if an n-word precedes it, the negative marker is no longer needed as a scope marker). This is for instance the case in Greek (a Strict NC language) with *oute kan* ('NPI-even'). If *oute kan* precedes the negative marker *dhen*, the latter may be left out. If it follows *dhen*, *dhen* may not be removed (cf. Giannakidou (2005)). This forms an argument that Greek *dhen* is in fact not semantically negative. As Greek is a Strict NC language, this confirms the assumption that in Strict NC languages the negative marker carries [uNEG].

(18) a. O Jannis *(*dhen*) dhiavase *oute kan* tis Sindaktikes Dhomes — Greek
The Jannis neg reads even the Syntactic Structures
'Jannis doesn't read even Syntactic Structures'

b. *Oute kan* ti Maria (*dhen*) proskalese o pritanis
Even Maria NEG invite the dean
'Not even Maria did the dean invite'

Finally, the semantic emptiness of negative markers may solve a problem put forward by Watanabe (2005) against Giannakidou's (2000) analysis of fragmentary answers. Giannakidou (2000, 2002) argues that n-words in Greek are semantically non-negative. Hence, she has to account for the fact that n-words in fragmentary answers like in (19)a yield a reading that includes a negation. She argues that this negation, expressed by *dhen*, is deleted under ellipsis. Hence the assumption that n-words are semantically non-negative can be maintained. Watanabe (2005) argues that this analysis violates the condition that ellipsis may only take place under semantic identity (cf. Merchant's (2001a) notion of e-GIVENness). However, as the question does not contain a negation, it may not license ellipsis of the negative marker *dhen*. If on the other hand, *dhen* is semantically non-negative, the identity condition is met again. The abstract negative operator then induces the negation in the answer. Note that in Non-strict NC languages the negative marker never follows an n-word, and therefore no negative marker can be deleted under ellipsis in the first place.

(19) a. Q: Ti ides? A: [*Op*¬ [*TIPOTA* [~~*dhen* ida~~]]] Greek
What saw.2SG? N-thing [NEG saw.1SG]
'What did you see?' 'Nothing!'

b. Q: ¿A quién viste? A: [*Op*¬ [A *nadie* [~~vió~~]]]
What saw.2SG? N-thing [saw.1SG]
'What did you see?' 'Nothing!'

3.3 A few words on syntax

Finally, a few words on the syntactic status of negative markers need to be said. All three analyses that have been discussed in section 2, as well as my own analysis that I present in section 5, rely crucially on the distinction between negative markers that are syntactic heads (X°) and those that have phrasal status (XP). I follow the standard analysis (Haegeman (1995), Zanuttini (1997, 2001), Merchant (2001b), Zeijlstra (2004) amongst many others) that negative adverbs (such as Dutch *niet*, German *nicht*, French *pas*) are XPs, whereas weak or strong preverbal negative markers as well as affixal negative markers have X° status (Italian *non*, Spanish *no*, Polish *nie*, Czech *ne*, Greek *dhen*, French *ne*). Hence negative markers can be distinguished in two respects, each with two possible values: they have either X° or XP status and they have either a value [iNEG] or [uNEG].[8]

4 Typological generalisations

Based on the notions discussed above, a number of languages have been investigated for the syntactic status of their negative markers, and their semantic value. Moreover it has been investigated whether these languages allow TNIs or not. The results are shown in (20) below.

(20) Language sample

Class:	*Language:*	*Neg. marker: X°*	*Neg. marker: [iNEG]*	*TNIs allowed*
I	Spanish	√	√	*
	Italian	√	√	*
	Portuguese	√	√	*
II	Czech	√	*	√
	Polish	√	*	√
	Bulgarian	√	*	√
	Serbo-Croatian	√	*	√
III	Greek	√	*	*
	Romanian	√	*	*
	Hebrew	√	*	*
	Hungarian	√	*	*
IV	Dutch	*	√	√
	German	*	√	√
	Norwegian	*	√	√
	Swedish	*	√	√
V	Bavarian	*	*	√
	Yiddish	*	*	√
	Quebecois	*	*	√

[8] In Zeijlstra (2006), it is argued that in Non-strict NC languages negative markers do not have a formal feature [iNEG], but a semantic feature [NEG]. However, as the interpretation of an element carrying [iNEG] is identical to the interpretation of an element carrying [NEG], I disregard this distinction in this paper, as nothing crucial in this analysis hinges on it.

Based on (20) the two following typological generalisations can be drawn:

(21) **G1**: Every language with an overt negative marker X° that carries [iNEG] bans TNIs.

G2: Every language that bans TNIs exhibits an overt negative marker X°.

These typological generalisations indicate that both the semantic value of the negative marker and its syntactic status play a role in determining whether and why a language bans TNIs. **G2** has already been observed by Zanuttini (1997), **G1** is to my knowledge a novel observation. In the next section I present an analysis that is based on these notions.

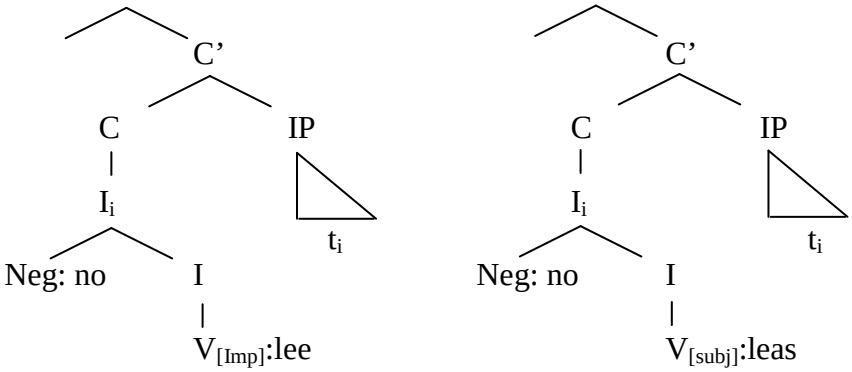
5 Analysis

I argue that both the ban on TNIs and its cross-linguistic distribution can be explained on the basis of the following three well-motivated assumptions. First, I assume that Op_{IMP} must take scope from C°, a standard analysis in the syntax of imperatives (cf. Zanuttini (1997)). Second, I adopt he classical observation that operators that encode illocutionary force may not be operated on by a (semantic) negation. In this respect, the analysis presented here reflects Han's analysis. Third, I adopt the HMC (Travis' (1984)), an instance of relativized minimality (cf. Rizzi (1989)). Now I demonstrate how for each combination of ±X°, ±[iNEG] the correct results are predicted.

5.1 Class I languages

The first class of languages consists of languages that exhibit a negative marker X°, which carries an [iNEG] feature. To these languages Han's analysis applies and V_{imp} must raise to C°. As the negative marker Neg° must be attached to V°, this negative marker c-commands [IMP], and given the syntactic head status of the negative marker, V_{imp} cannot escape out of this unit. This is illustrated for Spanish in (22)a. If, however, the imperative verb is replaced by a subjunctive, nothing leads to ungrammaticality, since the subjunctive does not carry along a feature that encodes illocutionary force, and thus it may be c-commanded by the negation (see (22)b). Obviously, this does not yield the semantics of a prohibitive. However, I assume, following Han, that the prohibitive reading is enforced through pragmatic inference. The language needs to fill the functional gap and uses the non-imperative construction with the subjunctive as a replacement. The SNI does not yield the reading of a prohibitive, but is then used as one.[9]

(22) a. * CP (*TNI) b. CP (SNI) Spanish



[9] Han (2001) suggests that the fact that the subjunctive encodes an irrealis, plays a role in the imperative interpretation. This is however contradicted by the fact that (for instance) an indicative can adopt this function as well (Italian plural SNIs exhibit an indicative).

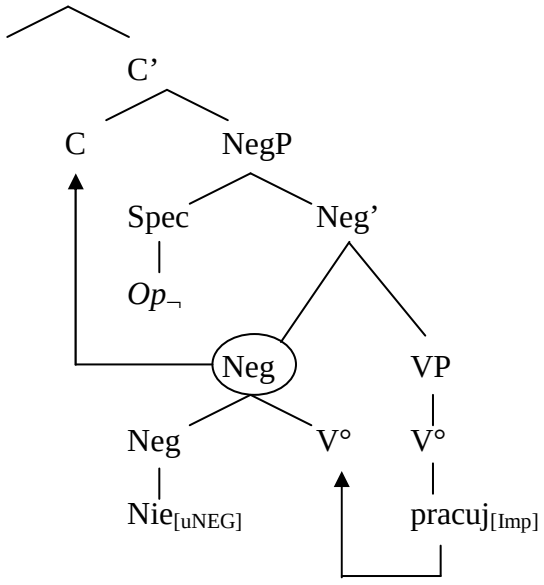
Note that the first typological generalisation (**G1**) immediately follows: since the negative head adjoins to V_{imp} and V_{imp} must raise to C°, Op_{IMP} cannot avoid being outscoped by negation. Thus every language with an overt negative marker X° that carryies [iNEG] bans TNIs.

5.2 Class II languages

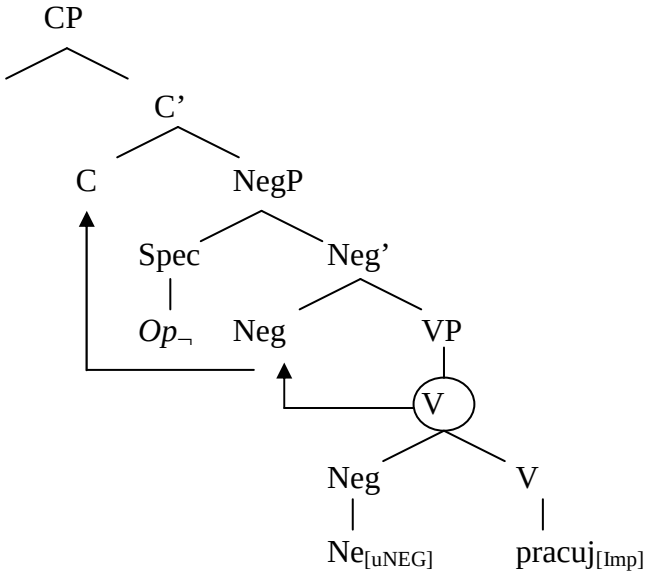
Languages that have negative markers X° which carry [uNEG] at their disposal differ with respect to the ban on TNIs. Czech, Polish, Bulgarian and Serbo-Croation for instance accept TNIs, whereas Romanian, Hungarian, Greek and Hebrew disallow them. In this subsection I discuss the first kind of languages.

In Slavic languages, such as Czech, Polish, Bulgarian and Serbo-Croation, the negative marker is always in preverbal position. Slavic languages however differ with respect to the phonological strength of the negative marker. Polish *nie* is phonologically strong and can be said to be base-generated in its own position Neg° that c-commands VP. Czech *ne* is weaker than Polish *nie* and it is thus unclear whether *ne* originated in Neg° or has been base-generated as a head adjunction onto V. In both cases, these negative markers are semantically non-negative and negation is thus induced from $Op_{\neg}$. I assume as Zeijlstra (2004) that this $Op_{\neg}$ occupies a Spec,NegP position. The clausal structure therefore does not block TNIs. In Polish V_{imp} moves to Neg°, attaches to *nie* and as a unit $[_{Neg}$ *nie*-$V_{imp}]$ moves along to C°. $Op_{\neg}$ remains in situ in Spec,NegP and Op_{IMP} takes scope from C°. In Czech the complex verbal unit $[_{V}$ *ne*-$V_{imp}]$ moves through Neg° (and all other intermediate head positions) to C°, from where Op_{IMP} takes scope. $Op_{\neg}$ is located in Spec,NegP. Thus, both in Polish and Czech the scopal condition $Op_{IMP} > Op_{\neg}$ is met. This is illustrated below in for Polish in (23) and for Czech in (24).

(23) Polish



(24) Czech



5.3 Class III languages

The third class of languages under discussion consists of (amongst others) Romanian, Hungarian, Greek and Hebrew. These languages also exhibit X° negative markers carrying [uNEG] features, but contrary to Class II languages they ban TNIs. As has been discussed in the beginning of this section, movement of V_{imp} to C° obeys the HMC. Consequently, if a negative marker is base-generated in Neg°, V_{imp} must attach to it, otherwise the derivation crashes. However, it depends on the phonological properties of a negative marker whether it allows this kind of clitisation. It could very well be that this negative marker cannot be attached to V_{imp}. In that case the language also bans TNIs and the language requires an SNI. This possibility is born out by the typology presented in (20).

A result of the fact that some languages generally block verbal movement to a higher position than Neg° is that alternative suppletive strategies have to be followed (subjunctives for instance generally have to raise to C°, too). One strategy can be to use a different negative marker for negative imperatives.[10] This is the case for instance in Hungarian, where TNIs (using the regular negative marker *nem*) are ruled out, but where the (phonologically weaker) negative marker *ne* is used as a suppletive marker. This negative marker allows for attachment to V_{imp} (either in Neg° or V°) and, carrying [uNEG], it can yield negative imperatives. This is illustrated below.

(25) Hungarian

a. **Nem* olvass!
Neg read.IMP
'Don't read!'

b. *Ne* olvass!
Neg read.IMP
'Don't read!'

If *ne* is base-generated in V, the derivation is equivalent to the one for Czech in (24), if *ne* is base-generated in Neg° a structure equivalent to (23) represents the correct structure.

Note that, if a second negative marker is used for negative imperatives, this distinction will be grammaticalised. It becomes part of the featural equipment of these negative markers in which contexts they are allowed to occur (mostly along the lines of mood ([±irrealis] for instance), as illustrated by Saddock and Zwicky (1985)). A phonologically distinct negative

[10] Van den Auwera (2005) shows that this is one of the strategies attested most often.

marker has such a feature bundle that it only occurs in those contexts where it is allowed, and the default negative marker will then be reanalysed such that it is assigned a feature bundle that ensures that it is mutually exclusive with respect to the other negative marker. As a result of this grammaticalisation both negative markers can be phonologically weakened in due course without changing the language with respect to the status of TNIs, although the original motivation for the second negative marker was the fact that the phonological strength of the default negative marker was too strong to allow head adjunction to V_{imp}. This explains why a large number of Strict NC languages (with negative head markers) still ban TNIs.

5.4 Class IV languages

It follows too that if a negative marker has phrasal rather than head status, TNIs are accepted. Regardless of the position of the negative marker, it cannot block movement of V_{imp} to C°. Hence Op_{IMP} can always take scope from C° and all scopal requirements are met. In Zeijlstra (2004) it has been argued that the position of the negative marker in Dutch is a vP adjunct position. The structure of a TNI in Dutch would then be like (26).

(26) $[_{CP}$ slaap$_{[Imp]i}$ $[_{vP}$ niet $t_i]]$ Dutch

Note that from this analysis typological generalisation **G2** follows immediately. If in a particular language there is no negative marker X° available, movement of V_{imp} to C° can never be blocked. Consequently, all languages that ban TNIs exhibit an overt negative marker X°.

