האגודה הישראלית לבלשנות תאורטית

THE ISRAEL ASSOCIATION FOR THEORETICAL LINGUISTICS

IATL 3

The Proceedings of the

Eleventh Annual Conference

Tel Aviv University 1995

and of the

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The Technion 1996

edited by

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CONTENTS

The Comparative in Comparative Conditionals*

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1. Introduction

This paper gives a semantic analysis of comparative conditional constructions (henceforth: CCs). Examples are given in (1) a. and b:

(1) a. The longer John has to wait, the angrier he gets.

b.

Je	müder	Otto	ist,	desto	aggressiver	ist	er.
The	tired -er	Otto	is	the	aggressive-er	is	he

"The more tired Otto is, the more aggressive he is."

This type of construction has been named "comparative conditional" by McCawley (1988). (1) a. is an English comparative *the...the...* construction and (1) b a German *je -desto* construction. While I will frequently use German examples, I would expect most of what I say about the semantics to carry over to CCs in other languages. In particular, English comparative *the...the...* constructions seem to have very much the same properties as German *je - desto* constructions.
I am particularly interested in one property of CCs that comes unexpectedly: While we obviously have a comparative, it is impossible to add an *als* (*than*) clause or phrase, i.e. to have an overt item of comparison:

(2)

*Je	müder	Otto	ist	als	Hans,	desto	aggressiver	ist	er.
The	tired -er	Otto	is	than	Hans	the	aggressive-er	is	he

*The more tired Otto is than Hans, the more aggressive he is.

Since an item of comparison is an obligatory part of the semantics of comparative constructions, we might ask ourselves whether we have a genuine comparative construction in CCs, and if so, what comparisons are actually made? The answer I will give to this

* I would like to thank Jochen Geilfuß most of all, who I had many inspiring discussions with. He got me interested in this construction in the first place and shared all his information with me. Thanks very much also to Franz d'Avis, Kirsten Brock, Gennaro Chierchia, Elisabet Engdahl, Kai von Fintel, Thilo Götz, Fritz Hamm, Irene Heim, Angelika Kratzer, Manfred Krifka, Uli Lutz, Jürgen Pafel, Marga Reis, Mats Rooth, Bernhard Schwarz, Arnim von Stechow, Karina Wilkinson and Dieter Wunderlich; moreover, to the audiences at the 1994 Blaubeuren conference "Recent Developments in Natural Language Semantics", at the University of Düsseldorf and at IATL 11, University of Tel Aviv. I am very grateful to my informants for data and discussion: Lansun Chen for Chinese, Ivan Derzhanski for Russian and Bulgarian, Ray Fabri for Maltese, Caroline Féry for French, Hanneke van Hoof and Guido Minnen for Dutch, Shin-Sook Kim for Korean and Ana Santisteban and her colleagues for a great number of data from various languages.

question is that an item of comparison is already implicitly present in the semantics, so that an (additional) overt item of comparison would be uninterpretable.
The structure of the paper is as follows:
In section 2. I will present those empirical properties of comparative conditionals that are going to be looked into (2.1.). Since one focus of this paper will be the derivation of the appropriate interpretation from S-Structure, some syntactic considerations are in order (2.2.). Section 3. starts with the interpretations that comparative conditionals intuitively have (3.1.): They are indeed a particular type of conditional. In order to be able to derive these interpretations, I will introduce the way I want to treat the comparative (in ordinary comparative constructions) in 3.2. This will enable us to derive the desired truth conditions via the level of Logical Form (3.3). In 3.4. I will look at some consequences that emerge from this treatment. Section 3.5. gives a summary of the analysis and of the motivation for its main features. Section 4. explores a more general consequence of my proposal. It necessitates a treatment of the comparative which does not combine *Adj* + *-er* at a lexical level. Not only does this exclude some current analyses of comparative constructions, but it also means that the comparative morpheme constitutes a separate meaningful entity at LF.

2. Problems & Preliminaries

2.1. Some Observations

Comparative conditional constructions exist in various languages. Here are some more examples of comparative conditionals in English and German:[1]

(3) a. Uli ist umso müder, je heißer es ist.
Uli is the tired -er the hotter it is
"Uli is the more tired, the hotter ist is."

b. The faster you drive, the sooner you'll get there.

McCawley (1988) gives a syntactic analysis of comparative conditionals in English, German and Mandarin.[2] We also find them, e.g., in French and Maltese ((4a) and (4b)):

(4) a. Plus quelqu'un est grand, plus il a de grand pieds.
More somebody is tall more he has of big feet
"The taller somebody is, the bigger his feet are."

---

[1]The construction can be equivalently formed with *umso* instead of *desto*. I will not distinguish between the two, although they differ somewhat in distribution.
[2]I have not included Mandarin since there is no overt marking of the comparative form of the adjective/adverb (neither in CCs nor in general). McCawley nevertheless argues that it is a comparative construction.

b. aktar ma jkun kiesah avukat, aktar ikollu success.
more Part is cold attorney more has success
"The colder an attorney is, the more success he has."

In all these languages, there is a main clause and a subordinate clause, each of which contains a comparative. (5) is an example from Korean:

(5) nalssi-ka tŏu-myŏn tŏu-lsurok Uli-nŭn tŏ p'ikonha-ŏss-ta.
weather-Nom hot-cond hot-(marker) Uli-Top more tired-Imp-Decl
"Uli was more tired, the hotter it was"

Here, interestingly, we have a conditional marker "myŏn", and another marker "lsurok", which seems to occur only in this construction (see Lee (1989)). The comparative marker "tŏ" is normally optional, but is obligatory in the main clause of CCs.
CCs exist in various other languages (e.g. Dutch, Danish, Hebrew, Russian, Hungarian etc.). While they seem to work in a very similar way in the other languages, I will from now on concentrate on English and, in particular, German.
In ordinary comparative constructions, the item of comparison (printed in italics in (6) a.) is semantically obligatory. When it´s missing, as in (6) b., we have to understand it as being provided by the context.

(6) a. Otto ist größer *als Luise*.
Otto is taller *than Luise*.
b. Otto ist größer.
Otto is taller.

In CCs, we don´t normally find an item of comparison, and adding one leads to ungrammaticality:[3]

(7) a. *Je müder Otto ist als Hans, desto aggressiver ist er.
The tired -er Otto is than Hans the aggressive-er is he
*The more tired Otto is than Hans, the more aggressive he is.
b. *Je müder Otto ist, desto aggressiver als Ida ist er.
The tired -er Otto is the aggressive-er than Ida is he
*The more tired Otto is, the more aggressive than Ida he is.

[3]This seems to be the case in all languages that I could check, for instance (apart from English and German) Korean and Dutch, as well as Mandarin Chinese.

c. *Je müder Otto ist als Hans desto aggressiver als Ida ist er.
The tired -er Otto is than Hans the aggressive-er than Ida is he
*The more tired Otto is than Hans, the more aggressive than Ida he is/ the more aggressive he is than Ida.

So, although we have a comparative in the subordinate clause and in the main clause, we cannot add an item of comparison to either of them. Any successful analysis has to provide an explanation of these data.
The *je - desto* construction not only cannot have an overt item of comparison, it doesn't allow difference specifications like *(um) eine Stunde ((by)an hour)* or *(um) drei Grad ((by)three degrees)* either, as shown in (8a). This again differs from normal comparative constructions, which optionally have a difference specification, see (8b) & (8c) I will offer a syntactic explanation for this fact in section 2.2.

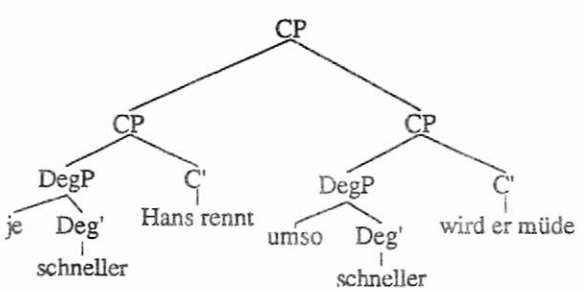
(8) a. *je (um) eine Stunde später es wurde, desto (um) drei Grad heißer wurde es.
the by one hour later it got the by three degrees hotter got it
"For each hour later it got, the temperature rose by three degrees."
b. Otto kam *eine Stunde* später als Luise.
Otto arrived *one hour* later than Luise.
c. Heute ist es *drei Grad* heißer als gestern.
Today it is *three degrees* hotter than yesterday.

2.2. Syntax

I will follow von Fintel (1994) in analysing the comparative conditional as a correlative construction. That means that the *je*-clause (when the sentence starts with it) is in the same position as a left-dislocated element, presumably adjoined to CP, as illustrated in (9b).

(9) a. Je schneller Hans rennt, umso schneller wird er müde.
The faster Hans runs the faster gets he tired
"Hans will get tired faster, the faster he runs."

b.



That means, I will assume that the subordinate clause and the main clause are sentential projections, presumably CPs. Their specifier positions contain the *je*-phrase and the *umso/desto*-phrase, respectively. The same presumably holds for English *the*-phrases. This is very similar to the suggestions made by Thiersch (1982).
The *je*-clause can occur extraposed as in (3) above. For simplicity, I will only regard structures as in (9). See Fillmore (1987), McCawley (1988), Thiersch (1982) and Wold (1991) for more information on the syntax of CCs.
I will assume a DegP analysis for *je*- and *umso/desto*-phrases and comparative *the*-phrases. The comparative morpheme is the functional head. The specifier position in ordinary comparatives can be filled by difference specifications like *drei Meter (three meters)*. For the DegP analysis, see e.g. Corver (1994), Heim (1990a), also Rapp (1992) on comparison constructions in German. I suggest that *je/desto/umso/the* also occupy the specifier position of DegP:

(10) $[_{DegP}$ drei Meter/je/umso/desto $[_{Deg'}$ größer]]

Thus, a difference specification and *je/umso/desto* are in complementary distribution because they occupy the same position. This accounts for the ungrammaticality of (8a). See also section 3.3. for some semantic motivation for this step.

3. Semantics

3.1. Interpretations

In (11) - (13), I have given examples of CCs that illustrate some of the relevant semantic properties of the construction.

(11) Je besser Otto vorbereitet ist, desto besser wird sein Referat werden.
The better Otto prepared is the better will his talk become
"The better Otto will be prepared, the better his talk will be."

(12) Je schleimiger ein Anwalt aussieht, desto erfolgreicher ist er.
The slimy-er an attorney looks the successful-er is he
"The slimier an attorney looks, the more successful he is."

(13) Uli war umso müder, je heißer es war.
Uli was the tired-er the hotter it was.
"The hotter it was, the more tired Uli was."

In (11') - (13') are the first rough formulations of the meanings of (11) - (13).

(11') $\forall w_1 w_2$ [Otto is better prepared in w_1 than in w_2]
=> [Otto's talk is better in w_1 than in w_2]
(where w_1 R w_0, w_2 R w_0 a, for a modal base R cf. Kratzer (1991). w_0 is the real world).

(12') $\forall x,y$ [attorney(x) & attorney(y) & x looks slimier than y]
=> [x is more successful than y]

(13') $\forall t_1, t_2$ [it was hotter at t_1 than it was at t_2]
=> [Uli was more tired at t_1 than he was at t_2]

(12") and (13") give paraphrases for (12') and (13'):

(12") If an attorney looks slimier than another attorney, he is more successful than the other one.

(13") If it was hotter at one point in time than it was at another time, then Uli was more tired at the first time than he was at the second.

(12) probably has got another reading, which means something like "Generally, the slimier an attorney becomes, the more successful he will be". Presumably, *an attorney* is understood generically, and we talk about a development in the sliminess of one and the same attorney (i.e. we are not comparing different attorneys). I will disregard that reading.
(11') - (13') do not as yet spell out the semantics of the comparative. I will come to that in 3.2. Some comments first:
We always have universal quantification over pairs. That can be worlds as in (11), times as in (13), or individuals as in (12). In (12), we have quantification over individuals in the same sense as in the synonymous sentence (12"), i.e. as in donkey sentences. Quite generally, the global structure of these interpretations is that of a conditional. The subordinate clause always enters into the restriction, similarly to the *if*-clause in conditionals. The nuclear scope is provided by the matrix clause.
A number of parallels between CCs and ordinary conditionals are immediately obvious: In conditionals, too, quantification apparently can be over different types of things, including worlds, times and individuals.[4] In the case of individuals, an indefinite in the antecedent clause gets bound by the matrix quantifier. A further parallel is the additional restrictions on the world variables in (11). In an ordinary conditional like (14), we don't want to make a claim about just any world that satisfies the restrictive clause. For instance, we would want to

[4]This is according to the "classical" analysis, cf. Heim (1982). I will disregard the possibility that conditionals involve quantification over situation variables here (see e.g. von Fintel (1994)).

disregard a state of affairs in which Otto is very well prepared, but a brick drops onto his head upon entering the seminar room.

(14) If Otto is well prepared, his presentation will be good.

We would want to do the same when evaluating the truth of (11). I assume that the work is done by the usual means, i.e. an accessibility relation, cf. Kratzer (1991).[5] Having made the point that additional restrictions are needed in principle, I will not specify them in the future. In CCs as well as in other conditional sentences, universal quantification seems to be a default; some crucial data is (15):

(15) a. Meistens ist ein Kletterer umso besser, je stärker er ist.
Mostly is a climber the better the stronger he is
"The stronger a climber is, the better he is usually."

b. Oft ist ein Mathebuch umso langweiliger, je dicker es ist.
Often is a maths book the boring-er the fatter it is
"A maths book frequently is the more boring, the fatter it is."

(15a) (in one reading; we get another one as in the case of (12)) intuitively has the interpretation given in (16a), and (15b) has that in (16b):

(16) a. MOST x,y [climber(x) & climber(y) & x is stronger than y]
[x is a better climber than y]

b. MANY x,y [maths book(x) & maths book(y) & x is fatter than y]
[x is more boring than y]

If this is correct, then we don't have universal quantification here, unlike in the cases looked at so far. This suggests that universal quantification can be overwritten by an overt adverb of quantification. Thus we have another parallel to ordinary conditional sentences (see Kratzer (1991), Heim (1982)). Compare e.g. (17a) and (17b) to (12) and (15) respectively.

(17) a. Wenn ein Hund geschlagen wird, wird er bissig.
If a dog beaten is becomes he vicious
"If a dog is beaten it becomes vicious."

b. Meistens wird ein Hund bissig, wenn er geschlagen wird.
Mostly becomes a dog vicious if he beaten is
"A dog usually becomes vicious if it is beaten."

[5] I will disregard ordering sources for the moment, because they seem unnecessary for the examples to be discussed and might complicate things. However, it is possible that they are needed, after all.

This first attempt at an interpretation for CCs already gives a preliminary answer to the most important question raised in section 2.1.: The comparative is real in the sense that it induces a comparison to be made in the semantics. The comparison in the subordinate clause of (11), for instance, is between Otto´s preparedness in two different worlds, and the one in the matrix clause is between the respective qualities of his presentation in these worlds. In (12), on the reading under discussion, we compare two attorneys with respect to their sliminess and their success. The problem will be to derive this semantics from the syntax. In order to do that, I first have to introduce the way in which I want to treat the comparative (which I have left unanalysed in the paraphrases so far). This will be done in section 3.2.
There is a paper by Dag Wold, "A Few Properties of *the...the...* Comparative Constructions" (Wold (1991)), which was only brought to my attention when I had already developed my analysis almost to its present state. Wold (1991) suggests basically the same kind of semantics, based on English CCs. I will not discuss his proposal here, the main reason being that the idea I arrived at independently does not to my judgement differ substantially from his suggestion, while on the other hand his semantic analysis is not very detailed. But I think it´s a fairly strong confirmation of our ideas that we arrived at the same conclusion independently, looking at two different languages.

3.2. The Comparative

As far as I can see, there is not yet such a thing as a standard semantic theory of comparatives. There seems to be agreement on some points, though. Adjectives have got an additional argument that denotes a degree. Degrees are entities in our model. They are ordered, i.e. form a scale. See for example Pinkal (1989a) for details. A comparison is made between two degrees - the comparative thus denotes some sort of operation on degrees. The intuition common to many theories of comparison is that (18), e.g., means something like: there is a degree d to which Luise is tall, and d is greater than any degree d' of which we can say that Otto is tall to degree d'.

(18) Luise is taller than Otto.

However, there are considerable differences as to how exactly this intuition is expressed, and how the semantics is linked to the syntax. See Stechow (1984) and Pinkal (1989b) for discussion, as well as Klein (1991).I will not enter into the ongoing discussion at this point. Rather, I will make a concrete proposal on the treatment that I would like to give the comparative. The proposal is based on what I need for CCs, and may not be entirely satisfactory in other ways. It is not exactly identical to any proposal in the literature, but it is very similar to Stechow (1984), (1993) and Heim (1985), (1990). What differences there are are either trivial or will be discussed in due course. There are, of course, reasons for picking

this theory rather than one based on Pinkal (1989b), for example. The important points will be discussed in sections 3.4., 3.5. and 4.
I propose to express the meaning of (18) as in (19a):

(19) a. -er' (λd[tall(d,Otto)]) (λd[tall(d,Luise)])
b. The max d_1[tall(d_1, Luise)] > the max d_2[tall(d_2,Otto)]

What exactly this means depends on the interpretation of the comparative morpheme *-er'*. A first guess is (20), which gives us interpretation (19b) for (19a).[6]

(20) [[-er']] (D_1) (D_2) = 1 iff The max d_2 $D_2(d_2)$ > The max d_1 $D_1(d_1)$

This is a version I will sometimes use, but which is not quite adequate yet in view of data like (21a):

(21) a. Luise is 3 cm taller than Otto (is tall).
b. -er' (λd[tall(d,Otto)]) (3 cm) (λd[tall(d,Luise)])
c. The max d_1[tall(d_1, Luise)] = 3 cm + the max d_2[tall(d_2,Otto)]

3 cm is presumably a name for a degree (of tallness) and specifies the difference between the degree to which Luise is tall and the degree to which Otto is tall. Thus, we need to have an additional argument for *-er*, as in (22).

(22) [[-er]] (D_1) (d) (D_2) = 1 iff the max d_2 $D_2(d_2)$ = d + the max d_1 $D_1(d_1)$

Presumably, the difference degree is existentially bound in those cases where there is no overt difference specification. (20) should really be (23a), then, and the interpretation of (19a) should be (23b):

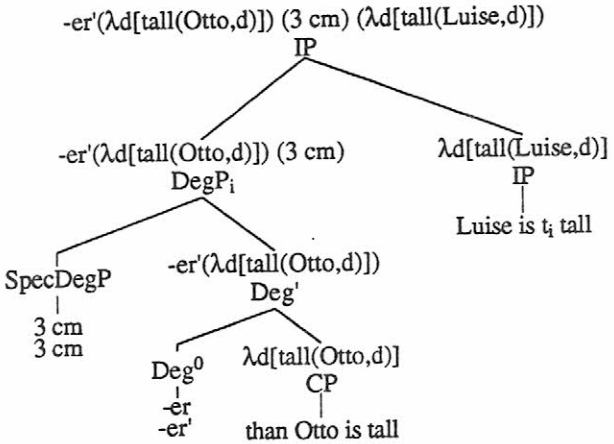
(23) a. [[-er]] (D_1) (D_2) = 1 iff ∃d[d>0 & the max d_2 $D_2(d_2)$ = d + the max d_1 $D_1(d_1)$]]
b. ∃d[d>0 & the max d_1[tall(d_1, Luise)] = d + the max d_2[tall(d_2,Otto)]]

(23b) is of course equivalent to (19b). We need to derive (21b) via an LF like (24) (compare Heim (1985), Stechow (1993)). (24) is an LF already annotated with translations.

---

[6]One obvious difference from Stechow and Heim is that I talk about *the* degree to which Luise is tall. In Stechow's and Heim's analyses, the degree in the correlate is existentially bound, rather than bound by *the*. I don't see that this has undesirable consequences for any of the examples I will discuss. I do this for formal reasons only. Compare Beck (1996).

(24)



(24) can be interpreted with the usual interpretational mechanisms (in particular, function application), to give us (21b). Now we can get back to CCs. (25b) (simplified version) or (25c) spell out the meaning of paraphrase (25a) of (11):[7]

(11) Je besser Otto vorbereitet ist, desto besser wird sein Referat werden.
The better Otto prepared is the better will his talk become
"The better Otto will be prepared, the better his talk will be."

(25) a. $\forall w_1 w_2$ [Otto is better prepared in w_1 than in w_2]
=> [Otto´s talk is better in w_1 than in w_2]

b. $\forall w_1 w_2$ [the max d_1[well(d_1, λx[prepared$_{w1}$(x)]) (Otto)] >
the max d_2[well(d_2, λx[prepared$_{w2}$(x)]) (Otto)]]
=> [the max d_1[good$_{w1}$(d_1, Otto´s_talk)] >
the max d_2[good$_{w2}$(d_2, Otto´s_talk)]]

c. $\forall w_1 w_2$ [∃d[d>0 & the max d_1[[well(d_1, λx[prepared$_{w1}$(x)]) (Otto)]=
d + the max d_2[well(d_2, λx[prepared$_{w2}$(x)]) (Otto)]]
=> [∃d[d>0 & the max d_1[good$_{w1}$(d_1, Otto´s_talk)] =
d + the max d_2[good$_{w2}$(d_2, Otto´s_talk)]]]

These are just more precise formalizations of the paraphrase (25a). The other examples from section 3.1. work in a completely analogous way.
Before proceeding to how I suggest deriving this interpretation, I would like to pause and consider it in some more detail. In particular, I would like to draw attention to the fact that the

[7] I will continuously mix object language and metalanguage in order to make the interpretations more easily understandable.

type of interpretation I suggest is rather weak. In the case of (11), for instance, (25) only says that if there is a positive difference in how well Otto is prepared in w_1 vs. w_2 then there must also be a positive difference in the quality of his presentation in w_1 vs. w_2 Nothing is said about the respective sizes of the differences, nor are they related to one another. Many people I have presented this to have complained that this is too weak. The suggestion is that (11) means something like: if there is a positive difference in how well Otto is prepared in w_1 vs. w_2, then there must also be a *corresponding* or *resulting* positive difference in the quality of his presentation in w_1 vs. w_2. So, the two difference degrees (the one in the antecedent clause and the one in the consequent) should somehow be related: Either they ought to be identical, or proportional, or the second should be functionally dependent on the first. This also seems to be the intuition underlying the paraphrases of Fillmore (1987) (who would paraphrase (11) as something like "Changes in the degree of preparedness of Otto yield corresponding changes in the degree to which his presentation is good") and Thiersch (1982), who proposes an operator "is proportional to".
I think that CCs can be used to describe functionally dependent relationships, or also causal relations; perhaps because of their peculiar semantics, they strongly tend to be used in this way, as for instance in (26). This might be why many people think that it´s part of their meaning.

(26) Je größer die Geschwindigkeit, desto länger der Bremsweg.
the greater the speed the longer the stopping distance
"The greater your speed is, the longer it takes to stop."

But I do not think that anything that expresses a causal relation or a functional dependence of the difference degrees is actually part of the meaning of CC constructions. Note that completely different functions can be described:

(27) a. Je größer eine natürliche Zahl ist, desto größer ist ihr Quadrat.
The greater a natural number is, the greater is its square
The greater a natural number is, the greater its square is.

b. Je größer eine natürliche Zahl ist, desto größer ist ihr Logarithmus.
The greater a natural number is the greater is its logarithm
The greater a natural number is, the greater its logarithm is.

c. Je größer eine natürliche Zahl ist, desto größer ist ihr Nachfolger.
The greater a natural number is the greater is its successor
The greater a natural number is, the greater its successor is.

I assume that (27) a.-c. are true statements. Let´s say, for simplicity, that the degree to which a number is great is that number, and that the ordering relation is then just the normal

ordering relation of numbers. According to my proposal, (27) a.-c. then mean (27') a.-c., or (more elaborately) (27"):

(27') a. $\forall x,y[\ x > y \Rightarrow x^2 > y^2]$
b. $\forall x,y[\ x > y \Rightarrow \log(x) > \log(y)]$
c. $\forall x,y[\ x > y \Rightarrow s(x) > s(y)]$

(27") a. $\forall x,y[\ \exists d[d>0 \ \&\ x= d+y] \Rightarrow \exists d[d>0 \ \&\ x^2= d+y^2]]$
b. $\forall x,y[\ \exists d[d>0 \ \&\ x= d+y] \Rightarrow \exists d[d>0 \ \&\ \log(x)= d+\log(y)]]$
c. $\forall x,y[\ \exists d[d>0 \ \&\ x= d+y] \Rightarrow \exists d[d>0 \ \&\ s(x)= d+s(y)]]$

But only in the case of (27c) are the two difference degrees identical. In the case of (27a), the difference degrees in the consequent become larger and larger, and in the case of (27b), smaller and smaller. I think that in the way of (27), one can make a true statement about any monotonic function. That makes it impossible to give any particular function f, such that for all CCs, the difference degree in the consequent is f applied to the difference degree in the antecedent. We could only say that in all CCs, there is such a function, but I don't think we would be able to say anything interesting about it. Moreover, in examples like (28), the differences in question can be very irregular. The meaning I suggest for (28a) is roughly (28b):

(28) a. Je größer eine Semantikerin ist, desto größer ist ihr Mann.
the taller a semanticist(fem) is the taller is her husband
"The taller a semanticist is, the taller her husband is."
b. $\forall x,y[\ S(x) \ \&\ S(y) \ \&\ \exists d[d>0 \ \&$ the max $d[\text{tall}(d,x)] = d +$ the max $d[\text{tall}(d,y)]]$
$\Rightarrow \exists d'[d'>0 \ \&$ the max $d[\text{tall}(d,x\text{'s husband})] = d' +$ the max $d[\text{tall}(d,y\text{'s husband})]]]$

(28b) would be true in a situation where semanticist A is 2 cm taller than B, A's husband is 10 cm taller than B's, C is 20 cm taller than D and C's husband is 1 cm taller than D's husband. I think that this is intuitively correct. (28a) is an accidental generalization, which does not lead you to expect any deeper underlying relationship, and in fact, there has to be none. I conclude that we do not want to end up with stronger interpretations than those I have suggested.

3.3. Derivation

I will talk about the modal case of comparative conditionals first, repeated for convenience:

(11) Je besser Otto vorbereitet ist, desto besser wird sein Referat werden.
The better Otto prepared is the better will his talk become
"The better Otto will be prepared, the better his talk will be."

(29) $\forall w_1 w_2$ [$\exists$d[d>0 & the max d_1[[well(d_1, λx[prepared$_{w1}$(x)]) (Otto)]=
d + the max d_2[well(d_2, λx[prepared$_{w2}$(x)]) (Otto)]]
=> [$\exists$d[d>0 & the max d_1[good$_{w1}$(d_1, Otto´s_talk)] =
d + the max d_2[good$_{w2}$(d_2, Otto´s_talk)]]]

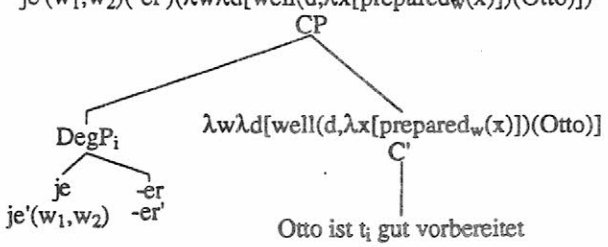
Let´s concentrate first on the *je*-clause, the meaning of which is given in (30).

(30) a. je besser Otto vorbereitet ist
b. $\exists$d[d>0 & the max d_1[[well(d_1, λx[prepared$_{w1}$(x)]) (Otto)]=
d + the max d_2[well(d_2, λx[prepared$_{w2}$(x)]) (Otto)]]]

The problem should now be obvious: We do not have an LF as in 3.2. with an overt *than*-clause giving us the first argument for *-er*. What we have is the comparative morpheme, *je* and the rest of the clause. I will assume that these are the three meaningful components we have got at LF, and that the transparent LF of the subordinate clause looks like (31):

(31)

je'(w_1,w_2)(-er')(λwλd[well(d,λx[prepared$_w$(x)])(Otto)])



We can get the desired result from this LF provided that *je* has the following meaning:

(32) [[je']] (w_1,w_2) ([[-er']]) ($D_{<s,<d,t>>}$) iff $\exists$d[d>0 & [[-er']] ($D(w_1)$) (d) ($D(w_2)$)]

(33) [[je' (w_1,w_2) (-er') (λwλd[well(d,λx[prepared$_w$(x)])(Otto)])]]
iff $\exists$d[d>0 & [[-er']]([[λd[well(d,λx[prepared$_{w1}$(x)])(Otto)]]]) (d)
([[λd[well(d,λx[prepared$_{w2}$(x)])(Otto)]]])
iff $\exists$d[d>0 & the max d[well(d,λx[prepared$_{w2}$(x)])(Otto)] =
d + the max d[well(d,λx[prepared$_{w1}$(x)])(Otto)]]

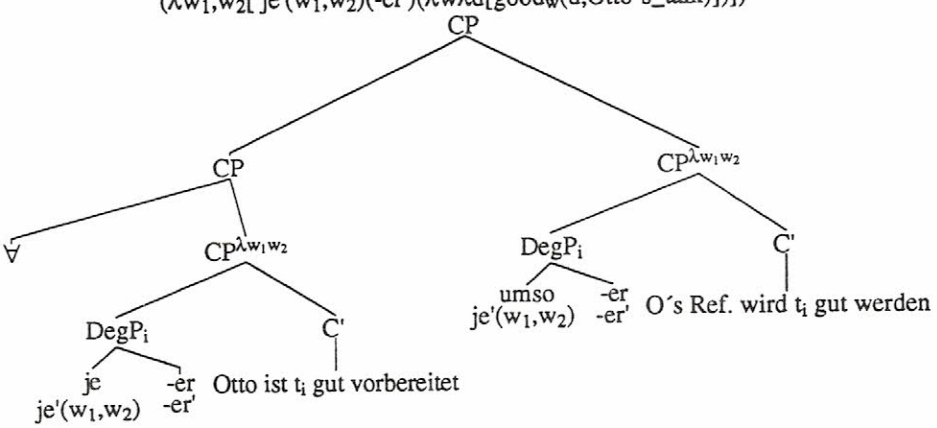
So much for the *je* clause. One point is worth mentioning: We have to split the comparative form of the adjective/adverb into the adjective (or adverb) and the comparative morpheme. I have reconstructed the adjective/adverb from the SpecCP position. It is not unusual to split

the adjective and the comparative morpheme (Stechow (1984), Heim (1985, 1990)), only normally reconstruction does not enter the picture, but rather QR of *-er* together with its first argument (as in 3.2.). The adjective is reconstructed in the syntax of LF essentially for convenience - it would probably be possible to get the same result via higher type traces and lambda conversion.

As I have argued in 3.1., the quantificational force comes from an implicit or overt adverb of quantification, which takes the subordinate clause as its first argument, and the matrix clause as its second argument. The internal structure of the matrix clause can thus be analysed in a way completely parallel to the subordinate clause. I have given the complete LF for (11) in (34), and its interpretation in (35).

(34)

$\forall(\lambda w_1,w_2[\ je'(w_1,w_2)(\text{-er}')(\lambda w\lambda d[well(d,\lambda x[prepared_w(x)])(Otto)])])$
$(\lambda w_1,w_2[\ je'(w_1,w_2)(\text{-er}')(\lambda w\lambda d[good_w(d,Otto's\_talk)])])$



(35) $[[\ \forall \quad (\lambda w_1w_2[\ je'\ (w_1,\ w_2)\ (\text{-er}')\ (\lambda w\lambda d[well(d,\lambda x[prepared_w(x)])(Otto)])])$
$(\lambda w_1w_2[\ je'\ (w_1,\ w_2)\ (\text{-er}')\ (\lambda w\lambda d[good_w(d,\ Otto's\_talk)])])\ ]]$

iff $\forall w_1w_2[\exists d[d>0\ \&$ the max $d_2[well(d_2,\ \lambda x[prepared_{w2}(x)])\ (Otto)] =$
$d +$ the max $d_1[well(d_1,\ \lambda x[prepared_{w1}(x)])\ (Otto)]]]$
$\Rightarrow[\exists d'[d'>0\ \&$ the max $d_2[good_{w2}(d_2,\ Otto's\_talk)] =$
$d' +$ the max $d_1[good_{w1}(d_1,\ Otto's\_talk)]]]$

je and *umso/desto* mean the same thing. They denote an operator which provides two descriptions of degrees by "doubling" the information provided by their last argument with respect to the variables they introduce, and they introduce the difference degree argument for the comparative. In this way they provide the three arguments for the comparative morpheme. The translations of the CPs corresponding to the *je*-clause and to the *umso*-clause, respectively, contain two world variables each (compare the meaning rule (32) for *je, umso,*

desto). These variables have to be bound in the same order in the two clauses. I suggest treating them as a pair for the present purposes. So we end up with universal quantification over pairs.

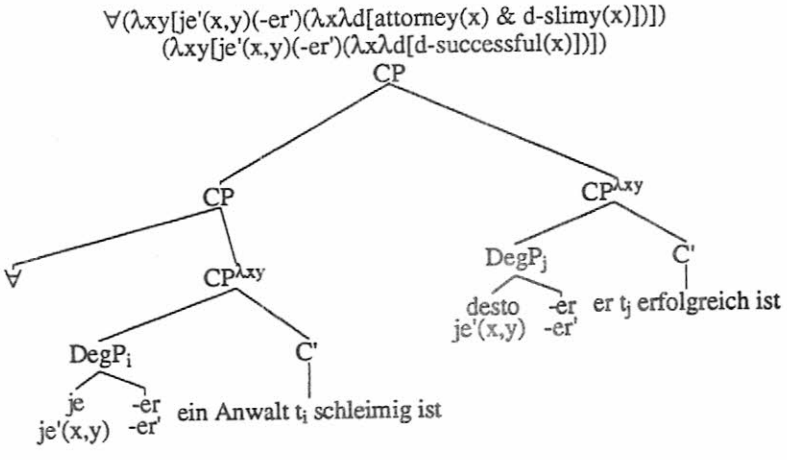
So much for the modal case. The temporal and individual quantifications are, of course, in principle quite parallel to the case looked at. Quantification over different types of variables necessitates that we have additional meaning rules für *je/umso/desto* for each case.

(36) a. $[[je']]\ (t_1,t_2)\ ([[-er']])\ (D_{<\tau,<d,t>>})$ iff $\exists d[d>0 \ \&\ [[-er']]\ (D(t_1))\ (d)\ (D(t_2))]$
b. $[[je']]\ (x,y)\ ([[-er']])\ (D_{<e,<d,t>>})$ iff $\exists d[d>0 \ \&\ [[-er']]\ (D(x))\ (d)\ (D(y))]$

Quantification over individuals seems to be a more problematic case, however. I will illustrate this by giving an example analysis using rule (36) b.

(37) Je schleimiger ein Anwalt ist, desto erfolgreicher ist er.
"The slimier an attorney is, the more successful he is."