5.5 Class V languages

Class V languages finally are NC languages without a negative head marker, such as Bavarian Quebecois and Yiddish. Given the explanation for **G2,** it is not expected that TNIs are banned in these languages. The only difference between these languages and Class IV languages is that the negative marker in these languages does not carry an [iNEG] feature.[11] Hence, an abstract negative operator $Op_{\neg}$ needs to be included. This could either be (depending on one's syntactic views) in a (higher) VP adjunct position or in Spec,NegP. Whatever structure is adopted (the representation in (27) is just an example of the two possible structures), verbal movement to C° cannot be blocked and therefore TNIs are allowed.

(27) Kuk nit! Yiddish
Look NEG
'Don't look!'
$[_{CP}$ Kuk$_{[Imp]i}$ $[_{NegP/VP}$ $Op_{\neg}$ $[_{NegP/VP}$ nit $[_{VP}$ $t_i]]]]$

5.6 Concluding remarks

It follows that the three assumptions that I presented in the beginning of this section (Op_{IMP} takes scope from C°, Op_{IMP} may not be c-commanded by a negative operator and the HMC) predict that in some languages TNIs are excluded. Moreover the analysis based on these assumptions predicts the typological generalisations **G1** and **G2**.

[11] This follows from the observation that in languages such as Yiddish a negative marker may occur both the left and to the right of an n-word, and exhibit NC.

6 Further evidence: diachronic change

In Non-strict NC languages with a negative marker X° (that must carry [iNEG]) TNIs must be banned. This holds for instance for Italian. However, it is known that Old Italian allowed TNIs (as pointed out by Zanuttini (1997) and shown in (28)). The analysis presented above predicts that is impossible that the negative marker *non* in Italian, which is a syntactic head, carries a feature [iNEG] but constitutes TNIs. It could however be that Old Italian *non* carried [uNEG] and thus the prediction is that Old Italian cannot have been a Non-strict NC language. This prediction is born out. Old Italian was a Strict NC language, with a negative marker *non* that carried a feature [uNEG], as shown in (29).

(28) a. *Ni* ti tormenta di questo![12] Old Italian
NEG yourself torment.2SG.IMP of this
'Don't torment yourself with this'

b. **Non* telefona a Gianni! Cont. Italian
NEG call.2SG.IMP to Gianni
'Don't call Gianni'

(29) a. Mai *nessuno* oma *non* si pió guarare[13] Old Italian
N-ever n-even-one man NEG himself can protect
'Nobody can ever protect himself'

b. *Nessuno* (**non*) ha detto *niente* Cont. Italian
N-body neg has said n-thing
'Nobody said anything'

Apparently Italian developed from a Strict NC language into a Non-strict NC language. Since in Old Italian TNIs were allowed, the change from Strict NC into Non-strict NC must have caused the ban on TNIs. Similar observations can be made for the development of Portuguese that used to be a Strict NC language that allowed TNIs and transformed into a Non-strict NC language that bans TNIs. See Zeijlstra (2006) for a more detailed analysis of the development of Romance languages with respect to NC. The analysis presented above predicts that the diachronic developments with respect to the acceptance of TNIs and the kind of NC that a language exhibits are related. The fact that this prediction is born out further supports this analysis.

7 Conclusions

In this paper I analyse the ban on TNIs as a result of three principles: (i) the fact that Op_{IMP} universally takes scope from C°; (ii) the fact that Op_{IMP} may not be c-commanded by a negative operator and (iii) the HMC (an instance of Relativized Minimality). It follows that if a negative marker is a syntactic head and carries an [iNEG] feature, V_{imp} may not move across Neg°, but must attach to it. Hence, the [IMP] feature remains under the scope of negation and the TNI is ruled out.

From this analysis the typological generalisations **G1** and **G2** can also be derived. **G1** follows, since (as explained above) every Non-strict NC language with a negative marker X° this negative marker must carry [iNEG] and thus TNIs are ruled out. **G2** follows because of the HMC. If a language does not exhibit a negative marker Neg°, this marker can never block verbal movement to C° and TNIs must be allowed.

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[12] Zanuttini (1997).

[13] Martins (2000): 194

Finally, it follows that diachronic developments with respect to the kind of NC (Strict/Non-strict) that a language exhibits may influence a language's ban on TNIs. It is shown for Italian that this prediction is indeed correct.

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HOW SEMANTICS DICTATES THE SYNTACTIC VOCABULARY

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Abstract

In this paper I argue that the set of formal features that can head a functional projection is not given by UG but derived through L1 acquisition. I formulate a hypothesis that says that initially every functional category F is realised as a semantic feature [F]; whenever there is an overt doubling effect in the L1 input with respect to F, this semantic feature [F] is reanalysed as a formal feature [i/uF]. In the first part of the paper I provide a theoretical motivation for this hypothesis, in the second part I test this proposal for a case-study, namely the cross-linguistic distribution of Negative Concord (NC). I demonstrate that in NC languages negation has been reanalysed as a formal feature [i/uNEG], whereas in Double Negation languages this feature remains a semantic feature [NEG] (always interpreted as a negative operator), thus paving the way for an explanation of NC in terms of syntactic agreement. In the third part I discuss that the application of the hypothesis to the phenomenon of negation yields two predictions that can be tested empirically. First I demonstrate that negative markers X° can be available only in NC languages; second, independent change of the syntactic status of negative markers, can invoke a change with respect to the exhibition of NC in a particular language. Both predictions are proven to be correct. I finally argue what the consequences of the proposal presented in this paper are for both the syntactic structure of the clause and second for the way parameters are associated to lexical items.

1 Introduction

A central topic in the study to the syntax-semantics interface concerns the question what exactly constitutes the set of functional projections, or more precisely, what constitutes the set of formal features that are able to project. Since Pollock's (1989) work on the split-IP hypothesis many analyses have assumed a rich functional structure, consisting of a UG-based set of functional heads that are present in each clausal domain (Beghelli & Stowell (1997) for quantifier positions, Rizzi (1997) for the CP domain, Zanuttini (1997) for negation or Cinque (1999) for the IP domain). This approach has become known as the *cartographic* approach (cf. Cinque (2002), Rizzi (2004), Belletti (2004) for an overview of recent papers). Under this approach the set of functional projections is not taken to result from other grammatical properties, but is rather taken as a starting point for grammatical analyses.

An alternative view on grammar, standardly referred to as *building block grammars* (cf. Iatridou (1990), Bobaljik & Thrainsson (1998), Koeneman (2000), Neeleman (2002)), takes syntactic trees to be as small as possible. Obviously, in many cases there is empirical evidence for the presence of a functional projection in a particular clause, e.g. due to the presence of an overt functional head. The main difference between the building block grammar approach and the cartographic approach (in its most radical sense) is that in the first approach the presence of a particular functional projection in a particular sentence in a particular language does not imply its presence in all clauses, or all languages, whereas this is the basic line of reasoning under the latter approach (cf. Cinque (1999), Starke (2004)). However the question what exactly determines the amount and distribution of functional projections however remains open.

The question what constitutes functional projections and thus the set of formal features that are able to project is not only important for a better understanding of the syntax-semantic

interface, but is also of acute interest to the study of parameters. Given Borer's (1984) assumption that parametric values are associated to properties of lexical elements, a view adopted in the Minimalist Program (cf. Chomsky 1995, 2000). For instance, the *Wh (fronting / in situ)* parameter follows from the presence of a [WH] feature on C° that either triggers movement of Wh terms to a sentence-initial position or allows them to remain in situ.

In the following section I provide some theoretical backgrounds and present my proposal in terms of syntactically flexible functional categories, arguing that a particular feature [F] can only be analysed as a formal feature able to create a functional projection FP if and only if there are (substantial) instances of doubling effects with respect to F present in language input during first language acquisition. After that, in section 3, I illustrate how the mechanism presented in section 2, works by discussing a case-study: negation and Negative Concord. In this section I demonstrate that negation is a syntactically flexible functional category: in Negative Concord languages negation is realised as a formal feature, in Double Negation languages it is not. Moreover I argue that Negative Concord should be analyse as a form of syntactic agreement and that the range of parametric variation can be derived from the different ways that negation can be formalised (or not) in a grammatical system. In section 4 two more consequences of the proposal of section 2 are discussed: (i) the syntax of (negative) markers and (ii) patters of diachronic change. Here I show that the hypothesis formulated in section 2 makes correct predictions, thus providing empirical evidence for it. Section 5 concludes.

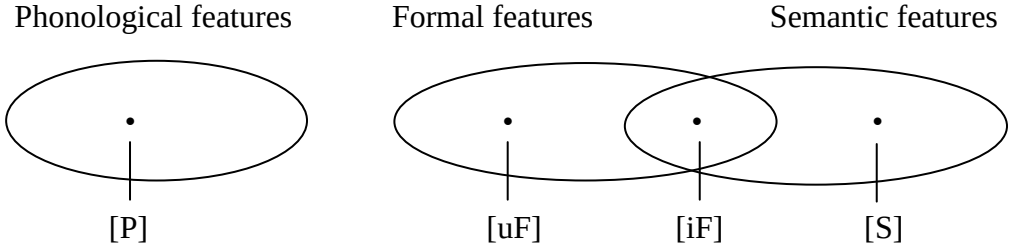
2 Formal features result from doubling effects

In the Minimalist Program (Chomsky 1995, Chomsky 2000, Chomsky 2001) Lexical Items (LIs) are assumed to be bundles of three kinds of features: phonological features, semantic features and formal features. In this paper the distinction between formal features and semantic features is of particular interest. First, I focus on the question as to what exactly are the differences between formal and semantic features. Second, the question rises how these differences can be acquired during L1 acquisition.

2.1 Formal features

As LIs consist of three different kinds of features, three different sets of features can be distinguished: the set of phonological features, the set of formal features and the set of semantic features. Following standard minimalist assumptions on the architecture of grammar, the set of formal features and the set of semantic features intersect, whereas the set of phonological features does not. This is illustrated in (1).

(1)



In the figure, the relations between the sets are illustrated. As the sets of formal and semantic features intersect, it follows that only some formal features carry semantic content. Therefore formal features have a value ±interpretable: interpretable formal features can be interpreted at LF, the interface between grammar and the (semantic) Conceptual-Intentional system; uninterpretable features do not carry any semantic content and should therefore be deleted in the derivation before reaching LF in order not to violate the Principle of Full Interpretation

(Chomsky 1995). Uninterpretable features ([uF]'s) can be deleted by means of establishing a checking relation with a corresponding interpretable feature [iF].

A good example of a formal feature is the person feature (a so-called φ-feature). It is interpretable on pronouns, but uninterpretable on verbs. This is the reason why finite verbs enter a relation with a subject, so that the uninterpretable person feature on the verb is checked against the interpretable feature on the subject and is deleted. A proper example of a semantic feature is genus (as opposed to gender), which does not trigger any syntactic operation. No feature has to be deleted, as genus can always be interpreted. The difference between formal features and semantic features thus reduces to their ability to participate in syntactic operations.

Now the following question arises: how can one know whether a particular feature is an interpretable formal feature [iF] or a semantic feature [F]? The final observation enables us to distinguish the two. From a semantic perspective the two are undistinguishable, as they have identical semantic content:

(2) $||X_{[iF]}|| = ||X_{[F]}||$

However, if one detects the presence of an uninterpretable formal feature [uF] in a sentence, there must be present an element carrying an interpretable formal feature [iF]. Hence an element Y carries an interpretable feature [iF] if (in the same local domain) an element carries an uninterpretable feature [uF] without yielding ungrammaticality (with Y being the only possible candidate to delete [uF]). In those cases Y must carry [iF] instead of [F], otherwise feature checking cannot have taken place. This question is of course not only relevant for the curious linguist, but plays also a major role in first language acquisition, as the language learner also needs to find out of which features a particular LI consists of.

2.2 Uninterpretable features and doubling effects

So, the question how to determine whether an LI carries a formal feature [iF] or a semantic feature [F] reduces to the question how to determine whether an LI carries a feature [uF]. If in a grammatical sentence an LI X carries a feature [uF] there must be an LI Y carrying [iF]. Hence, the question arises how uninterpretable features can be detected. This question is much easier to address: LIs carrying [uF]'s exhibit (at least) two properties that can easily be recognised (which already have been mentioned above) and are repeated in (3).

(3) a. A feature [uF] is semantically vacuous.

b. A feature [uF] triggers syntactic operations Move and Agree in order to be deleted.

At first sight there are three properties that form a test to recognise a feature [uF]: its semantic uninterpretability, the triggering of an operation Move and the triggering of an operation Agree. Below I argue that all of these three properties reduce to one single property: doubling.

First, although a feature [uF] is meaningless, it must establish a syntactic relationship with an element that carries [iF] and that therefore must have semantic content. This is illustrated in the following example with the person feature [i/u2SG]:

(4) a. Du kommst — German
You come

b. $[_{TP}\ Du_{[i2SG]}\ kommst_{[u2SG]}\ ]$

In (4) it is shown that the information that the subject is a 2nd person singular pronoun is encoded twice in the morphosyntax: first by the choice of the subject *Du*, second by the person marker *–st* on the verbal stem.

The example in (4) is already an example of the syntactic operation Agree as at some point in the derivation the verb's [u2SG] feature is checked against a corresponding [i2SG] feature. Without an Agree relation between *Du* and *kommst*, the sentence would be ungrammatical; if *kommst* did not have any uninterpretable person features at all, there could not have been triggered an Agree relation in the first place. Hence, if an Agree is a result of a doubling effect.

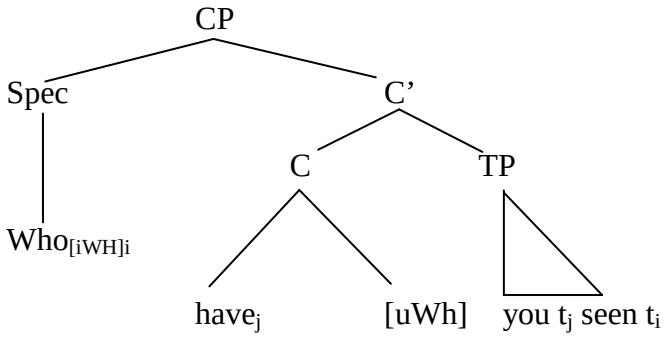
Such a relation is not restricted to two elements (one [iF], one [uF]), also multiple [uF]'s can establish a relation with a single [iF]. Ura (1996) and Hiraiwa (2001, 2005) refer to this phenomenon as *multiple Agree*. This is illustrated in (5) below for Swahili (Zwarts (2004)), which the noun class of the subject is manifested on multiple elements in the sentence.

(5) Juma a-li-kuwa a-ngali a-ki-fanya kazi — Swahili
Juma$_1$ SU$_1$-PAST-be SU$_1$-still SU$_1$-PROG-DO work
'Juma was still working'

Both in (4) and (5) the manifestation of one semantic operator is manifested more than once, a phenomenon that is known as *doubling*.