(37')



(38) [[∀ (λxy[je' (x,y) (-er') (λxλd[attorney(x) & d-slimy(x)])])
(λxy[je' (x,y) (-er') (λxλd[d-successful(x)])])]]
iff ∀xy[∃d[d>0 & the max d[attorney(y) & d-slimy(y)] =
d + the max d [attorney(x) & d-slimy(x)]]
=> ∃d'[d'>0 & the max d[d-successful(y)] = d' + the max d[d-successful(x)]]]

This is not the most intuitive paraphrase; rather, (39) is what we first would have thought of:

(39) $\forall xy$ [attorney(x) & attorney(y) & $\exists$d[d>0 & the max d[d-slimy(y)]
=d + the max d[d-slimy(x)]]
=> $\exists$d'[d'>0 & the max d[d-successful(y)] = d' + the max d[d-successful(x)]]

As far as I can see, the truth conditions of (38) and (39) differ in exactly one point, namely, when there are no attorneys. In that case, (38) does not have a truth value, because the definite descriptions in the antecedent do not denote. (39), on the other hand, comes out as true. This is not too bad for (38), really, because it might be argued that (37) does in fact presuppose that there are attorneys.

There are some more problematic aspects of (37), however, which concern the binding of the variable named *x* occurring in the two C's in (37'). This variable is introduced by the indefinite expression in the restrictive clause and by the pronoun in the nuclear scope. It gets bound by an ordinary lambda operator, not at a point where it encounters its "natural" binder. It is not quite clear to me just how problematic this is. Compare Beck (1996) for discussion.

3.4. Some immediate Consequences

Quite generally, the analysis captures the parallels to ordinary conditional sentences, simply because CCs *are* conditionals. This concerns quantificational variability, additional restrictions in the modal case, quantifiability of indefinites in the antecedent, and quantification over different types of things (see 3.1.).

The analysis provides an explanation for the missing item of comparison in the syntax: we do have a genuine comparison in the interpretations given above. We get the two elements to be compared with the help of the operator denoted by *je/umso/desto*. This operator derives two descriptions of degrees from the information provided by the syntax. Thus, to add an item of comparison in the syntax is impossible because we already have one, although one that is not visible as such at S-Structure. It is implicitly present with the operator. This operator bears quite a heavy burden in the derivation. I am not 100% certain that it should be localized with *je* etc., but I also don't know why it shouldn't be.

The meaning of *je* and *desto/umso* is identical, namely, as specified in (32). This is made plausible by data like (40a), where we have two *umso* clauses rather than a *je* in the subordinate clause, as well as by idiomatic expressions like (40b). Moreover, in the corresponding construction in Dutch, we can have *hoe* twice, as we have *the*[8] in English.[9]

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[8](35) and (38) are, of course, also the meanings I assign to English *the* in CCs. An anonymous reviewer complained that this is not the usual interpretation assigned to *the*, meaning the definite article. I hope that it has become clear that *the* in this case has nothing to do with the definite article. Indeed, English is the only language that uses the same form for the CC operator and the determiner. Thiersch (1982) quotes Jespersen, saying that *the* in CCs is historically unrelated to the definite article *the*. Quite generally, I wonder how one could make any sense whatsoever of interpreting the two clauses (!) forming a CC as two definite NPs.

[9]In Mandarin Chinese, the marker that presumably would do the same job is *yue*, which also occurs twice.

(40) a. % Umso länger du wartest, umso schlimmer wird es.
The longer you wait the worse becomes it
"The longer you wait, the worse it will become."
b. Je länger, je lieber.
The longer, the better

je/umso/desto/the have a second function according to (32), namely to introduce the difference degree that is to be the second argument of [[-er']]. I could have used the "reduced" form of [[-er']] (23a) with that argument existentially bound from the start. The outcome would have been the same. I have chosen the other option because of data like (41):

(41) Gestern war es kühl. Heute ist es umso heisser.
Yesterday was it cool. Today is it the hotter
"It was cool yesterday. Today it´s all the more hot."

I will not offer an analysis of these data. My intuition is that (41) means that it was cool yesterday and that it is hotter today than it was yesterday, and implicates that the difference between yesterday´s and today´s temperature is considerable. Maybe there is more to say about this difference, but the idea is that *umso* does say something about it. I think my analysis should make it possible to get a handle on that. This step provides additional justification for putting *je/umso/desto/the* in the position reserved for the difference argument of the comparative, SpecDegP.
By analysing the comparative as meaningful we do not only do justice to the fact that we obviously have a comparative form of the adjective (or adverb). There is also an interesting parallel to ordinary comparatives, in that the occurrence of a negative element sometimes leads to ungrammaticality:

(42) a. *Je größer der neue Angestellte nicht ist, desto weniger
The taller the new employee not is, the less
große Schuhe braucht er.
big shoes needs he.
*The taller the new employee isn´t, the less big are the shoes he needs.
b. *Hans ist kleiner als Otto nicht groß ist.
Hans is shorter than Otto not tall is
* Hans is shorter than Otto isn´t tall.

The explanation that Stechow (1984) suggests carries over to this treatment:

(43) a. *Otto ist größer als kein Kind.
Otto is taller than no child

b. the max d[tall(d,Otto)] > the max d[¬∃x[child(x) & tall(d,x)]]

In (43), the definite description fails to denote (under the assumption that the algebra of degrees does not have a maximal element), because then there is no maximal degree such that no one is tall to that degree (see Stechow (1984)).
The same can be said of one reading of (42) a.:

(44) $\forall w_1 w_2$ [$\exists$d[d>0 & the max d_2[¬[the new employee in w_2 is d_2-tall in w_2]]
= d + the max d_1[¬[the new employee in w_1 is d_1-tall in w_1]]
=> ...

It is not the occurrence of a negation per se that causes the ungrammaticality of sentences like (42), but the way that negation enters into the interpretation. In sentences like (45), the definite description does have a proper denotation, in spite of the negation contained in it. Accordingly, the sentence is grammatical.[10]

(45) Je länger Du nicht zum Frisör gehst, desto doofer siehst Du aus.
"The longer you don't go to the hairdresser's, the more stupid you look."

3.5. Summary of the analysis

I have suggested an analysis of CC constructions for German, which should also work for English comparative *the...the* constructions. There are a number of languages that also have CC constructions. I have used the properties they share with English and German to further support my suggestions.
I have analysed CCs as conditional sentences. They share a lot of properties with ordinary conditionals: As I have argued, they are quantified structures semantically, consisting of an element providing the quantificational force, a restriction and a nuclear scope. The quantifier can either be an overt adverb of quantification, or the invisible quantifier that Heim (1982) suggests for conditionals. The restrictor is provided by the subordinate clause, and the nuclear scope by the matrix clause. The quantifier is unselective, meaning it can bind different types of variables and a different number of variables. In the modal case, it needs the same additional restrictions we ordinarily associate with conditionals. We get donkey anaphora here like we do in ordinary conditionals.

[10]There remains the well-known problem of why a wide scope reading of negation with respect to the comparative is impossible. A corresponding reading is possible with non-negative operators. CCs behave in exactly the same way as ordinary comparative constructions in this respect. Since I have no solution, I will not discuss these data here.

The semantic difference from ordinary conditionals is that we obligatorily quantify over at least two variables. These variables induce (in each the restrictor and the nuclear scope) the two items (two descriptions of degrees) to be compared.
This leads to the second main feature of the analysis: Despite the lack of an overt item of comparison, I have treated the comparative as meaningful, i.e. as semantically corresponding to a comparison. I get the two items to be compared with the help of an operator that I take to be the meaning (or part of the meaning) of *the/je/desto/umso*. This operator takes as one argument whatever the clause it c-commands provides in the syntax, and "doubles" it, varying over a variable contained in it. This can be a world, time, or individual variable, whatever gets quantified over in the conditional structure. We end up with two related comparisons being made, one in each clause.Thus, an item of comparison is given, although it is not visible as such at S-Structure. An additional overt item of comparison would be uninterpretable, since the argument slots of the comparative morpheme are all filled.
the/je etc. syntactically and semantically fill the position of a difference degree, thus precluding elements like *three inches* etc.
While the details of my proposal are of course open to debate (the localization of the information I need, the role of the difference specification etc.), I think that the two main properties of my analysis are very much common sense, and are in fact desiderata of any analysis of CC constructions.

4. The comparative morpheme

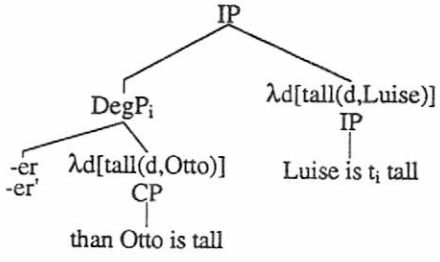
I will explore some theoretical consequences of the analysis proposed, relating to the role of the comparative morpheme and the interaction between morphology, syntax and semantics.
The treatment that I have suggested for the comparative is what Pinkal (1989b) calls a "discontinuous" analysis of the comparative. This means that the meaning of the comparative morpheme and the meaning of the adjective are not combined directly, i.e. there is no meaningful expression that is the interpretation of *A+-er* (and nothing else). I will show in this section that this is in fact a consequence of my analysis of CCs, that is, it is not possible to adopt my analysis and have a continuous analysis of the comparative in CCs.
This is interesting in two respects: Firstly, it is necessary to substantially modify some prima facie attractive treatments of comparative constructions, like Pinkal´s (1989a), if one wants to use them for CCs. Secondly, it means that words cannot be atoms for the interpretation procedure: Morphological boundaries have to be visible to the LF component.
In the light of more recent work in syntax, the second consequence does not seem smashingly surprising: everybody working in the general framework of Baker´s (1985) incorporation theory assumes that morphological boundaries are visible to syntactic levels anyway. Still, there are plenty of people who are opposed to this model of grammar. I have arrived at the same conclusion for completely different reasons, and from a completely different

perspective. One might consider this independent evidence for a particular model of interaction in grammar.
Here again is the interpretation of the comparative morpheme that I suggested in section 3.2. - for simplicity, I will use the reduced version given in (46), since the difference degree does not matter for the discussion.:

(46) [[-er']] (D_1) (D_2) = 1 iff The max d_2 $D_2(d_2)$ > The max d_1 $D_1(d_1)$

Thus, (47a) is expressed as in (47b) derived via the LF in (47c):

(47) a. Luise is taller than Otto (is tall).
b. -er' (λd[tall(d,Otto)]) (λd[tall(d,Luise)])
c.



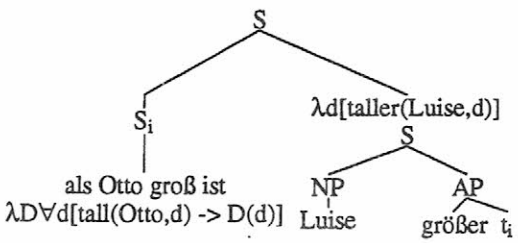
It is obvious why this analysis is discontinuous: There is no constituent in (47) which would get translated as the meaning of *taller*.
I need to have the comparative morpheme as a separate entity at LF in order to be able to state the semantics of the operator associated with *the/je* etc. in the way I have (as repeated in (48a)). For the present purposes, I will simplify this, too, and again disregard the difference degree as in (48b).

(48) a. [[je']] (w_1,w_2) ([[-er']]) ($D_{<s,<d,t>>}$) iff ∃d[d>0 & [[-er']] ($D(w_1)$) (d) ($D(w_2)$)]
b. [[je']] (w_1,w_2) ([[-er']]) ($D_{<s,<d,t>>}$) iff [[-er']] ($D(w_1)$) ($D(w_2)$)

To put it bluntly, the comparative morpheme occurs as a separate argument of *je* because the rest of the clause gets doubled, and serves as the two arguments of *-er*. The comparative morpheme itself, of course, is not used twice, and cannot be subject to the doubling operation.
One would now like to know whether this is a necessary consequence of the analysis of CCs I have suggested. I think that it is, and I will make this point in the following way.
I will have a look at Pinkal's (1989a) analysis, which treats *taller* etc. as a lexical unit, and show why it cannot be used in my analysis of CCs without modification. This will carry over to other analyses that, like Pinkal's, regard the comparative form as a unit. I will then try to boil things down as far as possible, i.e. state the minimal set of assumptions that I have to

make about the comparative and CCs in order for this point to go through (i.e. in order to conclude that CCs necessitate a discontinuous treatment of the comparative).
Here is Pinkal's semantics for ordinary comparatives.[11] (49a) gets interpreted as (49b), via an LF like (49c).

(49) a. Luise ist größer als Otto (groß ist).
Luise is taller than Otto (tall is)
b. ∀d[tall(Otto,d) => taller(Luise,d)]
c.



The comparative form of the adjective is treated as a unit. *taller* is defined as a relation between an individual x and a degree d, which holds iff the (maximal) degree to which x is tall is greater than d. The item of comparison is treated as a free relative, which is interpreted universally.
The treatment seems very elegant to me: *taller* is a lexical unit, and there is no need to raise bound morphemes at LF. Also, the item of comparison and the comparative morpheme don't have to form a constituent at LF. It might be quite natural to treat a *than*-clause as a free relative, in which case it is also natural that it is raised at LF and receives a universal interpretation.
Now, what would be Pinkal's semantics for the comparative in CCs? I have given an example in (50). If I am right in that (50a) is interpreted as in (50b), then it should in Pinkal's analysis be translated as in c.

(50) a. je besser Ottos Referat ist
The better Otto's presentation is
b. Otto's presentation is better in w_1 than in w_2
c. $\forall d[good_{w2}(d,Otto's\_presentation) => better_{w1}(d,Otto's\_presentation)]$

But how do we derive (50c)? We cannot have a semantic structure as in (51a), because there is no operator *je* that could generate (50c) from (51a) The only similar thing we could get is (51c).

[11] Or rather, a simplified version of it. But I hope to do justice to his main intentions.

(51) a. [[je']] (w_1,w_2) ([[$\lambda w \lambda d$[better$_w$(d,Otto´s_presentation)]]])
b. [[je']] (w_1,w_2) ($D_{<s,<d,t>>}$) iff ???
c. $\forall$d[better$_{w2}$(d,Otto´s_presentation) => better$_{w1}$(d,Otto´s_presentation)]

This is not what we want. The problem is of course that *better* occurs in the antecedent and in the consequent. Maybe we could have a structure as in (52).

(52) [[je']] (w_1,w_2) ([[better]]) ([[$\lambda A \lambda w \lambda d$[$A_w$(d,Otto´s_presentation)]]])
A is a variable of type <d,<e,t>>, an adjective meaning.[12]

But again, we want to use the positive form *good* of *better* in the antecedent of (50c) and the comparative form in the consequent. If we only have *better*, which is inseparable, we can´t get (50c), i.e. there is no operator *je* in (53) which would give us (50c).

(53) [[je']] (w_1,w_2) ($A_{<d,<e,t>>}$) ($D_{<<d,<e,t>><s,<d,t>>>}$) iff ???

Once more, we could only get (51c).
It is probably possible to derive a Pinkal semantics for CCs. Here is what I could come up with: We assume a semantic structure for (50a) as in (54a). The operation performed by *je* is given in (54b).

(54) a. [[je']] (w_1,w_2) ([[-er']]) ([[good]]) ([[$\lambda A \lambda w \lambda d$[$A_w$(d,Otto´s_presentation)]]])
b. [[je']] (w_1,w_2) ([[-er']]) (A) ($D_{<<d,<e,t>><s,<d,t>>>}$) iff
$\forall$d[D(A)(w_2)(d) => D ([[-er']](A)) (w_1)(d)]

This does indeed give us (50c).
We now need an appropriate meaning rule for the comparative morpheme:

(55) [[-er']](A) (d) (x) iff the (max) d'[A(d')(x)] > d
type of *-er*: <<d,<e,t>>, <d,<e,t>>>

But in the process, we have split up the comparative form of the adjective into the comparative morpheme and the positive form of the adjective, thus deviating from a crucial assumption of Pinkal´s: that the two form a lexical unit. Moreover, the analysis is now discontinuous in the sense that *-er* and *good* are not at first combined to form a meaningful expression. There is no constituent at LF that means *better*. Instead, *-er* and *good* are two separate arguments of *je*.

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[12] I ignore intensionality here, for simplicity.

Why did we fail in our original attempts? To put it simply, because my analysis of CCs wants to use the comparative morpheme once, but the meaning of the adjective twice. If the two are inseparable, we can't do that. I will now try to make the point as general as possible (i.e. not dependent on the details of the analysis, but on its general properties, which I hope are well motivated).

Let's assume that I am correct about the truth conditions I suggest. Then there are strong arguments in favour of analysing the comparative as meaningful. Thus we have a comparison in both the main clause and the subordinate clause. The comparative morpheme expresses the comparison operation between two degrees. In CCs, there is no overt item of comparison (indeed, we can never have one). This is why I suggest deriving the two degree descriptions by doubling the syntactic material (varying w.r.t. a variable contained in it). We need the information provided by the adjective in both descriptions, so in some sense or other, the adjective has to be used twice. There is only one comparison operation in each the subordinate clause and the matrix clause. Thus, the adjective meaning has to enter into composition twice, and the comparative morpheme once. They have to be distinguished in the operation mentioned above and treated differently. Therefore, they cannot be one bit of information at the level at which this operation is performed, i.e. they cannot be the interpretation of a single constituent at LF.

From this, we can conclude that the comparative form is not a lexical item that is an atom to LF, because it then would necessarily be a constituent at LF, too. Moreover, the analysis of the comparative has to be weakly discontinuous, in the following sense: It is not the case that in all comparative constructions, the comparative morpheme combines with the adjective/adverb in order to yield a meaningful expression *A+-er* (if we adopt a Pinkal style treatment in the way sketched above, they would still combine in most cases; the exception is CCs.). The general point concerning morphology and LF can also be made: the comparative morpheme must be a separate entity at LF.

This result is, of course, very much in line with those treatments of the comparative that are discontinuous (cf. Stechow (1984), Heim (1985)). Moreover, concerning the interface problem it is the same conclusion arrived at in Stechow (1994) on the basis of tense phenomena.

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THE WAS-W-CONSTRUCTION AND CLAUSAL TYPING*

Ellen Brandner

1. Introduction

So-called partial wh-movement is found in a variety of languages. The term refers to those constructions where a wh-phrase which is interpreted as having been long-extracted is still found in its originating clause whereas in the matrix clause a so-called scope marker, i.e. a kind of expletive wh-phrase is inserted. Some instances of this construction from various languages are given in (1)

(1) a. German
Was glaubst du [wen Maria t zur Party einladen wird]
what believe you whom M. to the party invite will

b. Romani (McDaniel 1989)
So o Demìri mislinol [kas i Arifa dikhla t]
what Demir thinks whom Arifa saw

c. Iraqi Arabic (Wahba 1991)
sh-tsawwarit Mona [Ali raah *wey*]
QP-thought Mona Ali went where

d. Hindi (Dayal 1993)
jaun *kyaa* soctaa hai [meri *kis-se* baat karegii]
John what thinks Mary who-with will-talk

The first detailed analysis for this construction, given by McDaniel (1989) has recently been challenged by Dayal (1993).

McDaniel suggested that the scope-marker is directly coindexed with the wh-phrase in the lower clause and thus behaves like an expletive with – in common terms – subsequent expletive

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replacement at LF. Therefore the term "partial movement", since the intuition is that the contentful wh-phrase moves at S-Structure only to an intermediate position on its way to its final position, i. e. Spec-CP of the matrix clause; this last step step taking place at LF.

Dayal (1993) proposes that the scope marker is the questioned counterpart of a correlate-NP, i.e. an NP base generated in the matrix clause which is coindexed with the extraposed sentential complement like in (2)

(2) $S\ O_i\ V\ [\ CP]_i$

The scope marker then is assigned a semantic interpretation of the form given in (3)

(3) $\lambda Q \exists q\ [T_i\ (q)\ \&\ Q(q)]$

(3) basically says that the scope marker can take only a question as its argument. With this, Dayal captures in a formal way the intuition that the scope marker corresponds rather to the questioned clause as a whole than only to single question phrase.

Another deviance from McDaniels analysis is that she doesn't assume that the scope-marker is base-generated in Spec-CP, but that it is an argument-NP inside the VP of the respective clause and then moves to its Spec-CP in a language like German or – as in Hindi – stays in its base-position, giving rise to the pattern found in (1d).

Dayal extends this analysis to all the languages in question, i. e. the scope marker is a questioned NP, base-generated in the VP of the respective clause. This seems reasonable at first glance, given for example the similarities of the lexical shape of the scope-marker – in all languages it corresponds to the questioned counterpart of the expletive NP, i.e. the most unspecified pronoun in a given language. However, there are differences between these languages which lead me to assume that such an unified account is not viable. In the following I will contrast German with Hindi, where Romani patterns like German and Iraqi Arabic seems to be more close to Hindi.

First of all, German is a language which has obligatory s-structural wh-movement whereas Hindi is a wh-in-situ language. Clearly, a wh-in-situ language will never have the possibility to express long-distance dependencies in terms of movement, and so it has to use a strategy like scope-marking to do

structural restrictions in Hindi, as is mentioned in Dayal. In contrast, German does allow long extraction, and the was-w-construction is simply an alternative to extraction[1]. Interestingly, the was-w-construction underlies the same strict locality constraints as adjuncts, i. e. it is not possible out of weak islands, just like overt movement, thus by no means can it be taken to have the same function as the Hindi construction[2], since then we would expect that German uses this strategy - which is obviously part of its grammar - in order to overcome its s-structural restrictions; which is obviously not the case.

Secondly, as independent evidence for her analysis, Dayal cites the following data from German:

(4) a. mit wem glaubt jeder Student$_i$ [daß er$_{j/i}$ gesprochen hat]
with whom thinks every student that he spoken has

b. was glaubt jeder Student$_i$ [mit wem er$_{j/i}$ gesprochen hat]
what thinks every student with whom he spoken has

'With whom does every student think that he has spoken'

where she claims that the bound variable reading for the pronoun is not available in the b-clause. This would be explained if it were true that the extraposed clause is in fact adjoined to CP which means that there would be no c-command relationship between the quantified NP and the pronoun, leading to the contrast (according to Dayal). However, this is simply not true, thus all informants I asked, including myself get the bound variable reading. Dayal doesn't discuss the corresponding data from Hindi, but Miriam Butt (p.c.) informed me that there is no contrast w.r.t. the bound variable reading in Hindi either. Thus, the binding data rather point into the other direction, namely that the embedded clauses are still in their base position, i.e. c-commanded by the other arguments of the clause

But that the binding data are not a reliable test for the position of extraposed clauses can be seen from the following data:

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[1] As is discussed in Dayal, Rizzi (1991) observed one important point where the two constructions behave differently. That is the fact that apparently the was-w-construction is not possible with weak islands, esp. negative islands. I will come to that later.

[2] It has been reported to me by several colleagues from the audience at IATL that there are languages which can apparently use this construction exactly in those environments where overt movement is not possible because of s-structural restrictions. This hardens my claim that the German construction differs fundamentally from the Hindi one.

(5)a. Jeder Studenti hat gedacht [daß eri/j den Test besteht]
every student has thought that he the exam passes

b. Jeder Studenti hat es gedacht [daß eri/j den Test besteht]
every student has it thought that he the exam passes

According to standard assumptions about the position of extraposed sentential arguments, cf. Bennis (1986), Vikner (1995), the b.-sentence should not allow the bound reading since the sentential argument is base-generated as an adjunct which is not c-commanded by the subject[3].

Furthermore, in some German dialects it is possible to use a duplicated form of the real wh-phrase instead of a *was:*

(6) *wen* glaubst du [*wen* Maria einladen wird]
whom believe you [whom Maria invite will]

The construction underlies the same restrictions and has the same properties, see below, as the more standard was-w-construction, indicating that it is in fact a dialectal variant. Now this is particularly incompatible with the assumption that *was* corresponds to a correlate, since there is no possible source for such a wh-phrase in the matrix clause. I will briefly come back to this construction at the end of the paper.

As a last point, I will mention a fact which has been recognized since long, see Höhle (1990), namely that *was* never appears in positions distinct from Spec-CP, cf. also Müller (1995) be it in a multiple question as in (7a) or in an echo-question (7b):

(7) a. * wer hat was geglaubt [warum Peter gegangen ist]
who has what believed why Peter left has

b. * Hans hat WAS geglaubt [warum Peter gegangen ist]
Hans has what believed why Peter left has

This is hard to explain if one assumes that *was* is base-generated in object-position, given that wh-phrases are licensed in their base position as long as another wh-phrase is in Spec-CP, i.e. in multiple

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[3] The question where complement clauses are generated in OV-languages such as Hindi and German is a difficult one. The binding data seem to imply that they are in general base generated to the right of the verb, in a osition where they can be c-commanded by the arguments of the matrix verb, see Haider (1993b) for this position. However theta-marking is canonically to the left in these languages, thus an extraposition analysis, for example Bayer (1995) for a recent proposal, seems to be justified equally. I won't take a stand here concerning this matter, however, it is obvious that the evidence drawn from such data is not really decisive, at least w.r.t. the analysis of the construction under discussion.

questions, cf. (7a). (7b) follows without further assumptions since expletives never can be stressed, a prerequisite for being licensed in situ in an echo-question.

In sum, the syntactic implications of Dayals analysis are not tenable for German. Although her analysis may work for Hindi and other wh-in-situ languages it is obvious that the German construction differs in important respects from the Hindi one. Why the constructions occur under such different circumstances remains an open issue for the moment.

In the following, I will therefore concentrate on the German construction and its implications for a general theory of wh-movement. At the end of the paper I will offer some speculations on the differences between the languages under discussion.

I would like to suggest an analysis of partial movement which unifies some aspects of both proposals. What I will do, is to try to formulate in different syntactic terms Dayals basic semantic intuition, namely that the scope marker is connected to a wh-clause and not to a wh-phrase; however, I will argue that the *was* is in fact an expletive, base-generated in the relevant Spec-CP positions[4]. This will be done by developing a theory of clausal typing, based on Cheng (1991), where the scope marker will be treated as an expletive typer, a job which is standardly done by real wh-phrases in a language like German, simply by virtue of its movement to Spec-CP. Some general considerations first on expletives and second typing procedures will then yield the wanted results, namely to integrate this construction into a general theory of wh-movement.

The rest of the paper is organized as follows:

First, I will present the main syntactic properties of the German was-w-construction, in passing I will note differences to other languages (as far as they are known to me). After that the notion of clausal typing will be introduced, thereby extending and modifying the original proposal by Cheng (1991).

The fourth section is devoted to show how such a theory, together with rather standard assumptions is able to account for the construction.

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[4] at least in German, see for Hindi below.

Finally then I will discuss the locality constraints occurring with the was-w-construction and then closing with some speculations on the implications for wh-movement at LF.

2. Properties and problems

2.1. Properties of the was-w-construction

So let us have a closer look at the syntactic properties of this construction. Since the most important properties of this construction, especially in German, are presented in great detail in recent literature, I will confine myself to simply listing the relevant properties, together with the corresponding examples:

1. *was* cannot appear in a simple multiple question:

(8) * was hat Hans Bücher wo gekauft
was has Hans books where bought

was is obviously not able to license further wh-phrases in their respective base positions, as opposed to real wh-phrases in multiple questions.

This is even the case when an embedded question is added, i.e. when there seems to be no violation of whatever constraint it is which requires a *was* to occur together with an embedded question, as shown in (9):

2. *was* doesn't license other wh-phrases in its own clause:

(9) * was hat Hans wann gesagt [wem er das Auto verkaufen wird]
was has Hans when said whom he the car sell will

On the other hand, it is possible to have additional wh-phrases in the clause, containing the real wh-phrase:

(10) was hat Hans gesagt [wem er wo das Auto verkauft hat]
what has Hans said whom he where the car sold has

3. the construction is only possible with verbs which select [-wh]:

(11) * was fragst du [wem er das Auto verkauft hat]
what ask you whom he the car sold has

Thus, *was* doesn't tolerate an embedded clause which is selected as [+wh].This will be discussed later in detail.

4. every clause in the construction must have a was[5] :

(12)a. * was glaubst du [ø daß Hans meint [wem er das Auto verkaufen will]]
what believe you that Hans thinks whom he the car sold has

But this does not hold for clauses out of which a real wh-phrase has been extracted:

(12)b. was glaubst du [wem$_i$ daß Hans meint [t_i daß er das Auto t_i verkaufen will]]
what believe you that Hans thinks whom he the car sold has

5. was doesn't allow an embedded Y/N question:

(13) * was glaubst du [ob er noch kommt]
what believe you whether he still comes

This of course can be explained at first sight by the very simple fact that *glauben* does not select a [+wh] complement, thus the D-Structure would already be ruled out. However that things are not so easy can be seen by the fact that the was-w-construction is not allowed even when a [+wh] complement is selected by a matrix verb [+wh], cf. (11).

6. *was* doesn't allow finite verb movement to C^0 in embedded clauses:

(14) * was glaubst du [wen hat er eingeladen]
what believe you whom has he invited

Although embedded V/2, i.e. finite verb movement to C^0 is allowed in sentential complements of a verb like glauben, as shown in (15b):

(15)b. Ich glaube [Maria wirdi den Hans nicht einladen ti]

Thus, the complement clause of a matrix verb like glauben turns w.r.t. its properties into a „wh-complement clause".

7. *was* cannot appear lower in the construction than a real wh-phrase:

(16) * wen glaubst du [was Maria denkt [daß Peter eingeladen hat]]

In Brandner (1994), it is suggested that (16) can be excluded by the WH-Island constraint, since the Spec-CP of the relevant clause must host both, the trace of the moved constituent which has moved

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[5] Some speakers accept this version, cf. Müller (1995). This is also reported to me by Fred Landman (p.c.) who speaks a Dutch dialect which has the construction. So there seems to be considerable variation w.r.t. to (10a). Later , it will be shown that this difference can be explained rather easily by assuming that in some dialects *that* is inherently underspecified w.r.t. the type and thus it only marks embeddedness, see below for further discussion.

in successive cyclic fashion from the deepest embedded clause, and *was*.[6] I will return to this apparent problem in section 4 where the differences between A-bar-chains and was-w-constructions will be discussed.

2.2. Problems and questions

Taking all these properties into consideration, it seems to be the case that *was* patterns in some respects like any other wh-phrase, for example it appears in Spec-CP, and additionally it doesn't allow finite verb-movement in embedded contexts, which is ruled out in German embedded questions[7]:

(17) * es ist mir gleich [wen$_i$ hat$_j$ sie t$_i$ eingeladen t$_j$]
it is me$_{dat}$ equal who has she invited
'I don't care who she invited'

Furthermore, a was-w-construction as a whole can act as the complement of a verb selecting an interrogative clause:

(18) Ich frag mich [was Maria denkt [wohin Peter gegangen ist]]
I ask myself what Maria thinks whereto Peter gone is

On the other hand, *was* doesn't license further wh-phrases in its clause as do real wh-phrases – nor can it appear in a simple clause; This somehow-in-between behavior of *was* needs a principled explanation and I think it is already obvious that standard accounts of overt wh-movement are not sufficient here.

The most puzzling problem, however, within current theories of wh-movement, is the fact that the contentful wh-phrase must move to the embedded Spec-CP, although there is no feature located in this Spec-CP – recall that the matrix verb crucially doesn't select for [+wh] – and that means, there is

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[6] This explanation is rejected in Müller (1995) because he assumes that the real wh-phrase and *was* share the same index which then of course holds also for the trace, thus the A-bar-chain is built correctly. However, if one assumes that it is not the wh-phrase and was which are coindexed but rather was with a clause – the position I will argue for in the following – then this explanation can be upheld.

[7] Note that this implies that the explanation for the ungrammaticality of (13) along the lines presented in Rizzi/Roberts (1989) is not sufficient. They claim that verb movement in embedded clauses is prohibited because the finite verb would „overwrite" the selected wh-feature, located in C^0, thus eventually the ban on verb movement can be reduced to the Projection Principle. However, since verb movement is equally not possible in the was-w-construction (where the matrix doesn't select for [+wh]) the reason must be sought somewhere else, see section 4 for further discussion.

no trigger for the movement and therefore it may not take place overtly, according to minimalist assumptions. This holds of course also for earlier analyses of wh-movement in terms of features, like Rizzis Wh-Criterion for example, and the Lasnik/Saito Filter (1984, 1992) which both require essentially the same, namely that a Wh-Phrase must be in the Spec of a phrase whose head bears a [+wh] feature and vice versa, where it is subject to variation whether this holds at S-structure or at LF. However, there is no wh-feature in the C^0 position of the embedded clause, nevertheless, the movement must take place:

(19) * Was glaubt Maria [daß Hans wen besuchen wird]
what believes M. that Hans whom visit will

McDaniel discussed this problem and her suggestion was that a wh-phrase can be licensed in a Spec-CP without a wh-feature if it is part of a wh-chain, defined as in (20).

(20) A Chain $C = (a_1, a_2,...,a_n)$ is a wh-chain iff:
a. $\forall a_1, 1 \leq i < n$, a_i locally A'-binds a_{i+1}
b. $\forall a_1, 1 \leq i < n$, a_i is a wh-element,
c. a_n is a variable in IP-internal position, and
d. for any scope marker a_i, $1 \leq i < n$, $(a_{i+1},...a_{n-1})$ contains a true wh-phrase

Thus, as soon as a wh-phrase is part of a wh-chain whose wellformedness constraint a. requires local A'-binding, i. e. the elements must be located in a Spec-CP position, it is allowed to be in a Spec-CP without a wh-feature.

However, given that recent developments within generative Grammar concerning economy require that every movement must be motivated, it is clear that it is no more sufficient to simply allow it for phrases (if certain conditions are met, i.e. the wh-phrase is a part of an A-Chain) to occur in various positions, rather the movement must be necessary, otherwise the derivation is ruled out. Thus, in essence the solution suggested by McDaniels can not be criticized because of empirical reasons, rather it is not strong enough in the sense of economy.

Another way to save the standard analysis of wh-movement and the corresponding analysis of the was-w-construction would be to use the assumption that at LF the Filter is satisfied since at this level the real wh-phrase has moved to the higher Spec-CP. Under this perspective no violation arises, since – at LF – only the trace is in the selected Spec-CP which of course doesn't count as a wh-phrase.

Such a solution is suggested in Stechow/Sternefeld (1988). But that this doesn't help was already recognized by McDaniel who discusses exactly this possible solution. The point is that according to Lasnik/Saito (1984), it holds universally that if a language has s-structural Wh-movement then also the Filter holds at S-structure which means that nevertheless the construction would violate this wellformedness condition. If it were possible in German to satisfy the filter only at LF in exactly this construction then there would be no explanation for the fact that German has obligatory s-structural wh-movement. So a solution along these lines is not viable either.

In sum, the main syntactic problems, raised by the construction under discussion, are the following:

1. what is the exact syntactic nature of **was**?
2. how can the in-between-behavior of this element be explained?
3. Why is there free alternation between was-w-construction and long movement (in German)?
4. what is the trigger for the overt movement of a wh-phrase in the embedded clause(s)?

3. Clausal typing

In the following I will discuss the above raised problems and my suggestion is to abandon this rather rigid mechanism of feature satisfaction which is normally used to explain overt wh-movement and rather try to relate overt wh-movement to other mechanisms found in the grammar. This is of course not in the spirit of the Minimalist Program where every kind of overt movement is triggered by (strong) features. However, I think already the discussion above shows that this mechanism leads to incorrect predictions, cf. the overt movement of wh-phrases in the embedded clauses.

In this section, I will present a theory of overt wh-movement which does not rely on satisfaction of a syntactic feature, instead overt movement of wh-phrases is triggered by the need of every clause to have a specified type, as was basically suggested already by Cheng (1991). The type of a clause must be encoded overtly. Moving one wh-phrase to Spec-CP is just one strategy to satisfy this requirement. Another way is to mark the interrogative clause via insertion of a particle, see below for details. There are of course still other ways imaginable, partially depending on language-specific

constraints. But what is important is that all these different ways to build a question are different implementations of the general and universal requirement that the type of a clause must be encoded in an unambiguous way[8]. Thus, under this view UG itself does not contain something like the Wh-Criterion (Rizzi 1991) and its reformulations in various ways but rather the simple statement that the clausal type has to be marked overtly. Of course this marking can only be achieved by using syntactic mechanisms which are allowed by UG on other grounds. Such a view – in contrast to the feature satisfaction mechanism – allows a more flexible treatment of the various constructions in the languages under discussion and it will be shown in the following that this flexibility is able to account for the various constructions in a rather straightforward way.

The idea concerning the was-w-construction is that inserting a was in a higher clause is just another way of typing a construction as interrogative which consists of more than one clause. I will call this an **interrogative concord**. Independently motivated constraints on the building of such a construction will then explain the above described properties. But first the theory of clausal typing will be introduced in more detail.

3.1. Cheng's proposal

Cheng (1991) proposes a view on s-structural wh-movement which differs from standard accounts in that she doesn't assume that s-structural wh-movement is triggered neither by a syntactic wh-feature nor by the need of scope-marking. Instead, she assumes that in English-type languages, where only one wh-phrase moves to Spec-CP, this movement is motivated by the need for a clause to have a specified type. Her hypothesis is given in (21).

(21) Clausal Typing Hypothesis (Cheng 1991:30)

> Every clause needs to be typed. In case of a wh-question, either a wh-particle in C^0 is used or else fronting of a wh-word to the Spec of C^0 is used, thereby typing the clause through C^0 by Spec-head-agreement.

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[8] What I do not address here is the question of so-called multiple fronting languages like Bulgarian for example, cf. Rudin (1989). These are languages where all wh-phrases are fronted to a clause-initial position. According to Cheng (1991) this is due to the fact that in these languages wh-phrases are for inherent reasons not licensed in their base-positions and therefore have to move. As already mentioned, this is not the case in German where a wh-phrase itself is possible in ist base-position, i. e. in an A-position.

Basically, she contrasts two different kinds of typing. One is exemplified by languages like Chinese which have a wh-particle, very often attached to the finite verb and at the same time show wh-in-situ and those which do not have particles of this kind, for example English which uses therefore the second strategy. In the following section, I will slightly modify and extend her proposal and then argue that the was-w-construction in German can be accounted for with this modified version of typing theory and some additional well-motivated assumptions.

3.2. Different typing procedures

3.2.1. Direct typing

Let us call the first strategy of typing which is mentioned in Chengs hypothesis direct typing. One good example for this strategy is Korean, for which it has already been shown by Bhatt/Yoon (1992), that it differs fundamentally w.r.t. type-marking from English and other Germanic languages:

(22) Korean (examples from Shin 1993:53ff)

a. ku-ka seoul-e ka-ass-ta
he-nom Seoul-to go-past-**decl**
'he went to Seoul'

b. ku-ka seoul-e ka-ass-nunya?
he-nom Seoul-to go-past-**interr**
'did he go to Seoul'

c. ku-ka eti-e ka-ass-nunya?
he-nom where-to go-past-**interr**
'where did he go to'

One can see that for different types different particles are used. *Ta* stands for declarative and *nunya* for interrogative[9]. (22b., c.) show in addition that the marker for Y/N questions and wh-questions is the same.

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[9] In many languages using the direct typing strategy it is possible to omit the particle in root clauses, for example in Turkish. This reminds of course on the wh-in situ in French root clauses, cf. Rizzi (1991). That the dropping of the particle seems to be restricted to root clauses suggests that typing

The same can be found in embedded clauses and here one can see that the typing morpheme is in fact part of the verbal morphology, since it is followed by the marker for embeddedness[10]:

(23) Korean (examples from Bhatt/Yoon (1992:2)

a. Bill-un John-i wa-ss-**ta-ko** sayngkakhanta
Bill-top John-nom come-past-**decl-sub** thinks
'Bill thinks that John came'

b. Bill-un John-i wa-ss-**nya-ko** mwul-ess-ta
Bill-top John-nom come-past-**interr-sub** asked
'Bill asked if John came'

c. hans-nun [maria-ka ku-lul salang-ha-**nunya-ko**] mwul-ess-ta[11]
Hans-top Maria-nom who-acc love-**interr-sub** asked

In sum, the type of the clause can be made visible via insertion of a morpheme; no additional movement is necessary in these languages, i.e. wh-phrases can be directly interpreted in their respective base-position, leading to the well-known wh-in-situ phenomenon. Although of course much more could be said about these phenomena, e.g. the so-called optional wh-movement in these languages, but for the purposes here, it is sufficient to state that the morphological marking of the clausal type is responsible for the behavior of the wh-phrases see Cheng (1991) for much more detailed discussion.

3.2.2. Autonomous typing

English-type languages don't exhibit this kind of morphology and – given that the hypothesis that every clause must have encoded its type is true – which seems a rather natural assumption, see also Brandt et al. (1991) – a different strategy is needed. Now if morphology doesn't provide us with such a direct way of clausal typing, the typing must take place by structural means. And this is the second strategy mentioned in Chengs definition in (21).

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[10] I will not go into the further consequences of this fact here, see Brandner (1994, chapter 3) for the suggestion that in these languages the functional features project together with the verb, building a complex feature domain which involves all the specifier positions contained in this domain. See also Haider (1993).

[11] The c-example is from Shin (1993:54). He does not gloss ko with subordination since there seem to be some lexical restrictions on the use of ko, not mentioned in Bhatt/Yoon (1991). However for the sake of concreteness, I will assume that ko in fact acts in general as the subordinator, at least in the examples used here, but see Shin for detailed discussion.

Abstracting away from the V/2 property in German for the moment, one can assume that in general the projection of an IP seems to be sufficient for a clause to be complete, even with respect to its type, since – following rather standard assumptions – the default type of a syntactically complete clausal projection is declarative[12]. That means that an IP, as a syntactic projection where all the licensing of the elements has taken place is a syntactic structure which is sufficient for interpretation: but only for declarative as the least marked complete type of a clause.

Now, if the type of a clause is different from declarative, then a further clausal projection will be projected, extending thereby the clausal projection, in the sense of Grimshaws (1991) extended projection. The claim is that only in such a construction the CP-layer of the root clause is present.

The finite verb – as a category which can be marked functionally and in addition which is in the right position in order not to violate the HMC – moves to the head position of this projection in order to give the functional head lexical content.

But this is only the first part of the operation, since at this point the structure tells us only that the clause is different from declarative but not what type it is. This is due to the fact that in English-type languages – as already mentioned – the finite verb cannot express the type of a clause by direct means. Thus, in order to specify the type, an operator is moved to Spec-CP and this operator endows the head of the projection with the relevant feature via a mechanism like for example dynamic agreement, as proposed in Rizzi (1991). The result is a CP as the clausal projection of an interrogative clause, with movement of the finite verb to C^0 and movement of a wh-phrase to Spec-CP, giving rise to what is referred to in traditional terms as Subject-Auxiliary-Inversion. Via dynamic agreement the operator is able to endow the clausal head with its feature and thus the whole clause is typed as [+interrogative].

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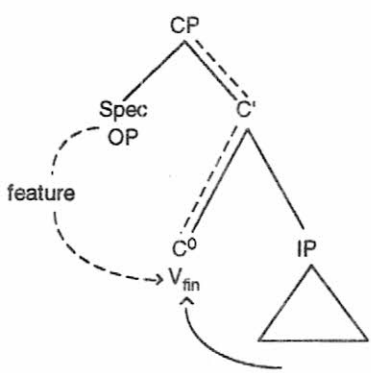
[12] In Brandner (1994, chapter 4) an analysis of V/2 in terms of clausal typing is presented. The basic idea there is that the I-position in the V/2 languages is defective in the sense that the finite verb cannot stay in this position as its final one, cf. Haider (1993) for evidence for this claim, i. e. IP cannot be the final clausal projection and given that IP is the minimal clausal projection there is only one way to rescue the interpretation of a declarative clause, namely the projection of CP, together with finite verb movement and accompanied by topicalization which ensures that no operator can move to Spec-CP, giving rise to an interpretation different from declarative.

This explains why only one wh-phrase per clause moves to Spec-CP, since the clause is now typed as [+interrogative] and – given economy– further wh-phrases in multiple questions can or even must stay in situ a position where they are obviously possible w.r.t. their own licensing requirements[13].

In addition, assuming that an extension of the clausal structure of this type can only take place in root clauses – a constraint which can be easily reduced to general prohibitions on the structural extension of selected complements – it follows without further assumptions that we find Subject-Auxiliary Inversion only in root contexts.

In sum, I don't assume that there is a syntactic wh-feature – located somewhere in the root clause – for which there is no syntactic source, rather the feature [+wh] becomes part of the highest functional extension of a clause via autonomous typing in the way just described and exemplified in (24).

(24)



Note that the term „feature" becomes a different interpretation here as the one which is used in the minimalist framework. The feature [+wh] in the root is not base-generated in C^0 and it is not responsible for the movement of the wh-phrase, rather, a clause gets the interpretation [interrogative] as soon as a respective feature (carried by an element, lexically marked with this feature) is in its highest clausal projection, and this happens only after the wh-phrase has moved to Spec-CP. Thus, the effect of the feature is a purely interpretational one and not a syntactic one in the sense that it is

[13] Of course, more has to be said w.r.t. languages like e.g. Polish in which all wh-phrases are moved to a sentence-initial position, cf. Rudin (1988). These will be ignored here for the moment, but see Cheng (1991, chapter 3.2) for an analysis consistent with the assumptions here and which basically refers to the licensing requirements of the wh-phrases themselves in these languages, see also Brandner (1994, chapter 6).

not responsible for the syntactic movement of the phrase. Languages which encode their interrogatives via lexical means (insertion of a particle) won't be in need to project this additional layer with subsequent movement of the finite verb (and a wh-phrase)[14]

And as just demonstrated, languages use different implementations for the encoding of this interpretational feature, indicating that maybe wh-movement is not that uniform across the languages as previously thought.

3.2.3. Typing via selection

Clearly, there is still another way to type a clause, namely via selection. The crucial difference between typing via selection and autonomous typing is that in selected contexts no extension of the functional domain of a clause is allowed. Thus, we don't have verb-movement, rather the CP is selected with its type and this type is encoded by a special complementizer, namely *if* or *whether* which then has two functions, namely first to mark the clause as subordinated and secondly to mark the type. This is exactly where English-type languages differ from Korean-type languages. Recall that the latter have two different complementizers which occur simultaneously – one for type and one for embeddedness and the two are independent from each other. This contrasts with English[15] where, depending on the type of the embedded clause, a corresponding complementizer is used. So we have *that* for a embedded declarative and *whether* for an embedded interrogative. However, since *whether* is reserved for Y/N questions, in case of a wh-question a wh-phrase must be fronted to Spec-CP since

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[14] There are languages hich have a wh-particle and nevertheless have overt wh-movement, Irish is a case in point, but also Standard Arabic. However, as far as I can see, the particle is inserted in C in these languages, i.e. clause-initial and is thus not part of the verbal morphology, so the generalization seems to be that it is not the existence of a wh-particle per se which renders wh-movement unnecessary, as Cheng assumes, but rather that the typing takes place in the verbal morphology. But clearly, to validate this, much more careful investigation of more languages is necessary.

[15] However, there are Germanic languages which seem to behave more like Korean in that in embedded questions not only a complementizer corresponding to *if* occurs but also a *that* -complementizer. This is found in some Dutch dialects, see Hoekstra (1992). A typical example is given below:

(i) wie denk je [of dat ik gezien heb]

One possible analysis would be to assume that in these dialects dat is a marker only for embeddedness and that it receives its interpretation as [+declarative] also by a default rule. I will return to this briefly at the end of the paper where the construction in 12 will be discussed.

there seems to be no special complementizer for embedded wh-questions. This will become crucial below.

But since there is no extension of the clausal projection – the CP is projected because it is selected as such – no verb movement is necessary and therefore ruled out by economy.

4. *Was* as a typer

With these assumptions in mind let us come back to the was-w-construction.

What I will propose now is that *was* serves only as a typer, that is a wh-phrase which has no quantificational force of its own, rather it has only the syntactic effect that the clause in which it is inserted will be of the type [+wh] and thus interpreted as [interrogative]. In that sense, it is not an expletive for wh-phrases but for wh-clauses, or more precisely only for the CP-layer – that part of the clause which is responsible for typing in German. This is where Dayals proposal is adopted, namely that the scope marker is coindexed with a whole wh-clause and not, as in McDaniels proposal only with a wh-phrase. The only difference to the syntactic analysis of Dayal is that I will further assume that *was* is directly inserted in Spec-CP, as an expletive and not base-generated as an argumental NP in the matrix clause. The reasons for this assumption were given above.

But as discussed above, *was* seems to behave in some respects like a real wh-phrase and some respects not.

In order to answer the question what kind of element *was* is in fact, it is necessary to have a closer look at the properties first of wh-phrases in general and then the one of expletive wh-phrases.

4.1. *The complexity of wh-phrases*

From a semantic point of view it has already been suggested by Katz/Postal (1964) that wh-phrases consist of two parts, namely a wh-part and an indefinite part. This idea has been recently resumed by Saito (1994) who refers to Kurodas (1968) formulation, see also Bayer (1995, chapter 6.6.2). Thus, a wh-phrase like *what* consists of two parts, a wh-part and an indefinite part.

(25) what --> wh + indefinite (something)

Recall that in German a wh-phrase is a typer only in case the wh-phrase is located in Spec-CP. Evidence for this claim comes from the following facts. First, as is well known, wh-phrases have properties of indefinites. In many languages there is even no morphological distinction between wh-phrases and indefinites, for example in Chinese, cf. Fushigauchi (1990), Cheng (1991). Rather it depends on the syntactic environment whether it is interpreted as existential or interrogative. As was described above, this environment is encoded in a language like Chinese with certain particles, having scope over the whole clause. Thus the wh-part is added in a specific syntactic context whereas the indefinite part exists independently. This already shows that the partition on (22) is justified.

On the other hand, in German, it is possible to use a wh-phrase[16] as an indefinite, like in the following example:

(26) Ich hab (irgend)wen getroffen
I have (some) whom met
'I met someone'

However, this interpretation of *wen* is only possible if it is situated in an A-position, i.e. crucially not in Spec-CP:

(27) * wen habe ich schon getroffen (as a declarative)
whom have I prt met

In order to get a declarative interpretation for (27), it is necessary to use the full form, i.e. *irgendwen*

(28) Irgendwen hab ich schon getroffen
somewhom have I prt met

Furthermore, in case one wh-phrase has been fronted, the other wh-phrase which remains in its base-position must be interpreted as interrogative:

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[16] In German, the version without the prefix *irgend* is also fine and is standardly interpreted as an indefinite (apart of course from an echo-interpretation which is ruled out in the example for contextual reasons). It is not clear to me whether this is a more phonetic phenomenon, i. e. PF-deletion of the prefix or whether there are in fact two versions, one a real indefinite and the other one an „abused" wh-phrase. But note that it is not possible to have:

*Ich habe welche Leute getroffen

in contrast to:

ich habe irgendwelche Leute getroffen

(29) wen hat wer gesehen
whom has who (somebody) seen

Another interesting fact is that in an embedded Y/N question an indefinite interpretation of *wen* is possible.

(30) Ich weiß nicht ob er dort wen getroffen hat
I know not whether he there whom met has

In fact, in (30) the wh-phrase can only be interpreted as an indefinite.

What we can see from these facts is that the indefinite part of a wh-phrase can be used independently, thus the wh-part can be deactivated under certain conditions, although it is morphologically present. This gives us more evidence for the claim that there are two parts in a wh-phrase where it depends again on the syntactic environment whether both parts are activated or only the indefinite one, cf. especially (29) where the typing of the entire clause results in the wh-interpretation of the wh-phrase in situ. This clearly is the mechanism which allows the additional wh-phrases in multiple questions to stay in situ and nevertheless be interpreted as question words.

Now, given this, it wouldn't come as surprise that the other part of a wh-phrase, namely the wh-part can also be used independently. And this is what I would like to suggest, namely that **was** corresponds to the wh-part of a wh-phrase but it lacks the indefinite part.

This implies that a wh-phrase is not per se a syntactic operator, rather it acts as an operator only in case it is moved to Spec-CP – in a language with autonomous typing[17]. In this sense, the functional definition of wh-phrases, argued for in Rizzi (1991:8) has gained additional evidence:

(31) Wh-Operator = a wh-phrase in an A'-position

Assuming now that *was* is base-generated in Spec-CP it is per definition an operator, i.e. a typer, but only in a purely syntactic sense i. e. with no inherent quantificational force. Thus, in contrast to Dayal, I will not assume that *was* is an existential wh-quantifier over propositions, rather it is a wh-phrase whose indefinite part is missing. Now, if was is a purely syntactic typer it needs to be coindexed with

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[17] Maybe that exactly this is the point where English differs from Bulgarian and similar languages, see Rudin (1988), i.e. in Bulgarian wh-phrases are always operators, i.e. their wh-part cannot be deactivated.

something which has quantificational force, and in this sense it is an expletive; if it were not coindexed it would violate the principle of Full Interpretation like any other (nominal) expletive.

Since it can only be coindexed with another typer it can have as its associate only a wh-phrase in a Spec-CP-position because, as shown above, a wh-phrase in situ is not an operator in the sense of a syntactic typer. With these assumptions we can derive already the first property mentioned in section 2.1., namely that *was* cannot appear in a simple multiple question, repeated in (32) finds a natural explanation: *was* cannot be coindexed with a wh-phrase in situ since this is not a typer in this context:

(32) * was hat Hans Bücher wo gekauft
was has Hans books where bought

Thus, the natural assumption – which is established for NP-expletives on empirical grounds and which in accordance with that should also hold for wh-expletives -- namely that an expletive can be coindexed only with an element of the same type explains this property.

The same would then hold for those constructions where a copied version of the real wh-phrase is used instead of *was* , compare example (6), repeated in (33).The copy too consists only of the wh-part, i.e. it is semantically empty but acts only as a typer – as desired since otherwise the interpretation of this construction should be impossible, given that there should be two variables, according to the Bijection Principle.

(33) *wen* glaubst du [*wen* Maria einladen wird]
whom believe you [whom Maria invite will]

Thus, the analysis so far gives us the correct results w.r.t. property (1).

4.2. Interrogative concord

As an expletive, *was* won't have an interpretation, thus it needs to be coindexed with another element – crucially of the same kind, which means with another typer, see above. I will call such a construction an *interrogative concord* , i.e. all the clauses in such a construction must be specified for the same type and as will be shown below this holds even for the type of the interrogative as such.

(34) Interrogative concord:

for α, β = clause

α is in interrogative concord with β iff

(i) α is the complement clause of β
(ii) the typer of α is coindexed with the typer of β
(iii) α and β are of the same type

(35) coindexation:

typer α is coindexed with typer β iff

(ii) β c-commands α
(iii) β locally A'-binds α

(36) proper typing

every clause must be properly typed

a. α is properly typed iff

(i) it is typed by autonomous typing (if α is the root clause)
(ii) it is typed by selection
(iii) it is typed directly
(iv) it is part of an interrogative concord

b. every clause must be typed unambigously:

only one typing procedure is possible per clause

So we can see that being part of interrogative concord is yet another way for a CP to get a type although it partially consists of familiar typing procedures, namely the autonomous typing in the root clause. The other clauses, being dependent, cannot be typed via autonomous typing, since this would involve an extension of the clause, which is in general prohibited. This explains property (6), namely that is there is no finite verb-movement to C^0.

With these assumptions we can derive further properties of the was-w-construction.

First recall that one of the most puzzling problems is that the wh-phrase in the dependent clause must move to the embedded Spec-CP although no feature is selected which would trigger movement. In fact, if there were a trigger, namely if the matrix verb would select a [+wh] feature the construction is no more possible, compare (11), repeated from section 2.1.:

(11) * was fragst du [wem er das Auto verkauft hat]
what ask you whom he the car sold has

Because of (36b), a clause must be typed unambiguously, i. e. it can only be typed once, this can be explained quite easily: verbs, selecting [+wh] complements cannot be part of an interrogative concord since their complements would be typed twice, namely first via selection and second by being part of an interrogative concord. Thus, property (3) is also explained.

The movement of the wh-phrase, resp. the insertion of another was in Spec-CP of an embedded clause then follows from the formulation of condition (ii) in (34). Since coindexation can only take place between typers and since a wh-phrase is a typer only in case it is in Spec-CP, the movement is necessary despite the fact that there is no trigger.

4.3. Locality constraints

From the assumption that *was* consists only of the wh-part of a wh-phrase it follows that the was-w-construction is sensitive to weak islands, since if it doesn't have an indefinite part, it never can have a referential index in the sense of Rizzi (1990) – for obvious reasons – and thus it has to be in the same local relationship with its associate like an extracted adjunct with its trace.

That the locality constraints imposed on the coindexation of *was* and the complement clause correspond to those of adjunct-trace relationships can also be seen from the data in (35-38), discussed in Müller (1995). Thus, it is not possible to build an interrogative concord with the complement of a factive verb nor with a complex NP nor is it possible with a subject clause:

(35) * was hast du bereut [wen du eingeladen hast]
what have you regretted who you invited have

? wen hast du bereut [daß du eingeladen hast]
who have you regretted that you invited have

* warum hast du bereut [daß du Peter t eingeladen hast]
why have you regretted that you Peter invited have

(36) * was hast du ein Gerücht gehört [wen Peter einladen will]
what have you a rumor heard who P. invite will

? wen hast du ein Gerücht gehört [daß Peter einladen will]
who have you a rumor heard that P. invite will

* warum hast du ein Gerücht gehört [daß Peter Maria t einladen will]
why have you a rumor heard that P. M. invite will

(37) * was ist es offensichtlich [wen Peter nicht einladen will]
what is it obvious who Peter not invite will

? wen ist es offensichtlich [daß Peter nicht einladen will]
who is it obvious that Peter not invite will

' who is it obvious that Peter won't invite'

* warum ist es offensichtlich [daß Peter Maria t nicht einladen will]
why is it obvious hat Peter Maria not invite will

In all the cases above the was-w-construction patterns with the extraction of adjuncts in that they are fully ungrammatical whereas argument extraction has an intermediate status. In sum, the assumption that *was* is an expletive leads to an unproblematic explanation of the only difference between long extraction and the was-w-construction. The assumption that *was* is an expletive typer, base generated in Spec-CP, i.e. a wh-phrase without semantic content in the sense of quantificational force – thus has gained additional evidence.

Another property which falls under locality constraints in the broad sense is the one which I mentioned in section 2.1. under (12)

(38=12) * was glaubst du [ø daß Hans meint [wem er das Auto verkaufen will]]
what believe you that Hans thinks whom he the car sold has

With the assumptions made above about the locality constraints it is rather obvious that this construction should be ruled out, simply because *was* must locally A'-bind the typer c-commanded by it. However, as was already mentioned, there seem to be dialects which apparently violate this locality constraint in that they allow an intermediate CP to have an empty Spec-position but with a *daß* in the C^0 position. Now these dialects would fit into the picture if it is assumed that *daß* is in fact underspecified w.r.t. [+declarative] such that it can acquire the feature [+wh] if it is in a relevant configuration. Assuming further that being in an interrogative concord is just the right configuration, simply because the CP-layers are coindexed[18], it doesn't come as a surprise that an intermediate CP

[18] Recall that the coindexing holds between the CP-layers, thus of course including the head-position.

can occur without a *was* in the Spec. Those dialects which have reserved *daß* for embedded declaratives will not allow the omitting of the typer[19].

4.4. The difference between wh-questions and Y/N-questions

Let us now come back to the further properties of the construction as listed in section 2.1. The explanation for property 2 will be delayed until section 5 where the similarities between interrogative concords and A'-chains will be discussed, so let us first turn to property 5, namely that it is not possible to have a Y/N-question as the complement in a was-w-construction:

(39=13) * was glaubst du [ob er noch kommt]
what believe you whether he still comes

This is of course at first sight unexpected since clearly the embedded clause is marked as interrogative and given that *ob* types the clause, as was discussed in section 3. and thus is a typer in the relevant sense – the construction should be possible – contrary to fact. Now one possible solution for this lies in the following observation: If the matrix clause is a wh-question and the embedded clause is a wh-question the sentence is ruled out:

(40) * glaubst du wer kommen wird
believe you who come will
'Do you believe who will come'

But interestingly, at least some speakers allow in such a construction an embedded Y/N question:

(41) glaubst du ob/daß er kommen wird
believe you whether/that he come will

So it seems that an interrogative concord can also be construed with Y/N questions, but crucially of course, all of the clauses must be of the same type, namely Y/N questions. So the claim is that *was* serves only for wh-questions as a typer and not for Y/N-questions.

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[19] A potential problem for this analysis was raised during the workshop in Tuebingen, namely that then the complementizer *daß* should also be able to satisfy the selectional requirement of a verb selecting a [+wh] complement. However, one could argue that *daß* is never able to express [+wh] if it is not coindexed with a wh-phrase, resp. a typer. Thus, *daß* is only possible in the just described situation if a wh-phrase is in its spec-position, resulting equally in a coindexation via spec-head-agreement.

Dayal reports that in Hindi, a Y/N question can be licensed by *kyaa* in the matrix clause. That would be explained if Hindi *kyaa* is a typer also for Y/N questions, i.e. that it can be a typer for both kinds of interrogatives.

Evidence for this claim comes from the following data from Mahajan (1995)

(42) sitaa-ne kyaa kal tumhẽ dekhaa thaa
Sita-erg Q yesterday you-dat saw be-past
'Did Sita see you yesterday'

In Hindi *kyaa* obviously serves as a typer in simple Y/N questions. Now, as already discussed in the introduction it is of course expected that Hindi differs from German in several respects since Hindi belongs to a language type which uses another strategy to type an interrogative clause. And since Hindi is a wh-in-situ language it uses the direct typing strategy. Thus, a typing particle is attached to the finite verb and types the clause; and interestingly *kyaa* is described as a clitic-like element in the sense that it cannot appear in other positions than directly adjacent to the verb, cf. Mahajan (1995). So one could argue that *kyaa* is like its Korean counterpart part of the verbal morphology. One (obvious) problem for such an approach lies in the fact that the clause which contains the real wh-phrase doesn't show up with *kyaa*, thus the interpretation of the wh-phrase should not be possible, (see also fn 14). But one could assume that *kyaa*, being part of the verbal morphology „selects" a wh-clause and thus the embedded clause is licensed as an interrogative. However, this requires a much more careful analysis. But nevertheless the data in (42) show that *kyaa* is not reserved for wh-questions like its German counterpart *was* and thus a lexical explanation for the ungrammaticality of (39) in the sense that *was* cannot be in an interrogative concord with a Y/N question – simply because of its lexical properties – but Hindi *kyaa* can, is justified.

4.5. Interrogative concord and A'-chains

So let us then come finally to the last remaining property, namely that wh-phrases which occur in the same clause as *was* are not licensed although *was* itself is coindexed with a wh-clause and thus doesn't violate Full Interpretation. The relevant data is repeated in (43):

(43=9). * was hat Hans wann gesagt [wem er das Auto verkaufen wird]
was has Hans when said whom he the car sell will

The problem is that the system proposed until now predicts that the wh-phrases co-occurring with was should be licensed, since the clause itself is typed and there is at first sight no reason why (43) should be ruled out. In what follows I will show that a clause which is typed either through movement or through insertion of *was* never behaves like a simple interrogative clause which will lead to further justification to the assumption that in the syntax only the syntactic part of wh-phrase is relevant.

As is we known, Negative Polarity Items (NPIs) are licensed in interrogatives like in the following examples:

(44)a. why did I ever read this book

b. don't know whether he will ever read this book

The same is found in German and standardly it is assumed that the WH-Operator has some inherent negative potential. Now interestingly, in clauses typed with *was*, this is not possible, although in the clause containing the variable, a NPI can occur:

(45)a. * was glaubtest du jemals [welches Buch er lesen wird]
what believe-past you ever [which book he read will]

b. was glaubtest du [welches Buch er jemals lesen wird]
what believe-past you [which book he ever read will]

Now this seems to be good evidence at first sight for my claim that *was* is only the wh-part of a wh-phrase, i. e. an expletive wh-phrase. However, as can be seen in (46), the same facts w.r.t. NPIs hold also for long-extraction structures:

(46)a. * welches Buch glaubtest du jemals [daß er lesen wird]
which book believe-past you ever that he read will

b. welches Buch glaubtest du [t daß er jemals t lesen wird]
which book believe-past you that he ever read will

Glaubst Du, dass er das jemals verstehen wird

From this, we can conclude that typing alone is not sufficient for a clause to be interpreted as interrogative in the sense that it does license NPIs[20]. What this suggests is that as soon as a wh-

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[18]It has been pointed out to me by Karina Wilkinson (p.c.) and Vaneeta Dayal (p.c) that NPIs are fully grammatical only in Y/N questions and that therefore the data are not really relevant. However, the crucial point is the contrast in (45) and (46) and thus, although NPIs may not be perfect in the b.-clauses, they are completely ruled out in the a.-clauses. Thanks to Anoop Mahajan for giving me this hint.

phrase is moved out of its domain, that is the CP wherein the variable is base-generated, only the wh-part plays a syntactic role, that is its typing ability. So, the head of an A-bar chain serves as a typer, too. Thus, it is predicted that in long movement structures the same effect as in (43) should be found, namely that in the clause containing the moved wh-phrase no additional wh-phrases are possible. And this is exactly what we find:

(47)a. * wen hat Maria warum geglaubt [daß Peter nicht einladen will]
who has M. why believed that P. not invite will

b. wen hat Maria geglaubt [daß Peter warum nicht einladen will]
who has M. believed that P. why not invite will

So the claim is – that despite syntactic pied-piping – what moves of wh-phrases is only the syntactic part of the wh-phrase whereas the quantifier stays in situ, and obviously it is the quantifier which turns an as [+wh] typed clause in an interrogative clause from interpretational point of view. Thus, syntactic typing is only a prerequisite for the interpretation of wh-phrases. This confirms furthermore the claim that syntactic wh-movement, respectively the building of an interrogative concord is only triggered by the need for a construction to be typed uniformly, i.e. as [+wh] and not because wh-phrases must move to Spec-CP in order to get an interpretation.

Now, if one assumes that only the wh-part of a wh-phrase is syntactically active one could expect that these wh-phrases behave just like *was*, given that they have no quantificational force. But this would lead to the wrong prediction that the following sentence should be possible which is bad:

(48) * warum hat Maria t geglaubt [wen Peter t nicht eingeladen hat]
who has Maria believed why Peter not invited has

Thus, if only the syntactic part of *warum* moves why shouldn't it then be possible for it to license the embedded wh-question just like the expletive? The answer lies in the constraints imposed on coindexation relations. Note that the moved *warum* must be coindexed with its trace, i. e. with an element in its clause otherwise it can never again combine with its quantificational part and thus interpretation would be impossible. Given that no element can be coindexed with two different elements, (48) is ruled out correctly.

Now one last question has to be addressed in order to make the picture complete. Recall that one motivation for the assumption that the wh-phrase in the embedded clause moves at LF is that at LF then no violation of the selectional requirements of a [-wh] selecting verb like *glauben* arises.

I would like to suggest that to tolerate such a CP seems to be a property of bridge verbs, just like they tolerate extraction, where also at one stage of the derivation, a wh-phrase is located in the Spec-CP of their complement. This implies that the special property of bridge verbs has to be sought in their indifference w.r.t. the type of their complement. Thus, whereas for exarnple a factive verb like *regret* selects a declarative complement, bridge verbs select only sentential complements, which – in the absence of any typing – will be declarative per default just like root clauses, see section 3. So bridge verbs tolerate any CP as their complement, irrespective of their type; the only thing which they select is a sentential complement.

Crucially, the clauses, hosting a wh-phrase in their Spec-Cp in an interrogative concord are not selected as [+wh] in the sense that they satisfy selectional requirements imposed on them by the matrix verb, rather they are licensed – „selected" so to speak – by the CP-layer in the higher clause and the property of bridge verbs is to be indifferent w.r.t. the type of their senential complements.

5. Conclusion

To sum up, the concept of an interrogative concord within a theory of clausal typing is able to account for the properties of the was-w-construction in German. In addition, it gives us also the key to account for the main problem, mentioned at the beginning of the paper, namely that wh-phrases can or better must occur in Spec-CP positions which are not selected as [+wh], i.e. where there is no [+wh] feature to satisfy. The answer is simple: wh-phrases never move in order to satisfy a syntactic wh-feature, rather they move in order to type a clause and since the lowest clause is of course also part of the interrogative concord it also must be marked as interrogative and therefore the wh-phrase moves to Spec-CP. In this sense, the overt movement is necessary because the general strategy to mark a clause as interrogative is exactly this kind of movement and therefore it doesn't violate economy.

A syntactic theory which is obliged to a strong notion of economy clearly has to say something about the fact that obviously both strategies are equally good in German, i.e. no derivation is more economic than the other. This is of course an unexpected result, given that a clear notion of economy should be able to choose between the two derivations and then one of the two should be ruled out. Müller (1995) attempted to solve this problem by assuming – within an optimality-theoretic approach – that the constraints responsible for the insertion of expletives and overt movement are „tied" in German, i.e. they are equally ranked. However, exactly this intuition can be captured within the standard P&P theory, perhaps by assuming that the insertion of an expletive and the movement of a phrase, i.e. the insertion of a (intermediate) trace are equally costly. Bayer (1995) assumes that even the apparent extraction structures are an instance of an interrogative concord, i.e. that there is no long movement at all in German but only insertion of wh-phrases in Spec-CP. He shows that complement clauses in German are in general LF-islands and thus it would be unexpected if wh-phrases were the only elements which could move out of complement clauses.

Another problem arises if one considers for example English which uses obviously the same strategy as German to mark interrogatives but nevertheless doesn't have the choice between long movement and a was-w-construction. Standardly it is assumed that English simply doesn't have the relevant expletive, i. e. something corresponding to *was*. Although such an assumption doesn't really explain why there should be such a difference it is in my view nevertheless viable. If one considers the differences w.r.t. nominal expletives between the Germanic languages where different shapes co-occur with different syntactic properties it is in my view justified that such a difference can also exist between wh-expletives. Thus whereas German would have two lexical entries for *was*, namely the ones given in (49), English would only have (50):

(49) German:	was1	wh + something
	was2	wh
(50) English	what	wh + something

Finally, the analysis sheds a new light on the syntactic properties of wh-phrases, namely that for the syntax only the wh-part seems to play a role which implies that syntactic wh-movement does not

specified type. The other implication of this analysis, namely that perhaps there is no LF movement of wh-phrases at all will be left open for now but clearly this analysis makes LF-movement of the real wh-phrase to the matrix clause unnecessary and given that the in-situ interpretation of wh-phrases which has been suggested already by several authors is viable then it seems to be plausible to assume that Wh-movement takes place only for purely syntactic reasons. I won't take a clear stand w.r.t. the question whether LF-movement of wh-phrases is necessary or not. However, the system proposed here leads one to expect that there is no LF-movement since the interpretation of a wh-phrase as a quantifier is not dependent on its actual position in the clause, i. e. an A'-position, rather whether the clause in which it occurs is syntactically marked as an interpretational domain for interrogatives. Reinhart (1994) has argued that wh-phrases which have not been moved must be interpreted in situ, thus a mechanism for this kind of interpretation is needed in any case. But this has to be examined more carefully in the future.