Now, let us have a look at the operation Move. Checking requirements of uninterpretable features always trigger movement. It follows immediately that Move should follow from doubling properties, since Move is a superfunction of Agree (Move = Agree + Pied-piping + Merge). I illustrate this with an example taken from Robert & Roussou (2003). It has been argued that *Wh* fronting is triggered by an uninterpretable Wh feature [uWH] on C. By moving the Wh word, which carries an [iWH] feature, to Spec,CP, C's [uWH] feature can be checked against this [iWH]. This is illustrated in (6).

(6)



In (6) the question feature is present three times in total in the structure: as [iWH] on the Wh word, as [uWH] on C and as a deleted [iWH] on the trace. Given that the *Wh* term had to be fronted, it can be determined that C must contain an uninterpretable feature [uWH]. In other words, Move unfolds the presence of an uninterpretable feature [uWH] although this feature has not been spelled-out. Hence Move too results from a double manifestation of the Wh feature in the sentence. [1]

[1] It remains an open question why in (6) the checking relation cannot be established by Agree as well. Much debate is going on about this question. In some recent minimalist versions it is assumed that in English C° has an additional EPP feature that is responsible for the movement. For the moment I will not open this discussion. It should be noted however that Move is a superfunction of Agree and since doubling is a triggering force behind Agree, it is behind Move too.

Note that the presence of the [uWH] feature is visible as a consequence of the fact that movement of the *Wh* term is required. Hence, all visible properties of [uF]'s result from detectable doubling properties. Moreover, as we saw, it also works the other way round. Doubling is defined as an instance of multiple manifestations of a single semantic operator. As only one element may be the realisation of this semantic operation ([iF]) al other manifestations must carry [uF]. Thus, whenever there is doubling with respect to F, there is a [uF] present, and whenever a [uF] feature is present in a syntactic structure, there is doubling with respect to F.

Now we can reformulate the answer to the question asked above. How can an [iF] be distinguished from [F]? The answer is that whenever there is doubling with respect to F, there are (only) formal features ([iF]/[uF]). Following this line of reasoning, if there is no doubling with respect to F, there is no reason to assume that F is a formal feature. In those cases, every instance of F always corresponds to a semantic feature [F]. As mentioned before, the question is crucial for L1 acquisition, as every L1 learner needs to find out of which features a particular LI consists. Therefore I put forward the following hypothesis:

(7) *Flexible Formal Feature Hypothesis (FFFH)*

a. Every feature [F] is first analysed as a semantic feature ([F]).

b. Only if there are doubling effects with respect to F in the language input, [F] has to be reanalysed as a formal feature [i/uF].[2]

This hypothesis, if correct, has consequences for the architecture of grammar. It rejects the idea that the set of formal features is fixed by UG, and states that every semantic operator[3] in principle can be part of the syntactic vocabulary (i.e. the set of formal features) or remains within the realm of semantics. In this sense this hypothesis treats the formation of the set of formal features on a par with grammaticalisation. Before continuing the proposal and its consequences in abstract terms, I first provide a case-study which proves that this hypothesis makes in fact correct predictions.

3 Case study: Negation and Negative Concord

The case study to test the FFFH presented above concerns negation. Doubling with respect to negation is clearly detectable, since two semantic negations always cancel out each other. If two negative elements do not cancel out each other, but yield one semantic negation, at least one of the two negative elements must be uninterpretable. This phenomenon is well described and known as Negative Concord (NC).

One can distinguish three different types of languages with respect to multiple negation: (i) Double Negation (DN) languages, in which two negative elements always cancel out each other; (ii) Strict NC languages, in which every clause-internal negative element (both negative markers and n-words[4]) yields only one semantic negation; and (iii) Non-strict NC languages, where either a preverbal n-word or a preverbal negative marker establishes an NC relation with a preverbal n-word. However, a negative marker in this type of languages may not

[2] The FFFH is not a hypothesis for an L1 acquisition theory. It is motivated by learnability requirements and should, if correct, count as a prerequisite for L1 acquisition theories.

[3] For a discussion about what exactly constitutes the class of semantic operators the reader is referred to von Fintel (1995), Keenan & Stabler (2003) and Roberts & Roussou (2003: ch. 5).

[4] The term *n-word* is due to Laka (1990) and defined in Giannakidou (2002) as elements that seem to exhibit semantically negative behaviour in some contexts, but semantically non-negative behaviour in other contexts.

follow preverbal n-words. An example of a DN language is Dutch, an example of a Strict NC language is Czech and an example of a Non-strict NC language is Italian, as is illustrated in (8)-(10) below.

(8) a. Jan ziet *niemand* — Dutch
Jan sees n-body
'Jan doesn't see anybody'

b. *Niemand* zegt *niets*
N-body says n-thing
'Nobody says nothing'

(9) a. Milan *(*ne*)vidi *nikoho* — Czech
Milan NEG.saw n-body
'Milan didn't see anybody'

b. Dnes *(*ne*)volá *nikdo*
Today NEG.calls n-body
'Today nobody calls'

c. Dnes *nikdo* *(*ne*)volá
Today n-body NEG.calls
'Today nobody calls'

(10) a. Gianni *(*non*) ha telefonato a *nessuno* — Italian
Gianni NEG has called to n-body
'Gianni didn't call anybody'

b. Ieri *(*non*) ha telefonato *nessuno*
Yesterday NEG has called n-body
'Yesterday nobody called'

c. Ieri *nessuno* (**non*) ha telefonato (a *nessuno*)
Yesterday n-body NEG has called to n-body
'Yesterday nobody called (anybody)'

In Dutch, two negations cancel each other out, and thus every negative sentence contains only one negative element. This is either the negative marker *niet* or a negative quantifier, as illustrated below. Note that the locus of the negative operator at LF does not coincide with its relative position at surface structure, but this is due to quantifier raising (independent from negation) in (11) or V2 in (13). Hence there are no doubling effects with respect to negation. As a result from the FFFH it follows that negation in Dutch is not formalised (or grammaticalised): the only negative feature [NEG] in Dutch is a semantic feature.

(11) Jan doet *niets* — $\neg\exists x.[\textbf{thing'}(x) \,\&\, \textbf{do'}(\textbf{j}, x)]$
[NEG]
Jan does n-thing

(12) *Niemand* komt — $\neg\exists x.[\textbf{person'}(x) \,\&\, \textbf{come'}(x)]$
[NEG]
N-body comes

(13) Jan loopt *niet* — $\neg\textbf{walk'}(\textbf{j})$
[NEG]
Jan walks NEG

Things are different, however, in NC languages. Let us start by discussing the Non-strict NC language Italian. In Italian postverbal n-words obligatorily need to be accompanied by the

negative marker *non* or a preverbal n-word. This means that a large part of negative sentences in the L1 input consists of sentences such as (14).

(14) Gianni *non* ha visto *nessuno* ¬∃x.[**person'**(x) & **see'**(**g**, x)][5]
[iNEG] [uNEG]
Gianni NEG has seen n-body

Since (14) contains more than one negative element, but only one negation in its semantics, only one of the negative elements can be semantically negative and the other one must be semantically non-negative. The latter element must therefore carry an uninterpretable formal negative feature [uNEG], and negation being formalised in this language the negative operator carries [iNEG] and not [NEG]. Negation must take scope from the position occupied by *non*. *Non* thus carries [iNEG] and *nessuno* carries [uNEG]. This distribution cannot be reversed, since otherwise a sentence such as (15) is expected to be grammatical, contra fact.

(15) *Gianni ha visto *nessuno*
Gianni has seen n-body
'Gianni hasn't seen anybody'

Non's [iNEG] feature also enables it to express sentential negation. This is shown in (16) where *non* functions as the negative operator.

(16) *Non* ha telefonato Gianni ¬**call'**(**g**)
[iNEG]

The fact that *non* is the carrier of [iNEG] and n-words carry [uNEG] seems to be problematic in one respect, namely that Italian also allows sentences such as (17). Here *non* is absent (and must not even be included). Hence all overt negative elements carry [uNEG].

(17) *Nessuno* ha telefonato a *nessuno* ¬∃x∃y[**person'**(x) & **person'**(y) & **call'**(x, y)]
[uNEG] [uNEG]

However, given the grammaticality and the semantics of the sentence, one element must have [iNEG]. Basically, there are two ways out. Either one analyses n-words as being lexically ambiguous between negative quantifiers and non-negative indefinites (cf. Herburger (2001)), but this would render (15) grammatical. The other way out is to assume that negation is induced by a (phonologically) abstract negative operator (*Op*¬), whose presence is marked by the overt n-words. Then (17) would be analysed as follows:

(18) *Op*¬ *nessuno* ha telefonato a *nessuno*
[iNEG] [uNEG] [uNEG]

This analysis is supported by the fact that if the subject n-word is focussed and the negative marker *non* is included, the sentences achieves a DN reading. Hence, apart from the presence of *non*, a second negative operator must be at work.

(19) *Op*¬ *nessuno* non ha telefonato a *nessuno*
[iNEG] [uNEG] [iNEG] [uNEG]

Hence, given the fact that in Italian not every instance of negation is semantically negative, negation is formalised and every negative element carries a formal negative feature: n-words carry [uNEG] and the negative marker *non* and *Op*¬ carry [iNEG].

In Czech, the application of the FFFH leads to slightly different results. First, since Czech is an NC language, negation must be formalised and n-words are attributed a feature [uNEG]. However the (default) assumption that the negative marker carries [iNEG] cannot be drawn

[5] For clarity reasons tense is neglected in all these readings

on this basis yet. The negative operator could also be left abstract. Hence, for the moment the value of the formal feature of the negative marker in (20) is left open.

(20) Milan *ne*vidi *nikoho* ¬∃x.[**person**'(x) & **see'**(**m**, x)]
[?NEG] [uNEG]

In Italian we saw that *non* must be the negative operator, since negation takes scope from the position that it occupies. Consequently, no n-word is allowed to surface left from this marker (with the exception of constructions like (19)). However, in Czech n-words are allowed to occur both to the left and to the right of the negative marker. This means that negation cannot take scope from the surface position of *ne*. The only way to analyse *ne* then, is as a negative marker that carries [uNEG] and which establishes a feature checking relation (along with the n-words) with a higher abstract negative operator:

(21) *Op*¬ *Nikdo* *ne*volá ¬∃x.[**person'**(x) & **call'**(x)]
[iNEG] [uNEG] [uNEG]

As a final consequence, single occurrences of *ne*, cannot be taken to be realisations of the negative operator, but markings of such an operator. In (22) the negative marker indicates the presence of *Op*¬ , which on its turn is responsible for the negative semantics of the sentence.

(22) Milan *Op*¬ *ne*volá ¬**call'**(**m**)
[iNEG] [uNEG]

Hence, in Czech even the negative marker is semantically non-negative. Czech and Italian thus differ with respect to the formalisation of negation to the extent that the negative marker in Italian carries [iNEG], whereas the negative marker in Czech carries [uNEG]. Note that this corresponds to the phonological status of the two markers: in Czech the negative marker exhibits prefixal behaviour, thus suggesting that it should be treated on a par with tense/agreement morphology. Italian *non* is a (phonologically stronger) particle, that can be semantically active by itself.

The application of the FFFH also drives in the direction of analysing NC as a form of syntactic agreement, a line of reasoning initially proposed by Ladusaw (1992) and adopted by Brown (1996) and Zeijlstra (2004). It should be noted however that these are not the only accounts for NC. Other accounts treat NC as a form of polyadic quantification (Zanutttini (1991), Haegeman & Zanuttini (1996), De Swart & Sag (2002)) or treat n-words as Negative Polarity Items (cg. Giannakidou 2000). The latter approaches both face problems, many of them addressed in the literature (cf. Zeijlstra (2004) for an overview). Unfortunately, space limitations prevent me here from addressing these issues here. The reader is referred to Zeijlstra (2004) for a discussion of how most of these problems can be explained away in a syntactic agreement approach of NC. Moreover, in the next section I discuss two consequences that follow from the syntactic agreement approach that is induced by the FFFH. These provide additional evidence for this explanation of NC.

A final point must be made regarding the range of variation that languages exhibit with respect to the expression of negation. Although I did not discuss every possible type of NC language (optional NC was left out of the discussion), the languages above cover the entire range of variation that one may expect: either every negative element is formalised as carrying a [uNEG] feature (Czech), or no element at all has been formalised (Dutch), or only some elements have been assigned [iNEG] while others have been assigned [uNEG] (Italian). All other kinds of NC languages could be analysed in the same manner. This means that the entire range of parametric variation with respect to the interpretation and expression of

negation follows from the proposal in (7).[6] Consequently, adopting (7) a parameter such as the NC parameter (a language exhibits/does not exhibit NC) or a subparameter responsible for the Strict vs. Non-strict NC distinction is a derived notion, not directly following from UG but as a by-product of a simple learnability mechanism.

4 Consequences

The FFFH and the exact analysis of NC in terms of syntactic agreement make several predictions that I discuss in this section. First I argue that the status of the negative feature (formal or semantic) has some consequences regarding the appearance and distribution of the negative projection (NegP after Pollock (1989)). Second I argue that the FFFH makes correct predictions about the consequences of diachronic change with respect to the obligatorily or optional occurrence of the negative marker.

4.1 Negative features and projections

Now let us look at the relation between the formal status of negative features and the syntactic status of negative markers. Negative markers come about in different forms. In some languages (Turkish) the negative marker is part of the verbal inflectional morphology; in other examples the negative marker is a bit stronger. Italian *non* is a strong particle, and the Czech particle *ne* is weak.[7] German *nicht* on the other hand is even too strong to be a particle and is standardly analysed as an adverb. Examples are in (23)-(25).

(23) John elmalari ser*me*di[8] — Turkish
John apples like.NEG.PAST.3SG — (affixal)
'John doesn't like apples'

(24) a. Milan *ne*volá — Czech
Milan NEG.calls — (weak particle)
'Milan doesn't call'

b. Gianni *non* ha telefonato — Italian
Gianni NEG has called — (strong particle)
'Gianni didn't call'

(25) Hans kommt *nicht* — German
Hans comes NEG — (adverbial)
'Hans doesn't come'

Note also that it is not mandatory that a language has only one negative marker. Catalan has a strong negative particle *no* and an additional optional negative adverbial marker (*pas*)

[6] This leaves open many possibilities, e.g. about the number of negative markers, their syntactic status, their position in the clausal structure, etc. Several of these issues are discussed in the next sections. It is important however that the range of variation with respect to negation is restricted by two constraints: (i) a language has the possibility to express negation (for reasons of language use rather than grammatical reasons) and (ii) negation can, but does not need to be formalised.

[7] I refrain from the discussion whether Czech ne should be analyses as a clitical, prefixal or as a real particle. It will become clear from the following discussion that the outcome would not be relevant for the final analysis in terms X°/XP status.

[8] Example from Ouhalla (1991), also cited in Zanuttini (2001)

whereas in West Flemish the weak negative particle *en* is only optionally present, next to the standard adverbial negative marker *nie*. Standard French even has two obligatory negative markers (*ne … pas*), as demonstrated in (26).