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Static and Dynamic Binding

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1 Introduction

This paper is about the similarities and differences between static ('bound anaphora') and dynamic binding. Syntactically, a key difference between statically and dynamically bound variables is that the former but not the latter are bound by operators that have scope over them. Among the two main types of approaches to dynamic binding, the so-called E-type pronoun approach (Evans (1985)) treats dynamic binding completely separately from ordinary predicate logic 'static' binding of variables. The so-called bound anaphora approach, on the other hand, (Groenendijk and Stokhof (1991)) treats dynamic binding as involving the binding of variables, thus making it similar to ordinary predicate logic 'static' binding. Recently, however, Dekker (1994) suggested a successor to Groenendijk and Stokhof's dynamic predicate logic which keeps variables for static binding but eliminates them from dynamic binding. His main argument is that the 'syntactically free but somehow semantically bound' variables used to achieve dynamic binding create technical and conceptual complications that can be eliminated by replacing variables with anaphoric terms. The price he pays is that static and dynamic binding are made incomparable. Independently, Ben-Shalom (1994) showed that pre-

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dicate logic itself can be thought of as a propositional modal system that involves copy predicates rather than variables. Both Dekker's anaphoric terms and Ben-Shalom's copy predicates can be thought of as copy operations based on paths. This paper suggests a synthesis of the two systems, where static and dynamic binding are both expressed by copy predicates. In the combined system, the difference between static and dynamic binding emerges as a procedural semantic intuition: static binding targets entities in a set S considered at the beginning of quantification; dynamic binding targets entities in the subset S' of S that is left at the end of quantification. In other words, at least for the range of phenomena covered by dynamic predicate logic, one can have one's cake and eat it too: it is possible to have a unified logical representation for static and dynamic binding while preserving the semantic intuition about the difference between them.

Section 2 summarizes the semantic trees system of Ben-Shalom (1996). Section 3 summarizes the predicate logic with anaphora system of Dekker (1994). Section 4 presents a system that combines the two. Section 5 uses the combined system for a semantic comparison of static and dynamic binding.

2 Semantic trees

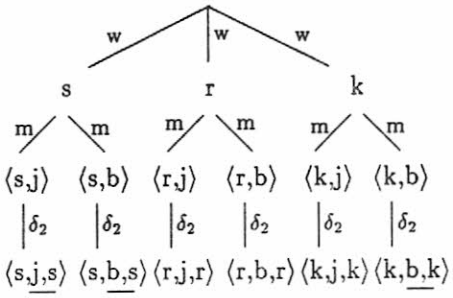
The semantic trees system Ben-Shalom (1996) is a version of predicate logic whose models can be thought of as trees. The truth value of a predicate logic sentence in a predicate logic model $\mathcal{D}$ can be determined by evaluating the appropriate propositional modal formula at the root of a tree. The tree has depth n for some finite n, and it corresponds to an n-ary relation over $\mathcal{D}$. Formulas are evaluated as tuples: For example, the binary predicate ADMIRE is true at a tuple e iff the second member of e from the right admires the first member of e from the right according to D. A statically bound pronoun is translated as a copy predicate δ_i for an appropriate i. The copy predicate δ_i is true of a tuple e iff the first member of e from the right is identical to the $i+1$-th member of e from the right.

The following example illustrates how ST works. The simplest way to read the

formula below is as a translation of *There is a woman that every man admires (her).* The tree is the part of $\mathcal{M}$ that is relevant for evaluating this formula in the model $\mathcal{M}$ determined by $D = \{j, b, s, r, k\}$ with MAN $= \{j, b\}$, WOMAN $= \{s, r, k\}$ and ADMIRE $= \{\langle j, s\rangle, \langle b, s\rangle, \langle b, k\rangle\}$. The formula is true at the root of the tree.

(1) There is a woman that every man admires.

$\Diamond($ *woman* $\wedge \Box($ *man* $\rightarrow \Diamond(\delta_2 \wedge$ *admire*$)))$



Formally, the semantic trees system is defined as follows:
The ST language is a propositional modal language. Its set of atomic formulas is the disjoint union of two sets: a set Φ of *relation symbols*, each with a natural number called its arity; and a set $\Delta = \{\delta_i \mid i \in \omega\}$ of *delta predicates.*

The formulas of ST are defined as follows:

Definition 1 (syntax of ST)

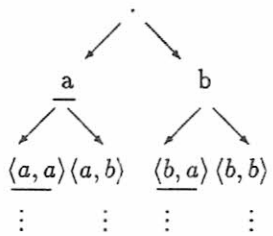
$$\phi ::= p \mid \delta_i \mid \neg\phi \mid \phi \wedge \psi \mid \Diamond\phi$$

with $p \in \Phi$, $\delta_i \in \Delta$. *As usual,* $\Box\phi$ *and* $\phi \rightarrow \psi$ *abbreviate* $\neg\Diamond\neg\phi$ *and* $\neg(\phi \wedge \neg\psi)$, *respectively.*

Complex formulas are built up from atomic formulas by negation, conjunction and existential quantification. The only difference from the syntax of ordinary propositional modal logic is the additional set of atomic formulas Δ.

An ST model $\mathcal{M} = \langle S, R, V \rangle$ is determined by a non-empty domain D of individuals, and a set of finitary relations over D with a set P of n-ary tuples of individuals for each relation symbol p of arity n. S is the set of tuples of finite length over D. sRs' iff $s' = s{\cdot}d$ for some $d \in D$. $s \cdot \langle d_0, \ldots, d_{n-1} \rangle \in V(p)$ iff n is the arity of p and $\langle d_0, \ldots d_{n-1} \rangle \in$ P. $s \cdot \langle d_0, \ldots, d_{i+1} \rangle \in V(\delta_i)$ iff $d_0 = d_{i+1}$.

This definition is illustrated in the figure below, which depicts a model $\mathcal{M}$ for an ST language with one relation symbol q, of arity 1, where $D = \{a, b\}$, and Q $= \{a\}$. The underlined tuples are the ones in $V(q)$.



If defined, the truth value of a formula ϕ of ST at a tuple s in a model $\mathcal{M}$ is determined in the ordinary propositional modal logic way. The only reason for the truth value of ϕ to be undefined at a state s is if it contains an atomic formula q evaluated at a tuple s'' which is too short for it: either q is a relation symbol of arity n and $|s''| < n$, or q is the delta predicate δ_i and $|s''| \leq i + 1$

Definition 2 (semantics of ST)

$$
\begin{array}{lll}
\mathcal{M} \models_s p & \textit{iff} & s \in V(p) \\
\mathcal{M} \models_s \delta_i & \textit{iff} & s \in V(\delta_i) \\
\mathcal{M} \models_s \neg\phi & \textit{iff} & \mathcal{M} \not\models_s \phi \\
\mathcal{M} \models_s \phi \wedge \psi & \textit{iff} & \mathcal{M} \models_s \phi \textit{ and } \mathcal{M} \models_s \psi \\
\mathcal{M} \models_s \Diamond\phi & \textit{iff} & \mathcal{M} \models_{s'} \phi \textit{ for some } s', sRs'
\end{array}
$$

3 Predicate logic with anaphora

The predicate logic with anaphora system (Dekker (1994)) is a version of dynamic predicate logic whose information states can be thought of as states of knowledge about

n roles for some finite n. An information state with degree n about a predicate logic model $\mathcal{D}$ corresponds to an n-ary relation over $\mathcal{D}$. For example, for every predicate logic $\mathcal{D}$ with domain D, the minimal state of knowledge about n roles is the full set of tuples D^n: the n roles can be played by any tuple of n individuals. The processing of a formula in an information state σ with degree n can change σ in two ways: it can rule out certain tuples of individuals in σ as playing these n roles; and it can extend tuples in σ to tuples in a new state σ' with more than n roles. A dynamically bound pronoun is translated as an anaphoric term p_i for an appropriate i. For each tuple e, the anaphoric term p_i 'copies' the i-th member of e from the right.

The following example illustrates how PLA works:

(2) There is a man. He walks.
$\exists x M(x) \wedge W(p_0)$

$$\begin{aligned}
\sigma[[\exists x M(x)]]_{\mathcal{M},g} &= \{e \cdot d \mid d \in D \ \wedge \ e \in \sigma[[M(x)]]_{\mathcal{M},g[x/d]}\} \\
&= \{e \cdot d \mid e \in \sigma \ \wedge \ d \text{ is a man } \} (= \sigma') \\
\sigma'[[W(p_0)]]_{\mathcal{M},g} &= \{e' \in \sigma' \mid \text{ the last element of } e' \text{ walks } \} \\
&= \{e \cdot d \mid e \in \sigma \ \wedge \ d \text{ is a man } \ \wedge \ d \text{ walks } \}
\end{aligned}$$

Formally, the predicate logic with anaphora system is defined as follows:
The PLA language is constructed from sets of relation constants R^n of arity n, a set C of individual constants, and countable sets V and $A = \{p_i \mid i \in \omega\}$ of variables and pronouns, respectively. The sets C, V and A together constitute the set of terms T.

The formulas of PLA are defined as follows:

Definition 3 (syntax of PLA)

$$\phi ::= R(t_1, \ldots, t_n) \mid t_1 = t_2 \mid \neg\phi \mid \phi_1 \wedge \phi_2 \mid \exists x \phi$$

with $t_i \in T$, $R \in R^n$, $x \in V$. As usual, $\forall x \phi$ and $\phi \rightarrow \psi$ abbreviate $\neg\exists x \neg\phi$ and $\neg(\phi \wedge \neg\psi)$, respectively.

A basic formula is either a relation symbol and the right number of terms, or an equality. Complex formulas are built up from basic formulas by negation, conjunction and existential quantification. The only difference from the syntax of ordinary predicate logic is the additional set of anaphor terms A.

A PLA model $\mathcal{M} = \langle D, F \rangle$ is a non-empty domain D of individuals, and an interpretation function F which assigns individuals in D to individual constants and sets of n-tuples of individuals to relations constants of arity n. An information state σ about $\mathcal{M}$ is a relation of degree k over D for some $k \geq 0$; if σ is non-empty its degree $|\sigma|$ is the length of the tuples in σ; if σ is empty its degree $|\sigma|$ is inherent. Information states are ordered by a partial order, based on a partial order on tuples: $e \leq e'$ iff there is a tuple e'' such that $e' = e \cdot e''$. $\sigma \leq \sigma'$ iff the degree $|\sigma|$ of σ is no larger than the degree $|\sigma'|$ of σ', and for every tuple e' in σ' there is a tuple e in σ such that $e \leq e'$. This definition is illustrated in the figure below:

$$\left\{ \begin{array}{c} \langle d_1, \ldots, d_n \rangle \\ \vdots \\ \langle d'_1, \ldots, d'_n \rangle \\ \vdots \\ \langle d''_1, \ldots, d''_n \rangle \\ \vdots \\ \langle d'''_1, \ldots, d'''_n \rangle \end{array} \right\} \leq \left\{ \begin{array}{c} \langle d'_1, \ldots, d'_n, d'_{n+1}, \ldots, d'_{n+m} \rangle \\ \vdots \\ \langle d''_1, \ldots, d''_n, d''_{n+1}, \ldots, d''_{n+m} \rangle \end{array} \right\}$$

Individual constants and variables are evaluated as in ordinary predicate logic with respect to a model and an assignment function, respectively. Pronouns are evaluated with respect to a case $e = \langle e_1, \ldots, e_{|e|} \rangle$ of an information state σ.

Definition 4

$$\begin{array}{l} [c]_{\mathcal{M},\sigma,e,g} = F(c) \\ [x]_{\mathcal{M},\sigma,e,g} = g(x) \\ [p_i]_{\mathcal{M},\sigma,e,g} = e_{|e|-i} \ \ (\ if\ |\sigma| > i\ ) \end{array}$$

If defined, the dynamic interpretation $\sigma[[\phi]]_{\mathcal{M},g}$ of a PLA formula ϕ in an information state σ is a state σ' such that $\sigma \leq \sigma'$. The formula that follows ϕ is interpreted in the

updated state σ'. The only reason for the dynamic interpretation of ϕ to be undefined at a state σ is if it contains a pronoun p_i that cannot be evaluated at a state σ'': either $|\sigma''| \leq i$ or σ'' is empty.

Definition 5 (semantics of PLA)

$$\sigma[\![R(t_1,\ldots,t_n)]\!]_{\mathcal{M},g} = \{e \in \sigma \mid \langle [t_1]_{\mathcal{M},\sigma,e,g},\ldots,[t_n]_{\mathcal{M},\sigma,e,g}\rangle \in F(R)\}$$
$$(\ \textit{if}\ |\sigma| > i\ \textit{for every}\ p_i \in \{t_1,\ldots,t_n\}\ )$$
$$\sigma[\![t_1 = t_2]\!]_{\mathcal{M},g} = \{e \in \sigma \mid [t_1]_{\mathcal{M},\sigma,e,g} = [t_2]_{\mathcal{M},\sigma,e,g}\}$$
$$(\ \textit{if}\ |\sigma| > i\ \textit{for every}\ p_i \in \{t_1,t_2\}\ )$$
$$\sigma[\![\neg\phi]\!]_{\mathcal{M},g} = \{e \in \sigma \mid \neg\exists e'\ \textit{such that}\ e \leq e' \wedge e' \in \sigma[\![\phi]\!]_{\mathcal{M},g}\}$$
$$\sigma[\![\phi_1 \wedge \phi_2]\!]_{\mathcal{M},g} = \sigma[\![\phi_1]\!]_{\mathcal{M},g}[\![\phi_2]\!]_{\mathcal{M},g}$$
$$\sigma[\![\exists x\phi]\!]_{\mathcal{M},g} = \{e \cdot d \mid d \in D \wedge e \in \sigma[\![\phi]\!]_{\mathcal{M},g[x/d]}\}$$

where $|\sigma[\![R(t_1,\ldots,t_n)]\!]_{\mathcal{M},g}|, |\sigma[\![t_1 = t_2]\!]_{\mathcal{M},g}|, |\sigma[\![\neg\phi]\!]_{\mathcal{M},g}| \stackrel{\text{def}}{=} |\sigma|$,
and $|\sigma[\![\exists x\phi]\!]_{\mathcal{M},g}| \stackrel{\text{def}}{=} |\sigma| + 1$.

4 A combined system

This section combines the PLA and ST systems. In the combined system, relations of finite degree are used for both information states and the evaluation of formulas. Both statically and dynamically bound pronouns are translated as copy predicates. The syntax of the combined system is as simple as that of ST, and its semantics is no more complex than that of PLA.

The following example illustrates how CS works:[1]

(3) There is a man. He walks.

$\Diamond\, man; \Diamond(\delta_0;\ walk)$

[1] If ST 'individual terms' are prefered not to have dynamic effects, they can be treated as involving $\Box$ rather than $\Diamond$.

$$
\begin{array}{lcl}
\sigma[\![\Diamond\ man]\!]_{\mathcal{M}} & = & \{e' \mid eRe' \text{ for some } e \in \sigma\}[\![\ man]\!]_{\mathcal{M}} \\
 & = & \{e \cdot d \mid e \in \sigma \ \wedge\ d \text{ is a man }\} (= \sigma') \\
\sigma'[\![\Diamond(\delta_0;\ walk)]\!]_{\mathcal{M}} & = & \{e'' \mid e'Re'' \text{ for some } e' \in \sigma'\}[\![\delta_0]\!]_{\mathcal{M}}[\![\ walk]\!]_{\mathcal{M}} \\
 & = & \{e' \cdot d' \mid e' \in \sigma' \wedge \\
 & & \quad d' \text{ is equal to the last element of } e' \ \wedge\ d' \text{ walks }\} \\
 & = & \{e \cdot d \cdot d \mid e \in \sigma \ \wedge\ d \text{ is a man } \ \wedge\ d \text{ walks }\}
\end{array}
$$

Formally, the predicate logic with anaphora system is defined as follows: The syntax of the CS language is practically identical to that of ST:

Definition 6 (syntax of CS)

$$\phi ::= p \mid \delta_i \mid \sim\phi \mid \phi;\psi \mid \Diamond\phi$$

with $p \in \Phi$, $\delta_i \in \Delta$. *As usual,* $\Box\phi$ *and* $\phi \rightarrow \psi$ *abbreviate* $\sim\Diamond\ \sim\phi$ *and* $\sim(\phi;\sim\psi)$, *respectively.*

A CS model is just an ST model $\mathcal{M} = \langle S, R, V\rangle$, as defined in Section 2. An information state σ about $\mathcal{M}$ is just a PLA information state about the base set D of $\mathcal{M}$, as defined in Section 3.[2] If defined, the dynamic interpretation of a CS formula ϕ at an information state σ about a model M is defined very much as in PLA. The only reason for the dynamic interpretation of a formula ϕ to be undefined at a state σ is if ϕ contains an atomic formula q evaluated at a state σ'' whose tuples are too short for q as an ST formula, as defined in Section 2. In the following definition, $R^* \stackrel{\text{def}}{=} \bigcup_{i\in\omega} R^i$.

Definition 7 (semantics of CS)

$$
\begin{array}{l}
\sigma[\![p]\!]_{\mathcal{M}} = \{e \in \sigma \mid e \in V(p)\} \\
\sigma[\![\delta_i]\!]_{\mathcal{M}} = \{e \in \sigma \mid e \in V(\delta_i)\} \\
\sigma[\![\sim\phi]\!]_{\mathcal{M}} = \{e \in \sigma \mid \neg\exists e' \textit{ such that } eR^*e' \ \wedge\ e' \in \sigma[\![\phi]\!]_{\mathcal{M}}\} \\
\sigma[\![\phi_1;\phi_2]\!]_{\mathcal{M}} = \sigma[\![\phi_1]\!]_{\mathcal{M}}[\![\phi_2]\!]_{\mathcal{M}} \\
\sigma[\![\Diamond\phi]\!]_{\mathcal{M}} = \{e' \mid eRe' \textit{ for some } e \in \sigma\}[\![\phi]\!]_{\mathcal{M}}
\end{array}
$$

where $|\sigma[\![p]\!]_{\mathcal{M}}|, |\sigma[\![\delta_i]\!]_{\mathcal{M}}|, |\sigma[\![\sim\phi]\!]_{\mathcal{M}}| \stackrel{\text{def}}{=} |\sigma|$, *and* $|\sigma[\![\Diamond\phi]\!]_{\mathcal{M}}| \stackrel{\text{def}}{=} |\sigma| + 1$.

[2] Information states were defined with respect to $\mathcal{M} = (D, F)$, but in fact only use D.

5 Static and dynamic binding

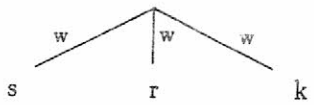
But CS is more than an elegant way of combining the systems of semantic trees and predicate logic with anaphora . Because it uses copy predicates to express both static and dynamic binding it offers a simple way of comparing them. A natural perspective about CS takes each tuple in an information state as a path, and interpretation as a process that eliminates and/or extends paths. In terms of this perspective, the two types of binding are similar in that both involve a copy operator that targets entities a fixed number of steps up every path. In addition, the interpretation of a quantified formula of the form $\Diamond(\phi)$ seem to involve the following steps: an initial set S of entities is considered at the point $\Diamond(^{\downarrow}$; some of these entities are eliminated during the interpretation of ϕ, until a final subset S' of S is left at the point $\Diamond(\phi)^{\downarrow}$. In terms of this perspective, a statically bound copy operator seems to target entities in an initial set S while a dynamically bound copy predicate seems to target entities in a final set S'. This distinction is illustrated in the following example, which depicts the current information state σ at several points during the processing of a formula with one statically bound delta predicate and one dynamically bound delta predicate. For simplicity, the initial information state is taken to be $\langle\rangle$, the minimal information state about 0 roles. The formula in (4) is evaluated in this information state with respect to the model determined by $D = \{j, b, s, r, k\}$, MAN $= \{j, b\}$, WOMAN $= \{s, r, k\}$, ADMIRE $= \{\langle j, s\rangle, \langle b, s\rangle, \langle b, k\rangle\}$, and BEAUTIFUL $= \{s, r\}$.

(4) There is a woman that every man admires. She is beautiful.

$\Diamond(\ woman\,;\Box(\ man \rightarrow \Diamond(\delta_2;\ admire)));\Diamond(\delta_0;\ beautiful)$

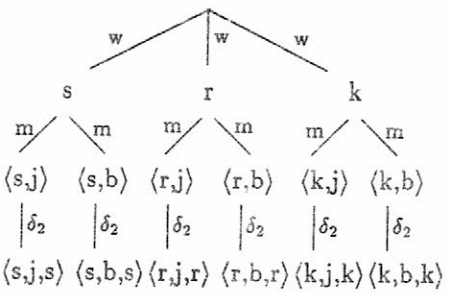
- $\Diamond(\ woman^{\downarrow}$

  The first quantification considers the set S of the women in D.



- $\Diamond(\ woman\,;\Box(\ man \rightarrow \Diamond(\delta_2{}^{\downarrow}$

  The statically bound δ_2 targets the entities in S.

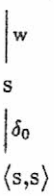


- $\Diamond(\ woman\,;\Box(\ man \rightarrow \Diamond(\delta_2;\ admire)))^{\downarrow}$

  The woman s is the only entity in S that meets the condition that every man admires her. S' is the set $\{s\}$.

- $\Diamond(\ woman\,;\Box(\ man \rightarrow \Diamond(\delta_2;\ admire)));\Diamond(\delta_0{}^{\downarrow}$

  The dynamically bound δ_0 targets the entities in S'.



6 Conclusion

This paper presents a system that combines the predicate logic with anaphora system of Dekker (1994) with the semantic trees system of Ben-Shalom (1996). In the combined system both static and dynamic binding are expressed by copy operations based on paths. The difference between the two types of binding emerges as a procedural semantic intuition: static binding targets entities in a set S considered at the beginning of quantification; dynamic binding targets entities in the subset S' of S that is left at the end of quantification.

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Focus-Structure & Scope

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I.1 Focus-structure[1]

F-structure (focus structure) is annotated structural description (SD) in which Topic and Focus constituents are marked. F-structure feeds both PF and semantics and is sensitive to lexical information. It feeds PF since this level provides the explicit phonetic spell-out including intonation. I argue that f-structure and not LF is the input to a semantic rule of Predication.

Crucial to this view of semantic interpretation is the rule of PREDICATION which is viewed as a relation between the "topic" of a sentence and its predicate. Formally, predication is a one place function mapping topics to truth values which operates on articulated f-structures in which Topic and Focus have been assigned. It follows that topics necessarily have widest scope.

Interpreting f-structure is a dynamic venture, in the sense that the f-structure of a sentence determines its information change potential. A sentence is thus viewed as a means of changing the information state of the interpreter or hearer. The discourse theory introduced here is fed by f-structure and thus conveys this change of state of the hearer. The rule of predication as it is defined here thus allows for a dynamic assignment of truth values.

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[1] See Erteschik-Shir (1996) for a detailed presentation of focus-structure theory.

I.2 Topic

The definition of Topic is derived from Reinhart (1981) who in turn draws on Strawson (1964, 97). According to Strawson the topic has three central properties:

a. The topic is what a statement is about.

b. The topic "is used to invoke identifying knowledge know or presumed to be possession of an audience."

c. "The statement is assessed *as* putative information *about its topic*."

Reinhart adopts this view of topics and offers a formalization in terms of the context set a la Stalnaker (1978): "The *context set* of a given discourse at a given point is the set of propositions which we accept to be true at this point." (Reinhart (1981, 78)) Each new assertion, if not rejected as false, adds a new proposition to the presuppositions in the context set. Reinhart suggests that the context set has internal organization, in particular, propositions in the context set are classified by their topics. Sentence topics thus determine under which entry a particular proposition is assessed and classified.

I.3 Focus

I adopt the definition of FOCUS in Erteschik-Shir (1973, 1986):

(1) The FOCUS of a sentence S = the (intension of a) constituent c of S which the speaker intends to direct the attention of his/her hearer(s) to, by uttering S. (See Erteschik-Shir and Lappin (1979)).

The definition of focus in terms of speakers intentions entails that it is a discourse property which is assigned to a constituent in a context of conversation. For any sentence

several focus assignments will generally be possible, one of which is realized in discourse. A sentence, in discourse, has only ONE main focus which is assigned to a syntactic constituent. This constituent may be an NP, a VP or even the whole S (as in an out-of-the-blue sentence). The topic of a sentence is excluded as a focus because it is by definition already in the hearer's attention. Hence, the focus constituent is selected freely among the nontopic constituents of the sentence. The fact that the focus is defined as the constituent to which the hearer's attention is drawn enables the constituents contained in it to provide the topics of the following sentences since these constituents have (by means of the newly processed utterance) become part of the domain of what the hearer is now attending to.

The distinction between plain focus as defined hear and contrastive focus has often been blurred. Contrast is contextually constrained to occur only if a contrast set is available:

(2) A: Who wants to marry John, Janet or Ann?

B: JANET wants to marry John.

B's answer is contrastive because it selects *Janet* from the contrast set provided in the context. If, however, no such context set were provided by A, *Janet* in B's answer would be a noncontrastive focus. Outside of context contrastive and noncontrastive foci may therefore coincide.

A further focus type with distinct properties is what I refer to as a Restrictive Focus. Restrictive foci, like contrastive ones require a context specified set:

(3) A: Which one of his friends wants to marry John?

B: JANET wants to marry John.

Here the focus, *Janet*, is selected from the contextually specified or restrictive set of *John's*

friends. *Janet* is, however, not contrasted with any other particular individual. Note that in B's answer, the set of *John's friends*, qualifies as a topic. This set in fact provides the topic of a (subordinate) focus structure in which *Janet* is the focus.

B's answer could, of course, also be a response to:

(4) Who wants to marry John?

in which no contextually specified set is assumed. *Janet* in this case would be a nonrestrictive, noncontrastive focus. B's answer therefore can occur in three different context types and accordingly can be assigned three different focus structures. My claim that a sentence has only one focus therefore pertains to nonrestrictive, noncontrastive foci. Such foci I refer to below as "main" foci.

I.4 The Filing System

In this section I introduce the discourse rules that interpret f-structures. F-structures are SDs (structural desctiptions) with both topic and focus assigned. Topic and focus assignment is free, conditioned only by syntactic structure: Foci and overt topics must form constituents.[2] It is possible to imagine a theory of f-structure which does not restrict topics and foci to syntactic constituents. Such a theory would, however, be totally unconstrained and would not enable any intonational, syntactic and semantic predictions. The free assignment of f-structure means that not all f-structure assignments will be interpretable. Others will be contextually constrained. The f-structure rules can be viewed as a filter which rules out incorrect f-

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[2] Foci are always overt. Topics, for example stage topics which represent the here-and-now, are not. The requirement that a topic must form a syntactic constituent obviously makes sense only for overt topics.This restriction does not apply to contrastive foci.

structures.

I define a file consisting of a set of "cards" and a set of rules which determine the changes in the file induced by an utterance. Topic and Focus are viewed as the basic elements of f-structures which trigger the application of file change rules. In particular, incorporating Reinhart's (1981) basic insight into their nature, topics represent existing cards which must both be old and "prominent" in the discourse and these cards provide the locus for truth value assignment. The system also incorporates a basic idea from Heim (1981) namely that indefinites trigger the construction of new "cards" and definites presuppose the existence of old ones. Finally, the focus is, according to its definition here, the constituent to which the hearer's attention is drawn. Translated into the discourse theory, this means that focussed cards are placed prominently in the file.

Utterances are conceived of as a set of instructions by a speaker to a hearer to update and organize a file so that the file will contain all the information the speaker intends to convey. The file consists of indexed cards upon which the information is entered according to well-defined principles. Each card has an indexed "heading" and information pertaining to this heading can be entered on the card. The file itself can be viewed as a partially ordered stack of such cards. In particular, the top-of-the-file is where "prominent" cards are to be found.

The following rules show how new cards are made out and how cards get to be on top of the file. Note that the instruction for a topic requires the topic card to be on top of the file. The instruction for focus puts a card on top of the file providing a potential future topic.

F-structure Rules

I TOPIC instructs the hearer to locate on the top of his file an existing card (or an existing set of cards) with the relevant heading and index.

II FOCUS instructs the hearer to either

i) open a new card and put it on the top of the file. Assign it a *heading* and a new index (in the case of an indefinite) or

ii) locate an existing card and put it on the top of the file (in the case of a definite)

III PREDICATION instructs the hearer to evaluate the predicate with respect to the topic where the predicate is taken to be the complement of the topic.
If the result of the evaluation is TRUE the UPDATE rule applies:

IV UPDATE instructs the hearer to enter the focus on the topic card and then to copy all entries to all cards activated by the focus rule.

The hearer's file, at any given point in a discourse, consists of two types of cards: Those that are on top of the file (and provide potential topics) and those that are not. The latter consist of definite cards which can be accessed by focus rule ii. Existential presupposition is associated with all the cards in the file. Presuppositions also take the form of existing entries on cards.

I.5. An illustration

Assume the following interaction: A is speaking, B is listening. The cards for the speakers are available on top of the file: "I" is licensed as the topic of (5):

A says:

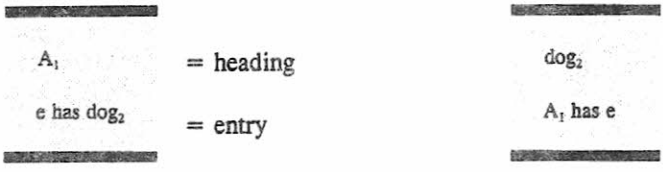
(5) I [have a dog]. [It] is brown.
FOC TOP

B's update:

1. Pull the card for A_1 (first person) from the top of the file. (TOPIC rule)
2. Evaluate "A_1 has a dog" with respect to A_1. (PREDICATION)
3. If 2 yields TRUE, enter "e has a dog" on A's card. (UPDATE)

4. Open a new card, label it dog_2. Put it on top of the file (FOCUS rule i.)
5. Enter "A_1 has e" on this card. (UPDATE)

The following cards are now on top of the hearer's file and are available as future topics:



The heading 'identifies' an individual. In the new card for dog_2, the heading allows future definite references to this dog such as 'the dog'. Entries may commute to the heading: Once further entries are added they may replace or modify the heading deriving new headings such as 'the dog you have' (= 'your dog') or 'the brown dog.' Entries can in this way be viewed as restrictions on the heading.

The entry for the second sentence in (5) can now be made by B. The pronoun is interpretable only if entered on an available card from the top of the file. The features of the heading in card 2 match this pronoun, licensing the entry on this card.

The following steps are taken by B:

1. Pull card 2 from the top of the file. (TOPIC rule)
2. Evaluate "e is brown" with respect to dog_2. (PREDICATION)
3. If 2. yields TRUE, enter "e is brown" on card 2. (UPDATE)

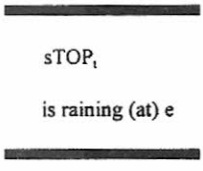
In the f-structure model as just illustrated, pronouns must always be interpreted with respect to an available topic card, i.e., a pronoun is necessarily a topic. If no card is available on top of the file for this purpose, the pronoun cannot get interpreted. The pronoun *it* thus refers to the heading of the card just opened and is placed on top of the file, i.e., it refers to dog_2.

I.6 Stage topics

A STAGE topic ($sTOP_t$) defines the spatio-temporal parameters of the utterance. Stage topics may be overt ('this afternoon', 'on Park Avenue') or discoursally implied (the here-and-now). The truth value of a sentence with such a topic is determined by examining a card with a spatio-temporal heading. Out-of-the-blue sentences can be uttered because a card which signifies the 'here-and-now' of the discourse situation is always located on top of the file providing an implicit stage topic:

(6) $sTOP_t$ $[\text{It is raining}]_{FOC}$

(6) is assessed by examining the implicit stage topic (the here-and-now) to see if *it is raining* there. In this case the whole sentence is taken as a focused event predicated of a stage:



I.7 Subordinate f-structure

Partitives can be subjects of individual level predicates, i.e., they qualify as topics. Yet, it is counterintuitive to propose that cards with partitive headings such as the italicized ones in (7) must be available to the hearer:

(7) a. *Two of the students* are intelligent.
b. *Some of the students* like linguistics.

A card must, however, be available for the definite NP *the students* in both sentences in (7). Here *the students* functions as a subordinate topic, i.e., the card with the heading *students*$_i$ must be on top of the file. What the partitive does is instruct the hearer to select *two* or *some*

members from the set of students and to assess the sentence with respect to these members of this set only, i.e., the partitive triggers a partitioning of the set of students according to the restrictive focus rule. Note the intonation of the partitive topics (capitals indicate stress):

(8) a. TWO of the students are inTELLigent.
b. SOME of the students are inTELLigent.

The stress on *two* and *some* indicates that these constituents are to be interpreted as foci within the larger topic constituent. The topic part of this constituent defines a set, i.e., the hearer has on top of his file a set card with the group heading $students_i$. Although the hearer does not necessarily have a set of cards representing the individual students, but only one individual card which defines the group, partitioning is still possible: He selects a subset from this set. This subset is defined by the focus constituent. When the subset is defined cardinally, the hearer must open a particular number of cards, in the case of (8)a., it will include exactly two cards. These cards each have the heading:

(9) $student_j \in \{students_i\}$

This relation is represented by attaching the subset cards to the group card as above. The new cards do not represent specific students, i.e., two students are selected at random from the set of students defined by the subordinate topic.

An analysis of partitive topics has been derived by which they trigger subordinate update. The following f-structure is assigned to (8)a. and subordinate update applies to construct a new card for the subset of the set of students which has exactly two members:

(10) $[[\text{Two}]_{\text{FOC-sub}}$ of $[\text{the students}]_{\text{TOP-sub}}]_{\text{TOP}}$ $[\text{are intelligent}]_{\text{FOC}}$

For *some* (as well as *few*, *many*) there is no enumeration of individual cards, hence the partitioned subset consists of only one unindividuated card. In (8)b. the subset will consist of

any number of cards that counts as *some*. The card for such a subset is made available on top of the file by the restrictive focus rule making it accessible as a topic for the main processing of the sentence.

II.1 Scope and f-structure

A variety of results follow from the view that f-structure mediates between s-structure and semantics. This paper demonstrates that f-structures are scopally disambiguated. One important result is that the topic by definition takes scope over the rest of the sentence. Further, the existence of f-structures with implicit stage topics allows for unscoped interpretations.

I argue here that topics are quantificational in that they provide the domain for overt quantifiers. A topic provides a link to the preceding discourse in which it is introduced by a focus constituent which may or may not be restrictive. In the former case, its quantificational nature follows from the application of the semantic rule of predication which requires assessment for every single member of this restricted set. The link of the topic to the discourse also makes the contextual restriction of quantifiers fall out automatically. So, for example, the topic *everyone* must be interpreted as 'everyone we are talking about', it is a context specified set represented by a card with the heading *everyone*$_i$, i.e., it is referential.

II.2 Weak Determiners

In the following only the subject can be the topic since a stage topic is excluded due to the individual level predicate:

(11) a. TWO students are inTELLigent.

b. Two STUdents are inTELLigent.

A possible context for (11)a. is one in which a set of students is supplied by the context:

(12) [I have a class of six students.] TWO (students) are intelligent,

THREE (students) are mediocre, and ONE (student) is a total idiot.

In (12) the set of students focally introduced in the bracketed sentence is fully partitioned. The subject of (11)a. is therefore interpreted partitively if the necessary restrictive set has been introduced in the preceding discourse. The intonation of (11)a. supports this analysis. A subordinate f-structure is indicated in which the unstressed noun 'students' is the topic and the stressed quantifier is the focus:

(13) $[\text{TWO}_{\text{FOC-sub}}\ \text{students}_{\text{TOP-sub}}]_{\text{TOP}}$ . . .