(26) a. *No* serà (*pas*) facil — Catalan
NEG be.FUT.3SG NEG easy
'It won't be easy'

b. Valère (*en*) klaapt *nie* — West Flemish
Valère NEG talks NEG
'Valère doesn't talk'

c. Jean *ne* mange *pas* — French
Jean NEG eats NEG
'Jean doesn't eat'

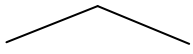
I adopt the standard analysis that negative affixes and weak and strong negative particles should be assigned syntactic head (X°) status, whereas negative adverbials are specifiers/adjuncts, thus exhibiting XP status (cf. Zanuttini (1997a,b), Rowlett 1998, Zanuttini (2001), Merchant 2001, Zeijlstra 2004).

The difference between X° and XP markers has influence on functional structure. X° negative markers must (by definition) be able to project themselves, yielding a clausal position Neg°. On the other hand, XP negative markers may occupy the specifier position of a projection that is projected by a (possibly abstract) negative head Neg°, Spec,NegP (as is the standard analysis for most adverbial negative markers), but this is not necessarily the case. It could also be an adverbial negative marker that occupies an adjunct/specifier position of another projection, for instance a *v*P adjunct position. In that case it is not necessary that there is a special functional projection NegP present in the clausal structure (it is not excluded either).

Now the question follows: when is a negative feature able to project? Giorgi & Pianesi (1997) addressed this question in terms of their feature scattering principle, arguing that 'each feature can project a head.' However, given the modular view on grammar in which features are divided in different classes, the question emerges which kind of features can head a projection. One would not argue that every lexical semantic feature or every phonological feature might have its own projection. Feature projection is a syntactic operation, and should thus only apply to material that is visible to syntax. Hence, the most straightforward hypothesis is that only formal features can project. This means that a feature can only head a projection if [F] has been reanalysed as a formal feature [i/uF].

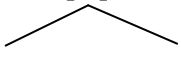
Consequently, it follows immediately that the availability of a negative projection NegP in a particular language then depends on the question whether negation has been reanalysed as a formal feature [i/uNEG] in this language. This makes the following prediction: only languages that exhibit doubling effects with respect to negation (i.e. only in NC languages) NegP may be available. This claim can easily be tested as it has been argued above, that X° negative markers occupy a Neg° position, whereas adverbial negative markers do not have to occupy a Spec,NegP position. The prediction following from this is that only in the set of NC languages one can find negative markers X° (see (27)).

(27) a. NC: [u/iNEG]/[X]



[u/iNEG] X

b. Non-NC: [X]



[NEG] [X]

In Zeijlstra (2004) this prediction has been tested for a threefold empirical domain (a sample of 267 Dutch dialectal varieties, a sample of 25 historical texts, and a set of 25 other

languages from different families) and been proven correct.[9] This provides empirical evidence for the FFFH.

4.2 Negation and diachronic change

Since Jespersen (1917) it is known that a large majority of languages has developed with respect to the expression of negation. These changes concern both the syntax of the negative marker and the occurrence of NC. As follows from the previous subsection, these two phenomena are not unrelated. In this subsection, I first discuss how the FFFH applies to the Spanish development from a Strict NC into a Non-strict NC language. Second, I exemplify the change from Dutch from an NC language into a DN language.

4.2.1 Spanish: from Strict NC to Non-strict NC

Old Spanish was a Strict NC language, where a subject n-word was allowed to precede the negative marker *no*, as is shown for 11th century Spanish in (28).[10]

(28) Qye a myo Cid Ruy Diaz, que *nadi no* diessen posada — 11th Cent Spanish[11]
That to my lord Ruy Diaz, that n-body NEG gave lodging
'that nobody gave lodging to my lord Ruy Diaz'

Given the fact that the language input during L1 acquisition contained expressions of the form in (28) the negative marker was assigned a formal feature [uNEG]. However, at some point speakers began to omit the negative marker *no* in constructions such as (28), analysed as (29). This change is not surprising, since the negative marker in these constructions did not contribute to the semantics of the sentence (the fact that there is an abstract negative marker located in a higher position than *nadi* follows from the presence of this subject n-word). Hence the L1 input had the form of (30) with an increasing relative frequency of instances of (31). At a certain point the absence of cases of *no* following *nadi* was thus robust that the cue that forces the language learner to assign *no* the feature [uNEG] disappeared. As a result *no* was always the highest element in a negative chain and therefore *no* got reanalysed as [iNEG] leading to the judgements in (32). Note that this reinterpretation of *no* is correctly predicted by the FFFH.

(29) *Op*¬ nadi no
[iNEG] [uNEG] [uNEG]

(30) *Op*¬ nadi (no)
[iNEG] [uNEG] [uNEG]

(31) *Op*¬ nadi
[iNEG] [uNEG]

(32) a. *No* vino *nadie* — Modern Spanish

[9] Two kinds of exceptions have been found. First, Standard English, being a non-NC language allows for the negative marker *n't* ,which behaves like a negative head. Possibly this is related to the fact English is on its way of transforming itself into an NC language (cf. Zeijlstra (2004)). Alternatively, English negation can be said to exhibits doubling effects, as it may trigger movement (negative inversion). Second, a number of Southeast Asian languages lack n-words. In those languages however, it can be shown that negative markers trigger Move, thus exhibiting a doubling effect as well.

[10] For an overview of the development of Spanish negation, see Herburger (2001) and references therein.

[11] Example taken from Herburger (2001).

NEG came nobody
'Nobody came'

b. *Nadie* (**no*) vino
NEG came nobody
'Nobody came'

4.2.2 Dutch: from NC to DN

Similar observations can be made for Dutch. Middle Dutch was a language that used two negative markers *en/ne … niet* to express sentential negation, as shown in (33). However, as (34) shows, in most cases which contained an n-word only the preverbal negative marker *en/ne* was present.

(33) Dat si *niet en* sach dat si sochte[12] Middle Dutch
That she NEG NEG saw that she looked.for
'That she didn't see what she looked for'

(34) Ic *en* sag *niemen* Middle Dutch
I NEG saw n-body
I didn't see anybody

As in most languages exhibiting two negative markers, one of them disappears. 16th and 17th century Holland Dutch in most cases left out the preverbal negative marker *en/ne*, and only exhibited *niet*. As a consequence of this development, the presence of *en/ne* also lost ground in constructions with n-words, resulting in expressions like (35).

(35) Ic sag *niemen* 17th Cent. Dutch
I saw n-body
I didn't see anybody

Hence, the language input contained less and less constructions as the ones in (36), but more and more expressions in which an n-word was the only negative element in the sentence. As the cue to assign n-words a [uNEG] feature vaguely disappeared, n-words were no longer reanalysed as [uNEG], but kept their semantic [NEG] feature (37).[13]

(36) a. *Op*¬ en niemen
[iNEG] [uNEG] [uNEG]

b. *Op*¬ niemen en
[iNEG] [uNEG] [uNEG]

(37) Ic sag *niemen*
[NEG]

To conclude, the two developments described above show exactly how a change in the syntax of negative markers leads to a change in the interpretation of multiple negative expressions. Note that these latter changes follow completely from the FFFH and no other additional account has to be adopted.

[12] Lanceloet 20042.

[13] Similarly, the negative marker *niet* also did not get reanalysed anymore, thus keeping its [NEG] feature.

5 Conclusions

In this paper I first I argued on theoretical ground that the set of formal features, i.e. the set of features that can head a functional projection, is not provided by UG, but is a result of L1 acquisition. Only those semantic features that exhibit (overt) doubling effects are formalised (or grammaticalised). This has been formulated in the FFFH. Consequently, as only formal features can project, the number of functional projections FP that a particular grammar has at its disposal is limited by the FFFH. Each grammar, based on the language input during L1 acquisition, makes a particular choice of semantic operators that can be realised as FP's. Thus clausal structure is subject to cross-linguistic variation and not a UG-based template.

In the second part of this paper I applied the FFFH to the domain of negation. Negation is a semantic operator that differs cross-linguistically in the way it surfaces in morphosyntax. Languages differ with respect to whether they exhibit doubling effects (known as NC) and thus the result of this application is that only in NC languages, negation is formalised. In DN languages negation is not realised as a formal feature.

The claims about the flexible formal status of negation are empirically testable. Not only requires it an analysis of NC in terms of syntactic agreement (cf. Zeijlstra (2004) who shows that such an analysis solves many problems that other analyses have been facing). It also makes correct predictions about the syntactic status of negative markers and the diachronic relation between the syntax of negative marker(s) and the occurrence of NC. First, it is shown that only NC languages may exhibit a negative marker Neg°. Second, it follows that if the (optional) negative marker for independent reasons ceases to occur in particular contexts, this may influence the overt doubling effects and therefore alter the status of the language as a (Strict) NC language.

The FFFH, which is not only theoretically but also empirically well motivated, has consequences for the notion of parametric variation. Parametric variation seems not to be derived from the different ways that a functional head can be marked (cf. Roberts & Roussou (2001) for a proposal along these lines), but to follow from how a particular semantic operator is marked: either as a formal feature or not. If marked through some formal feature then a number of different options remain open: it may be manifested by an overt lexical head, it may trigger Move or Agree, etc. In any case, the parametric space can be said to follow from the FFFH in combination with general syntactic mechanism. This has been illustrated for a few possible ways to express sentential negation in section 3 (NC) and 4 (negative markers).

Finally, the proposal presented above allows formulating predictions in terms of typological implications, which can be tested empirically. This is an interesting result, as with Newmeyer (2004) the question whether typological implications count as linguistic evidence has recently become subject of debate. I hope to have shown in this paper that typological implications can be used a testing mechanism for different proposal concerning the status of formal features.

Of course, the FFFH is still programmatic in nature. It seems to make correct predictions for negation, but it should be evaluated for a number of other functional categories in order to determine its full strength. However, I think that the evidence provided in this paper sheds more light on exactly how semantics dictates the syntactic vocabulary.

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ADVERBIAL QUANTIFICATION AND FOCUS IN HAUSA

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Abstract

The paper investigates the interaction of focus and adverbial quantification in Hausa, a Chadic tone language spoken in West Africa. The discussion focuses on similarities and differences between intonation and tone languages concerning the way in which adverbial quantifiers (AQs) and focus particles (FPs) associate with focus constituents. It is shown that the association of AQs with focused elements does not differ fundamentally in intonation and tone languages such as Hausa, despite the fact that focus marking in Hausa works quite differently. This may hint at the existence of a universal mechanism behind the interpretation of adverbial quantifiers across languages. From a theoretical perspective, the Hausa data can be taken as evidence in favour of pragmatic approaches to the focus-sensitivity of AQs, such as e.g. Beaver & Clark (2003).

1 Introduction

The paper investigates the semantic effects of grammatical focus marking and focus-background structure on adverbial quantification in Hausa, a Western Chadic tone language, which is spoken mainly in Northern Nigeria and the Republic of Niger.[*] The discussion focuses on similarities and differences between intonation and tone languages concerning the way in which adverbial quantifiers, henceforth AQs, and focus particles, henceforth FPs, associate with focus constituents. The main purpose of the paper is to introduce new empirical data from a semantically under-researched language into the theoretical debate. It will emerge that typologically diverging languages do not differ much in how adverbial quantification and focus-background structure interact. Concerning their relevance to the theoretical debate, the Hausa data may be taken as evidence in favour of more pragmatically oriented approaches to the analysis of AQs, and to the interpretation of focus in general.

The paper is organized as follows. Section 2 provides a quick overview over the interaction of adverbial quantification and focus-background structure in intonation languages, such as English and German. Section 3 introduces the focus marking system of Hausa, which differs a lot from the accent-based focus-marking systems of intonation languages. Section 4 contains a few methodological remarks on semantic fieldwork in general. The core part of the paper is section 5, which presents the main empirical findings concerning the interaction of adverbial quantifiers and focus-background structure in Hausa. Section 6 provides a sketch for a unified analysis of AQs in Hausa and intonation languages, which gives rise to a prediction for the behaviour of AQs in intonation languages. Section 7 concludes.

2 Adverbial Quantification and Focus in Intonation Languages

Most, if not all semantic accounts of adverbial quantification are based on intonation languages, which mark focus prosodically by means of a nuclear pitch accent. In these

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languages, AQs exhibit focus sensitivity in that grammatical focus marking has a truth-conditional effect on their interpretation, see e.g. Lewis 1975, Rooth 1985, 1992, Partee 1991, von Fintel 1994, Herburger 2000, among many others. To recapitulate, consider the sentences in (1a-c), where a change in accent position induces a change in meaning:

(1) a. MUSA always eats rice. *SUBJ-focus*

b. Musa always EATS rice. *V-focus*

c. Musa always eats RICE. *OBJ-, VP-, sentence-focus*

Following work by Partee (1991), semantic accounts of the focus-sensitivity of AQs try to capture their interpretation in terms of tripartite structures: the semantic representation of clauses containing an AQ is split up into three parts depending on their focus-background structure: the AQ is the quantificational operator, the background is mapped on the restriction of the quantifier, and the focus constituent is mapped on the nuclear scope of the quantifier. This is illustrated for (1a-c) in (2).[1]

(2) *Operator* *Restriction* *Nuclear scope*

a. $always_e$ (∃x x eats rice at e) (Musa eats rice at e)
= Always, if somebody eats rice, it is MUSA.

b. $always_e$ (∃R Musa R-s rice at e) (Musa eats rice at e)
= Always, if Musa does something with rice, he EATS rice.

c. $always_e$ (∃y Musa eats y at e) (Musa eats rice at e)
= Always, if Musa eats something, he eats RICE. (= OBJ-focus)

A first empirical generalisation that emerges from (1) and (2) is given in (3):

(3) *Focus-Sensitivity of AQs:*
The grammatically marked focus constituent is never mapped to the restriction, but to the nuclear scope of the AQ (Partee 1991).

According to (3), there is a tight relation between grammatical focus marking and the interpretation of AQs. In addition, semantic accounts assume an equally tight connection between the background of a clause and the semantic restriction of the AQ: according to this assumption, the background of a clause, with the focus constituent replaced by a variable, would be automatically mapped to the restriction. A variant of this proposal is found in Rooth (1999), where it is assumed that AQs do not associate with focus per se, but rather with the presuppositions induced by the focus-background structure of the clause.

However, recent studies of the focus-sensitivity of AQs have cast some doubt on the validity of the second claim. Cohen (1999) and Beaver & Clark (2003), henceforth B&C (2003), discuss a number of examples in which the background, i.e. material that is not grammatically marked for focus, is not automatically mapped to the restriction of the AQ. Consider (4) from B&C (2003:336, ex. (31)):

(4) Mary always took *someone*$_F$ to the cinema.

The meaning of the background in (4) can be paraphrased as ‘Mary took x (=someone) to the cinema’. Given the above assumption that the background is automatically mapped on the restriction of the AQ, the meaning of the entire clause in (4) should therefore be the

[1] For the sake of simplicity, I assume without further argument that adverbial quantifiers quantify asymmetrically over events or situations only. See e.g. Heim (1990), de Swart (1991), and von Fintel (1994) for relevant discussion.

tautological 'Always, if Mary took someone to the cinema, she took someone to the cinema.', contrary to fact. Rather, the meaning of (4) can be paraphrased as in (4')

(4') Always, if *Mary went to the cinema*, she took someone with her.

The restriction of *always* in (4) is implied by, but not identical to the background of (4). Based on the interpretation of sentences such as (4), we therefore arrive at a second generalisation concerning the interaction of AQs with focus-background structure:

(5) *No direct association with backgrounded material:*
Backgrounded material, i.e. material that is not grammatically marked for focus, is not automatically mapped to the restriction of the AQ (see also B&C 2003: 340)

Rather, it seems that the contribution of the background to the identification of an AQ's restriction is more indirect and mediated by the pragmatics.

Finally, even though AQs are focus-sensitive, they differ from focus particles (FPs) such as *only* in that they stand in a loser semantic (and syntactic) relation to the focus constituent (B&C 2003: 348ff.). This is illustrated by the degraded status of (6), a variant of (4) with *always* replaced by the - at first sight synonymous – FP *only* (B&C's (32)):

(6) ?Mary only took *someone*$_F$ to the cinema.

To the extent that it is acceptable, (6) can only mean something like 'the single person that Mary took to the cinema was someone', which is not very informative to say the least. The difference between AQs and FPs also shows up in the minimal pair in (7ab) (B&C's exs. (3) and (4)): The variant with *only* is ungrammatical, but the variant with *always* is fine:

(7) a. *Sandy only feeds Nutrapup to *Fido*$_F$, and she only feeds Nutrapup to *Butch*$_F$ too.
b. Sandy always feeds Nutrapup to *Fido*$_F$, and she always feeds Nutrapup to *Butch*$_F$ too.

B&C (2003) account for these differences by assuming that FPs such as *only* are focus-functional: they make direct reference to the focus-background structure of a clause in their truth-conditions, and often in form of syntactic licensing conditions as well. The truth-conditions for sentences containing the FP *only* are stated in (8a). Compare these with the truth-conditions for sentences containing the AQ *always* in (8b) (B&C 2003: 349):

(8) a. [[NP only VP]] = $\forall e\,[p(e) \rightarrow q(e)]$
(with q = *[[NP VP]]*, and *p = [[NP VP]] minus the content of focused material within the VP*)

b. [[NP always VP]] = $\forall e\,[\sigma(e) \rightarrow \rho(e,e') \wedge q(e')]$
(with *q = [[NP VP]]*, σ a contextually constrained variable over sets of situation, and ρ a contextually constrained variable over relations between events)

According to (8a), (7a) states that the only event of Sandy feeding somebody with Nutrapup is an event of Mary feeding Nutrapup to Fido, and the only event of Sandy feeding somebody with Nutrapup is an event of Mary feeding Nutrapup to Butch. As both conjuncts are uttered in the same context, this is clearly contradictory. In contrast, the interpretation of clauses with AQs such as *always* is largely governed by pragmatic factors. The connection between the restriction of *always*, σ in (7b), and the focus-background structure of the clause is established indirectly, in that σ must not contradict the presuppositions of the clause, *including those stemming from its focus-background structure*. For this reason, (7b) can receive an interpretation that is not contradictory, given appropriate values for σ and ρ. For example, if σ is the sets of events in which Sandy feeds some number of dogs, and if ρ is the temporal-and-physical-part-of relation, then (7b) would state that in every event in which Sandy feeds some dogs, she feeds Nutrapup to Fido, and in every event in which Sandy feeds some dogs, she

feeds Nutrapup to Butch (but she does not, say, feed Nutrapup to Cuddles because he is too old and has no teeth left) (see B&C 2003: 352). In this case, the restriction σ would not contradict the background presupposition of (7b), according to which Mary feeds Nutrapup to someone. The difference between AQs and FPs is stated again in (9):

(9) Adverbial quantifiers stand in a loser semantic and syntactic relation to the focus constituent than focus particles.

Notice finally that the generalisation in (3) still holds. Since the meaning of the entire clause, q, is mapped to the nuclear scope of the AQ *always* (see also Partee 1999), it follows that the meaning of the focus constituent will be mapped to its nuclear scope, too. However, the effect of grammatical focus marking on the interpretation of AQ-sentences is only indirect: the focus-sensitivity of AQs arises because their interpretation depends on a contextually-salient set of events, σ, and because focus-marked material is usually not contextually salient and therefore not part of σ, see once again B&C (2003: 348).

3 Focus Marking in Hausa

This section discusses the basic patterns of grammatical focus marking in Hausa. Section 3.1 gives some general information on Hausa, which will ensure a better understanding of the empirical data to be introduced later. Section 3.2 shows how focus is grammatically marked in Hausa. Section 3.3. demonstrates that such focus marking is not obligatory with non-subjects, resulting in massive focus ambiguity.

3.1 General Information on Hausa

Hausa belongs to the Western branch of the Chadic language family, which belongs to the Afro-Asiatic languages. Its grammatical system is well documented, see e.g. the grammars by Newman (2000) and Jaggar (2001). Hausa is a tone language with three lexical tones: a high tone, a low tone (`), and a falling tone (^). The basic word order is SVO and pronominal subjects can be dropped. Hausa has no overt case marking, which means that arguments are identified by their position relative to the verb and by subject agreement. Oblique arguments are marked by prepositions. The verb is not inflected for tense or agreement. Instead, temporal and aspectual information as well as subject agreement are encoded by means of a TAM-marker preceding the verb: The TAM-marker *taa* in (10), for instance, indicates that the subject is 3sg.f and that the sentence is in the perfective aspect.

(10) Kànde taa dafà kiifii.
Kande 3sg.f.perf cook fish
'Kande cooked fish.'

In the progressive aspect, the verb appears in its nominalized form. With many verb classes, this verbal noun and the following complement are linked by the nominal linker *–n/-r* 'of', which is typically found in associative *N-of-N*-constructions, cf. (11):

(11) Ya-nàa *gyaara-n* mootaa.
3sg.m-prog repairing-of car
'He is repairing the car.'

3.2 Grammatical Focus Marking

Focus in Hausa is not marked by pitch accent, but syntactically: the focus constituent is moved to a focus position in the left periphery. Like other instances of A'-movement, such as *wh*-fronting and relativization, focus movement is indicated by a morphological change in the aspectual marker, which appears in the so-called relative form (Tuller 1986). In addition, the fronted focus constituent is optionally followed by the particle *nee/cee*, see e.g. Green (1997),

and Newman (2000).[2] (12a) exhibits the neutral SVO order. In (12b), a focused object NP has been fronted. (13) illustrates focus fronting with a PP-adjunct.

(12) a. Kànde *taa* dafà kiifii.
Kande 3sg.f.perf cook fish
'Kande cooked fish.'

b. *Kiifii*$_1$ *(nèe)* Kànde *ta* dafàa t_1.
fish PRT Kande 3sg.f.perf.*rel* cook
'Kande cooked FISH.'

(13) *Dà wuƙaa*$_1$ *nèe* *ya* sòokee shì t_1. (Newman 2000:192)
with knife PRT 3sg.perf.*rel* stab him
'He stabbed him with a KNIFE.'

In contrast, focused subjects are focus-marked by (vacuous) movement: in the progressive and perfective aspect, the focus status of the subject is marked on the TAM-marker, which appears in the relative form. Thus, (12a) could not be used to answer the subject question 'Who cooked fish?'. Instead, one would have to use (14) with a short-voweled relative aspect marker (and optional particle).

(14) *Kànde*$_{F,1}$(cèe) t_1 t*a* dafà kiifii.
Kande PRT 3sg.f.perf.*rel* cook fish
'KANDE cooked fish.'

Section 5.1 will demonstrate how the fronting of different focus constituents effects the interpretation of adverbially quantified sentences.

3.3 No Obligatory Focus Marking with Non-Subjects

Closer scrutiny of the focus facts in Hausa shows that focused non-subjects need not be fronted, but can also remain *in situ* (Green and Jaggar 2003). As a matter of fact, the *in situ* variant is the preferred option with new-information focus (Hartmann and Zimmermann, to appear-a). Instances of *in situ* focus are grammatically unmarked, that is, they are marked neither syntactically nor prosodically, e.g. by pitch movement, duration or intensity (Hartmann and Zimmermann, to appear-a). (15A) illustrates such an unmarked focus constituent (*dawaakii*) in an answer to a *wh*-question:

(15) Q: Mèe su-kà kaamàa? A: Sun kaamà *dawaakii*$_F$ (nè).
what 3pl-perf.rel catch 3pl.perf catch horses PRT
'What did they catch?' 'They caught HORSES.'

In this respect, Hausa differs drastically from intonation languages, which invariably have a (focus-marking) pitch accent somewhere in the clause, and which therefore exhibit obligatory focus marking.

The optional lack of focus marking leads to a considerable degree of focus ambiguity, which must be pragmatically resolved. The SVO order in (15A) could thus be used to answer the questions 'What did Kande cook?' (OBJ-focus), or 'What did Kande do?' (VP-focus), as well as 'What happened?' (sentence focus). This raises the question of how the absence of

[2] The particle *nee/cee* has received various analyses in the literature. Traditionally, it is called a *stabilizer* (Newman 2000). Alternatively, the particle has been analysed as a copula element in a cleft-like construction (McConvell 1973), or as a focus marker (Green 1997). Most recently, Hartmann and Zimmermann (to appear-b) provide semantic arguments that *nee/cee* should be analysed as a focus-sensitive marker of exhaustivity. As nothing hinges on the correct choice for the purposes of this article, I will simply gloss *nee/cee* as a particle (PRT).

grammatical focus marking with non-subjects affects the meaning of sentences with AQs. We will turn to this question in section 5.2.

Notice again, that unlike all other constituent, focused subjects must be marked. Presumably, this restriction, which is found in many African languages (Hartmann & Zimmermann 2004), has a functional origin. In their unmarked preverbal position, subjects frequently receives a default interpretation as topic of the clause (Givon 1976, Chafe 1976). Consequently, a subject will have to be marked whenever it does not function as the topic of the clause, for instance when it is focused.

Summing up, focus in Hausa is marked syntactically by fronting, and morphologically by a change in form of the perfective and progressive TAM-markers. Hausa differs from European intonation languages in that focus may, but need not be grammatically marked. This means that many instances of focus must be resolved pragmatically, based on the context: This is the case with non-subject foci that are realised *in situ*, as well as with instances of subject focus in the future and habitual aspect, both aspects without relative TAM-marking.

4 Methodological Remarks on Semantic Fieldwork

Before we turn to the actual discussion of the focus-sensitivity of AQs in Hausa, a few general remarks on the methodology of semantic fieldwork are in order. After all, asking language consultants about meanings is difficult, especially when it comes to the subtle meaning differences arising from the interaction of AQs with the focus-background structure of a clause. Because of this problem, the Hausa data were collected following Matthewson's (2004) methodological guidelines for semantic fieldwork.

According to Matthewson (2004), the only licit elicitation methods for semantic fieldwork are the ones listed under (16):

(16) i. Translations of entire clauses

ii. Truth-condition judgments relative to a context

iii. Felicity judgments relative to a context

In each case, the elicitation of judgments is achieved by asking whether a particular clause A is appropriate in a previously set up discourse context or situation.

A particularly daunting problem in the semantic analysis of sentences in a foreign language arises in connection with potentially ambiguous sentences. Straight translation tasks from the object language into the metalanguage generally fail, as the language consultant usually translates the sentence on its most prominent reading, afterwards rejecting translations of less prominent readings. In order to establish the meanings of potentially ambiguous clauses, one should therefore stick to the following strategies, the first three of which are taken from Matthewson (2004):

(A) Never ask the consultant directly for an ambiguity judgment as this would be asking for an analysis. There is the danger that consultants may overlook or even discard less prominent readings. Instead,

(B) if you have a suspicion what the less preferred reading may be, ask for this reading first, by setting up an appropriate context and then asking for a truth-condition or felicity judgment.

(C) Choose examples that pragmatically force the less preferred reading.

In order to illustrate how one reading can be pragmatically forced over another, consider adverbially quantified transitive clauses in English with a pitch accent on the object NP. The pitch accent could indicate focus on the VP or on the object. Assume now that we want to test for the association of the AQ with object focus. In order to do so, one should look for an

example such as (17), which would make the VP-focus reading highly unlikely, or even false, due to our world knowledge. (17) is modelled on Hausa data actually used in the elicitation.

(17) Hausa people *mostly* [$_{VP}$ eat [$_{NP}$ TUWO]].

On the VP-reading, without any further context, (17) states that on most occasions on which Hausa people *do anything*, they eat tuwo, a kind of mush made form cassava, yams, rice or grain, which is eaten with almost any meal. As Hausa people usually do not spend the larger part of the day eating, (17) should be judged unlikely or even false on this reading. In contrast, on the OBJ-reading, (17) states that on most occasions on which Hausa people *eat anything*, they eat tuwo. Given the above remark on the eating habits of Hausa people, this is correct. The difference in truth-conditions or felicity between the two readings, therefore makes (17) a good test case for the existence of association with object focus.

(D) Control for the focus constituent in a clause by adding material in form of negative contrastive clauses, which serve to disambiguate the focus-background structure.

The Hausa example in (18) illustrates strategy (D). The first clause is at least four-ways ambiguous between an OBJ-, VP-, a sentence-focus, or even a SUBJ-focus reading, as there is no relative TAM-marker in the habitual aspect. Disambiguation is achieved by adding a negative contrastive, which is identical to the first clause except for the contrastive focus constituent *riigunàa* 'dresses':

(18) Yawanci maɗînki ya-kàn yi huulunàa, baa-yàa yî-n *riigunàa*
mostly tailor 3sg.m-hab make caps neg-3sg making-of dresses
'In most instances, a tailor makes HATS, not SHIRTS.'

The resulting structure in (18) only has the OBJ-focus reading because it is the object that is contrastively focused under negation. This discussion of the methods used in eliciting semantic data in Hausa sets the stage for the upcoming discussion of the interaction of Hausa AQs with focus.

5 Adverbial Quantification and Focus Marking in Hausa

This section presents the empirical findings concerning the semantic interaction of Hausa AQs such as *kullum* 'always', *yawanci/galibii* 'mostly/usually' and the habitual aspect marker *-kan* with the focus-background structure in that language. We will consider cases with grammatical focus marking and cases without grammatical focus marking in turn. Section 5.1 shows hat Hausa AQs are sensitive to grammatical focus marking. Section 5.2 discusses the interpretation of adverbially quantified sentences in the absence of grammatical focus marking. Section 5.3 deals with differences between AQs and FPs in Hausa.

A major result of the discussion is that the interaction of AQs with the focus-background structure in Hausa is very similar to that found in intonation languages, despite the observed differences in the way that focus is grammatically marked. Furthermore, the discussion shows that the correct interpretation of adverbially quantified sentences in Hausa relies heavily on contextual information, especially when focus is not grammatically marked. The fact that the interpretation of AQs in Hausa is governed by pragmatic factors can be taken as another argument in favour of pragmatic approaches to the interpretation of AQs in general.