(11)b. is acceptable under a contrastive reading or a specific reading. The focused (stressed) noun enable the necessary subordinate f-structure. Weak determiners allow for either specific or partitive readings by means of subordinate f-structures.

It is also possible to verify that assessment of these topics must be distributive. Distributive readings range over the sets defined by these strong NPs. A "weak" topic is a contradiction in terms involving quantifying over undefined sets.

II.3 Strong Determiners

What it means for an NP to be strong or definite is that a card representing a discourse restricted set (of students, here) is assumed to be available in the hearer's file. This set can be interpreted as a sum or as a set. Again, the set interpretation is necessary for the distributive assessment of the sentence. Examine the following examples:

(14) a. Every student is intelligent.
b. Every student in my class is intelligent.

To determine the truth value of (14)a. each of the individual students in the set must be examined. This set is represented by a restrictive set of cards on top of the file which receives a unified heading. The individual cards which constitute this set must be examined in order for a truth value to be assigned. The restrictive set can be introduced by a subordinate f-structure as in (14)b. I assume no partitioning of this set since *every* ranges over all the members of the set.

How the set is to be partitioned is a property of the particular quantifier in question. The evaluation process for *most* is more complex than the one suggested for universal quantifiers. In the following

(15) Most students in my class are intelligent.

a topic set encompassing the students in my class is available and this set is partitioned by the quantifier. As before the derived set provides the main topic for assessment. How do we such a partitioning with *most*? Clearly there is no single set that *most students* could represent. As mentioned by an anonymous reviewer, when our model contains students a, b, c, d, then the sets {a,b,c}, {a,c,d}, {b,c,d} and {a,b,c,d} provide possible partitions for which the evaluation of the sentence comes out true. If *most* is interpreted roughly as 'more than half', then the

result is achieved if any partitioning of the set of students which results in more than half of them is licensed. The result of partitioning should therefore not be viewed as defining a necessarily unique new subset. For *most*, *many*, etc. it suffices that a subset of the appropriate size is definable. Note the interpretation of the pronoun in the following:

(16) Most of the students came to the party. *They* had a good time.

The pronoun refers to whichever set of students (counting as *most* students) actually came to the party.

Whether the quantifier is strong or weak, if it quantifies a topic, it must receive a strong reading, i.e., there must be a card, or set of cards available on top of the hearer's file. I have shown that topic sets generate a quantificational reading when they consist of more than one member. This reading is obtained because the rule of predication must distribute over the individual members of this set.

III.1 Quantifier Scope

I now argue that f-structures are scopally transparent and can be interpreted directly. I limit the discussion to scope interactions in simple transitive sentences. At least the following three f-structures are available for sentences with quantifiers in subject and object position (Q_1 = subject, Q_2 = object):

(17) a. $[Q_1]_{TOP}\ [V\ Q_2]_{FOC}$

b. $TOP_2\ [Q_1\ V\ Q_2]_{FOC}$

c. $sTOP_t\ [Q_1\ V\ Q_2]_{FOC}$

Two important results follow from the interpretation of f-structures argued for here:

1. Topic quantifiers take wide scope over any other quantifier

2. There are non-scoped f-structures

I will start by discussing Topic-scope: A topic has been defined as a card on top of the file. The existence of such a card presupposes the existence in the discourse of the referent of the card 'heading'. Predication takes the focus constituent and assesses its truth value with respect to the topic. It follows that the topic necessarily has wider scope than any constituent contained within the focus. Thus, in (17)a. Q_1 is the topic, Q_2 is contained within the focus. Predication applies as follows: For each individual contained in Q_1, the truth of the focus constituent containing Q_2 is assessed, i.e., Q has scope over$_2$Q . If we follow the same reasoning for (17)b., we get the opposite scope relation. Two scoped readings thus follow without further ado from applying predication to these f-structures.

In (17)c. the topic is a stage topic, hence neither of the quantified NPs is a topic and a nonscoped reading results.

III.2 Cardinal Scope

According to Landman (in prep.) a sentence such as (18) has the eight readings listed in (19) and (20). (19) represents four unscoped readings in which each of the cardinals enables a collective and a distributive reading. (20) represents the four scoped readings which Landman derives by a special scope rule. [C = collective, D=distributive, subscript s=subject, subscript o=object, scope=parenthesis]:

(18) Two girls arrested three boys.

(19) a. C C {+(a,b)} ---> {+(1,2,3)}

b. C D {+(a,b)} ---> 1
---> 2
---> 3

c. D C a ---> {+(1,2,3)}
b --->

d. D D a ---> 1
b " 2
" 3

(20) a. D_s (C_o) a ---> [1,2,3]
b ---> [4,5,6]

b. D_s (D_o) a ---> 1 b ---> 4
---> 2 ---> 5
---> 3 ---> 6

c. D_o (C_s) [a,b] ---> 1
[c,d] ---> 2
[e,f] ---> 3

d. D_o (D_s) a ---> 1 c ---> 2 e ---> 3
b ---> d ---> f --->

The f-structure of all the cases listed in (19) is (17)c. which has a stage topic. For each plural NP there are two possible interpretations: collective and distributive. (19)a. gets collective readings for both NPs, i.e., the group,'2 girls' arrested the group '3 boys'. (19)b. says that the group '2 girls' arrested 3 individual boys. (19)c. involves 2 individual girls who arrest a group of 3 boys. (19)d. is the double distributive reading in which 2 individual girls arrest 3 individual boys, i.e., there is *some* pairing between the 2 girls and the 3 boys such that for each girl there is one or more boys (of the three) that she arrests, and no boy gets left unarrested. (Since the reading leaves the number of pairings unspecified with a minimum of three and a maximum of six, the number of 'arrows' which indicates the number of 'pairings' has been left open.) This reading includes the 'all-all' reading in which each of the two girls arrests each of the three boys.

All of these are assessed with respect to the discourse here-and-now, i.e., only *one* event is involved for each reading (and only two girls and three boys are involved in each case). A distinction is thus made between the number of pairings, in this case the number of arrests (which ranges between 1 and 3), and the number of events. Imagine, for example, the

following spatio-temporal parameters: Today, between 6-7 pm, in Beer Sheva. These parameters define the stage upon which all the arrests take place. No individual stages for each separate pairing is made available. This is a requirement of the stage topic reading evidenced by the presence of an overt stage topic:

(21) a. Today, two girls arrested three boys.
b. At 6 o'clock, two girls arrested three boys.
c. On the corner, two girls arrested three boys.

The two scoped readings (20)a. and (20)b. are derived from the f-structure in (17)a. by allowing the object to be either distributive or collective. Similarly, for (20)c. and d. which are derived from the f-structure (17)b.[3]

The three f-structures in (17), together with Landman's analysis of plurals as either distributive or collective, renders the eight readings listed above. Landman's scope rule becomes superfluous if predication is read off f-structures, since this is what forces a distributive reading of topics. The unscoped readings are also a direct outcome of the view that f-structures allow for stage topics.

III.3 *Some-Every* Scopes

Let us test whether these predictions can be verified with other quantifiers:

(22) a. Someone arrested everyone.
b. Everyone arrested someone.

Someone cannot be a main topic (unless it is contrastive). Further, *someone* is singular,

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[3] These readings in which the object NP is interpreted as having wide scope are highly marked. Only a context that enhances the object-topic reading will make such a reading possible. This is the reason it takes brute force (i.e., ample contextualization) to convince speakers of the readings in which the object has scope over the subject.

therefore the distributive/collective distinction is irrelevant. Therefore only 3 readings, represented by the following f-structures, are available for each sentence:

(23) a. $sTOP_t$ [everyone$_D$ arrested someone]$_{FOC}$
b. $sTOP_t$ [everyone$_C$ arrested someone]$_{FOC}$
c. Everyone$_{TOP}$ [arrested someone]$_{FOC}$

(24) a. $sTOP_t$ [someone arrested everyone$_D$]$_{FOC}$
b. $sTOP_t$ [someone arrested everyone$_C$]$_{FOC}$
c. TOP_i [someone arrested everyone$_i$]$_{FOC}$

(23)a. involves one event in which one person gets arrested by each of the members of the set defined by *everyone*. (23)b. differs only in *everyone* being viewed collectively, i.e., the arrest is performed as a group action. In (23)c. *everyone* is the topic of the sentence. *Everyone* must therefore be a discourse specified set represented by an indexed card on top of the file. Since predication involves assessment for each individual member of this set, a distributive reading is achieved. This reading takes an 'undefined' *someone* for each of the members of the set and gives us the interpretation:

(25) $\forall x, \forall y$ (x arrested y)

(23)c. is the least marked f-structure for the sentence. It follows that (25) is the most natural reading. The readings derived from the f-structures with stage topics are very highly marked. This is because strongly quantified NPs necessarily presuppose a contextually defined set, i.e., they represent an existing card. If a context with a stage topic is contextually forced the following f-structure with a subordinate f-structure is therefore most plausible:

(26) $sTOP_t$ [everyone$_{TOP\text{-}sub}$ [arrested someone]$_{FOC\text{-}sub}$]$_{FOC}$

The subordinate f-structure again derives a 'scoped' reading in which *everyone* has wide scope. The readings resulting from (23)a. and b. in which a 'single' *someone* is arrested, are therefore

almost impossible to get.

The story is the same for the f-structures in (24)a. and b. except that the 'arresting' is reversed. Here again, properties of the strong quantifier force a subordinate f-structure as follows:

(27) $sTOP_t$ [$TOP_{i\text{-}sub}$ [someone arrested everyone$_i$]$_{FOC\text{-}sub}$]$_{FOC}$

The f-structure (24)c. is almost impossible to contextualize at least with the predicate 'arrest'. Destressing *everyone* together with an appropriate context generally works.

III.4 Scoped Stages

In the preceding sections I showed that topics provide a restrictive set over which quantifiers range. Stage topics are no different in this respect. They too function as the restriction on quantifiers. Relevant quantifiers are *sometimes*, *everywhere, always* etc. These quantifiers cannot be used as stage topics with individual level predicates, neither can they be used with stage level predicates unless they are assigned a f-structure with a stage topic. Examine (28) and its f-structure (29):

(28) Sometimes a boy meets a girl.

(29) $sometimes_{sTOP_t}$ [a boy meets a girl]$_{FOC}$

Here, a set of times $\{t_i,\ldots t_n\}$ are derived exactly as *some students* was derived in section 2.2. The focused sentence is then assessed with respect to each of these times. (The stage topic also includes a location supplied by context with respect to which the sentence is assessed.)

What I have argued so far is that any individual NP topic will have wide scope with respect to any quantifier in the focus constituent. This follows from the predication rule, in

which the focus is predicated of the topic. I have also argued for a class of unscoped readings. These are the cases in which the whole sentence is predicated of a stage topic. It follows that if the stage topic is overt, any quantifier phrase included in it will also take wide scope. None of the following are predicted to be ambiguous:

(30) a. In every city, John loves someone.
b. In every city, someone loves you.
c. In some city, John loves everyone.
d. In some city, everyone loves you.

This paper showed that scope can be read off f-structure. It was argued that the topic takes wide scope because predication involves assessment for truth value of each individual member of a restrictive topic set.

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Focussing on Lexical Nuclei

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I The English middle construction

The middle construction provides a window into the lexicon because, while many verbs do enter into the middle, many do not. By studying the middle, we can get insight into how different verbs are classified, as well as into which components are relevant in verbal classification.

Our theory of the structural representation of verb classes in the lexicon, together with the theory of focus structure, and the interaction between the two, provides an account for the restrictions on the middle as well as on its interpretation. The middle is illustrated in (1):

(1) a. This kind of glass breaks easily.
b. Soft bread does not cut.
c. Heavy doors close with difficulty.
d. This type of vegetable cooks fast.
e. These new stoves clean easily.

but not all verbs can be middles. Consider (2):

(2) a. *Large bears do not kick easily [ungrammatical as middles]
b. *Rabbits chase easily
c. *Unpopular people do not phone
d. *Romance languages know well
e. *High summits reach with difficulty

Roberts (1985) and Hale & Keyser (1988) have argued that middles are restricted to change of state verbs, i.e., verbs that describe a change of state in the entity denoted by their object

NP. Thus, they have argued, the subject of the middle can only be the so-called 'affected theme' of a verb.

There is further evidence for distinguishing the class of verbs that involve the representation of a state. Rapoport (1993) argues that object-hosted depictives are possible only with change-of-state verbs. Thus, the examples of (3), using the verbs of (1), are grammatical:

(3) a. Smith broke all the glasses new.
b. The baker cut the bread hot.
c. They closed the door wet (with paint).
d. Jones cooked the vegetables fresh.
e. Paul cleaned the old stove unplugged.

but those of (4), with the verbs of (2), are not:

(4) a. *Herman kicked the bear tired
b. *Eleanor chased the rabbit small
c. *Mary phoned Terry drunk
d. *I knew that song new
e. *Sara reached the finish line stretched

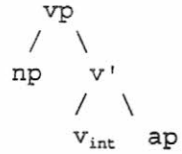
So, the same verbs that can be middles allow the object-hosted depictive predicate.

II Lexical Representation

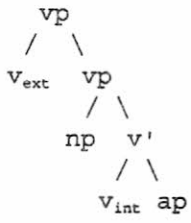
The theory we base ours on is that of Hale & Keyser (1991, 1993). Their lexical structures are based on aspectual classes. This correlation, in fact, as we will see, is not exact. The verb's behaviour is predictable more from the lexical structures than from a Vendlerian classification.

Examples of three of these structures are in (5):

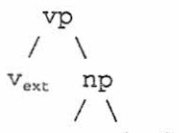
(5) a. inchoative



b. causative



c. activity



In Hale and Keyser (1991), the lexical representation of a verb is itself a syntax. The verb projects a certain structure (which is also projected into the syntactic level). Each label in the lexicon is a universal category, although realization in individual languages may differ and there may be more than one categorial realization of a single lexical category in any one language.

Each of the lexical categories is identified with a particular notional type: v is associated with the type event (dynamic); n denotes entities, instances; a denotes states, attributes; and the notional type of p is interrelation (spatial, locational, etc).

Lexical categories project unambiguous syntactic structures (i.e., binary branching at most) and only one intermediate (bar) level. Arguments are restricted to the complement and specifier positions.

In this theory, predication is a basic relation: According to Hale & Keyser, ap and pp are lexical predicates: a full interpretation principle, one of predication, forces the appearance of the internal subject in lexical representation. This is the case in inchoatives, for example. VPs, on the other hand, are not predicates at the lexical level. VP_{ext} is not a predicate until the syntactic level, when it can associate with INFL. Thus, it is only at the syntactic level that the VP_{ext}'s subject is represented. This subject receives the interpretation

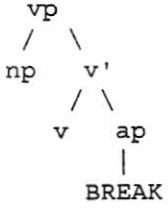
of 'causer' or 'bringer about' (which includes 'agent'). Activities and causatives, then, have no lexical subject. We have marked the v heading the lexical representation of such verbs: v_{ext}.

In Hale & Keyser, every verb is associated with one of these structures. Each particular meaning results from head movement and incorporation into the various heads of the structure. In our theory, essential meanings, termed 'nuclei', are associated with these lexical semantic skeleta. However, the particular lexical nuclei do not originate in association with a particular structural position. Rather, the nuclei are inserted freely into any of the possible positions in the set of lexical aspectual structures (although, certainly, movement is not ruled out as an option).

Thus, a nucleus like BREAK can be inserted into V_{int} of (5a), which yields the inchoative 'break': the glass broke. and when inserted into v_{ext} of (5b), the result is the causative 'break': Mary broke the glass.

As we can see, nuclei are, in principle, compatible with more than one structure. Insertion, then, is free, so the nucleus BREAK can also be inserted into the ap state position, yielding the association in (6):

(6)



It is this particular lexical association that yields the middle reading, in this case 'NP breaks' or 'NP breaks easily'. It is crucial to our analysis that this association is lexical.

Thus, an association with the v_{int} position, which yields the inchoative, and an association with the ap, which yields the middle, will project differently into syntax, although both will end up as verbs on the surface, as required by the headedness of the entire structure by a v.

In the case of the middle, the association of the nucleus with the ap (state) lexical position, yields the middle's stative interpretation. Because the middle interpretation is the one derived when the verb nucleus is in the ap position in this particular structure, the middle verb must attribute a property to the np_{int}, its subject. As noted in Rappaport-Hovav and Doron (1990), middles are individual-level, as well as stative. Thus, middles are apparently restricted to change-of-state verbs, that is, ones that include this ap position.

But some verbs that are not obviously change-of-state verbs can also be middles, as we see in (7):

(7) a. The car drives easily.
b. This piano plays easily.
c. Novels by Linor read well.

Recall that verbal nuclei are freely inserted into the lexical structures. So a nucleus can be inserted into any of the possible positions in the structures in (5). As long as an interpretation is possible, the result is well-formed.

So the nuclei of so-called activity verbs, that can be inserted into the activity structure in (5c), can also be inserted into the causative structure (5b), as we see in the well-formedness of the object-host depictive sentences that these verbs head, as shown in (8):

(8) a. I drove the car freshly-painted.
b. I played the piano newly-tuned.
c. I read the paper hot off the press.

More evidence of the possibility of insertion of the nuclei of verbs like drive and play

into structures representing a state is found in the well-formedness of the middles of (7), derived from the association of (6), i.e., the nucleus inserted into ap. But in order for the nucleus to be interpreted in this position, it must be able to define a property of its subject np. This is indeed possible with the middle verbs of (7): A car can be understood as being in a driven state, a piano is something that can or cannot be in a played state. If the nucleus associated with ap can describe a characteristic property of its subject np, then that association can be interpreted and the result is a grammatical middle.

As Condoravdi (1989), who also argues against an affectedness constraint, puts it: "the generalization expressed by the middle is understood as stemming from some inherent, characteristic properties of the entity denoted by the subject NP." She does suggest that such properties are those that we construe as essential structural properties in our mental conception of physical objects, that the middle often denotes some change in material integrity, qualities of shape and size etc., and it is these internal structural properties that determine the progress of changes in the entity denoted by the subject.

In our analysis, such structural change is not a necessary concept in accounting for the middle, although it is true that in general, people do tend to characterize objects more by their state (as in the middles of (1)), and less by what one can do to them, as in the middles of (7). For us, any time the ap can be interpreted as describing some intrinsic characteristic of the np, the middle projected from this structure is well-formed. This point is again illustrated in the contrast in (9):

(9) a. This cart pushes easily.
    b. *This boy pushes easily.

A cart can be characterized as being in a pushed state or not, whereas a boy cannot be so

characterized (although it is certainly possible to push one).

In this way, our analysis includes the observation of Rappaport-Hovav and Doron (1990) that what is crucial to examples like those in (7) is that the NP, such as a car, for instance, is an artifact, inherently characterized by the use for which purpose it was produced. An event of driving, for example, is a fulfillment of this purpose, i.e., it is an event of bringing it about that the respective artifact is implemented. However, artifact-implementation, although in the general spirit of what we are proposing, is too narrow a restriction, as we see in the examples of (10):

(10) a. This meat will eat well.
b. The wine drinks well.

Meat is not produced for the purpose of our eating it, but meat is inherently edible. Thus, the ap 'eat' describes a characteristic property of meat, and so an np headed by 'meat' can be the ap's subject in the structure of (6).

We conclude that any verb that can be interpreted in the structure and association of (6) can form a middle. Thus, the contrast in (11):

(11) a. *This wall hits easily
b. Baseballs are hitting easily this season.

Baseballs, not walls, can be characterized as being in a hit state. Hit, then, can be in the state structure, as further evidenced by the grammatical object-hosted depictive of (12b):

(12) a. *Billy hit the wall wet
b. Billy hit the ball (over the fence) wet.

A verb that includes the ap position, then, is not necessarily a change-of-state verb, but is any verb that can be interpreted as describing an intrinsic state.

In this way, we explain why, despite an apparent verb class restriction, activity verbs can indeed enter into the middle. It is due to facts like these that we claim that our theory, based on the aspectual lexical structures of Hale and Keyser, predicts more accurately the behaviour of verbs in syntax than does a strict Vendlerian aspectual classification.

III The Role of M

In our structures (as opposed to those of Chierchia (1989) and Rappaport Hovav and Levin (to appear), for example), the middle and inchoative do not have the complex lexical structure of transitive causatives, and no external argument np is represented. Although it is true that some circumstance brings about certain changes, like glasses breaking, for instance, we believe that knowing this has to do with our real world knowledge and does not need linguistic specification as well. It follows from this analysis, then, that the middle verb is not necessarily agentive, counter to the arguments of Keyser & Roeper (1984) and Fagan (1992), who cite examples like those in (13):

(13) a. *This kind of bread cuts easily all by itself
b. *This book reads well all by itself
c. *This table cleans easily all by itself

The argument is that all by itself implies 'without aid', which is not compatible with the presence of an implicit agent; hence, the ungrammaticality. We claim, rather, that the apparent agentivity of the middle has nothing to do with the middle construction itself, but rather with the type of verbal nucleus entering into it.

Certain verbs have a means/manner/instrument component, which we have termed 'M'. The apparent agentivity of the middle is simply due to the presence of this M in the lexical

representation of the middle verb. When the nucleus has M, it is understood as agentive, whether or not an agent is present, and thus the middles of (13) are ungrammatical. When the nucleus has no M, on the other hand, it is not inherently agentive, and so the middle headed by it is not interpreted as agentive. And indeed, the addition of all by itself with these M-less verbs does not result in ungrammaticality, as the examples of (14) show:

(14) a. This kind of glass breaks easily all by itself.
b. Those heavy doors always open easily all by themselves.
c. This vegetable cooks easily all by itself.
d. My favourite apples redden easily all by themselves.

So M, which has an effect on the interpretation of middles, is one way to classify nuclei, as we now demonstrate.

In any lexical theory, such as those of Hale & Keyser, Rappaport Hovav & Levin, and Ritter & Rosen, principles determining the compatibility of various nuclei with various skeleta are necessary. M provides one such restriction.

Nuclei with an active M can be interpreted only in v_{ext} position, because M must head a predicate. This is not entirely different from Hale & Keyser's claim that Manner necessarily relates to the external argument or agent. Since v_{int} does not head a lexical predicate, M is not interpretable in this position. It follows that M-verbs don't form inchoatives since M is not interpretable in v_{int}:

(15) a. *The city destroyed
b. *The house decoratede
c. *The paper cut
d. *The material crushed

However, Non-M verbs *do* form inchoatives:

(16) a. The glass broke.
b. The door opened.
c. The airplane disintegrated.
d. The apples reddened.

Inchoatives thus provide a diagnostic for M. Verbal passives provide another diagnostic for M. Only M-verbs form complete verbal passives (cf. Grimshaw and Vikner (1991):

(17) a. The dress was cut/ruined/damaged.
b. *The glass was broken/frozen/melted [incomplete]

M verbs can be separated into two classes: those which have an identifiable manner (*cut*) and those for which no particular manner can be identified (*destroy*). Inserting a nucleus into ap forces the subordination of M, possible only if M is separable, i.e., identifiable. *Cut*'s M is identifiable, i.e. a specific 'cutting' instrument is involved. Therefore *cut* can be inserted in ap, its M is thus subordinated, and an interpretation is possible, yielding the middles:

(18) a. Soft bread does not cut.
b. This material crushes easily.
c. Dry clay shapes with difficulty.
d. This cloth dyes quickly.

Subordinated M does not play a syntactic role, i.e., when M is inactive, the agent which is associated with M is not syntactically available:

(19) a. *This bread cuts (easily) to feed an army
b. *This book reads by intelligent people
c. *What the table does is clean

Constrast (19a), for example, with *Mary cut the bread to feed the army* in which the verb is interpreted in v_{ext} position, where M is not subordinated. (Of course, subordinated M still has an effect on interpretation, as was noted regarding the agentivity of some middles.

Destroy's M is not identifiable. Destroying is a complex event which describes a

process, i.e., some activity is necessarily involved. There is, however, no one way of destroying:

(20) a. The frost destroyed my garden (by freezing the plants).
b. The fire destroyed the house (by burning it).
c. The thorny branch destroyed my dress (by tearing it).

This, we argue, follows from the M component inherent in these predicates. Thus M-verbs like *destroy*, although change-of-state verbs, do not form middles:

(21) a. *Small cities destroy quickly
b. *Colorful paintings embellish easily
c. *Public housing does not decorate

Predicates thus fall into the following three classes (examples partially from Lakoff (1977)):

(22) non-M verbs (which can be interpreted in any position, allowing inchoatives, middles and causatives, for example):

break, crumble, shred, tear, shatter, burst, slit, disintegrate

(23) M verbs with identifiable manner (which can be interpreted in ap when M is subordinated as well as in v-ext position):

crush, mash, slice, mince, mangle, demolish.

(24) M verbs with non-identifiable manner (which can be interpreted only in v-ext position, yielding an accomplishment):

destroy, embellish, ruin, decorate.

IV The Focus-Structure of Middles

In order for a sentence to be interpreted it must have a topic and a focus; truth value is assigned by evaluating the predicate with respect to the topic. Individual level predicates (including the middle) are interpreted by assessing the truth of the predicate with respect to

the individual topic. The subject is therefore the only possible topic. In (25), it is John we examine to evaluate the truth of the sentence:

(25) $John_{TOP}$ [is intelligent]$_{FOC}$

In (26), it is this bread that is examined to evaluate whether it has the property of being cuttable with ease, rendering the focus structure:

(26) [This bread]$_{TOP}$ [cuts easily]$_{FOC}$

i.e., it is a property of 'this (kind of) bread' that it becomes cut easily.

However, in (27), the sentence is evaluated *not* by examining the properties of some man, but rather by examining the current situation (what we call a STAGE TOPIC) to see if it has 'a man' in it.

(27) $sTOP_t$ [A man arrived]$_{FOC}$

In this case the whole sentence provides the focus which is predicated of a sTOP. For individual level predicates, where the individual subject plays the role of TOPIC, the VP is the only potential focus.

(28) is the structure of middles after syntactic movement:

(28)

Recall that in our theory the middle verb enters syntax in AP and then moves to V. In the resulting structure CUT is part of a word consisting of an A and an empty V.

Note that focussing on part of a word necessarily results in contrast:

(29) I am advocating PROsecution not PERsecution. (Bolinger, 1961)

Since contrast provides a focus, a contrastive middle is grammatical, as shown in (30a&b):

(30) a. THIS bread cuts.
b. Bread doesn't CUT, it SLICES.
(contrast in characterization of final state of bread)
c. *Challah doesn't SLICE, it TEARS.

In (30c), the contrast is in the means of arriving at that state, hence M is contrasted, thus conflicting with its subordination. The contrastive f-structure of (30a) is shown in (31), in which the contrastive element is focused within a contextual topic-set.

(31) $\left[\left\{\begin{array}{l}\text{this bread}_{FOC}\\ \text{that bread}\end{array}\right\}\right]_{TOP}$

The context provides the topic-set consisting of two kinds of bread. This bread is focused from within this set. Thus an unmodified middle is necessarily contrastive. Without a contrastive context an unmodified middle is ungrammatical, as in (32):

(32) *This bread cuts

When CUT's M is subordinated, the result *This bread cuts* is ungrammatical without the addition of one of the following: contrastive stress, negation, a modal, or an adverb. We argue that these elements are required by focus structure principles. The f-structure of the individual-level middle form necessarily takes the subject as the topic, leaving the VP as the only potential focus. However, the nucleus is in the incorporated A of the V and so cannot constitute a noncontrastive focus; thus the f-structure is defective if a contrastive context is not provided.

A legitimate f-structure can be derived by adding *any* focussable element. The f-

structures of such augmented middles are shown in (33) (Examples partially from Fagan, 1992):

(33) a. [This bread]$_{TOP}$ [cuts easily]$_{FOC}$ or: [This bread]$_{TOP}$ cuts [easily]$_{FOC}$ (contrast)
b. [The shoe chest]$_{TOP}$ [stows on floor or shelf]$_{FOC}$
c. [This kind of glass]$_{TOP}$ [breaks daily]$_{FOC}$
d. [This kind of glass]$_{TOP}$ [doesn't break]$_{FOC}$
e. [This kind of glass]$_{TOP}$ [can break]$_{FOC}$

The requirement that some element must be added thus reduces to the requirement that every sentence must have a focus. However, not every modifier yields a grammatical middle:

(34) (Examples partially from van Oosten, 1977):

a. *The floor cleans willingly.
b. *The farm wagon pulls if we have a horse.
c. *The tent puts up in my back yard.

These verbal modifiers modify M and thus force the focussing of M, which conflicts with M-subordination, resulting in ungrammaticality. The contrasts in (35) & (36) are thus explained.

(35) a. *This bread cuts carefully.
b. This bread cuts quickly/easily.

(36) a. *In this factory glasses break with a stone.
b. In this factory glasses break daily.

Condoravdi (1989) assigns a different interpretation to middles. Her interpretation of (37a) is represented in (37b):

(37) a. This bread cuts smoothly.
b. G [e: bread (x), cut(e), Patient (e,x)] [smooth (e)]

i.e., given the occurrence of some event of cutting this bread by some agent, the event

progresses in a smooth fashion. The parallel f-structure is given in (38):[1]

(38) [bread-cutting event by some agent]$_{\text{TOP}}$ [smooth]$_{\text{FOC}}$

Condoravdi argues that without the adverbial the nuclear scope is devoid of content. Her approach is thus similar to the one proposed here in that anything that provides the nuclear scope with content licenses the representation. It is not, however, clear how an account of the fact that contrast licenses middles could be represented in her logical form representation.

This paper employed the middle construction to demonstrate the possibilities available to a free insertion lexical model combined with the interpretive principles of focus structure.

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[1] The Topic functions as a restrictor and the focus as the nuclear scope.

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Changing the Context. Dynamic Semantics and Discourse

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This paper is an informal introduction to some aspects of dynamic semantics. It is a compilation of earlier reports on joint work with Frank Veltman. The opening section can also be found in Groenendijk et al. 1996a. Section 3 is drawn from Groenendijk et al. 1995a. Some of the discussion in section 4 derives from Groenendijk et al. 1996c.

1 Setting the stage

1.1 Context and interpretation

Within the logical-semantical tradition, the meaning of a sentence is (often) equated with its truth conditions: to know what a sentence means is to know in which circumstances it is true or false.[1] In more up-to-date approaches,[2] however, the meaning of a sentence is identified with its context change potential: to know the meaning of a sentence is to know how it changes a context.

The difference is not that the context dependent nature of interpretation is taken into account. The importance of contextual factors is generally acknowledged within traditional logical semantics, too. Usually, truth conditions are stated relative to both a model of the world, and certain other parameters which provide contextual information, such as the time and place of the utterance, its source and addressee, and possibly other features of the utterance situation.[3]

What *is* new, is the focus on context *change*: interpretation not only *depends* on the context, but also *creates* context. This is why the more fashionable approaches are

1. Formulated in terms of truth conditions, this picture seems inherently restricted to indicative sentences. However, without much difficulty it can be extended to other sentence moods. For example, in an analogous fashion, the meaning of an interrogative sentence can be equated with its answerhood conditions: to know what an interrogative sentence means is to know what under which circumstances counts as a true answer. (See Groenendijk and Stokhof 1996 for argumentation and an overview.)
2. Such as game theoretical semantics (Hintikka 1983; Hintikka and Kulas 1985), discourse representation theory (Kamp 1981; Kamp and Reyle 1993), file change semantics (Heim 1982; Heim 1983), update semantics (Veltman 1996), dynamic semantics (Groenendijk and Stokhof 1991; Chierchia 1995).
3. Within the formal semantics tradition, this development is associated with the pioneering work of Montague, Kaplan, Lewis, Cresswell. (Partee 1996 gives an extensive overview of this tradition.)

often advertised as 'dynamic'. In taking both context dependency and context change into account, dynamic approaches to interpretation confront the hermeneutic circle. Of course, it is not the observation of the interdependency of context and interpretation that is original, but rather its incorporation within a formal framework.[4]

Studying the way in which context is constructed (and deconstructed) is particularly relevant for discourse analysis. This brings another novelty to the fore. Whereas traditionally semantics concentrated on the interpretation of single sentences, dynamic theories have discovered discourse. Again, the observation that the interpretation of a sequence of sentences, more often than not, cannot simply be equated with the interpretation of the logical conjunction of its components is far from original. However, not dumping such matters in the pragmatic wastebasket, but taking them to heart in semantics proper, might be called an innovation.

1.2 Context and information

If one restricts oneself to purely informative discourse, one can look upon context change as information change, and hence upon interpretation as an incremental process of updating information. A context can be identified with an information state, and the meaning of a sentence can be characterized as an update function on information states.[5]

Information is usually partial (and need not be correct). One way to model information is to look upon an information state as a set of possibilities, viz., those possibilities which are still open according to the information. If information concerns 'the world', an information state can be identified with a set of possible worlds, each representing a different way the actual world could be as far as the information goes. On this view, extending information about the world amounts to the elimination of certain possibilities. If an information state is updated with a sentence, those worlds are eliminated in which the sentence is false, leaving only worlds in which the sentence is true.[6]

Note that dynamic interpretation is defined here in terms of truth conditions: if this would be the complete and correct picture, there would be no reason to *replace* the traditional notion of meaning as truth conditional content by the dynamic notion of information change potential. The latter notion could simply be defined on top of the former.[7]

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4. The present paper, being of an informal nature, does not bear witness to this. But some formal background for the concepts introduced here in an informal way, can be found in Groenendijk et al. 1995b; Groenendijk et al. 1996b.
5. This view is taken, e.g., in dynamic semantics and update semantics, and in some versions of file change semantics. As will become clear shortly, discourse representation theory embodies a different perspective.
6. This so-called 'eliminative' approach to the modeling of information and information change also has a venerable ancestry, being present already in Hintikka's early work on modalities and epistemic logic.
7. This is, basically, the line pursued in early work on context change and presupposition such as that of Stalnaker, and, somewhat later, of Gazdar. For an elegant illustration of the superfluousness of the 'dynamification' of static interpretation, see Dekker 1993b, chapter 5. A thorough historical and systematic overview of the different approaches to the dynamics of interpretation, both from a linguistic and from a logical perspective, can be found in van Benthem et al. 1996.

However, there are several ways to argue that truthconditional content is not the basic notion that oils the wheels of the interpretation engine. One such way is the following.[8] Consider the contrast between the following minimal pair (due to Barbara Partee):

(1) I dropped ten marbles and found all of them, except for one. It is probably under the sofa.

(2) I dropped ten marbles and found only nine of them. ??It is probably under the sofa.

The first sentences in (1) and (2) are truthconditionally equivalent: they provide the same information about the world. Hence, if meaning is identified with truthconditional content, they have the same meaning. At the same time, however, one may observe that whereas the continuation with the second sentence in (1) is completely unproblematic, the same continuation in (2) is not equally felicitous.[9] This points towards two conclusions. The first is that, appearances notwithstanding, the opening sentences of the two examples somehow do differ in meaning, and that, hence, truthconditional content does not exhaust meaning. The second conclusion is that the update effects of a sentence are not restricted to the information about the world it conveys, but may also concern another kind of information, which has to be incorporated in the notion of an information state, too.

1.3 Information and representation

In section 1.1, dynamic theories of interpretation were characterized as subscribing to the view that meaning is context change potential. In section 1.2, it was remarked that some such theories hold that the object of change, viz., context, basically consists of information. And the marbles-example was adduced there as one kind of example that indicates that, besides information about the world, also other information has to be taken into account.