5.1 Hausa AQs are Sensitive to Grammatical Focus Marking

The investigation of the interaction of Hausa AQs with instances of grammatically marked focus shows that Hausa AQs are sensitive to the focus-background structure induced by grammatical focus marking, just like their counterparts in intonation languages. The focus-marked constituent must be mapped onto the nuclear scope and not onto the restriction of the AQ. The interpretation of the sentences in (19) and (20) differs accordingly, depending on which constituent is focus-marked by means of movement to a left-peripheral position.

(19) a. yawancii *waake*$_{F,1}$ (nèe) Hàwwa ta-kàn dafàa t_1 *OBJ*
mostly beans PRT Hawwa3sg.f-HAB cook
'Most times, if Hawwa cooks something, it is *beans*.'

b. yawancii *Hàwwa*$_{F,1}$ cèe t_1 ta-kàn dafà waakee *SUBJ*
mostly Hawwa PRT 3sg.f-HAB cook beans
'Most times, if somebody cooks beans, it is *Hawwa*.'

In (19a), the object has been fronted, and the AQ ranges over sitations in which Hawwa cooks something (in the absence of further contextual information). In (19b), the subject has been fronted, and the AQ ranges over sitations in which somebody cooks beans. Notice that the focus status of the subject in (19b) is indicated by the presence of the optional particle *cee*. The examples in (20a-c) serve to illustrate the same point for ditransitive clauses, with focus on the direct object, indirect object, and subject respectively.

(20) a. kullum *kud'ii*$_{F,1}$(nee) na-kèe bâ Audù t_1 *OBJ*
always money PRT 1sg-prog.rel give Audu
'It is *money* that I always give to Audu.'

b. kullum *Audù*$_{F,1}$ (nee) na-kèe bâ t_1 kud'ii. *IO*
always Audu PRT 1sg-prog.rel give money
'It is to *Audu* that I always give money.'

c. kullum *nii*$_{F,1}$ (nèe) t_1 na-kèe bâ Audù kud'ii. *SUBJ*
always 1sg PRT 1sg-prog.rel give Audu money
'Always I *myself* give money to Audu.'

d. *kullum* nèe na-kèe bâ Audù kud'ii. *AQ*
always PRT 1sg-prog.rel give Audu money
,It is *every day* that I give Audu money.'

As (20d) shows, it is also possible to mark focus on the AQ itself.

The minimal pair in (21ab) does not differ in terms of word order. On the surface, both sentences show the unmarked word order SVO. Nonetheless, the relative TAM-marker *takèe* in (21b) marks the subject as being in focus. Correspondingly, the AQ *kullum* 'always' ranges over situations in which someone is cooking beans, stating that it is always Hawwa who is cooking beans. That the subject *Hawwa* is indeed in focus, can be seen from the fact that the sentence is considered inappropriate if two women are cooking beans, in particular if the particle *cee* is present.[3]

(21) a. Kullum Hàwwa ta-*nàa* dafà waakee. *OBJ*
always Hawwa 3sg.f-prog cook beans
'Always, Hawwa is cooking BEANS.'
(consultant's comment: She does not have to cook anything else)

b. Kullum Hàwwa$_{F,1}$ (cèe) t_1 ta-*kèe* dafà waakee. *SUBJ*
always Hawwa PRT 3sg.f-prog.*rel* cook beans
'It is HAWWA that is always cooking the beans.'

[3] At first sight, the exhaustivity effect in (21b) appear to be in contradiction to the non-exhaustive behaviour of *always* in English, which was pointed out in connection with the Fido-Butch-example in (7ab). I would like to contend, though, that the observed exhaustivity effect does not follow from the presence of the AQ *kullum*, but that it is either a semantic effect of the overt syntactic focus construction (à la Kiss 1998), or – more likely – that it follows from the presence of *nee/cee*, if *nee/cee* is indeed an exhaustivity marker as argued by Hartmann and Zimmermann (to appear-b), cf. fn.2. In any event, the fact that it is the subject *Hawwa* that is exhaustively quantified over shows clearly that Hawwa must be the focus of the utterance, as the exhaustivity operator typically ranges over the focus domain.

In (21a), on the other hand, there is no focus marking at all. As the consultant's comment shows, (21a) can receive a reading on which the AQ is interpreted relative to the focused object NP, and on which it states that whenever Hawwa cooks something, she cooks beans. We will turn to the interpretation of sentences without focus marking shortly.

Concluding this section, let us briefly take note that – perhaps not surprisingly – the interpretation of adverbially quantified sentences in other Chadic languages also depends on the focus structure of the clause. The examples in (22a-c) are taken from Gùrùntùm, another Western Chadic language, whose focus marking system differs from the Hausa one in two ways: First, focus in Gùrùntùm is marked morphologically by means of a focus marker *a* on the focus constituent. This a-marker precedes the focus constituent in case of NP- and PP-focus, and follows the focus constituent in case of sentence focus. Second, constituent focus is obligatorily marked. These differences notwithstanding, the data in (22a-c) illustrate that AQs in Gùrùntùm show the same kind of focus sensitivity as their counterparts in Hausa, or - for that matter - in intonation languages.

(22) a. Kóo vùr məkɑ̃ɑ̃ Mài Dáwà sh-**á** *gànyáhú*. *OBJ*
every when Mai Dawa eat-foc rice
'Every day Mai Dawa used to eat RICE. (comment: this is about what MD ate)'

b. Kóo vùr məkɑ̃ɑ̃ **á** *Mài Dáwà* shí gànyáhú. *SUBJ*
every when foc Mai Dawa eat rice
'It is only MAI DAWA that used to eat rice every day.'

c. Kóo vùr-məkɑ̃ɑ̃ Mài Dáwà *sái* *tí* *shí* *gànyáhú*-**à**. *clause*
every when Mai Dawa then 3sg eat rice-foc
'Everyday, Mai Dawa used to eat RICE.'

In all three sentences, the syntactic position of the focus marker *a* in the clause has an effect on the interpretation of the AQ: The focus-marked constituent ends up in the nuclear scope of the adverbial quantifier.[4]

5.2 The Interpretation of AQs in the Absence of Focus Marking

Hausa AQs can also associate with material that is not grammatically focus-marked. This happens whenever focus is grammatically unmarked, such that the grammar imposes no constraints on the focus-background structure. In such cases, the association of the AQ with the unmarked focus constituent seems to be determined solely by pragmatic factors.

It is important that here as elsewhere, the phrasing 'the AQ associates with X' is intended as a shorthand for 'the AQ is interpreted relative to a sentence with focus on X'. In this respect, Hausa AQs differ from focus particles, which will be shown to truly associate with a focus constituent in the sense that they depend on a clearly identifiable focus constituent for a proper interpretation, see section 5.3.

The fact that AQs can occur in the absence of focus marking raises the question of whether the AQ can associate with more than one constituent in the clause in such cases. The following data suggest that this question can be answered in the affirmative: adverbially quantified sentences without grammatical focus marking are ambiguous between various

[4] Example (22c), where entire clause *tí shí gànyáhúà* 'He ate rice' is in focus, is particularly interesting. Apparently, association of the AQ with the full clause is possible only once the clause has been emptied of all topic-like material, such as the preverbal subject *MaiDawa*, which is replaced by the pronoun *tí*. Evacuation of the topic MaiDawa leads to a syntactic tripartition into AQ, topic, and clause, which may very well be an overt reflex of the semantic representation of the sentence. Given the limited amount of data available, though, further clarification of this issue must await further research.

readings. The focus ambiguities that arise from the absence of focus marking are listed in (23) (abstracting away from foci on non-maximal constituents for ease of exposition):

(23) *Focus ambiguities arising from the absence of focus marking:*

i. perfective/progressive: VP, OBJ, sentence

ii. in all other aspects: VP, OBJ, SUBJ, sentence

Recall that the focus status of subjects must be indicated by a relative TAM-marker in the perfective and in the progressive aspect. It follows that sentences without focus marking are at least three-ways ambiguous in these two aspects, cf. (23i). In the habitual and future aspect, where there are no relative TAM-markers, sentences without focus marking are even four-ways ambiguous, cf. (23ii) and (18) above.

The ambiguity of adverbially quantified sentences without focus marking creates a methodological problem already raised in section 4: in spontaneous translation tasks, the VP_{FOC}-reading, and where applicable the $SUBJ_{FOC}$-reading, is often the dominant reading, thus suppressing the OBJ_{FOC}-reading. In order to check for the availability of the less prominent OBJ_{FOC}-reading, we therefore have to fall back on the methodological tools discussed in section 4 in connection with (17) and (18), i.e. strategies (C) and (D).

The progressive sentences in (24) and (25) below illustrate strategy (C). The possibility of subject focus is excluded, as the TAM-marker does not appear in its relative form. The sentences are all of the form *The Y usually drink X*, such that the VP_{FOC}-reading would state that in most situations in which the Y do anything they drink X. The lexical material was chosen in such a way that the VP_{FOC}-reading is most likely to be false, or at least highly implausible in the absence of further contextual information. In order to check for the availability of the OBJ_{FOC}-reading, we varied the object and subject NPs in such a way that the resulting sentences should be true on this reading with some NP-combinations (the pairings *Hausa people - kunu*, and *Europeans - coca cola*), but false with others (the pairings *Hausa people - coca cola*, and *Europeans – kunu*). Indeed, the consultants' reactions, which are indicated after the relevant examples, matched these expectations. (24a), with the pairing *Hausa people – kunu*, was judged to be true. (24b), on the other hand, with the pairing *Hausa people - coca cola*, was strongly rejected.

(24) a. Yawanci hausawa su-nàa shân kùunú → *true*
mostly Hausa.people 3pl-prog drinking kunu.
'Most times, Hausa people drink kunu.'

b. Yawanci hausawa su-nàa shân coca-cola → *not true!*
mostly Hausa people 3pl-prog drinking coke.
'Most times, Hausa people drink coca cola.'

Conversely, (25a), with the pairing *Europeans – kunu*, caused amusement on the side of the consultants, whereas (25b), with the pairing *Europeans - coca cola*, was deemed appropriate:

(25) a. Yawanci turawa su-nàa shân kùunú → *laughter*
mostly Europeans 3pl-prog drinking kunu
'Most times, Europeans drink kunu.'

b. Yawanci turawa su-nàa shân coca-cola → *appropriate*
mostly Europeans 3pl-prog drinking coke.
'Most times, Europeans drink coca cola.'

The observed systematic variation in the judgments indeed seems to suggest that the AQ, here *yawanci* 'usually, most times', associates with the object NP in (24) and (25), in particular as this reading is the easiest to construe in the absence of further contextual information. It should be noted, though, that the observed judgments do not provide waterproof evidence

against a VP-focus, or even sentence focus interpretation of (24) and (25). After all, situations of Hausa people drinking kunu are perceived as more normal than Hausa people drinking coke (and conversely for the Europeans). It follows that interpretations such as 'Whenever Hausa people do anything, they drink kunu' (VP-focus) or 'Whenever something happens, Hausa people drink kunu' (sentence focus) are more likely to be accepted as true as their counterparts with *kunu* replaced by the Western (or rather Northern) drink *coca cola*.

In order to really be sure that AQs can associate with an unmarked focused object, we therefore have to fall back on strategy (D). In (26ab), the focus constituents of the first clause, marked by italics, are controlled for by the structure of the negative contrastive clause:

(26) a. Gaalìbii Hàwwa ta-nàa dafà *waakee*, baa-tà dafà *shìnkaafaa*
usually Hawwa 3sg.f-prog cook beans NEG-3sg.f. cook rice
'Normally, Hawwa cooks beans, not rice.'

b. Gaalìbii Hàwwa ta-nàa *dafà* *waakee*, baa-tà *shaaré dà6ee*
usually Hawwa 3sg.f-prog cook beans NEG-3sg.f sweep floor
'Normally, Hawwa cooks beans rather than sweeping the floor.'

As the paraphrases show, the AQ *gaalìbìi* 'usually' associates with the object in (26a) and with the VP in (26b). Based on (26ab), we can therefore conclude that AQs in Hausa can associate with various constituents in the absence of grammatical focus marking.

More generally, the sentences in (24) to (26) support Beaver & Clark's (2003) claim that material that is not *grammatically* marked for focus, be it by accent or movement, is not automatically mapped onto the restrictor of the AQ, cf. (5). Rather, part of the *grammatically* unmarked material is mapped onto the nuclear scope because it constitutes the focus constituent. In the case of Hausa, this state of affairs obtains because the information-structural category of focus is often not marked at all. In general, given that the determination of unmarked foci in Hausa relies on pragmatic resolution based on contextual information, it follows that the association of AQs with focus in this language is a pragmatic phenomenon, rather than a grammatically hard-wired process.

5.3 Adverbial Quantifiers vs. Focus Particles

In section 2, English adverbial quantifiers were shown to differ from focus particles in that the former stand in a loser syntactic and semantic relation to the grammatically marked focus constituent than the latter. This section shows that the same can be said for Hausa: as in English, the association of Hausa FPs, such as *sai* and *kawai* 'only, just', with focus constituents is subject to strict licensing conditions:

The focus-sensitive particle *sai* can only combine with overtly focus-moved NPs, cf. (27a). It never combines with *in situ* focus constituents, cf. (27b) (Kraft 1970):

(27) a. Bàshîr *sai* *ruwaa*$_F$ ya kaawoo
Bashir only water 3sg.m.perf.rel fetch
'Bashir fetched only water.'

b. *Bàshîr yaa kaawoo *sai* *ruwaa*$_F$
Bashir 3sg.m.perf fetch only water

The focus-sensitive expression *kawai* also occurs predominantly with focus constituents that have been overtly moved to the left periphery, cf. (28ab).

(28) a. *Lìttàttàafai*$_F$ *kawài* ɗàalìbai su-kà sàyaa.
books only students 3pl-perf.rel buy
'The students bought only BOOKS.'

b. ??D'àalìbai sun sàyi *lìttàttàafai*$_F$ *kawài*.

students 3pl.perf buy books only

Marginally, *kawai* also occurs with *in situ* foci. If this happens, *kawai* has to be adjacent to the focus constituent immediately to its left. This is demonstrated in example (29B), taken from a collection of naturally occurring discourses (Randell et al. 1998).

(29) A: Nii kò, bá ni sôn dooyàa.
I PRT NEG 1sg.cont like yam
'As for me, I don't like yams.'

B: Tòo bàa sai kì ci *shìnkaafaa*$_F$ *kawài* ba?
PRT NEG then 2sg.subj eat rice only Q
'Well, but you don't eat only rice, don't you?'

As is clear from the immediately preceding context in (25A), the focus constituent in (25B) must be the object NP *shinkafa* 'rice', which is immediately followed by the focus-sensitive particle *kawai*.

The data in (27) to (29) show, then, that the FPs *sai* and *kawai* 'just, only' are in need of a clearly identifiable focus constituent with which to associate semantically. This constituent can be identified on the base of two criteria: First, the FPs are adjacent to it. In addition, the focus constituent plus FP are obligatorily (*sai*) or frequently (*kawai*) moved to the overt focus position in the left periphery of the clause. Similar facts hold for the FP *kaɗai* 'only', and for the particle *nee/cee* (Hartmann & Zimmermann, to appear-b).