Before turning to the details of such an account, however, we want to give a very brief sketch of another view on context, which will be referred to as the 'representational view'. It localizes the dynamics of the process of interpretation in the incremental build-up of the representation of a discourse. The context of interpretation for an individual sentence is a so-called 'discourse representation structure' (DRS), a representation of the semantic content of the preceding discourse. The sentence contributes its information to the DRS that provides the context for its interpretation, by adding so-called 'discourse referents' and constraints to it.[10]

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8. Other arguments, not involving anaphoric relations, concern presupposition, modality, conditionals and counterfactuals, defaults, tense and aspect, plurality, questions and answers. For discussion and a wealth of references, see van Benthem et al. 1996. A textbook which concentrates on the impact of dynamic semantics on empirical linguistics is Chierchia 1995.

9. Note that if there is a pause between the two utterances, then the sequence in (2) becomes just as acceptable as that in (1). The 'pragmatic effect' of the two opening sentences in all likelihood is exactly the same: we go down on our knees and help to search for the missing marble. What is remarkable, then, is that we first have to start this physical exercise to consider the second sentence in (2) felicitous, whereas in the case of (1) we also consider it so already before we start doing our gymnastics.

10. This characterization of the representational view is drawn from Kamp and Reyle 1993. In this

For example, the interpretation of the pronoun 'it' in the second sentence of the examples (1) and (2) requires that there be a suitable discourse referent in the contextual DRS to which it can be linked.[11] The opening sentence in (1) provides one. It introduces a discourse referent for the group of ten marbles which were dropped, and another discourse referent for the one among them that was not found. In the case of (2), a discourse referent for the group of ten marbles is introduced, and another one for the nine of them that were found. And although it can be *inferred* that one marble is missing, the sentence as such does not introduce a referent for it. Hence, the pronoun 'it' in the second sentence has nothing to cohere to. This is how, in principle, discourse representation theory accounts for the difference between (1) and (2).

The discourse representation structures themselves are not objects of information, but representations of information. They are of a linguistic nature, and as such are not semantic objects. Sentences and discourses are interpreted *via* an interpretation of the DRSs that represent them. The interpretation takes the form of a standard (static) truth conditional interpretation: the meaning of a DRS, and hence of the (piece of) discourse that it represents, is identified with the set of models (possible worlds) in which it is true.

The dynamics of the interpretation process resides solely in the incremental build-up, and not in the semantic interpretation, of the DRSs, and hence, of the discourses they represent. Given that the DRSs that represent them differ in form, but are true in the same models, the difference between the opening sentences of (1) and (2) is not considered to be a difference in semantic content, but one in form, unless one is prepared to look upon the representations themselves as being (parts of) the meaning. If this be the case, the assumption of a language of thought as an intermediary between language and interpretation is an essential ingredient of discourse representation theory: it counts as a mentalistic theory of meaning.

This marks the difference between a dynamic representational theory of interpretation and a dynamic semantics. In a dynamic semantics, contexts are 'objects of information', i.e., semantic objects, not linguistic ones. Consequently, what undergoes change in the dynamic process of interpretation are semantic objects, not representations. Of course, for practical purposes a dynamic semantics for a natural language might be designed using a translation procedure into a logical language. But in principle it should be possible to do without such a representational level. Hence, the resulting theory of

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textbook on discourse representation theory, DRSs are introduced as belonging to a 'language of thought', where it is stressed that in order to play their role in a theory of meaning, the DRSs themselves are in need of (model-theoretic) semantic interpretation. Somewhat confusingly, they are sometimes referred to as information structures, a characterization which is also is used for the models in terms of which they are interpreted. Likewise, they are sometimes said to represent sentences, or larger pieces of discourse, and they are also characterized as representing the semantic content of discourse. The latter is taken here as the most appropriate description of their ontological status.

11. Discourse referents can best be compared with syntactic variables. They are expressions of the representation language. They are not themselves referents of expressions. And they (usually) do not refer to a particular object. As is generally the case with variables, their meaning resides in the variety of possible objects that can be assigned to them. For a thorough logical investigation of these matters, see Vermeulen 1994. Historically, discourse referents go back to early work of Karttunen.

meaning can remain neutral with respect to the existence and the nature of a language of thought. It is compatible with mentalism, but it is not wedded to it.[12] However, besides such abstract philosophical and methodological questions, there is also the empirical issue of descriptive adequacy: are representational and non-representational approaches equally successful in explaining the linguistic data? And, to be sure, that issue can be settled only in the long run, by detailed investigations of concrete phenomena.

2 Interlude

In the preceding section the contours of a dynamic semantics were sketched. An example was given of a difference in meaning which cannot be accounted for as a difference in truth conditions. The diagnosis was that two sentences may provide the same information about the world, but different 'discourse information'. This view was contrasted with an alternative approach which localizes the difference at a representational level, rather than at the level of semantic content.

In section 3 the potential of a dynamic semantics will be illustrated by showing that it provides a natural framework for an analysis of anaphoric definite descriptions and certain other anaphoric noun phrases in terms of contextually restricted quantification. This particular example is chosen also because it seems to present an empirical challenge for a representational approach. The discussion that follows remains at an informal level, but it takes place against the background of the more formal presentations in Groenendijk and Stokhof 1991; Groenendijk et al. 1995b; Groenendijk et al. 1996b. The various notions that are used rather casually here are intended to be in close correspondence with their formal counterparts defined in these earlier papers.

We focus on (singular) anaphoric definite descriptions, treating them—together with certain other anaphoric terms—as quantifiers, where quantification is dynamic and contextually restricted. The analysis is in line with the philosophy of Neale 1993 and Ludlow and Neale 1991, who defend a uniform Russellian, i.e., a quantificational analysis of the semantics of definites and indefinites, explaining apparent non-quantificational aspects in (epistemic) pragmatic terms. The contribution to this stock of ideas is twofold: quantification is dynamic—which accounts for binding relations across the syntactic scope of quantifiers—; and, when appropriate, restricted to context sets—which makes sense of the uniqueness preconditions of anaphoric definite descriptions and the preconditions of other kinds of anaphoric terms. The idea that (anaphoric) definite descriptions involve context dependent quantification is not new, of course. However, the mechanisms building up contextual domains have remained largely unexplicated. Dynamic semantics seems to provide a suitable framework for analyzing these mechanisms. In combination with its dynamic quantificational mechanism, it allows an easy switch between absolute and restricted quantification.

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12. For a more extensive discussion of the issue of representationalism, and the related question of compositionality of interpretation, see Groenendijk and Stokhof 1991; Groenendijk and Stokhof 1990; Kamp 1990. Cf., also Janssen 1996.

Also, an argument will be presented against an alternative approach to anaphoric definite descriptions, which accounts for their anaphoric nature by co-indexing them with a specific term in the context. Some examples will be provided which are intended to show that—at least in some cases—co-indexing cannot do the job, whereas contextually restricted quantification can. As it seems to be the case that in those cases where co-indexing does work, contextually restricted dynamic quantification can also be used, the hypothesis that the latter is to be preferred as a general mechanism seems not unwarranted.[13]

In section 4, some attention is paid to differences in behavior of anaphoric definites in various kinds of discourse. Besides monological texts, dialogues provide another kind of context in which they may occur, with slightly different conditions on the appropriateness of their use. One of the relevant factors is the nature of the information that speech participants have at their disposal, and may or may not share. By taking a closer look at these issues, a more subtle notion of information, and information change can be obtained. However, the empirical field of definites and anaphora is vast and treacherous. Here, we can only scratch the surface, and deal with a few, relatively simple examples. Further research is called for to really take the present analysis to the test.

3 Anaphoric descriptions and context

3.1 Two kinds of information

From the discussion of the examples in (1) and (2), we concluded that information states should contain two kinds of information: information about the world, and discourse information. In the end, it is information about the world that counts, but in acquiring such information through discourse, one also has to store information pertaining to the discourse as such. For example, in order to be able to resolve anaphoric links across utterances, one has to keep track of the discourse items, viz., the 'things' which were talked about. At present, this is the only kind of discourse information we take into account.

Information about the world is modeled as a set of possible worlds. The possible worlds which are present in an agent's information state should be looked upon as alternative ways the world could be as far as the partial information of the agent goes. As information about the world grows, some such alternatives will be eliminated. According to this picture, growth of information about the world amounts to elimination of possibilities.[14]

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13. No claim is being made that *all* anaphoric terms can be treated in this way. In earlier papers (Groenendijk and Stokhof 1991; Groenendijk and Stokhof 1990; Groenendijk et al. 1995b; Groenendijk et al. 1996b), (singular) anaphoric pronouns are analyzed by means of co-indexing, i.e., as bound variables, where the dynamics of the binding mechanism allows for variables to be bound outside the syntactic scope of a quantifier. The present paper remains neutral with respect to the question whether a co-indexing mechanism or contextually restricted quantification is most suitable for the interpretation of anaphoric pronouns.

14. According to this picture, partiality of information is modeled in terms of the presence of several

The modeling of discourse information is restricted at present to keeping track of items which are introduced by the discourse. Extending discourse information amounts to inserting new items. An initial state will contain no discourse items. As discourse goes on, the number of items grows. Once the discourse has ended, discourse information can be discarded, and the items can be deleted. Inserting and deleting items can also occur locally, triggered by the interpretation of particular parts of the discourse, even certain parts of a single sentence.

Discourse information is linked to information about the world. A link is a possible assignment of an object to each of the discourse items, an object which—relative to a particular possible world and the values of the other items—could be the value of the item in question. When a new item is added, the possible links are extended to cover the new item. More than one such extension may be possible, which means that one link can subsist in several others. It may also happen that further information provided by the discourse about the items leads to the elimination of one or more possible links. Since links are relative to possible worlds, this may lead to the elimination of a world: cut its last link and you eliminate a possible world. Discourse information can make a world of difference.

For the purpose of illustration, information states can be depicted as simple matrices, as is shown in the figures below.[15] An initial state consists of a single column, where each field in the column is filled with a possible world. The introduction of a discourse item adds a new column to the matrix.[16] The fields of the new column are filled with an object that could be the value of the item with respect to the world in the first column. Since there can be more than one such possible value, adding a new column may result in having several different rows in the new matrix, which extend the same row in the old matrix. However, an old row may also disappear, in case it is impossible to assign a suitable value for the new field with respect to that row.

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alternatives, where these alternatives—possible worlds—are total objects. There is an obvious alternative way of picturing partiality, viz., by modeling it in terms of a partial object, a partial world or situation. According to the latter picture, growth of information amounts to extending the situation. We opt for the eliminative picture here, because it is technically more simple.

15. Pictures can be illuminating. But they can also easily mislead. Representing information states as simple matrices has its limitations. It suggests that information states are small, finite objects, whereas in fact they are usually infinite. It is also important to keep in mind that—unlike the boxes of discourse representation theory—the matrices do not represent discourse, but depict the result of interpreting discourse. They are filled with model theoretic objects, represented in the metalanguage, not with expressions of the object language.

16. We do not take into consideration here the possibility that 'discourse' items come to life by other means than explicit discourse. For example, the salient presence of an object in the visual field shared by two or more agents may lead to the creation of a discourse item, too. (Cf., footnote 9 for a case of salient absence.)

Furthermore, it may happen that, although an item is not explicitly introduced by the discourse, it is implicitly present on the basis of what has been said. The latter may be thought to occur in case of the anaphoric use of the definite 'the captain', after one has talked about a ship, without explicitly having mentioned its captain. See Dekker 1993a for an analysis of implicit arguments in a dynamic setting.

w_0
w_1
w_2
w_3

(a)

w_0	Alf
w_0	Bill
w_0	Chris
w_1	Alf
w_1	Bill
w_1	Chris
w_2	Alf
w_2	Bill
w_2	Chris
w_3	Alf
w_3	Bill
w_3	Chris

(b)

w_1	Alf
w_2	Alf
w_2	Bill
w_3	Alf
w_3	Bill
w_3	Chris

(c)

Figure 1: [Initial state] *(a)* A man *(b)* walks in the park. *(c)*

3.2 A man

Suppose an agent has the following information: Either no man walks in the park, or only Alf does, or both Alf and Bill do, or all men in the domain of discourse—Alf, Bill and Chris—are strolling there. Furthermore, he has the information that only Bill is wearing blue suede shoes.[17]

If these are the only relevant pieces of information, the information state of the agent can be depicted as in figure 1a, a one-dimensional matrix just consisting of four possible worlds. (The subscripts are used as a mnemonic device, to indicate how many men are walking in the park.)

Now suppose the agent is told the following:

(3) A man is walking in the park.

The initial information state depicted in figure 1a is transformed into state 1c, where the intermediate state 1b exemplifies the effects of processing the indefinite term 'a man'.

Interpreting an indefinite involves the introduction of a new discourse item in an information state, i.e., the addition of a new column to the matrix. With respect to each possibility in the initial state, there are three possible values to assign to the new field, since there are three men in the domain of discourse. So, for each of the four possibilities in 1a, we obtain three extensions in the intermediate state 1b, one for each man in the domain of discourse.

17. It is not thàt essential for the example, but the description of the information of the agent is to be taken in such a way that it is about objects, about the interpretations of expressions of the object language. For example, the description of the information is to be understood in such a way that the agent may very well not know which of the three men is called Alf, which one is called Bill, or which one is called Chris. In our description of the information of the agent, 'Alf', 'Bill' and 'Chris' function as expressions of the metalanguage to name these three objects. They are not the homophonous names of the language that the agent shares with other agents.

Processing the remaining predicative part of the sentence results in the elimination of rows in which the man that is the value of the new field, is not walking in the park in the world of that row. This means that in the resulting state 1c, world w_0—the world in which no man walks in the park—drops out of the picture. And each of the other three possibilities in the initial state subsists in as many extensions as there are men walking in the park in the world of that row, with one of those men as a possible value of the newly introduced discourse item.

Indefinites are interpreted in terms of dynamic existential quantification. The quantificational effect can be seen in figure 1 from the fact that world w_0, a world in which it is not the case that there is a man who walks in the park, is eliminated. This would be the only effect of ordinary 'static' existential quantification. In addition, the dynamic effect is that a new item, a new object of information, is now available in the resulting information state: a man who walks in the park. It is a partial, indefinite, non-identified object. Its presence in the information state makes it possible to refer back to him—the man who walks in the park.[18]

3.3 Context sets

As can be observed from the way they are depicted, information states come naturally with a contextually restricted domain of discourse. In each possibility there is not just the global domain of discourse, consisting of all the objects that live in the world of that possibility, there is also the restricted set of the objects which in that possibility are the values of the discourse items. This set is called the 'context set' of that possibility.In the states depicted in figure 2 below, the context set consists in each possibility of a single individual. And in the states depicted in figures 3b and 3c, the context set in each possibility consists of two objects.

Quantification restricted to context sets was first introduced and studied in Westerståhl 1984. He stresses the point that a context set is to be distinguished from a universe of discourse. Unlike the latter, the former is not constant over pieces of discourses. Westerståhl only considers 'the formal framework for context sets, leaving (the more difficult) question of *how* context sets are chosen to more ambitious semantic theories'. In the present set-up, context sets are not subject to choice, but are constructed (and deconstructed) in a deterministic fashion through the interpretation procedure. In principle there is a choice to be made when one meets a term in a text: that between absolute and contextually restricted quantification. But once one has opted for the latter, the relevant context sets are simply provided by the contents of the information state at that point, leaving one no further choice. The context sets do have the characteristic features of being relatively small and in constant flux, because they depend on the discourse items, which have a relatively short life span. The fact that information states come with context sets can be used to interpret anaphoric terms as contextually restricted quantifiers. The general picture is as follows.

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18. A pioneering work on the role of information in semantics in general and on the nature of partial objects as objects of information in particular, dating from pre-dynamic days, is Landman 1986.

The update associated with an anaphoric term is characteristically partial and comes with a precondition, making a certain requirement on the actual contents of the context sets of the possibilities of the input state. Either the state has to already support the requirement, or—in case accommodation is permitted[19]—it should be consistent with it, i.e., it should be possible to update the state in such a way that afterwards it meets the requirement.[20] If the state can not (be made to) meet the precondition, the interpretation procedure aborts. If it can, the process continues along the following lines. A new discourse item is added, and the possible values of the new item are determined relative to the objects in the context sets, in a way which depends on the quantificational nature and the descriptive content of the term. Invariably, if it succeeds, the procedure as a whole will output a real extension of the input state.

3.4 The man

As for anaphoric definite descriptions,[21] they have as their precondition that within the context set of each possibility, i.e., among the values of the discourse items in a row, there is a unique object that satisfies its descriptive content. If this condition can not be fulfilled, the updating process comes to a halt. If it can, the definite description introduces a new discourse item, and in each possibility, the value of the new item is the unique object in the context set that satisfies the content of the description.[22] Note that the uniqueness requirement is far from absolute. Not only does it allow that in the world there is more than one object that satisfies the content of the description (which absolute quantification would forbid), it even allows that among all the possible values of the discourse items in the state as a whole there are many such objects, also with respect to a single possible world.

Following this recipe, updating the state depicted in figure 2a—the result of updating the sample information state with sentence (3)—with sentence (4), will lead to the state 2c, *via* the intermediary state 2b, which is the result of processing the anaphoric definite 'the man'.

(4) The man is wearing blue suede shoes.

The man that is being talked about has to be Bill, since according to the information of the agent, Bill is the only one wearing blue suede shoes. (But Bill is not the only man, nor is he the only man walking in the park.)

Notice the following. The definite description itself introduces a new discourse item. In the present case, this may seem of little use, since the two discourse items are completely indistinguishable: in each possibility in the information state the two items have the same value. And from here on, they will behave as if they were one and the

19. Accommodation will be left out of consideration in what follows. See Groenendijk et al. 1995a for some discussion.

20. What are called 'pre-conditions' are closely related to presuppositions. For an analysis of presupposition in a dynamic framework see Zeevat 1992; Beaver 1995; Krahmer 1995. For a recent overview of different approaches, see Beaver 1996.

21. For other analyses in a dynamic setting, see Heim 1982; van Eijck 1993; Krahmer 1995.

22. Obviously, this procedure needs further refinement.

w_1	Alf
w_2	Alf
w_2	Bill
w_3	Alf
w_3	Bill
w_3	Chris

(a)

w_1	Alf	Alf
w_2	Alf	Alf
w_2	Bill	Bill
w_3	Alf	Alf
w_3	Bill	Bill
w_3	Chris	Chris

(b)

w_2	Bill	Bill
w_3	Bill	Bill

(c)

Figure 2: A man walks in the park. *(a)* The man *(b)* wears blue suede shoes. *(c)*

same. We will meet other cases, though, where the introduction of a new item by an (anaphoric) definite description will turn out to be essential.[23]

Notice also that we did not introduce a level of logical (or other) form at which the anaphoric relation is *represented*. To account for anaphoric relations at a level of representation would involve some mechanism of co-indexing. We would have to use the same number, or the same syntactic variable in presenting the contribution of 'a man' and 'the man' to the discourse representation. No mechanism of co-indexing plays a role in the update procedure stated above. The anaphoric definite description picks up its antecedent solely *via* its quantificational force and its descriptive content. Again, in this particular case, one might just as well have used a co-indexing mechanism, linking the definite explicitly with a particular discourse item introduced earlier. However, as we will see shortly, in general the two procedures do make a difference.

3.5 Another man

Not only definite descriptions can be anaphoric, virtually any quantifier can be used in an anaphoric way. The indefinite determiner 'another' is a clear case of a quantifier that can only be interpreted by relating it to context sets. Consider:

(5) A man is walking in the park. Another man is walking in the park, too.

Contextual dependence comes in at several points. First of all, there is the precondition that in every possibility there should be at least one man in the context set of that possibility. If not, the interpretation process comes to a halt. If this precondition is met, the state is extended with a new discourse item, the value of which in a possibility is to be a man from the global domain of discourse, which is not yet a member of the context set of that possibility. How many extensions result in the new state for each old possibility depends on how many such men there are.

Consider again our sample state as it was specified in section 3.2. After an update with the first sentence of (5) it results in the state depicted in figure 3a. A further update with the second sentence of (5) leads to 3c, *via* 3b, which present the effect of processing the anaphoric indefinite 'another man'. Note that world w_1—in which only one man

23. If a state contains two indistinguishable items, this is a good reason for cleansing it by discarding one of the two. Doing so saves space and can make no difference for whatever update is still to follow.

walks in the park—has been eliminated. (Just as w_2 would be eliminated if we repeat the last sentence of (5) once more.) In this case, too, no co-indexing is used to account for the anaphoric link. In fact it is hard to imagine how one could call upon co-indexing as a way to account for this kind of anaphoric relation. (Co-indexing seems particularly unsuited to deal with iterated uses of 'another...(yet) another...'.)

The two discourse items that are present in the information state obtained after processing (5) have a special feature. They are quantitatively distinct: in each possibility they have a different value. But they are qualitatively indistinguishable: for each possibility in which the two items have a particular value, there is another possibility which is the same, except for the fact that the values of the two items are interchanged.[24]

The fact that the items introduced in (5) by the indefinite terms 'a man' and 'another man' are quantitatively different, but qualitatively equal, explains why one cannot refer back to a particular one of the two men involved using a singular anaphoric definite description.[25]

3.6 The one and the other

Of course, it is possible to continue (5) and to refer by anaphoric means to each of the two men separately. One way to do so is as follows:

(6) The one is wearing blue suede shoes, the other is not.

Observe that such anaphoric reference is to neither of the two men in particular. We treat 'the one...the other...' as a polyadic quantifier. Its precondition is that the context set of each possibility consists of two different objects which satisfy the descriptive content

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24. Continuing the remark made in footnote 23: here one meets another reason for cleansing information states. Since after processing (5), the two discourse items are qualitatively indistinguishable, there is little use in keeping these two separate items. It would do just as well to have a single item instead, the value of which in each possibility is the *set* consisting of the two men in question. This would halve the number of possibilities in state 3c, since the order in which the two have been introduced is irrelevant. Apart from being more economic, such a cleansing operation would make no difference. We abstain from actually performing them, since plural reference is left out of consideration anyway. For extensive discussion of plurality in the context of dynamic semantics see van der Does 1993; van den Berg 1996.

25. Notice the difference between (5) and (i):

(i) A man entered the room. Another man entered the room.

Unlike (5), it is most natural to interpret (i) as a description of two subsequent events. In that case, as participants in two different events, the two men are qualitatively different, which does make it possible to anaphorically refer back to just one of them using a description such as 'the man who entered first' or, simply 'the first' and 'the second'.

Another case in point is:

(ii) Look! A man is walking in the park. Look! Another man is walking in the park, too.

Apparently, both men are located in the visual field of the speech participants, and hence are distinguishable. That is why here, too, a definite description can be used to refer to a particular one of these two men. For example, one could continue (ii) with 'The first one is my brother'. Such a continuation would be out in the case of (5), under the assumption that there is no additional information, visual or otherwise, from outside the discourse that qualitatively distinguishes between the two men.

In the case of (ii) the indefinites are used referentially: for each of the discourse items introduced by them, its value is the same in each possibility, since —by assumption—the object is observationally present. (See Ludlow and Neale 1991; Groenendijk et al. 1996c.)

w_1	Alf
w_2	Alf
w_2	Bill
w_3	Alf
w_3	Bill
w_3	Chris

(a)

w_1	Alf	Bill
w_1	Alf	Chris
w_2	Alf	Bill
w_2	Alf	Chris
w_2	Bill	Alf
w_2	Bill	Chris
w_3	Alf	Bill
w_3	Alf	Chris
w_3	Bill	Alf
w_3	Bill	Chris
w_3	Chris	Alf
w_3	Chris	Bill

(b)

w_2	Alf	Bill
w_2	Bill	Alf
w_3	Alf	Bill
w_3	Alf	Chris
w_3	Bill	Alf
w_3	Bill	Chris
w_3	Chris	Alf
w_3	Chris	Bill

(c)

w_2	Alf	Bill	Alf	Bill
w_2	Alf	Bill	Bill	Alf
w_2	Bill	Alf	Bill	Alf
w_2	Bill	Alf	Alf	Bill
w_3	Alf	Bill	Alf	Bill
w_3	Alf	Bill	Bill	Alf
w_3	Alf	Chris	Alf	Chris
w_3	Alf	Chris	Chris	Alf
w_3	Bill	Alf	Bill	Alf
w_3	Bill	Alf	Alf	Bill
w_3	Bill	Chris	Bill	Chris
w_3	Bill	Chris	Chris	Bill
w_3	Chris	Alf	Chris	Alf
w_3	Chris	Alf	Alf	Chris
w_3	Chris	Bill	Chris	Bill
w_3	Chris	Bill	Bill	Chris

(d)

w_2	Alf	Bill	Bill	Alf
w_2	Bill	Alf	Bill	Alf
w_3	Bill	Alf	Bill	Alf
w_3	Alf	Bill	Bill	Alf
w_3	Bill	Chris	Bill	Chris
w_3	Chris	Bill	Bill	Chris

(e)

Figure 3: A man walks in the park. *(a)* Another man *(b)* walks in the park, too. *(c)* The one ... the other .... *(d)* ... wears blue suede shoes ... does not. *(e)*

of the quantifier, which in this particular case is empty. Thus, the precondition makes use of the only aspect that distinguishes between the two men (in the discourse): that they are quantitatively distinct. If the precondition is met, two new discourse items are added, and for each old possibility, we end up with two new ones: one extension in which in the field of the two new items we find the values of the two old items in the same order, and one in which we find them in the two new fields in the reverse order. (See figure 3d.)

In view of the 'non-specific' nature of the anaphoric reference, it is impossible to co-index one of the elements of the polyadic definite with one of the two preceding indefinites. In the particular case of (5) followed by (6), this may seem of little importance, precisely because the two items introduced by (5) are qualitatively indistinguishable. However, in general this is something to be reckoned with. Consider the following example:

(7) Alf is walking in the park. Bill is walking in the park, too. The one is wearing a hat, the other is not.

When interpreting the last sentence, we can not associate one of the items introduced by the polyadic definite with a specific discourse item, be it either the item introduced by the name 'Alf', or the one associated with the name 'Bill'. To establish such a specific link, we need additional information, i.e., we need to know which of the two actually is wearing a hat. On the other hand, lack of this information does not prevent us from processing this sequence of sentences. If we had to co-index each of the elements of the polyadic quantifier with one particular item in the context, the uninterpretability of this sequence would in fact ensue, which shows that something like the procedure as it was described above, is called for.

Polyadic anaphoric definite descriptions are not the only kind of anaphora that resist linking to specific discourse items. Sometimes also non-polyadic anaphoric definite descriptions behave in this way:

(8) Eva wrote down a number. She wrote down another number. ... She wrote down another number. She subtracted the smallest number from the largest one.

In order to interpret the terms 'the smallest number' and 'the largest number' we need *not* be able to identify particular discourse items as satisfying their descriptive contents. The term 'the largest number' has as its precondition that in each possibility there is among the objects in the context set of that possibility a number which is greater than all others. Analogously for 'the smallest'. (So, both the definite article as such, and the interpretation of 'largest' and 'smallest' involve contextually restricted quantification.) In the example in question, this precondition is easily met.

But, surely, the largest number we find in the one possibility can be the value of one particular item (i.e., can occur in the field in one particular column), whereas the largest number we find in another possibility can be the value of another item (i.e., can occur in the field of another column). It is precisely this feature that blocks an analysis that proceeds by co-indexing the anaphoric definite description with a particular preceding indefinite.

w_0
w_1
w_2
w_3

(a)

w_1	Alf
w_2	Alf
w_2	Bill
w_3	Alf
w_3	Bill
w_3	Chris

(b)

w_2	Bill	Bill
w_3	Bill	Bill

(c)

Figure 4: B's states. [Initial state] *(a)* A man walks in the park. *(b)* The man wears blue suede shoes. *(c)*

4 From monologue to dialogue

The examples discussed above all concern (small) monologues of a single speaker, and they were discussed solely from the viewpoint of a hearer. In this section we make some observations concerning the more general case of a discourse with more than one speaker. Again we concentrate on anaphoric relations, which across utterances of different speakers will appear to exhibit special features of interest.[26]

4.1 Paying attention

Before turning to dialogue, it is useful to consider the different roles of speaker and hearer in a monological discourse in some more detail, and introduce some relevant notions. Here, there is one speaker, A, providing information, and one hearer, B, paying attention.

Above we considered the following discourse:

(9) A: A man is walking in the park. The man is wearing blue suede shoes.

and discussed its update effects for a hearer who has the following information. Either no-one is walking in the park, or just Alf, or Alf and Bill, or Alf, Bill and Chris; Bill is wearing blue suede shoes. Assuming B is such a hearer, the update effects on his initial state are as recapitulated in figure 4.

The discourse provides the hearer B with new information. After updating with it, he has the information that Alf and Bill are walking in the park, and that maybe Chris is, too. Furthermore, he has the discourse information that the speaker A must be referring to a particular man, viz., Bill, since he is the only one who is wearing blue suede shoes. In the diagram this corresponds to the fact that the possibility consisting of w_0 is eliminated after an update with the first sentence. The other three initial possibilities then still subsist. After an update with the second sentence, only those possibilities subsist where Bill is the value of the discourse item. This means that the initial possibility

26. Analyses of this type of discourse in a dynamic setting are scarce. See Francez and Berg 1994 for a discussion in the framework of discourse representation theory, and Groenendijk et al. 1996c for some more elaborate discussion along the lines of the present paper.

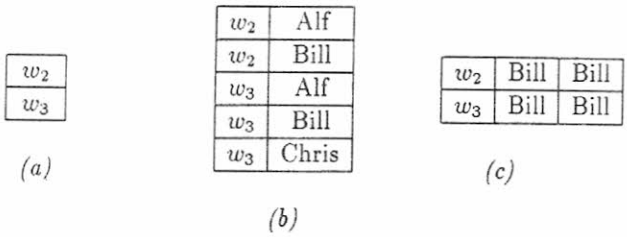

Figure 5: A's states. [Initial state] *(a)* A man walks in the park. *(b)* The man wears blue suede shoes. *(c)*

consisting of world w_1, in which only Alf walks in the park, does not subsist in the final state either.

Observe that the fact that B obtains new information from the discourse, indicates that there is a fundamental difference between speaker and hearer. If a hearer learns something from a discourse this implies that he himself would not have been in the position to utter it sincerely, as we may assume the speaker was. The difference can be explicated in terms of the notion of *support*. For a speaker to utter a sentence correctly it is required that his information state supports it.[27] An information state s supports a sentence ϕ iff every possibility in s subsists after an update of s with ϕ. In other words, for every possibility in s there should be one or more extensions in s updated with ϕ.[28] Clearly, the initial state of the hearer B, as depicted in figure 4, supports neither the first sentence, nor the discourse as a whole, which is why he could obtain new information by updating with it.

A state which does support (9) is the-one depicted in figure 5a. It is actually quite like the final state 4c, in which B ended up.[29] It implies that either Alf and Bill, or Alf, Bill and Chris walk; and that Bill wears blue suede shoes. Obviously, if A is in this state, he can sincerely utter (9), for it supports his utterances.

But equally obviously, this state is not the only possible state that supports (9). For example, suppose another speech participant C believes that Alf is not walking in the park, but that Chris is, and that maybe Bill strolls there, too. Suppose furthermore that C believes that Chris is the only man wearing blue suede shoes. Then—even though his state has no possible world in common with B's initial state—his information also supports the utterances in (9). And note that despite this mismatch between the information of C and that of B, the discourse could still proceed without problems, at least up to that point. Of course, if C were to continue the discourse in (9) by saying: 'It is Chris', it would become apparent to B that something is wrong. If B would try to up-

27. This follows Grice's Maxim of Quality.
28. See Groenendijk et al. 1995b; Groenendijk et al. 1996b for more discussion. The notion of support also plays a key role in the definition of dynamic entailment. Roughly, $\phi_1 \ldots \phi_n$ are said to entail ψ iff every state which is updated consecutively with $\phi_1 \ldots \phi_n$ supports ψ.
29. The difference is that in A's initial state 5a, no discourse items occur yet. But after having produced his discourse, A is in the same final state as B: here, exchanging information results in rare close harmony.

date his state 4c with this additional utterance (linking the pronoun with the discourse item present), the result would be that no possibility remains: the *absurd state*. In other words, B's state 4c is inconsistent with the sentence 'It is Chris'.

The notion of (in)consistency is a key notion for a hearer, i.e., for someone who is paying attention. A sentence ϕ is *consistent* with an information state s iff updating s with ϕ does not lead to the absurd state, the state in which no possibility has remained.[30] If the sentence uttered by a speaker is consistent with the information of the hearer, the hearer can update his information with that sentence. If an update with what the speaker has said results in the absurd state, the hearer knows—on the assumption that the speaker utters the sentence sincerely—that his information is incompatible with that of the speaker. Awareness of this fact, will guide him: he will give notice of the observed inconsistency, and a discussion may ensue in order to find out where the difference of opinion lies, and to try and resolve it.

Consistency and support are important semantical notions within dynamic semantics. The first is hearer-oriented, the second is speaker-oriented. The information state of a speaker has to support the sentences he utters in discourse. A hearer will only be willing to update his information state with pieces of discourse which are consistent with his information.

4.2 Exchanging information

Let us now turn our attention towards dialogue, rather than monologue. Consider again the discourse in (9), but suppose that A utters only the second sentence, after its first sentence has been uttered by a different speaker:

(10) D: A man is walking in the park.
A: The man is wearing blue suede shoes.

There is a difference between A's monologue in (9) and the dialogue between D and A in (10). Suppose that before the discourse starts, A's initial state is again the one depicted in figure 5a, which supports 'A man is walking in the park'. After updating with D's utterance, A is in the state 5b. It appears that—although a discourse item is available in A's information state, which seems to license the use of the anaphor 'the man'—A's utterance is infelicitous nonetheless. This is remarkable, in view of the fact that if A were to have uttered the first sentence himself, he could have followed up by uttering the second sentence without problems. After all, as we saw above the monologue is supported by A's information state.

It does not seem too difficult to explain why A's utterance of the second sentence is problematic. If we compare 5b, the state A is in after having updated his initial state 5a with D's utterance, with 5c, the state that results after updating 5b with his own utterance of the second sentence, we see that not all possibilities in 5b subsist in 5c. Those possibilities in which the value of the item in 5b is not Bill, do not subsist in the final state 5c. In other words, 5b, the state of A after updating with D's utterance, does

30. Again, see Groenendijk et al. 1995b; Groenendijk et al. 1996b for some more discussion.

not support his own utterance.[31]

Intuitively, what seems to be at stake is this. It is D who has introduced the discourse item of a man walking in the park. After D's utterance of the first sentence, there are several possible values of the discourse item. D may intend to delimit these possibilities by adding more features to this as yet indefinite man.[32] A, however, does not seem to be licensed to turn D's indefinite man into a more definite one on his own account.[33]

What this observation comes down to, is that there is a difference in acceptability conditions for the use of anaphoric expressions in monological and dialogical situations. It matters for the correct usage of an anaphoric expression who introduced the discourse item(s) it is linked to.[34]

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31. Observe that also in the monological case, A's second sentence is not supported (in the technical sense) by state 5b, i.e., the state that results after updating A's own initial state with his first sentence. Both the first sentence, and the sequence of the two sentences as a whole, are supported by his initial state, but the intermediate state as it is depicted in figure 5 does not support his second sentence.

32. He may also not intend any such specification, but simply want to draw A's attention to the fact that someone is there; D, or A for that matter, might continue after the first sentence with 'Let's get out of here!'.