The fact that Hausa FPs are in need of a clearly identifiable focus constituent argues for a syntactic and semantic specification in their lexical entry. FPs in Hausa appear to subcategorize for a nominal focus constituent with which they also associate semantically. Following Beaver & Clark (2003), one can capture this behaviour of FPs by specifying them as [+ focus-functional] in their lexical entry. On the other hand, we have seen that AQs do not impose similar restrictions on the grammatical realisation of the focus constituent. The focus constituent need not be marked, and the AQ does not generally occur adjacent to it. The difference in syntactic and semantic behaviour of AQs and FPs thus suggests a categorical distinction between the two types of expressions: While FPs are [+ focus-functional], AQs can be analysed as [- focus-functional], again following Beaver & Clark (2003).

To conclude, surface differences aside, the observed differences between AQs and FPs in Hausa appear to replicate similar differences between AQs and FPs in English and other intonation languages. Again, this similarity suggests that essentially the same basic mechanisms of interpretation are at work in both language groups. In the next section, we will therefore proceed to sketch a unified account of the interpretation of AQs in Hausa and in intonation languages.

6 AQs in Hausa and Intonation Languages: A Unified Analysis and a Prediction

In the preceding section, Hausa AQs were shown to resemble their counterparts in intonation languages when it comes to the association with constituents that are overtly marked for focus (section 5.1), and the differences between AQs and FPs (section 5.3). Furthermore, we concluded in section 5.2 that the association of Hausa AQs with focus is pragmatically governed. This conclusion is in line with Beaver & Clark's (2003) findings for AQs in intonation languages (section 2), and more generally with other pragmatic approaches to focus-sensitivity and focus, see e.g. Rooth (1992), Dryer (1994), Roberts (1996), Büring (1997), and Kadmon (2001). From a theoretical perspective, then, the Hausa facts can be taken as evidence in favour of such more pragmatic approaches to the focus sensitivity of AQs over more grammaticized analyses that crucially rely on grammatical focus marking.

Given the observed similarities between Hausa AQs, on the one hand, and AQs in intonation languages like English on the other, it is tempting to come up with a unified analysis for AQs in both types of languages. The analysis, as sketched in (30), is based on Beaver & Clark's (2003) analysis of English AQs, see section 2.

(30) *Unified Analysis of AQs in Hausa and Intonation Languages:*

i. AQs take their whole clause as nuclear scope. (see also Partee 1999)

ii. The restriction is not provided by the grammar, but is pragmatically determined.

iii. In intonation languages, and with instances of grammatically marked focus in Hausa, the restriction of the AQ must be compatible with all presuppositions, including those stemming from grammatical focus marking.

iv. With unmarked focus in Hausa, the restriction must be compatible with the contextual information that determines the locus of focus.

The discussion of Hausa AQs is of interest to the discussion of AQs in English and other intonational languages for yet another reason: the Hausa data observed show clearly that there is no inherent need for grammatical focus marking with AQs. In intonation languages such as English, the picture is not so clear because it is blurred by the obligatory occurrence of a nuclear pitch accent in all sentences. In other words, English AQs are always accompanied by a clause-mate nuclear pitch accent, but possibly for independent reasons. Motivated by the facts from Hausa, then, one could adopt a more radical position and speculate that English AQs, too, do not require a constituent to be grammatically marked for focus in order to associate with it.

In order to find out whether or not this claim is correct, we have to find out if there are ever configurations in English in which an AQ can co-occur with a grammatically unmarked, i.e. fully destressed focus constituent. Previous studies have shown that FPs cannot: Rooth (1996) and Beaver et al. (2004) show that the associates of FPs such as *only* must be grammatically marked. If marking by pitch accent is impossible, e.g. with instances of so-called *second occurrence focus* (SOF), in which the associate of the FP is given and therefore blocked from carrying a nuclear pitch accent, it is marked by duration and intensity instead (see also Féry & Ishihara, to appear).

Given the observed differences between AQs and FPs, one may therefore wonder if English AQs behave differently in SOF-contexts. More precisely, the question is whether there is any kind of prosodic marking on the SOF *bicycles* in (31c), an example adapted from Beaver et al. (2004):

(31) a. Both Peter and his siblings spent their youth with petty crimes and theft.
b. Peter always stole [BICYCLES]$_F$.
c. Even his youngest brother PAUL always stole [bicycles]$_F$.

If there is no prosodic marking on *bicycles*, English AQs will be fully identical to their Hausa counterparts in terms of grammatical behaviour. In particular, there will be nothing in the lexical entry of an English AQ that would require the AQ to co-occur with a prosodically marked constituent. If *bicycles* was prosodically marked, however, this could indicate that English AQs are not fully parallel to Hausa AQs after all, and that they are dependent on some sort of focus marking for the identification of the relevant background presuppositions that constrain the restriction of the AQ to take place. Hopefully, future phonetic studies of AQs in SOF-contexts will help to clarify this issue.

7 Conclusion

In this paper, I have investigated the semantic interaction of adverbial quantifiers and focus marking in Hausa. The main result was that intonation and tone languages such as Hausa do not differ fundamentally when it comes to the association of AQs with focused elements, despite the fact that focus marking in Hausa works quite differently. This may hint at the existence of universal mechanisms behind the interpretation of adverbial quantifiers across languages.

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WHEN THE DONKEY LOST ITS FLEAS: PERSISTENCE, CONTEXTUAL RESTRICTION, AND MINIMAL SITUATIONS *

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Abstract

This paper revisits the question of whether propositions in situation semantics must be persistent (Kratzer (1989)). It shows that ignoring persistence causes empirical problems to theories which use quantification over minimal situations as a solution for donkey anaphora (Elbourne (2005)), while at the same time modifying these theories to incorporate persistence makes them incompatible with the use of situations for contextual restriction (Kratzer (2004)).

1 Introduction

Kratzer (1989) introduces a framework for situation semantics that was taken as a starting point by a substantial body of later work. One properties of this theory is that what is true of a small situation must remain true of larger situations that it is a part of. This is known as **persistence**. Kratzer's argumentation for this condition, however, is of a conceptual nature. This led most of the work which adopted her framework to overlook this condition, and neglect to incorporate it into their theories.

In this paper, I will return to the issue of persistence, with several goals in mind. First and foremost, I aim to show that the persistence condition is not just motivated on conceptual grounds, but it is justified empirically. While doing so, I shall also explore some of the requirements that are necessary for a proposition to be persistent. Finally, I shall discuss the consequences of persistence to different lines of research in situation semantics. Specifically, I will show that theories of donkey anaphora that require quantification over minimally small situations are in conflict with Kratzer's (2004) theory of contextual restriction, as the latter requires that quantification involve large situations in order to ensure persistence.

2 Persistent Propositions

Kratzer (1989) introduces a situation semantics (later partially revised in Kratzer (2002)) which relies heavily on the part-whole relationship of situations. Situations, according to this framework, are groupings of entities, their properties, and relations between them. Reference to situations is handled through situation variables, which can be quantified over just like other variables. Much of the power of this framework is derived from the fact that situations in this system are partially ordered by the sub-situation operator $\leq$. If $s \leq s'$, then s' may contain at least one entity, property, or relation that s does not. There is a maximal element to this ordering - the possible world, which, naturally, includes all the entities, properties, and relations that exist

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in that world. For brevity, I shall call a situation s' an **extension** of a situation s iff $s \leq s'$ and $s \neq s'$.

In this system, a proposition is defined as a set of situations, such that a proposition p is true in a situation s if $s \in p$. Nothing said so far prevents a proposition from being true in a situation s, but false in some extensions of it. For example, take the proposition p which is expressed in (1):

(1) There are no living kings.

(1) is, under a straightforward analysis of its meaning, true of a situation s_1 that includes only an individual x and the fact that x is alive. However, there may be a larger situation s_2 that includes x, the fact that he lives, and the fact that he is a king. (1) is not true of s_2. But note that $s_1 \leq s_2$.

As mentioned above, Kratzer (1989) takes the view that this is an unwelcome result. She suggests that a condition be added such that all natural-language propositions be **persistent**, following the definition below:[1].

(2) A **persistent proposition** is a proposition of which it is true that, for every s such that $s \in p$, for every s' such that $s \leq s'$ it holds that $s' \in p$.

With this condition in place, then, in the world described above, s_1 cannot be a member of the proposition expressed by (1), due to the existence of s_2.

It is important to note that Kratzer does not enforce this condition by somehow filtering out non-persistent propositions. Rather, she provides denotations for quantifiers that encode persistence. For example, instead of the non-persistent denotation for *every* provided in (3), she suggests (4)[2]:

(3) **Non-persistent quantification**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s$. For all $x_{\langle e\rangle}$: if $f(\lambda s.x)(s) = 1$, $g(\lambda s.x)(s) = 1$

(4) **Persistent quantification**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s$. For all $x_{\langle e\rangle}$: if $f(\lambda s.x)(w) = 1$, $f(\lambda s.x)(s) = 1$ and $g(\lambda s.x)(s) = 1$

The difference between the two quantifiers is as following: in (3), the quantifier is restricted to entities which have property f in s, and it predicates of them that they also have property g. In (4), the quantifier is restricted to all the fs in the world, and it states that they have that property in s, as well as g. Thus, a proposition only holds of situations that include all the fs in w, and in which all of them are also gs. Both these properties will hold of every larger situation[3].

While writing persistence into the determiner denotation ensures that all sentences end up denoting persistent propositions, it also complicates these denotations. Since Kratzer does not

[1]Terminology due Barwise and Perry (1983). It is important to distinguish this use of *persistent* from the unrelated use of the same term in Barwise and Cooper (1981), where it is used to denote "right upwards monotone".

[2]The denotations given below differ from Kratzer's in their notation, as I use the same formalism as Elbourne (2005). Nonetheless, the ideas are the same, with one major simplification: Kratzer (1989) deals with some distinctions which go beyond the scope of this paper, such as the distinction between propositions that are true accidentally and propositions that are true by some inherent fact about the nature of the world. I will ignore such distinctions here.

[3]This is actually not entirely correct. Take the sentence *Every professor owns an even number of hats* - there can be a situation s that includes all the professors, and each of them has an even number of hats in that situation, but there's a situation s' in which one professor has an additional hat. I will ignore this issue in the discussion that follows, since it will not carry over to the quantifier denotations that use minimal situations.

provide empirical justification for doing so, most of the literature following her work chose to use the simpler, non-persistent denotations[4]. The next section will examine one such theory, and show why this choice leads to empirical problems.

3 Minimal situations and donkey anaphora

3.1 The Heim/Elbourne solution for donkey anaphora

One recent promising use of situation semantics has been to solve a problem that arises in the resolution of donkey anaphora. This line of research was first suggested by Heim (1990), and worked out in detail by Elbourne (2005) and Büring (2004). In the following discussion I shall make reference directly only to Elbourne's theory; however, a similar point could be made with Büring's implementation.

Situation semantics become necessary because of an apparent problem for the E-type analysis (Evans (1977), Evans (1980)) of donkey anaphora, itself one of the most attractive explanations of this phenomena. In the E-type analysis, the donkey pronoun is taken to have semantics similar to a definite description, such that (5) is interpreted as (6):

(5) Every farmer who owns a donkey beats it.

(6) Every farmer who owns a donkey beats [the donkey].

However, there is a major problem with this solution: definite descriptions require a unique referent. Such a referent does not seem to be available in donkey anaphora; (5) can clearly be true in a context that contains multiple donkeys (and in fact, if there was only a single donkey, it would be hard to imagine (5) used with felicity).

The Heim/Elbourne solution relies on the insight that, due to the nature of situation theory, even if there is more than one donkey involved in the overall world, there are sub-situations of that world that contain only one donkey. Thus, it is possible to make use of those situations to ensure unique referents for the donkey pronouns.

All that needs to be done is to take care to only refer to situations small enough to contain exactly one donkey. For this purpose, instead of making reference to just any situations within the denotation of the quantifiers, instead they should quantify over **minimal situations**. A minimal situation such that p holds is a situation $s \in p$ such that there is no situation $s' \in p$ such that $s' \leq s$.

For example, the following is Elbourne's denotation for *every*:

(7) **Minimal quantification**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s_1$. For all $x_{\langle e\rangle}$: for each minimal situation s_2 such that $s_2 \leq s_1$ and $f(\lambda s.x)(s_2) = 1$, there is a situation s_3 such that $s_3 \leq s_1$ and s_3 is a minimal situation such that $s_2 \leq s_3$ and $g(\lambda s.x)(s_3) = 1$

Paraphrased informally, *every* quantifies not over individuals that have a certain property (the NP restriction), but over sub-situations of its argument situation that contain only the individual and said property. For each of these situations, *every* claims that it is possible to extend it in such a way that a second property (the VP denotation) holds true of the individual.

By adding this quantifier denotation to the E-type story, (5) can be informally paraphrased as (8):

[4]For a discussion of persistence in non-Kratzarian situation theory, see Cooper (1991)

(8) Every situation can be divided up in such a way that for every sub-situation that involves a farmer, a donkey he owns, and nothing else, there is a situation that involves the farmer, the donkey, the ownership, and the fact that the farmer beats the unique donkey in that situation.

At first blush, this solves the problem, as, by virtue of being minimal, the minimal situation will never contain more than than the single donkey necessary to make the subject have the property of being a farmer who owns a donkey. This donkey makes a good unique referent (within the context of the situation) for the definite description to pick up. Thus, the E-type reference problem seems to be solved[5].

3.2 The Problem

The preceding discussion, however, contains a henceforth unstated assumption. Namely that, whenever donkey anaphora occurs, an appropriate minimal situation that will provide a unique referent is available. Unfortunately, this is not always the case.

3.2.1 The donkey that lost its fleas

For example, take a world in which there are three farmers (A,B,C), each of which owns a donkey. Farmers A and B each take good care of their respective donkeys, grooming them daily. As a result, their donkeys have no fleas. Farmer C, however, does not groom his donkey, which has many fleas.

It is pretty uncontroversial that sentence (9) is true in this context (ignoring causality for the sake of simplicity):

(9) Every farmer who owns a donkey which has no fleas grooms it.

But applying the minimal situation analysis as given above to this sentence, (9) is false in this scenario.

To see this, note that there is a situation (call it s^7) which involves farmer C, his donkey, the owning relationship between them, but no fleas, nor possession relations between the fleas and the donkey. s^7 conforms to the requirements of being a minimal situation that contains a farmer who owns a donkey which has no fleas. Due to the denotation of *every*, every such minimal situation needs to have an extension wherein the farmer in question (farmer C) grooms the donkey. However, there is no situation that satisfies that requirement, and thus the sentence is false.

3.2.2 The donkeys hiding out of the situation's reach

A second manifestation of this problem can be seen in the following sentence:

(10) Every man who owns a farm beats every donkey in it.

According to the minimal situation analysis as given above, this is a tautology.