33. Of course, if—as in the monological case—A himself has introduced the indefinite man, he is licensed to make him more definite. Continuing footnote 31, that is why there is nothing wrong with A's monologue, even though his intermediate state 5b does not support his second sentence. Continuing footnote 32, it is not unlikely that already before starting his monologue, A *intends* to refer specifically to Bill. The intermediate state in figure 5 does not reflect such intended reference. It reflects who, according to his own information, could be possible referents on the basis of what he has made public himself so far. (By the way, A can never succeed in turning his indefinite man into Chris, i.e., not without loosing support.)

Another example that may point towards the relevance of speaker's intentions is a dialogue-version of the monologue (5), discussed in section 3.5:

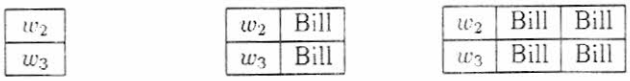
(i) D: A man is walking in the park.
A: Another man is walking in the park, too.

If A, as before, is initially in the state depicted in figure 5a, and, hence, in state 5b after having updated with D's utterance, he might seem to be entitled to utter the second sentence in (i). The result of updating A's own state 5b with his utterance would result in the state depicted earlier in figure 3c. Since from the start A has the information that there is more than one man walking in the park, both D's utterance and his own are supported by A's information. Still, A's use of the anaphoric indefinite 'Another man', does not seem to be tremendously felicitous. In this case, the reason is not that A is making D's indefinite man more definite. He is not. He only adds an equally indefinite, qualitatively indistinguishable, but quantitatively distinct man. However, as we observed in section 3.5, when two qualitatively equal man are present in the context sets, one cannot refer back to a particular one of them by using a singular definite description. This means that A's utterance robs D from the possibility to turn 'his' indefinite man into a more definite one.

Another way to look at it is that D may intend to refer to a (more) particular man. To the extent that intentions are 'private', A is not in the position to choose a man who is different from the one possibly meant by D. Except under special circumstances, he has simply no idea whom that might be.

These questions are closely connected to such issues as speaker's reference, and its relation to semantic reference, referential and attributive use, and so on, familiar from the work of Kripke, Donellan, and others. See Dekker 1995 for some discussion in a dynamic setting.

34. This goes against the assumption made in Francez and Berg 1994 that any sequence of sentences that is acceptable as a single speaker discourse, is equally acceptable as a discourse where the different sentences in the sequence are uttered by different speakers.



(a) *(b)* *(c)*

Figure 6: [Initial state] *(a)* Look [pointing at Bill], a man walks in the park. *(b)* Yeah, the man wears blue suede shoes. *(c)*

4.3 Sharing a perspective

We do not claim that the discourse in (10) is unacceptable under all circumstances. Our claim is merely that the acceptability conditions are different in the monological and the dialogical situation. To be sure, (10) *can* be a correct discourse, be it under rather special circumstances. One such case is where D and A take turns in telling (or making up) a story. But this seems to be a mere variant of the monological case, in the sense that under such circumstances D and A are operating as a single agent, rather than as two agents exchanging information.

More interesting is the case where D and A find themselves in a particular kind of observational situation. Suppose that one man is prominently present in the visual fields of both D and A, in such a way that D can be sure that his utterance cannot fail to draw A's attention to this individual. A realizes this, too, and it seems that it is for this reason that he can use the anaphoric definite to refer to this same individual. The following variant of (10) more clearly exposes these features of the utterance situation:

(11) D: Look! A man is walking in the park.
A: Yeah! The man is wearing blue suede shoes.

But if this is the situation, assuming the initial state of A to be the same as depicted in figure 5a, the result of updating it with D's utterance, together with the non-linguistic information provided by D's gestures and possibly other particular features of the situation, results in the intermediate state depicted in figure 6b, rather than the one in figure 5b. In this case, A's own utterance of the second sentence is clearly supported by the state he is in after D's utterance of the first sentence.[35]

4.4 Appreciating the difference

The observations made above may suggest that for the use of an anaphor to be correct it is sufficient if the utterance of the second speaker in a dialogue is supported (in the technical sense) by the information he has after having updated with the utterance of

35. Similar observations can be made concerning the example (i) discussed in footnote 33. Compare this example with:

(ii) D: Look! A man is walking in the park.
A: Yeah! And look! Another man is walking in the park, too.

Here, the utterance situation prevents A from introducing a qualitatively indistinguishable man in the context, and which individual D intends to refer to, is apparently clear to A. (Cf., also footnote 25.)

the first speaker. However, there are several reasons to doubt this.[36]

Consider again the monologue in (9), uttered by A. Suppose B is again in the initial state depicted in 4a. Suppose B reacts to A's utterance as follows:

(12) A: A man is walking in the park. He is wearing blue suede shoes.
B: It is Bill

Clearly, B's utterance is supported by the information state 4c that he is in after having updated with A's utterances.

There may be situations in which this is sufficient and where the exchange is correct. But suppose that B is rather unsure about A's information. Concerning who are walking in the park and who is wearing what kind of shoes A's information might be compatible with his own. But A's information might also be like that of C, who thinks that Chris is the guy wearing blue suede shoes, and who has information about who might and might not be walking in the park which is incompatible with B's own information. If there is such uncertainty about what common knowledge they have, B's use of an anaphor does not seem to be correct just like that. In such a situation, B would rather continue A's utterances as follows:

(13) B: Then it is Bill. (Bill is wearing blue suede shoes.)

The 'Then' in (13) indicates that B draws a conclusion on the basis of his own initial information, updated with what A has been saying. It invites A to check against his own information whether he can share the conclusion or not.[37]

One thing this observation suggests is that if the use of an anaphor by a speaker B in a discourse context created by a speaker A is to be felicitous, it is not only B's own information about the world, and the discourse information linked to that, that counts. The information of the speech participants about the information of each other is equally relevant. Roughly speaking, for B's utterance in (12) to be felicitous, he has to take for granted that there is sufficient consensus about the constitution of the partial object brought under discussion by A to support coordinated co-reference.[38] Lack of sufficient certainty about that does not block B's ability to use anaphora relating to antecedents introduced by A completely, but he has to embed them under an operator like 'Then', which politely invites A to test whether he can agree upon the conclusion B has arrived at concerning the discourse item introduced by A. Leaving the 'Then' out, B would seem to order A bluntly to update with, i.e., to accept what B has figured out for himself about the discourse item introduced by A. The greater the agreement about the object of information A and B assume to share, the more smoothly such unqualified use of the anaphor by B will appear.

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36. One is the example (i) discussed in footnote 33, where the utterance of the second speaker, containing an anaphoric indefinite 'Another man', was seen to be infelicitous, even though after an update with the sentence of the first speaker, his state supported his own utterance.
37. For other observations and analyses of the dynamic role of such modal expressions see Zeinstra 1990, Vermeulen 1994, chapter 5.
38. The incorporation of such higher order information in the architecture of information states is studied in Groeneveld 1995; Gerbrandy 1996.

4.5 Hearsay

As we described the situation in which B would utter (13) rather than the unqualified sentence in (12), B reckoned with the possibility that A's information was incompatible with his own. However, that is not essential. Also in case B is convinced that A's information is correct, is equally sure about his own information, and has every reason to believe that A's attitude towards his information is no less trustworthy, then the rules of language use still seem to dictate that if B's utterance is supported by his own information updated with what A has said, and not simply on the basis of his own direct information, B should explicitly qualify his utterance as being partially based on what A has said.

Consider the following case. A is visiting B in his apartment, which overlooks a park. It is in the middle of the night. B is preparing another drink in the kitchen. A is looking out of the window, and sees a man in the park in the light of the street lamps. He reports his observation:

(14) A: A man is walking in the park.

Based on his long time experience, B knows that always if a man is walking in the park at this time of the night, he is walking his dog. He has no reason whatsoever to distrust A's eyesight. So, on the basis of a simple modus ponens[39] his information state surely supports:

(15) B: He is walking his dog.

But B would not put it like that. He would rather say something like:

(16) B: Then he must be walking his dog.

This invites A to inspect the situation, and respond with something like:

(17) A: Yeah, you're right, he is.

Much in the same way as if B had asked:

(18) B: Is he walking his dog?

The unqualified assertion (15) is only correct, if following A's utterance, B looks out of a window for himself and observes man and dog.[40]

It seems that the rules of discourse are rather strict about this. Independently of how sure we are about our own information, and about the information of the other

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39. A dynamic one, though.

40. Note that it is not just the potential defeasibility of the B's observational generalization that triggers the 'Then' in his utterance. It is no less needed in the following (rather silly) exchange:

(i) A: The water is boiling.
B: Then it is a 100 degrees Celsius.

Only if B is reading the temperature from a thermometer that is held in the water (imagine that A and B are pupils practicing in a science class) it would be alright for B to say:

(ii) It is a 100 degrees Celsius.

Note, however, that whereas in (16) 'must be' sounds better than 'is', the opposite is true of (i). This, we think, might be related to whether or not defeasibility is taken into account. For an account of defeasible reasoning in a dynamic setting, see Veltman 1996.

speech participants, if we believe ourselves that if ϕ then ψ, we are told that ϕ, and hence can come to the conclusion that ψ, we are not entitled to simply react with ψ, but we have to qualify our utterance of ψ in a way that makes clear that ψ is not supported solely by our own (direct) information, but is a conclusion which is drawn on the basis of our own information together with what the other participant has told us.

Why, one might wonder, are the rules of conversation so cautious about this? The answer, we believe, is that it is a safety measure against the dangers of combining pieces of information from different sources. Person A may be in an information state that supports ϕ, and is consistent with both ψ and 'not ψ'. Person B may be in an information state which is consistent with ϕ, and which supports 'if ϕ then ψ'. A is entitled to assert ϕ. B has no reason not to update with that piece of information. If he does, and treats the new piece of information on a par with his own conditional information that 'if ϕ then ψ', then he arrives in a state which supports ψ. So he would be entitled to utter ψ. Since ψ is consistent with A's information state, there would be no reason for A not to update in turn with this piece of information.

However, had A been aware of the fact that B's justification for saying ψ was that he believes that 'if ϕ then ψ', then he might have been more reluctant to perform the update with B's utterance of ψ. A himself does not believe that 'if ϕ then ψ'. He might actually have good reasons to doubt this. So, had he been aware of the discrepancy in information, he might have started a discussion about it, instead of updating with ψ just like that. The function of a modal qualification as in 'Then ψ' is precisely to make explicit that ψ is a conclusion drawn from the combination of one's own information together with what one has been told. Whereas an unqualified utterance by B of ϕ invites A to update with ϕ if he consistently can, an utterance of 'Then ψ' invites A to test whether his information *supports* ψ. If the test fails, discussion can start about why according to B given that ϕ, ψ has to be the case. In the course of that, A may or may not get convinced by B that ψ.

Another way to put it is that in order to be justified in uttering a non-qualified statement ϕ in a discourse, it should be supported on the basis of own's own direct information. An utterance of 'Then ϕ' is justified if it is supported by one's own direct information, updated with utterances of other participants. The rule seems to be hard and fast, it also has to be obeyed in case one is convinced of the correctness of one's own information and the correctness of the information of the other participants in the discourse. Fortunately, in her profound wisdom language preserves her subjects from their frailties.

5 Summing up

We have described and defended a move from the traditional logical-philosophical concept of meaning as a pictorial relation between language and the world, towards the more progressive view which ties the notion of meaning directly to the process of interpretation of discourse. The bite of it does not lie in metaphors, such as the slogan that

meaning is information change potential, but in providing logical tools to implement and analyze these ideas. However, in the present informal paper these had to remain on the background.

We have shown dynamics at work in an analysis of certain anaphoric relations in terms of contextually restricted quantification. In particular the incorporation of discourse information—next to, and in relation to information about the world—enabled us to actually implement this old idea, where we grant that we showed the drawings of a proto-type, rather than a real machine that could hit the road.

From the observations we made about anaphoric relations across utterances of different speakers, we can draw some conclusions concerning the ways in which the notion of an information state has to be refined in order to be able to make the move from monologue to dialogue. Not surprisingly, the discussion showed that it is essential to extend information states with information of the agent about the information of the other participants in the discourse. Agents have to keep track of which discourse items were introduced by whom. And the conversational right to anaphorically relate to an object of information originating from another participant in the discourse depends on how sure we can be about whether or not we are talking about 'the same thing'. To avoid disinformation to occur too easily, we should keep apart our own direct information, and the information obtained by updating with what others have said. In short, information as it plays a role in interpreting and taking part in dialogue has a much more elaborate structure than exposed in our spreadsheets.

A thin polemic line that ran through the story was an argument against the widespread representationalistic conception of context and interpretation. This conception entered into logical semantics—which is an heir to Frege's anti-mentalism—by way of discourse representation theory. The main motivation in its original presentation in Kamp 1981 was also provided by anaphoric relations, in particular cross-sentential and so-called donkey-anaphora. We hope to have shown that the kind of anaphoric relations discussed above, call for an analysis at the level of information content, rather than by linking formal elements in a language of thought.

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Carlson's last puzzle; will it go the way of Fermat's last theorem?

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0. INTRODUCTION

In his seminal and pioneering study of degree relatives, Carlson (1977) noted two major types of environment that appeared to allow the CP-internal "relativized" nominal of a degree relative, but not that of a restrictive or appositive relative. These were: (i) environments with narrow-scope properties, and (ii) a null VP that has been elided under "antecedent-contained" conditions. The problem posed by (i) was elucidated to a significant extent by Carlson; subsequently, Heim (1987) offered a number of valuable refinements, and more recently, Grosu and Landman (1996) proposed a complete analysis of degree relatives **and** other constructions which went beyond Carlson and Heim in both breadth and depth. In contrast to (i), neither Carlson, nor Heim, nor (to the best of our knowledge) anyone else was able to shed any light on (ii). The purpose of this paper is to remedy this state of affairs by proposing a solution to (ii) which relies on central aspects of the analyses of (i) proposed in the studies cited above, and in particular in Grosu and Landman (op. cit.).

The paper is organized as follows. In section 1, we outline the major features of the analysis of degree relatives proposed in those earlier studies, as well as the kind of solution put forward in them with respect to the problems raised by facts of type (i). In section 2, we address the problems raised by facts of type (ii) and propose a solution to the specific problems noted by Carlson. In section 3, we extend the proposals of section 2 to other types of data, in particular, to appositive relativization and to VP-Deletion constructions that do not involve relative clauses. In section 4, we return to our analysis of degree relatives and point out a further empirical advantage of our approach.

1. BACKGROUND

Carlson (1977) observed that relativization into a variety of narrow-scope contexts is possible in English, provided that wh-pronouns are not used. The phenomenon is illustrated in (1) in relation to the presentational there-insertion context.

(1) a. *John and Mary, who there were -- at last night's party, are my best friends.

b. *The students who there were -- at the party behaved rather unseemingly.

c. The students (that) there were -- at the party behaved rather unseemingly.

(1a) shows that appositive relativization, which in standard contemporary English **must** utilize wh-forms, is incompatible with the presentational context. (2a) shows that restrictive relativization, which **may** utilize wh-forms in English, is also incompatible with the context at issue when it utilizes such forms. (3a) shows that relativization out of that context is possible when no wh-form is used (the relative may be introduced by that, or exhibit no marker of subordination at all). Grosu and Landman's account of such facts, which was an adaptation of proposals made in Heim (1987), was esssentially the following: at LF, the "gap" indicated by "--" must contain an individual variable bound by an existential operator (this is essentially Milsark's 1974 analysis of the there-construction). In appositives, the gap in question must be construed as a definite anaphoric pronoun, and in restrictives, as an individual variable bound by an abstraction operator with CP-scope. These two requirements cannot be satisfied simultaneously. That is, in the case of the appositive, the variable in the gap cannot both be definite and be bound by the existential operator; in the case of the restrictive, this variable cannot be bound both by the existential operator and by the abstraction operator. Hence, the infelicity of (1a,b). In (1c), a different strategy is available, which makes it possible to avoid a clash. Specifically, it may be assumed that the gap is filled at LF by a more complex object having essentially the form d many students, where d is a degree variable modifying the noun. This more complex object makes it possible to reconcile the narrow-scope requirements of the presentational context with the need to have an operator-binding configuration with CP scope in the following way: the individual variable is bound by an existential operator (on which the noun acts as a restrictor), and the degree variable is bound by an abstraction operator with relative-clause scope. - For the sake of completeness, we note that neither Carlson, nor Heim, nor Grosu and Landman had an interesting account of why degree relativization, in contrast to appositive or restrictive relativization, disallows wh-pronouns in English. We brought up this point, however, because it constitutes a useful diagnostic for identifying certain types of relatives (in particular, non-appositives with wh pronouns are necessarily restrictives).

Carlson and Heim assumed that degree relative clauses have the essential semantics of comparative clauses; thus, both types of clauses were assumed to designate a degree, in particular, the maximal element of the set of degrees designated by the lambda abstract. Grosu and Landman argued that this kind of analysis, while presumably appropriate for comparatives, is insufficient for degree relatives. Specifically, they argued that abstraction and subsequent "maximalization" must apply not just to degrees, but to ordered triples that consist of (a) a degree, (b) a plural individual whose cardinality is given by that degree, and (c) a sortal predicate (corresponding to the external head noun) which characterizes the plural individual. A corollary of this analysis is that CP defines a unique plural individual, with specific sortal and cardinality properties, so that the only role that the CP-external material in head position can play is a resumptive one. This modification of the Carlson-Heim analysis has the following advantages over its predecessors: (A) it correctly predicts that "subdeletion" is impossible in degree relatives (because the sortal must be "resumed"); (B) it correctly allows the entire construction to designate a plural individual, not just a degree (because the individual is a member of the maximal triple that constitutes the meaning of CP); (C) it correctly predicts that the class of external D(eterminer)s is restricted to definites and universals, as illustrated in (2) (weak or partitive D's violate resumptiveness); (D) it yields a reasonable account of the fact that degree relatives (in contrast to restrictives and appositives) may not iterate (stack), as shown in (3) (since the sortal and cardinality properties of the plural individual are fixed within CP, they cannot be independently specified within multiple CP's).

(2) I took away {every, all the, those, the (three), #three, #many, #most}
books that there were -- on the desk.

(3) The only sailor that there was on the boat (*that there had been on the island)
died in the explosion.

To summarize, degree relativization is compatible with narrow-scope contexts because the individual variable may be narrowly bound and the degree variable may be widely bound. In contrast, restrictive relativization is incompatible with narrow-scope contexts because there is only an individual variable, which cannot be both narrowly and widely bound; appositive relativization is also incompatible with narrow-scope contexts, because the "relativized" nominal is a definite discourse anaphor, which necessarily has widest scope. These

distinctions have been demonstrated and justified in relation to the presentational there context, but comparable distinctions can be found in a variety of additional narrow-scope contexts, as partly illustrated in (4)-(7).

(4) a. Every kilo {that, *which} you put on -- increases the risk of a heart attack.

b.*Two kilos that you put on -- increase the risk of a heart attack.

(5) a. Every minute {that, *which} the movie lasted -- past midnight increased my discomfort.

b.*Two minutes that the movie lasted -- past midnight increased my discomfort.

(6) a. John is almost the doctor {that, *who, *which} his father was -- .

b.*John is almost a doctor that his father was -- .

(7) a. Every time {that, *which} the bell rang --, I opened the door.

b.*Three times that the bell rang --, I opened the door.

Furthermore, the semantic category of degree relatives finds realization not only in the form of overtly headed relatives with an internal "gap", but also in a number of additional external forms, for example, as free relatives, which, as Grosu and Landman (1996) argue, have an overt CP-internal "relativized" nominal (the wh-phrase) and null CP-external resumptive material; we will make some use of free relatives below.

2. CARLSON'S PUZZLE

In the preceding section, we summarized the major points of Grosu and Landman's solution to data of type (i). In this section, we take up Carlson's data of type (ii). An illsutrative paradigm is provided in (8).

(8) a. Marv put everything {*which, that, ∅} he could -- in his pocket.

b. Marv put {everything, (all) the things, the three, *three/*few/*most things} he could -- in his pocket.

The infelicity of which and of weak or partitive D's shows plainly that restrictive relativization is here excluded. The exclusion appears to be due not to a narrow-scope context for the "relativized" nominal, as in (1), but rather to the fact that this nominal is a proper subpart of an elided VP, which moreover has arisen due to antecedent-contained deletion (ACD); this, in any event, was Carlson's characterization of the phenomenon.

One reason why this phenomenon seemed mysterious (to Carlson) is, we submit, that the characterization just provided is incorrect. As shown in (9), restrictive relativization, forced by the weak D's, is possible under the two conditions identified by Carlson, that is, (I) proper containment of the "relativized" nominal within an elided VP, and (II) ACD.

(9) a. Bob kissed {many, three, most} girls that his brother
{didn't, wouldn't, refused to}-- .

b. John has read quite a few books that Mary **also** has -- .

c. This chap can do {many, quite a few} things that no **other** individual {can, could, would} -- .

d. The president is reluctant to take steps which, in his view, only **God** {may, should, ought to} -- .

e. Due to his injury, Bob is unable to lift several objects that he once **effortlessly** could -- .

One thing that distinguishes the data in (9) from those in (8) is that the relative clauses in the former, but not in the latter, contain an instance of **sentence stress with focus import**. We will argue in what follows that this property, but not Carlson's (I)-(II), needs to be appealed to in constructing an explanatory account of the contrasts in (8).

Cinque (1993), building on earlier studies, shows that sentence stress may arise in virtue of the application of mechanical procedures (which, essentially, cyclically reinforce certain instances of lexical stress). Such instances of sentence stress may be used to express focus (essentially, an informational choice out of a number of conceivable alternatives; Rooth 1992); at the same time, focus may also be expressed by stressing some item that does not receive stress in the manner just noted, either because the item in question is not in a structural position that leads to sentence stress (through cyclic reinforcement of lexical stress), or because it lacks lexical stress altogether. Reinhart (to appear) argues that the latter way of conveying focus import is "marked" and that the former is "unmarked". Now, observe that the relatives in (8) consist of a pronoun and an auxiliary, neither of which carries lexical stress; accordingly, unmarked sentence stress cannot be assigned within the relative; furthermore, the discourse context does not seem to license marked stress on any of these two items (in particular, there seems to be no obvious grounds for construing them as contrasted with

anything else); accordingly, the relative CP's cannot include a focus. In contrast, the relative CP's in (9) all include a stressable item, and thus a possible focus (the items in boldface script). In (9b, e), stress is assigned in virtue of the unmarked procedure, and in the remaining subcases of (9), stress is of the marked variety (see Cinque op. cit. for justification of this point). This distinction is not, however, of particular importance here; what matters is that the relatives in (9), but not those in (8), include a focus.

What has just been said suggests that something like (10) is a more adequate descriptive generalization than Carlson's conjunction of (I) and (II).

(10) DR's need not contain a focus; restrictive relatives must.

In fact, (10) yields better empirical predictions not only with respect to data like (9), but also with respect to data like (11), which do not involve ACD, and thus fall outside the predictions made by Carlson's conjunction of (I) and (II).

(11) a. #A boy who loves Mary hit a boy who does -- .

b. A boy who loves Mary hit a boy who **doesn't** -- .

c. A boy who loves May hit a man who **also** does -- .

At the same time, (10) does as well as (I)-(II) in respect to data like (12), where VP-Deletion has not applied (note that the overt VP includes stressable items).

(12) Marv put in his trunk three things which he could {fit **in**, **put** there}.

There is only one type of data known to us with respect to which (10) appears to be too strong as it stands. As shown in (13), restrictive relatives may fail to exhibit a focus when they fall entirely within the defocused portion of a focus construction.

(13) A **boy** who loves Mary hit {a **girl**, **another** boy} who does -- .

We have thus seen that, with the exception of cases like (13), (10) appears to express a true generalization. We will now attempt to derive this generalization from deeper considerations. As a preliminary to this enterprise, let us take a look at some basic (and minimally controversial) properties of focus constructions. A focus construction is a linguistic constituent, contained within a single illocutionary unit, and which is (minimally) partitioned in the following way: Intonationally, there is a peak (a bearer of sentence stress) and a string of deaccented and/or deleted material; informationally, (some constituent that properly contains) the bearer of sentence stress is construed as focus, and the deaccented/deleted

remnant of the partitioned constituent is construed as "focus-related topic" (Tancredi 1992). The import of "focus-related topic" is, roughly, "topic whose content is determined by the discourse context of the focus construction."

Turning now to the problem at hand, we begin with a consideration of restrictive relatives. The standard position on the semantics of restrictive CP's is that they are predicates formed by abstraction over an individual variable, the quantificational, cardinality and/or sortal properties of the set thus defined being ultimately determined by material **external** to CP (the D and NP in head position). In constructions where the CP-internal variable and the abstraction operator that binds it are unambiguously associated with the "relativized" element -- a state of affairs found, for example, when there is an extraction chain headed by a wh-pronoun or null operator -- we may expect the "relativized" element, in particular, a wh-pronoun, to be unable to function as a focus, since the ultimate binding of the variable by a CP-external D excludes a set of alternative construals for the relativized element, and thus a necessary condition for focus. This prediction is confirmed by the deviant version of (14), in which a contrastive focus construal for a wh-pronoun is attempted.

(14) This is the fellow whose **mother** I like, and that is the fellow

{whose **father**, ***whom**} I like.

It emerges from the above that restrictive relativization imposes a semantic partition on a relative clause, in particular, a partition into an element whose value is externally fixed and a "remainder" which is predicated of it. We wish to suggest that the "unmarked" state of affairs is for this semantic partition to induce a corresponding informational partition such that the "relativized" element is construed as a focus-related topic, and the remainder of the relative, as an **informative** comment on it, which must therefore include a focus (compare this proposal with the view of unmarkedness in Reinhart, to appear). If this conclusion is on the right track, the infelicity of the starred versions of (8) and (11) is predicted, since the "remainder" of the various relatives includes no focus.

As is well known, marked focus partitions are possible, if licensed by the discourse context. In (13), the marked contrastive stress pattern forces an informational partition of the entire sentence which places all of the two relative clauses within the focus-related topic. Crucially, this partition is consistent with the structurally imposed requirement that the wh-pronouns not

be foci. Since marked informational partitions win over unmarked ones, the "remainder" of the two relatives need not contain a focus. The felicity of (13) is thus unproblematic.

Turning now to degree relatives, recall that the content of the "relativized" nominal is wholly determined within CP. Therefore, no subelement of a degree relative (necessarily) has its content determined CP-externally. If so, there is no reason to expect that degree relatives should induce (unmarked) informational partitions of any kind. And in fact, both the "relativized" nominal and the "remainder" of a degree relative are free to contain or not contain a focus. We illustrate this state of affairs in relation to free relatives, which, as noted in section 1, are also maximalizing constructions; we utilize them, rather than Carlson's kind of degree relatives, because their "relativized" nominal is overt, and thus stressable.

(15) a. John took away [what there was on the **desk**].

b. Please send to Mary [**what** I brought up], not [**whom** I brought up].

c. I will send [what I can] to your **relatives**.

(15a-c) show, respectively, that a focus may occur within the "remainder" of CP, on the "relativized" element, or not within CP at all. This last option is exactly parallel to the felicitous versions of (8). Putting it together with what has been said about restrictive relatives, we have in effect provided an account of the contrasts in (8), and thus, a solution to "Carlson's puzzle."

Before concluding this section, we would like to briefly return to our characterization of extraction chains in restrictive relatives as **necessary** structural counterparts of the operation of abstraction over an individual variable. In relatives with resumptive pronouns, the latter is a **typical**, but not a **necessary** reflection of the individual variable, since the latter may be pragmatically implied, as illustrated by the colloquial English example in (16) (adapted from Akmajian and Kitagawa 1976).

(16) This is the kind of car that the carburettor never works properly.

If so, we may expect what appear to be resumptive pronouns to allow a (contrastive) focus construal. The Hebrew example in (17) and its English translation illustrate this possibility.

(17) Ze ha-baxur še ani ohev et **axoto**, ve ze ha-baxur še ani ohev **oto**.
"This is the boy (such) that I like his **sister**, and that's the boy (such) that I like **him**."

3. APPOSITIVE RELATIVES AND OTHER CONSTRUCTIONS

While Carlson did not directly discuss the possibility of ACD "into" appositive relatives, later writers, in particular, May (1985), ruled out this possibility (on grounds that need not concern us here), and sought support in infelicitous data like (18a).

(18) a. *Dulles suspected Philby, who Angleton did -- .
b. Dulles suspected Philby, who, incidentally, Angleton did **-- as well.**
c. Dulles suspected Philby, who Angleton, incidentally, **didn't.**

But Hornstein (1994) observes that the operation at issue is sometimes permitted, and illustrates this option with (18b); we provide an additional illustration in (18c). Now, Horstein was unable to provide an explanation for the contrast in felicity between (18a) and (18b). We will show that this contrast yiedls to a natural extension of the account we provided with respect to Carlson's puzzle.

To begin with, observe that the "remainder" of the relative in (18a) does not include a possible focus. Thus, marked (contrastive) stress is not obviously licensed by the context, and unmarked stress is not possible either, because (i) it is not assignable to subjects (Cinque 1993), and (ii) the auxiliary carries no lexical stress. In (18b-c), on the other hand, sentence stress can fall on the boldfaced items, so that the CP "remainder" may include a focus. Are there grounds for assuming an informational partition of appositives along the lines that we proposed for restrictives? As far as we can see, the grounds for doing so are even more immediate than in the previously considered case. Uncontroversially, appositive relatives are declarative illocutionary units, in which the chain headed by the wh-phrase is a discourse anaphor whose content is externally fixed by its antecedent. It seems equally uncontroversial that a declarative illocutionary construction must be informative, and thus contain a focus. Since the wh-phrase has its content externally fixed, it can only be construed as focus-related

topic; this assumption is supported by the data in (19), which are entirely parallel to those in (14).

(19) This is John, whose **brother** I like, and this is Bill,

{whose **sister**, ***whom**} I like.

The focus can thus only be contained within the "remainder"; the absence/presence of a focus in (18a)/(18b-c) can thus be viewed as responsible for the observed contrasts in acceptability.

Note that, since appositives are illocutionary units, the informational partition just proposed is a necessity, not merely an unmarked state of affairs. Given the impossibility of a focus construction that cuts across illocutionary boundaries, appositives that fail to contain a focus cannot be "salvaged" by the kind of strategy employed in (13), as shown by the infelicity of (20a). The only way that we can see to salvage such data is to ensure that the relatives themselves contain foci, as is the case, for example, in (20b).

(20) a. ***John**, who loves Mary, hates **Bill**, who does.

b. John, who loves Mary, hates Bill, who **doesn't**.

The kind of account that we have offered with respect to the contrasts in (8) and (18) can easily be extended to VP-Deletion data that do not concern relative clauses, and which, to the best of our knowledge, have not been satisfactorily explained so far. Thus, consider the contrast in felicity between the reduced version of (21a) on the one hand and the full version of (21a) and (21b) on the other.

(21) a. John went to Paris, and Mary did --, *(too).

b. John went to Paris because **Mary** did -- .

In (21a), the second conjunct is a declarative illocutionary unit, and must contain a focus. This requirement is not satisfied by the reduced version, because Mary is not a possible target of unmarked sentence stress, and is not naturally contrastible with John, either. The full version, however, does contain a possible focus, and so does the adverbial clause in (21b), since Mary is construable as contrasted with John. - We provide in (22) a comparable set of data, in which the sentences with elided VP's are independent discourse sentences.

(22) a. John picked up a book. *Later on, he did --- .

b. John picked up a book. Later on, he did -- **again.**

c. John did not do his homework on Monday. On Tuesday, he **did** -- .

d. John did not burn that paper. **Mary** did -- .

4. TYPING UP ONE LOOSE END

The contributory part of this paper has addressed only facts of type (ii) (see Introduction). In this last section, we address one fact of type (i) which was not discussed in Grosu and Landman (1996). We will show that their modification of the Carlson-Heim analysis yields a straightforward account of the fact in question.

Recall (from section 1) that Carlson-Heim attributed to degree relatives the essential semantics of comparatives; in particular, they assumed that such constructions can only designate **degrees**, but not **individuals**. Grosu and Landman, however, pointed out that this view of degree relatives is too restrictive, and showed that degree relatives can also designate individuals; illustrations of this option are the data in (23), which imply that Bob took away the very books that there were on the desk, not just some set of books with equal cardinality.

(23) a. Bob took away [the few books that there were -- on the desk].

b. Bob took away [every book that there was-- on the desk].

To allow for this option, Grosu and Landman proposed that the meaning of relative CP's like those in (23) must be an ordered triple, one of whose members is a plural individual (see section 1 for more details). A consequence of this move is to make the plural individual (**and** its atoms) available for further semantic manipulation; for example, the plural individual can be used in constructing a referent for the bracketed constituent in (23a), and its atoms can be used for universal quantification at the DP-level in (23b) (see Grosu and Landman for details).

An additional prediction of the proposal just noted is that the plural individual and its atoms should be able to interact with operators that take scope over them. In contrast, Carlson specifically assumed that such interaction is not possible, and maintained (in his section 2.4) that data like (24) support his assumption.

(24) a. Max ate everything {which, that} would fit in his pocket.

b. Max put everything he could -- in his pocket.

Thus, he claimed that the version of (24a) with which can only mean that Max tried to fit all the edible things (within the universe of discourse) **one by one** in his pocket and then ate all those that had fitted in his pocket **individually**; the version with that, on the other hand, is claimed to allow a reading which limits Max to eating just the set of objects that fit in his pocket **together**. (24b), which is necessarily a degree construction (see section 2), was claimed to allow only the latter type of reading, that is, one on which Max put in his pocket just the set of objects which together correspond to the maximal capacity of his pocket. Carlson proposed that these (presumed) facts follow from the assumption that only a cardinality, but not the atoms of a plural individual, are in the scope of the corresponding modals in (24a-b).

As implied by the parenthesized qualification in the preceding sentence, we view Carlson's claims as factually incorrect. This is perhaps hard to detect in relation to the data in (24), and for the following reasons. Since that relatives can be either degree relatives or restrictives, the fact that the version of (24a) with that has a distributive reading can in principle be a property of just the restrictive construal. In (24b), where the relative is unambiguously a degree relative, the practical impossibility of exceeding the capacity of one's pocket by putting into it all the objects that could fit in it one at a time is an obscuring factor.

Before tackling Carlson's example (24b) directly, we will first discuss a clearer case, that of free relatives. Free relatives, which are necessarily maximalizing constructions, allow the missing reading readily.

The data in (25a-b), which are parallel to (1c) and the felicitous versions of (8) respectively, show that free relatives **can** be of the maximalizing type; (25c), which is parallel to (3), shows that they **must** have this status.

(25) a. Bob took away whatever (objects) there {was, were} -- on the desk.

b. John put what(ever) he could -- in his pocket.

c. What(ever) John buys (*what(ever) he gives to Mary)
is invariably expensive.

Now, consider (26).

(26) John took away whatever (books) he could fit in a particular mold.

We submit that this sentence allows a reading on which the books were individually checked against the mold.

Finally, we come back to Carlson's degree relative in (24b). While we agree that, for reasons already mentioned, in out of the blue situations, a distributive reading is hard to get for (24b), this reading does emerge when we put (24b) (substituting book for thing) in an appropriate context, as, for example, in (27).

(27) In the game show, Max was presented with a pile of books, some of which were small enough to fit in his pocket, while others were too big. He worked as hard as he could, and within the time limit, he put, one after another, every book he could in his pocket.

This shows that the atoms of the plural individual can be distributed over by the modal, confirming the predictions of Grosu and Landman's modification of Carlson's analysis.