This is because the restriction of the quantifier requires that the quantification be over minimal situations in which a man own a farm. These situations obviously do not include any donkeys, as

[5]There are further issues to be addressed as to what happens when a single farmer owns more than one donkey and similar cases. I refer the reader to Elbourne (2005) for detailed discussion.

none are mentioned in the quantifier's restriction. But every such situation has many extensions which have nothing to do with donkeys or beatings. Lets take one such minimal situation (call it s^{12}) One such situation, for example, contains the man, the farm, the owning relationship between them, and also the man's blue hat, and nothing else. Call this situation s^{34}. s^{34} trivially satisfies the condition that the farmer beats every donkey in the farm in s^{34}, since there are no such donkeys. Since for every minimal situation in which a man owns a farm a similar arbitrary extension can be found, (10) is always going to be true[6].

3.2.3 What went wrong

There is a clear intuitive notion of what is wrong in these examples. In (9), The minimal situation that includes farmer C and his donkey includes no fleas; yet it feels like it should not count as a minimal situation *of a farmer who owns a donkey with no fleas*, as the donkey in question does have fleas outside this situation. In (10), it does not feel sufficient that for every man/farm pair there is an arbitrary extension in which all the donkeys in that extension are beaten. Rather, it seems that the man should beat every donkey in an extension includes all the donkeys in the farm.

It is here that persistence is needed.

In (9), what is necessary is to quantify over minimal situations that involve a donkey with no fleas, **and** are not sub-situations of a situation for which said donkey has fleas. In (10), it is required that the man beat every donkey in the farm in the situation in question, and that there is no extension of that situation in which the farmer doesn't beat every donkey in the farm.

Thus, it can be seen that ignoring persistence creates problems for Elbourne's framework. The obvious way to correct these problems is to reintroduce persistence into the equation.

Before seeing how that can be done, it is important to note that the problem faced above is not a consequent of the fact that the sentences are generic and in present tense. For example, the same problem faced by (9) is equally faced by (11), which is neither:

(11) Yesterday, every bald athlete who ran a race which had no celebrities in the audience won it.

4 Persistence - consequences and implementation

In the previous section, I found some problems for the Heim/Elbourne analysis of donkey anaphora and suggested that modifying their theory to ensure persistence will solve these problems. In this section I shall demonstrate this.

4.1 Persistence and monotonicity

Not all determiners need to have persistence explicitly written into their denotations. Those that denote quantifiers that are upwards monotone on both arguments are, in fact, persistent by default.

To see why monotonicity matters, it is helpful to look at the denotation of a quantifier that does not have persistence written in, such as the denotation of *every* given in (3), repeated below as (12):

[6]This ignores the possibility that *every* has an existence presuppositions. If such a presupposition is reintroduced, then (10) will no longer be a tautology. However, this does not solve the problem, as the sentence will only require that the man beats *at least one* donkey in his farm to be true.

(12) $[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s.$ For all $x_{\langle e\rangle}$: if $f(\lambda s.x)(s) = 1$, $g(\lambda s.x)(s) = 1$

The quantifier is restricted to entities x that have property f in a situation s. Because the subsituation relation $\leq$ is upwards monotone, then, assuming that f does not in itself contain any downwards entailing operators, if something has the property f in s it has the property f in every s' such that $s' \leq s$. In other words, the set of xs that have property f in s is a subset of the set of xs that have the property f in s'.

Thus, going from a situation to an extension of it in essence replaces the domain argument of the quantifier by a superset of it. This is always safe if the determiner is upwards monotone in its restriction, but not if it is downwards or non-monotone in that argument. Parallel reasoning applies to the nuclear scope of the determiner. This means that if a determiner is upwards monotone in both arguments, nothing needs to be added for it to provide persistent quantification.

4.2 Quantifier monotonicity vs. sentence entailment

It is worth noting that it is the monotonicity of the quantifiers that matters, rather than the entailment properties of any particular sentence. For example, note that for (9), the quantifier *no fleas* is embedded in the restriction of the quantifier *every farmer*. This means that the argument slots of *no fleas* are actually an upwards entailing environment, as can be seen from the following inference pattern:

(13) Every farmer who owns a donkey which has no fleas grooms it.
   a. $\not\Rightarrow$ Every farmer who owns a donkey which has no red fleas grooms it.
   b. $\Rightarrow$ Every farmer who owns a donkey which has no parasites grooms it.

Based on this information, one could be led to expect that there should be no persistence problems associated with the arguments of *no*. But, as shown in section 3.2.1, that is incorrect. The reason is that while entailment is calculated by the sentence as a whole, persistence must be ensured in embedded propositions as well as matrix ones. (9) can be paraphrased as the follows:

(14) Every x of which it holds that x **is a farmer that owns a donkey that has no fleas** is such that x grooms the relevant donkey.

For the whole sentence to express a persistent proposition, the bolded proposition must itself be persistent for each x. If it is not, then going from a situation to an extension of it may alter the domain of the matrix quantifiers, by changing whether individual farmers fall under the restriction or not. This is the nature of the problem in example (9).

Thus, the nature of the embedded quantifier is relevant, even if ultimately its arguments end up being an upwards entailment environment. This shows that the decision in Kratzer (1989) to include the persistence condition in the denotation of (non-upwards monotone) quantifiers is the correct way to handle persistence, and I will follow suit.

4.3 Implementing persistence

Since failures of persistence arise when a proposition that was true in a small situation fails to be true in a larger one, the best way to prevent this is to check that the proposition holds in as large a situation as possible. This is a potential problem, as the Heim/Elbourne solution for donkey anaphora relies on the presupposition that minimal situations give unique referents. Can persistence be implemented in a way that satisfies both demands?

In fact, there is no need to look beyond what was already discussed to find an implementation that makes this possible. The persistent quantification in Kratzer (1989) adds a condition that the individuals quantified must satisfy the restriction of a quantifier in the largest situation available (i.e., the entire world) **in addition** to the situation quantified over. This denotation allows checking persistence against the maximal situation *w*, while at the same time the actual quantification remains on truly minimal situations. Thus, the best of both worlds has apparently been achieved, at least as far as using situations to account for donkey anaphora. Adding such a condition to Elbourne's *every* results in the following:

(15) **Persistent minimal quantification**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s_1$. For every $x_{\langle e\rangle}$: if $f(\lambda s.x)(w) = 1$, then $f(\lambda s.x)(s_1) = 1$ and for every minimal situation s_2 such that $s_2 \leq s_1$ and $f(\lambda s.x)(s_2) = 1$, there is a situation s_3 such that $s_3 \leq s_1$ and s_3 is a minimal situation such that $s_2 \leq s_3$ and $g(\lambda s.x)(s_3) = 1$

This denotation of *every* (and a similarly modified denotation for *no*) would avoid both of the problems for Elbourne's system. In the case of the donkey that lost its fleas, the reasoning is simple: farmer C is not a farmer who owns a donkey with no fleas in *w*, and thus does not fall under the domain of quantification. The other problem is a bit more complex: the matrix *every* quantifies over all the men in *w* that own a farm, and for each minimal situation that includes such a pairing, it states that there is an extension wherein every donkey in [[the farm]] is beaten. So far, the persistence makes no difference. But the embedded *every* now quantifies over every entity in *w* that is a donkey in the farm in the relevant minimal situation, rather than just those donkeys that are present in an arbitrary situation. Thus, no donkeys can escape notice.

But this denotation is only possible under the assumption that reference to *w* in a determiner denotation is unproblematic. In the following section, it shall be shown that this does not fit comfortably with other recent uses of situation semantics.

5 Persistence and contextual restriction

One property of persistent quantification as discussed so far is that it is global; every quantifier in some sense quantifies over the whole world.

If nothing further is said, this leads to strange-looking predictions. Take the following sentence, for example:

(16) Every tree is laden with wonderful apples.

By global persistence, (16) would only be true if every tree in the entire world is laden with wonderful apples. Kratzer (1989) solves this by appealing to contextual domain restriction to fill in additional descriptive material. According to her, (16) really should be given a reading along the lines of the following:

(17) Every tree [in my orchard] is laden with wonderful apples.

This is an intuitively appealing notion, as it is a well-established fact that contextual restriction must come into play in exactly these sentences anyway. However, the viability of this option depends heavily on the way in which contextual restriction is implemented. While Kratzer (1989) does not provide an actual theory of contextual restriction, she is clear that this must be done by an additional mechanism rather than then the situations themselves, explicitly rejecting the theory of contextual restriction provided in Barwise and Perry (1983) because it relies on

non-persistent propositions.

5.1 Contextual restriction via topic situations

In contrast to her earlier position, Kratzer (2004) proposes that contextual restriction should be accounted for not by adding descriptive material to the sentence, but rather by applying the proposition in question to a *topic situation*, which contains only the contextually relevant entities.

According to Kratzer, utterances in context represent an *Austinian proposition* (after Austin (1950)) - that is, a pairing of a topic situation and a proposition $<s, p>$. An assertion operator ASSERT is responsible for applying the topic situation as a situation argument for the proposition (i.e., the one required by the λs of the highest scope operator)

(18) $[\![\text{ASSERT}]\!](<s, p>) = p(s)$

Since every embedded operator is passed a situation variable by the next higher operator which is a sub-situation of the situation parameter of that operator, this ensures that all quantifiers are restricted to elements of the topic situation.

Put differently, this system relies on the principle that each operator only has access to the situation that the operator above gives it, and can only pass down parts of that situation to lower operators. This, indeed, recaptures one of the intuitive uses of situations; they are used in order to talk about just part of the world[7].

This principle would be nullified if direct reference to w is allowed, such as used above to ensure persistence. Doing so allows a quantifier to see information that was not strictly passed down to it by a higher operator. For example, imagine the following scenario: yesterday, a semantics exam was graded. Exactly one student got a B; surprisingly, she did so without making any actual errors, but just by failing to answer questions in a satisfactory manner. It is felicitous to say:

(19) Some student who made no errors got a B.

(19) requires the existence of a student who made no mistakes in the relevant context - i.e., on her semantics exam. It will not be falsified if that same student made an error in her phonology exam.

However, if persistence is checked relative to the world, then the error on the phonology exam will be enough to remove the student from the domain of quantification (for there are errors in w which she made), thus falsifying the sentence.

5.1.1 Local persistence

Accepting the theory of contextual restriction in Kratzer (2004), then, means that a way of implementing persistence is necessary: one wherein persistence is local to the situation which the quantifier received as an argument.

Note that, if minimal situations are ignored, local persistence actually comes for free in Kratzer (1989). The denotation of *every* given in (3) (repeated below as (20)) is only problematic as far

[7]Note that Kratzer (2004) does not specifically rule out an additional mechanism for contextual restriction. In fact, she argues that such a mechanism must exist for restrictions that are based on cultural conventions. But for the purposes of this paper, what is important is that normal contextual restriction, i.e. the kind that determines the relevant apples for the use of *every apples* in ((16)), is handled via topic situations.

as persistence is concerned because the situation variable it was passed was taken to be totally unrelated to the global domain in which persistence was desired. If, following Kratzer (2004), this situation variable is taken to always reflect the contextual domain wherein persistence needs to hold, (3) (repeated as (20)) will suffice.

(20) $[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s$. For all $x_{\langle e\rangle}$: if $f(\lambda s.x)(s) = 1$, $g(\lambda s.x)(s) = 1$

In the Heim/Elbourne system, however, things are not so simple. The first problem is that having the property specified in the restriction is only checked in a minimal situation, not in the actual contextual situation. This can be solved with a minimal modification of (15), replacing the reference to *w* with reference to *every*'s situation parameter s_1, as follows:

(21) **Locally persistent minimal quantification**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s_1$. For every $x_{\langle e\rangle}$: if $f(\lambda s.x)(s_1) = 1$, then for every minimal situation s_2 such that $s_2 \leq s_1$ and $f(\lambda s.x)(s_2) = 1$, there is a situation s_3 such that $s_3 \leq s_1$ and s_3 is a minimal situation such that $s_2 \leq s_3$ and $\text{g}(\lambda s.x)(s_3) = 1$

(21) can handle the problem of the disappearing fleas as well as (15) can. Simply put, it is not sufficient that a minimal situation can be found that contains a farmer, his donkey, and no fleas, it is also necessary that he has no fleas in the context situation. This is all that is necessary to get the correct reading for that sentence.

However, there is a second problem. Unlike in the simple case of (3), in the minimal situation-based theory embedded quantifiers no longer have access to everything in the topic situation, but only have access to what is in the situation passed down to them from the higher quantifier, as desired. This, unfortunately, reintroduces the other problem. To see this, lets return to (10), repeated as (22):

(22) Every farmer who owns a farm beats every donkey in it.

As before, the minimal situation (call it s_{farm}) in which a farmer x owns a farm contains no donkeys. Now take an arbitrary extension (s_{farm+}) of that situation, such that s_{farm+} contains no donkeys. By the definition of the quantifier, it is now necessary to check whether *beats every donkey in it* is true of x in s_{farm+}. This involves passing s_{farm+} as the situation parameter of the embedded quantifier *every*. This is the largest situation which the persistence condition of *every* can see. But there are no donkeys in the farm in s_{farm+}. Thus, the persistence condition is toothless in this scenario.

Thus, domain restriction that relies on situations variables being passed down from one operator to the next prevents using persistence to solve the problem of elements hiding outside minimal situations.

5.1.2 Possible alternatives

Other methods of using situations for domain restriction may not suffer from this problem:

One possible solution is to claim that the topic situation is always available for direct reference in a discourse. Thus, it is possible to use the definition in (15), simply replacing the reference to *w* with s_{topic}:

(23) **Locally persistent minimal quantification (alternative)**:
$[\![\text{every}]\!] = \lambda f_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda g_{\langle\langle se\rangle,\langle st\rangle\rangle}\lambda s_1$. For every $x_{\langle e\rangle}$: if $f(\lambda s.x)(s_{topic}) = 1$, then $f(\lambda s.x)(s_1) = 1$ and for every minimal situation s_2 such that $s_2 \leq s_1$ and $f(\lambda s.x)(s_2) = 1$, there is a situation s_3 such that $s_3 \leq s_1$ and s_3 is a minimal situation such that $s_2 \leq s_3$ and $g(\lambda s.x)(s_3) = 1$

Another possibility, raised by Recanati (2004), is that topic situations are not used to saturate a situation argument slot, but rather are added as a form of semantic enrichment. Such a system would differ enough from Kratzer (2004) that the results above would not necessarily hold for it (though other problems may well rise, based on the exact implementation).

6 Conclusion

This paper explored the notion of persistence and has shown that the form in which it is implemented has crucial consequences for the applications of situation semantics in linguistics. Not paying proper attention to persistence introduces empirical problems for the system of Elbourne (2005). Attempting to solve these problems taught us more about the nature of persistence and how it interacts with minimal situations. Among the lessons was that implementing a persistent minimal situations approach to donkeys is impossible if the contextual restriction method proposed in Kratzer (2004) is also used.

Thus, the basic lesson of this discussion is that persistence is important. By attending to it, problems may be avoided and hidden problems may be uncovered.

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