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The Binyan Hitpa'el Decomposed: On the Derivation and Function of the Hebrew Binyan Hitpa'el

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Introduction: Overview of the Hebrew Verbal System

The Hebrew verbal system consists of seven morphological templates, called *binyanim* (sg. *binyan*). Verbs are formed by combining a consonantal root with a binyan. Some illustrations of this are given in the table in (1):

(1)

	g.d.l	s.d.r	d.l.k
pa'al	*gadal* "grow" (intrans)		*dalak* "burn" (intrans); "be lit"
nif'al			*nidlak* "be kindled, become lit"
pi'el	*gidel* "grow" (trans); "bring up a child"	*sider* "arrange, organise"	
hitpa'el	*hitgadel* "become great, large"	*histader* "get organised"	
pu'al	*gudal* "be grown"	*sudar* "be organised"	
hif'il	*higdil* "enlarge; to make great, important"	*hisdir* "cause to be arranged"	*hidlik* "ignite; turn on (a light)"
huf'al	*hugdal* "be enlarged; to be made great"	*husdar* "be arranged"	*hudlak* "be ignited, turned on"

The majority of roots, like those illustrated here, are realised in a number of different binyanim. In each of its realisations, a root expresses the same basic lexical meaning; a root always describes the same kind of eventuality. Thus, for instance, all verbs with the root *g.d.l.* describe events to do with growing. However, this meaning is modified in each different instantiation.

Ideally, it should be possible to show that the properties of a Hebrew verb are a combination of the properties of the root and the properties of the binyan itself. In this paper, I will argue that this is indeed the case for the binyan hitpa'el.

1. The Binyan Hitpa'el: Description and Characterisation

All verbs in the hitpa'el are intransitive; they do not subcategorise a direct object. The primary functions of the hitpa'el have generally been given as the expression of reflexive, reciprocal and inchoative meanings (see, for instance, Berman 1978, Glinert 1989), and I take the forms which express these meanings to be the central and regular instances of verbs in this binyan. Some of these verbs have roots which otherwise occur only in nouns or adjectives, or in intransitive verbs in another binyan; the majority, however, have roots which also occur in a transitive verb. These are the cases on which I will be focussing here. Examples of the verbs under consideration are given below:

Reciprocals

hitrae	"to see" (in a social sense)
hitxabek	"to hug"
hitnašek	"to kiss"
hitavek	"to struggle, fight (with)"
hitpayes	"to make up with, make peace with"
histaxsex	"to get into conflict "

Reflexives

hitraxec	"to wash oneself"
hitlabeš	"to dress oneself"
hitpašet	"to undress"
hitkaleax	"to take a shower"
hitgaleax	"to shave oneself"
hitaper	"to put on make up"
hitgared	"to scratch oneself"
hitpater	"to resign"
histarek	"to comb one's hair"
hitbasem	"to perfume oneself"
hitgonen	"to defend oneself"

Inchoatives

hitbalbel	"to get confused"	*hitkamet*	"to get creased"
hitmale	"to become full"	*hitašpez*	"to be hospitalised"
hitroken	"to become empty"	*histovev*	"to be turned"
hištage'a	"to go mad"	*hitaxzev*	"to be disappointed"
hišta'amem	"to get bored"	*hitgalgel*	"to roll"
hityašev	"to sit down"	*hictamcem*	"to be reduced"
hizdaken	"to grow old"	*hitazrex*	"to become a citisen"
hitromem	"to rise up"	*hizda'azea*	"to be shocked"

A number of the hitpa'el inchoatives are ambiguous between a true inchoative reading, and what I will call an agentive inchoative reading, under which the surface subject is construed as the agent. This ambiguity is illustrated in (2) and (3):

(2) a. *ha-galgal mistovev al ha-seren*
the-wheel turns(HIT) on the-axle
"The wheel turns on the axle"

b. *ha-seren mesovev et ha-galgal*
the-axle turns(PIEL) ACC the-wheel
"The axle turns the wheel"

(3) a. *rafi histovev lehistakel le'axor*
rafi turned(HIT) to look behind
"Rafi turned around to look back"

b. *rafi sovev et acmo lehistakel le'axor*
rafi turned(PIEL) ACC himself to-look behind
"Rafi turned himself to look behind"

The verb *mistovev* in (2)a has a clear inchoative meaning, its subject bearing the same role as the object of the transitive verb *mesovev* in (2)b. However, in (3)a, the verb is agentive; Rafi does indeed undergo a change of position (he turns), but he is also responsible for this change.

On the basis of certain syntactic similarities between sentences like (3)a and true hitpa'el reflexives, Borer and Grodzinsky (1986) claim that this second reading of the inchoatives is simply a reflexive reading. However, there are differences between the two sets

of verbs. First, as can be inferred from the glosses, (3)a and (3)b are not synonymous. (3)a is the only natural way to describe the action of turning one's body or head in a different direction; (3)b cannot be used in that meaning, but might be used if, say, Rafi was sitting in a wheelchair, and turned himself around in the chair. In contrast, the truly reflexive verbs like *hitraxec*, "to wash oneself", are completely synonymous with the parallel transitive used with a full reflexive pronoun.

The second difference between true hitpa'el reflexives and these agentive inchoatives shows up in the interaction between so-called reflexive dative clitics, and inanimate subjects. Hebrew uses dative clitics in a variety of constructions; one of these is what Borer and Grodzinsky (1986) call the reflexive dative, in which the dative is anaphorically related to the agent argument of the verb. An example is given in (4):

(4) *ha-yalda axla la et ha-tapuax*
the-girl ate to-her ACC the-apple
"The girl ate the apple at her leisure / with enjoyment"

Both agentive inchoatives and hitpa'el reflexives with an agentive subject are naturally used with these reflexive clitics, as in (5) and (6)[1]:

(5) a. *dani hitbalbel lo*
dani got-confused(HIT) to-him
"dani got all confused"

b. *dani histovev lo pitom*
dani turned(HIT) to-him suddenly
"dani suddenly turned around"

(6) a. *ha-yeled hitraxec lo ha-boker behana'a*
the-boy washed(HIT) lo-him this morning with-pleasure
"The boy washed up this morning with pleasure"

b. *ya'el hitlabsha la be-iti'ut*
ya'el dressed(HIT) to-her slowly
"ya'el slowly got dressed"

In addition, some hitpa'el inchoatives can be used with a reflexive dative and an inanimate subject to produce the agentive inchoative reading, under which some sort of metaphoric agentivity is attributed to the subject. This gives examples such as those in (7), adapted from Borer and Grodzinsky:

(7) a. *ha-kadur* *hitgalgel* *lo* *ke-ilu* *be-xavana*
the-ball rolled to-it as if on purpose

ad *emca* *ha-kviš*
to middle-of the-road
"The ball rolled to the middle of the road as if on purpose"

b. *migdal šalom* *mitparek* *lo* *kvar*
tower shalom fall-to-pieces(HIT) to-it already

šanim
years
"The shalom tower has been falling (itself) to pieces for years."

It is, however, impossible to achieve a similar effect with reflexive verbs; when these are used with inanimate subjects, the only possible reading is a "fairy-story" type of reading where the subjects are understood to be fully personified:

(8) a. ??*ha-even* *hitraxec* *lo* *ba-yam*
??the-stone washed(HIT) to-it in-the-sea
"the stone washed itself in the sea"

cf.
ha-even *ništaf* *ba-yam*
the-stone was-washed(NIFAL) in-the-sea
"the stone was washed in the sea"

On the basis of these observations, I maintain a three way distinction between the reflexives/reciprocals, the inchoatives and the agentive inchoatives.

The main aim of this paper is to distinguish between the set of verbs which become reflexive or reciprocal in the hitpa'el, and those which become inchoatives. I begin by looking in more detail at the syntactic structure of these verbs (section 2); in section 3, I discuss their lexical representation; and in section 4, I consider a way of characterizing the function of the hitpa'el which explains the range of verb types which surfaces in this binyan.

2. The Syntactic Structure of Reflexives/Reciprocals and Inchoatives

2.1. Hebrew Dative Clitics

In their discussion of Hebrew dative clitics, Borer and Grodzinsky (1986) show that the possessive dative construction provides a diagnostic for unaccusativity in Hebrew. In this construction, a dative pronoun is used to express a relationship of possession, or something similar, between the referent of the pronoun and the referent of one of the other NPs in the sentence. (9) provides an example of this construction.

(9) (possessive)
ha-yalda axla li et ha-tapuax
the-girl ate to-me ACC the-apple
"The girl ate my apple"

Borer and Grodzinksy argue that the possessive dative must be related to a deep structure internal argument, and thus can be used grammatically with intransitive verbs which are unaccusative, but not with those which are unergative. Examples (10)-(13)(Borer & Grodzinsky ex. 43a,c and 44a,c) show the result of applying this diagnostic to hitpa'el verbs: hitpa'el reflexives and reciprocals are ungrammatical with the possessive dative, whilst hitpa'el inchoatives allow them. This constitutes a first piece of evidence that the reflexives and reciprocals are unergative, whilst the inchoatives are unaccusative.

(10) **ha-yeled lo hitraxec li ha-boker.*[2]
the-boy not washed-HIT to-me this morning
"My son didn't wash up this morning"

(11) **ha-yeled ve-ha-yalda hitkatvu li ševa šanim*
the-boy and-the-girl wrote-HIT to-me seven years
"My son and daughter corresponded for seven years"

(12) *ha-mexonit hitnagša li ba-ec*
the-car collided to-me in-a-tree
"my car collided with a tree"

(13) *ha-migdal hitparek li*[3]
the-tower fell-apart to-me
"my tower fell apart"

2.2 Resultative Phrases

Levin and Rappaport (1994) note that a resultative phrase may be predicated of an NP which is immediately post-verbal at deep structure, but may not be predicated of a pre-verbal NP, and thus that resultative phrases serve as a diagnostic for unaccusativity. The test is used as a diagnostic for Hebrew verbs in Doron (1993). Applying this test to hitpa'el verbs produces the same results as the earlier tests: resultatives are possible with inchoatives, as in (14) and impossible with reflexives, as in (15):

(14) *ha-yerakot hitbašlu le-isa dvika*
the-vegetables became-cooked to-a-pulp sticky
"the vegetables cooked to a sticky pulp"

(15) a. **dana hitkalxa le-nikayon muxlat*
dana showered to-cleanliness complete

b. **ha-saxkanit hitapra le-yefeyfiya*
the-actress made-herself-up to-a-beautiful-woman

Thus, once again, we have evidence that the single argument of the hitpa'el inchoatives is an internal argument originating in post-verbal position, while the argument of the reflexives and reciprocals originates in its pre-verbal position.

2.3. Subject Oriented Adverbials

Chomsky (1986b) uses "by"-phrases and agent-oriented adverbials as a diagnostic for the presence of implicit arguments. He argues that although both passives and inchoatives in English lack an explicit agent argument, the agent argument is implicitly present, and syntactically active, in passives, but not in inchoatives. Thus, passives can be used with a "by"-phrase and with agent-oriented adverbials, and can control an embedded PRO. None of these possibilities exist for inchoatives, which do not have even an implicit agent argument. Chomsky's examples (123,124,126) are given below:

(16) a. The boat was sunk by John.
b. *The boat sank by John.

(17) a. The boat was sunk voluntarily.
b. *The boat sank voluntarily.

(18) a. The boat was sunk [PRO to collect the insurance]
b. *The boat sank [PRO to collect the insurance]

These facts can be replicated in Hebrew. The examples in (19)-(21) contrast pu'al passives (the a. sentences) with hitpa'el inchoatives (the b. sentences):

(19) a. *ha-takciv* *cumcam* *al-yedei* *ha-memšala*
the-budget was-reduced by the-government
"The budget was reduced by the government."

b. **ha-takciv* *hictamcem* *al-yedei* *ha-memšala*
the-budget got-reduced by the-government

(20) a. *ha-takciv* *cumcam* *bexavana*
the-budget was-reduced on purpose
"The budget was reduced on purpose."

b. **ha-takciv* *hictamcem* *bexavana*
the-budget got-reduced on purpose

(21) a. *ha-takciv* *cumcam* *kedey laxsox kesef*
the-budget was-reduced to save money
"The budget was reduced to save money."

b. **ha-takciv* *hictamcem* *kedey laxsox kesef*
the-budget got-reduced to save money

Agentive inchoatives pattern with passives with respect to purpose clauses and agent-oriented adverbs. Unlike passives, however, their agent is explicitly realised; consequently, they do not allow "by"-clauses.

(22) a. **dani* *hitazrex* *al-yedei* *ha-memšala*
dani got-citisenship by the-government

b. **dani* *histovev* *al-yedei* *ha-kosem*
dani was-turned by the-magician

(23) a. *dani* *hitazrex* *bexavana*
dani got-citisenship intentionally
"dani intentionally became a citisen"

b. *dani* *histovev* *bexavana*
dani turned intentionally
"dani turned around on purpose"

(24) a. *dani* *hitazrex* *kedey* *lehitxaten im* *ahuvato*
dani got-citisenship in-order to-marry with his-love
"dani became a citisen in order to marry his love"

b. *dani* *histovev* *kedey l* *irot* *ma* *kore*
dani turned in-order to-see what happens
"dani turned round to see what was happening"

Also as expected, hitpa'el reflexives can be used with subject oriented adverbials and can control a purpose clause, but cannot take a "by"-phrase.

(25) a. *dana hitapra* *kedey* *leheraot* *tov / bexavana*
dana made-up(HIT) in order to appear good /intentionally
"Dana put on make-up to look good / intentionally"
(Example from Kaveh 1992)

b. *rafi hitraxec* *kedey* *liyot* *naki/ bexavana*
rafi washed(HIT) in order to be clean /intentionally
"Rafi washed up in order to be clean"

These facts suggest that hitpa'el inchoatives lack an external agent argument altogether, just as the reflexives lack an internal argument, as evidenced by their incompatibility with possessive datives (see section 2.1.). Once again, then, we must conclude that the hitpa'el morphology does not function as a syntactic argument and bearer of the "missing" theta role. Agentive inchoatives, however, do have a syntactically active agent, suggesting that their agentive interpretation is more than a pragmatic effect.

This data does not provide direct evidence of argument structure. However, Levin and Rappaport (1995) have shown that it is generally the case that agentive predicates, being a subset of what they call "internally caused verbs" are unergative. On the basis of this generalisation, in combination with the evidence discussed in the previous subsections, I conclude that the hitpa'el verbs are not syntactically homogeneous. The reflexives are unergative; the inchoatives are unaccusative; the agentive inchoatives also have unergative properties, but differ in some respects from the reflexives.

Having thus characterised the data, I now proceed to the questions central to the analysis: What is the relationship between the transitive forms of these verbs and their intransitive hitpa'el realisations? What characterises the sets of verbs which produce reflexives or reciprocals and those which produce inchoatives? And why do these forms occur in the hitpa'el?

3.0 The Causative-Inchoative Alternation

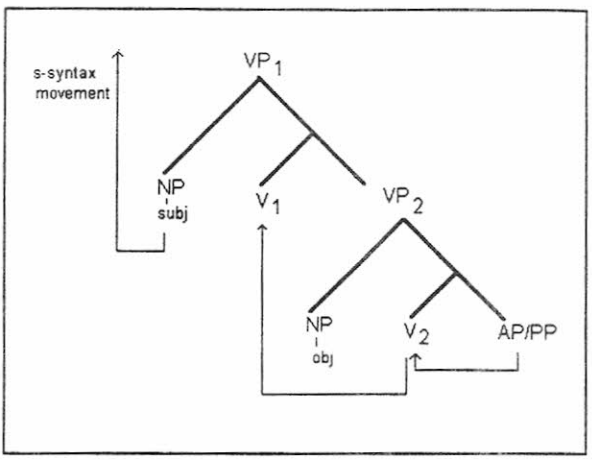
It has been observed that there is a class of verbs which cross-linguistically shows an alternation between a causative use and an inchoative use. The alternation between the inchoative hitpa'el verbs and their transitive variants looks like a quite typical instance of this causative-inchoative alternation. My first assumption, then, is that these verbs should be analysed in the same way as the alternating verbs of other languages.

The causative-inchoative alternation has been investigated in Hale and Keyser (1993) and Levin and Rappaport (1995). Both Levin and Rappaport, and Hale and Keyser, although working with different formalisms and assuming quite different frameworks, argue that the lexical representation of causative verbs is bi-clausal. This corresponds to the structure of the event described by a causative verb, which consists of two subevents: the causing subevent, and the central subevent, generally an event of change of state or location. Here, I will be adopting Hale and Keyser's formal framework, with some modifications.

Hale and Keyser propose that lexical representations are syntactic in nature, involving projections of syntactic categories. These projections are subject to the same constraints as non-lexical syntactic structures; similarly, the same movement processes which occur in the syntax (which Hale and Keyser refer to as s-syntax) are assumed to occur also within lexical representations (the level of l-syntax).

In Hale and Keyser's framework, the bi-clausal causative structure is one in which a projection headed by an empty verb takes a VP complement. This structure is claimed to be canonically interpreted as representing an event which causes a second event, and thus no explicit CAUSE constant is required. A schematic form of the lexical representation of the causative structure is given in (26):

(26)



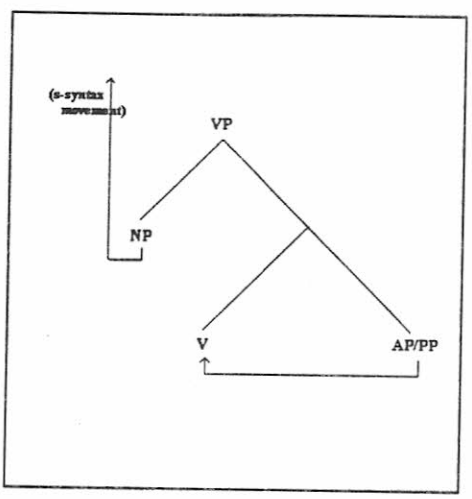
This structure differs from that proposed by Hale and Keyser in one respect. Hale and Keyser argue that the external argument position is not present in the lexical representation, and that this argument is inserted only at the level of deep structure. Here, following Levin and Rappaport, I assume that all argument positions which are filled at some level are present in the lexical representation, including the external argument position.

In this structure, the nature of the caused event is specified by the complement of the lower verb. This complement is generally either an AP or a PP, whose head adjoins to the lower verb, and is predicated of the subject of the lower VP. (In the case of a PP, the nominal head first adjoins to the preposition; the [N,P] complex then adjoins to the verb.) This verbal complex then raises to adjoin to the higher verb, producing the causative meaning.

In the intransitive variant of these verbs, illustrated in (27), only the lower VP is projected, and consequently only one argument position is available. The change of state represented by the [V,AP/PP] complex is still predicated of the NP which occupies this position; thus, this NP is, as before, the theme argument. However, as no other argument is present, it is this argument which raises to surface subject position in the s-syntax, thus producing an unaccusative, inchoative verb. On this view, neither structure is more basic;

they simply represent different projection possibilities which are available for verbs of this type.

(27)



My assumption, then, is that this is the source of the hitpa'el inchoatives: this is the surface realisation of the single argument projection of verbs which participate in the causative-inchoative alternation. (We will return below to the question of why this form is morphologically marked as the hitpa'el.).

A somewhat different analysis is required to explain the agentive inchoatives. As we have already observed, the single argument of these verbs is both an affected entity, the argument of a change-of-state event, and an agent, the argument of a causing event. Possibly, these verbs are derived from a causative structure in which only one argument is inserted, namely, the lower argument. In the derivation of the verb, this argument is moved from its original position, where it is interpreted as theme, to the external argument position, where it receives the additional agentive interpretation. This argument then becomes the surface subject of the verb. This is not a particularly attractive analysis, as it involves a violation of the Projection Principle, with a single argument filling two theta positions. It is possible that

the process is allowed if it occurs in the lexicon, before the level of s-syntax; but such a proposal requires careful consideration, which I cannot give it here.

Whatever the correct analysis of agentive inchoatives turns out to be, it must provide an explanation for why some verbs can receive an agentive inchoative reading, and others cannot. The verb *histage'a* "to go mad", for instance, cannot be interpreted as an agentive inchoative, as is evidenced by the ungrammaticality of the reflexive dative ((28)a) and of agent oriented adverbials ((28)b).

(28) a. **rafi hištage'a lo*
rafi went-mad to-him

b. **rafi hištage'a kedey lehištaxrer min ha-cava*
rafi went-mad in-order to-get-released from the-army

Leaving this problem unsolved, I turn now to the question of why the transitive verbs which become reflexive in the hitpa'el do not also allow the inchoative argument projection, and thus also have an inchoative alternation. The answer I propose is that the semantic properties of these verbs prevent their realisation as inchoatives.

3.1. Non-alternating verbs

Levin and Rappaport and Hale and Keyser observe that not all causative verbs have an intransitive variant. Some of the contrasts they observe are given in (29) and (30):

(29) a. We dripped honey on the cornbread.
b. Honey dripped on the cornbread.

c. We smeared mud on the wall.
d. *Mud smeared on the wall.

(Hale and Keyser (1993))

(30) a. Pat / the falling rock / the earthquake broke the vase.
b. The vase broke.

c. Pat / the shears / ?the wind cut the clothesline.
d. *The clothesline cut.

e. The terrorist murdered/ assassinated the senator.
f. *The senator murdered / assassinated.

(Levin and Rappaport (1995))

Both sets of researchers observe that whenever something is specified about the nature of the causing event, the argument of that event cannot be left completely unexpressed, and so the verb cannot have an intransitive variant[4]. Different verbs specify different kinds of things about the causing event: *smear* in (29)c-(29)d specifies the manner in which the agent moves the material; *cut* in (30)c-(30)d specifies the kind of instrument which must be used in the causing event (hence, the figurative flavour of *The wind cut the clothesline*, which only makes sense if we are thinking of the wind figuratively, as a kind of a cutting instrument); and *murder* and *assassinate* in (30)e-(30)f specify that the argument of the causing event must be an agent.

Turning now to the verbs which become reflexive, rather than inchoative, in the hitpa'el, we notice that these verbs are all necessarily agentive: they can only be used with an agentive subject. One illustration of this restriction is the distinction between the Hebrew verbs *raxac* and *šataf*; both verbs mean "wash", but they are distinct in that *raxac*, which appears as a hitpael reflexive, allows only agentive subjects, whilst *sataf* allows non-agentive subjects, as illustrated in (31):

(31) a. *ha-mitnadvim/hamayim* *raxcu* *et avnei* *ha-xof*
the-volunteer / the water washed ACC stones the-beach
"The volunteers/*the sea washed the stones on the beach"

b. *ha-mitnadvim / hamayim* *šatfu* *et* *avnei ha-xof*
the volunteer / the water washed ACC stones the-sea

The agentivity requirement is illustrated with respect to some of the other verbs in this class in (32):

(32) a. *ha-sapar/ *ha-sakin* *gilax et* *panav šel* *dani*
the-barber / the-blade shaved ACC face of dani
"The barber / *the blade shaved Dani's face"

b. *ha-yeled / *ha-masmer* *gired* *et* *ha-peca*
the-boy / the nail scratched ACC the-sore
"The boy / *the nail scratched the sore"

It is further the case that almost all of these verbs are like *cut* in describing an event which requires the performance of a particular set of actions or the use of a particular kind of instrument: washing, for instance, must involve water, shaving must involve a sharp blade, showering requires the agent to be in a specific location, and so on. How exactly the specification of this property should be represented is not crucial here; the important point for our purposes is that the verbs which fail to become inchoative in the hitpa'el have a lexical property which, in general, prevents the formation of inchoatives. Thus, the absence of the inchoative interpretation here is due neither to an idiosyncratic property of the verbs involved, nor to a special characteristic of the binyan, but is due to a lexical property which systematically produces this effect.

In fact, it seems possible to make an even stronger generalisation about hitpa'el reflexives. In many cases, the transitive forms of the reflexives do not specify something about the cause of the eventuality in addition to describing the result state; rather, the action of the agent is all that is described. These verbs do not entail any specific changes of state of their internal arguments. Consider the verb *wash*. Clearly, the expected result of a washing action is that the object become cleaner; however, it is certainly possible to say:

(33) Theo washed the baby, but she was dirtier than ever when he finished.

The failure to clean the baby does not mean that Theo didn't wash the baby, but only that he washed her unsuccessfully. The sentence *Theo washed the baby* would normally carry a

strong implicature that the washing had its intended effect; but this implicature can be cancelled felicitously. In contrast, the following is anomalous:

(34) ?? Theo turned the knob, but the knob didn't turn / didn't become turned.

An action of turning is not accomplished unless the thing acted upon turns; if this does not happen, Theo may have *tried* to turn the knob, but he cannot be said to have turned it. Similar examples distinguishing between the two kinds of verbs are given in (35)-(38):

(35) The barber shaved Theo, but his chin was still covered in stubble.

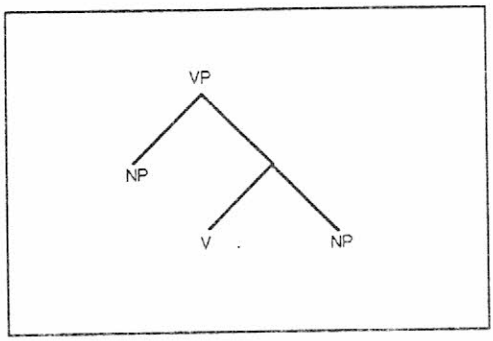
(36) Cleo combed her hair, but it wasn't tidy or untangled.

(37) ??Cleo confused Theo, but he didn't get confused / remained unconfused.

(38) ??Theo bored Cleo, but she didn't get bored / remained interested.

The transitive forms of the hitpa'el reflexives describe an action performed by an agent, but it is not part of their meaning that the intended aim of the action be fulfilled. In contrast, the transitive alternants of hitpa'el inchoatives describe clearly causative eventualities, eventualities which consist of two subevents. An assertion of a statement containing such a verb constitutes an assertion that both subevents occurred; and it is therefore anomalous to go on to assert that the central subevent - the event in which the affected entity is affected - has not occurred. To explain the absence of this anomaly with verbs such as *wash* and *shave*, I suggest that these verbs, although transitive, are underlyingly monoclausal; they describe a single event of an agent performing some action, but no consequence of this action is specified. The reason these verbs do not entail the change-of-state event is that this event is simply not part of their meaning. Rather, these verbs simply express a relation between two arguments. Their lexical representation will have the form shown in (39):

(39)



In this structure, the verb which heads the VP is the lexical verb; the NP positions are filled by the syntactically realised arguments of the verb. This is what distinguishes this transitive structure from the inchoative structure; there, the VP is headed by an empty verb which acquires its lexical content through incorporation of the head of the complement. If this is the structure of these verbs, then the reason why they do not become inchoatives in the hitpa'el is straightforward: the only argument structure which these verbs project is that shown in (39), and this is not a structure from which inchoatives can be derived.

This section provides an explanation for why the intransitive forms of these verbs cannot have an inchoative interpretation. In the next section, I turn to the question of the source of their reflexive or reciprocal interpretation.

3.2. Inherent Reflexives and Object Deletion

The verbs which occur in the hitpa'el as reflexives or as reciprocals constitute a fairly limited set. Many of them are verbs which, cross-linguistically, occur both as transitives and as reflexive verbs, often in conjunction with a simplex reflexive marker. Some examples are given in (40):

(40) *French*
Jean lave l'infant.
Jean se lave.

English
Theo washed the baby.
Theo washed.

Dutch
Max wast Karel.
Max wast zich.

Reinhart and Reuland (1993), following Everaert (1986), assume that such verbs are doubly listed in the lexicon, with one entry being a transitive verb which projects two arguments, and the other being an intransitive, reflexive verb. Whether or not it is essential to assume double listing is not crucial here: the central idea is that the reflexivity of these predicates is one of their idiosyncratic lexical properties. This is particularly evident in the English case. We can say *Theo washed the baby* and *Theo washed himself* - where reflexivity is expressed by the reflexive pronoun - and also just *Theo washed.* This latter can only be interpreted reflexively. The same is true of the verbs *shave, shower, bathe, dress, undress* and *scratch.* Likewise, the following verbs may be used with a plural subject and without an object to produce a reciprocal meaning: *hug, kiss, fight*[5]. However, it is not a general property of English transitive verbs that their internal arguments may be omitted to produce a reflexive meaning. (41)a cannot be used with the meaning of (41)b.

(41) a. *Cleo touches.
b. Cleo touches herself

My proposal, then, is that the verbs which occur as reflexives in the hitpa'el are parallel to deleted object reflexives in English: they are a limited set of verbs which allow non-realisation of their internal argument to produce a reflexive or reciprocal predicate. I would suggest that, like the causative-inchoative verbs, these verbs are associated with two different argument projections: a transitive projection, and an intransitive one. The intransitive projection is only interpretable as either a reflexive or a reciprocal, as the verb describes an action performed ON something. Apparently, though, such an interpretation is not a default possibility for all agentive transitive verbs in Hebrew (as it is not in English); it is only

available for verbs which are lexically marked as having this interpretation. Hence, it is only these transitive verbs which allow this particular intransitive option[6].

This analysis also explains why the verbs which participate in the causative-inchoative paradigm do not have a reflexive or reciprocal interpretation. The internal argument of these verbs is the single argument of an event of change of state or position, an event which is an essential part of the verbs meaning, which is in fact the verb's entire meaning in its inchoative form. A bi-clausal projection lacking an internal argument position is ruled out, as Hale and Keyser argue, by the principle of Full Interpretation. Similarly, a monoclausal projection lacking an internal argument would represent a change of state predicated of no argument, and would, likewise, be uninterpretable. So, these verbs are simply not compatible with a projection which lacks an internal argument, and thus do not have reflexive or reciprocal forms.

4.0 The Function of the Binyan Hitpa'el

I have argued that the intransitive form of causatives which occurs in the hitpa'el is interpreted as an inchoative simply because that is the one interpretation which is available for the single argument structure which such verbs project. Similarly, I have claimed that the reflexive or reciprocal meaning which is associated with other hitpa'el verbs arises because these verbs allow for only one intransitive projection, and this projection involves reflexive interpretation. What remains to be explained is why these argument structure variants are emerging in the hitpa'el rather than in any other binyan.

One potential explanation is that hitpa'el morphology marks the deletion of an argument position in the underlying lexical representation of a verb. Levin and Rappaport argue that in causative-inchoative pairs, the inchoative alternant is in fact derived from the causative structure, which is the basic lexical representation of the verb. Given this, we can think of the inchoative as being derived through a process which deletes the external argument position. This deletion process will be licensed for any causative verb which does not specify anything about the causing event. Deletion of the lower argument position is never licensed,

by the principle of Full Interpretation, as mentioned above. Once the deletion process has applied, an argument is inserted in the remaining argument position, but the only interpretation now available is the inchoative one. Similarly, if we take the transitive form of the reflexives and reciprocals as basic, we can treat these verbs as derived via argument position deletion: in this case, it is the internal argument which is deleted.

The appeal of this analysis is two-fold: it associates hitpa'el morphology with a specific lexical process, and it allows for a unified analysis of hitpa'el inchoatives and reflexives/reciprocals. The problem which this analysis faces is the large number of hitpa'el verbs which are not argument structure variants on transitive verbs. Many of these, such as the verbs in (43), share a root with an intransitive pa'al form. Here, there is clearly a conceptual relationship between the verbs, but, equally clearly, the hitpa'el forms are not derived through any process of argument position deletion. There are also a number of verbs, such as those in (44), whose roots occur only in the hitpa'el or in a noun or adjective, and which, again, cannot be treated as being derived from some other argument structure projection.

(42)

sa'ar	"rage"	*hista'er*	"attack"
amal	"work"	*hitamel*	"train"
dan	"discuss"	*hitdayen*	"litigate"
rac	"run"	*hitrocec*	"rush about"
halax	"walk"	*hithalex*[7]	"walk about"

(43)

hištaxave	"bow"
hitmahmah	"linger, delay"
hitateš	"sneeze"
hištael	"cough"
histakel (al)	"look (at)"
hitbonen (be)	"look (at)"

In light of these examples, it seems impossible to treat the hitpa'el as marking a particular derivational process; rather, the hitpa'el seems to be associated with a particular surface structure, namely a structure in which only one argument is licensed. Hitpa'el morphology is

associated with a kind of syntactic template; a verb can be realised in the hitpa'el only if it is compatible with an argument structure which can be mapped onto this syntactic frame. Consequently, two kinds of verbs are realised in the hitpa'el: verbs which are inherently single-argument predicates, and so can be realised in a syntactic configuration which licenses a single argument; and verbs which are potentially intransitive, that is, verbs which allow non-realisation of one of their potential arguments. As we have seen, different verbal structures allow for the non-realisation of different arguments, producing verbs with different types of interpretation. Certainly, this syntactic characterisation does not constitute a complete account of the hitpa'el, as there are intransitive verbs in other binyanim. What is needed, as the next step in the investigation, is a lexical semantic comparison of intransitives in the hitpa'el and in other binyanim, and a systematic characterisation of what distinguishes between them. This, I must leave for further work.

It also remains to be seen how the analysis proposed here can be applied to other languages which show the same patterns. As is well known, this pattern of verb types associated with a single morphological marker occurs in a wide range of languages, from Romance to the Eskimo languages. Consequently, it seems likely that the hitpa'el data considered here are part of a single, cross-linguistic phenomenon for which we would hope to find a single, unified explanation.

What I have tried to show here is that in looking for such an explanation, careful attention must be paid to the lexical structures with which the morphological marker under consideration interacts. My claim is that the hitpa'el is not inherently a reflexiviser, nor a creator of inchoatives, and that the range of verb types which emerge in the hitpa'el is not due to any ambiguity in the hitpa'el itself. Rather, the hitpa'el is associated with a very general property of intransitivity. However, intransitivity is produced in different ways from different lexical structures, with differing results; it is the different properties of these lexical structures which are responsible for the range of meanings produced.

Endnotes

* I would like to thank Chris Collins and Molly Diesing for much helpful discussion whilst I was working on this paper. Thanks also to the participants of IATL 11 for their comments and suggestions.

1. Borer and Grodzinsky in fact claim that reflexive datives must be associated with an external argument, and hence that the grammaticality of agentive inchoatives used in this construction shows that the verbs are unergative in this use. However, there are a number of reasons to think that what is required for the grammatical use of a reflexive dative is not an external argument, but an agent. First, the reflexive dative is ungrammatical with hitpa'el inchoatives whose surface subjects cannot be construed as the agent of the event described, as in a and b:

a. *ha-iša hizdakna la
the-woman aged(HIT) to-her

b. *dani hištage'a lo
dani went-mad(HIT) to-him

Second, verbs which are unergative but non-agentive do not allow the reflexive dative, as illustrated below:

c. *ha-zevel/he-yeled hisriax lo
the-garbage/the-boy stank to-him
"the garbage/the boy stank itself/himself"

d. *ha-yahalom nicnec lo
the-diamond sparkled to-him
"the diamond sparkled itself"

Levin and Rappaport (1995) point out that verbs like those in c and d describe events which are internally caused, being due to some internal property of the argument of the verb. However, the subjects of these verbs are not agents; even when animate, they are not in control of the eventuality described. Like all verbs which describe internally caused events, these are unergative. Nonetheless, they are not compatible with a reflexive dative.

2. The sentences marked as ungrammatical are ungrammatical on the intended reading, but may be quite acceptable on a different reading of the dative. In particular, many of these are naturally interpreted with an ethical dative reading.

3. The dative pronouns in (12) and (13) also have an ethical dative reading. (13), then, can mean something like "The tower fell apart on me".

4. For Levin and Rappaport, this follows from their assumption that the external argument "in some sense stands for the causing subevent" (97). Non-realisation of the argument is equivalent to non-realisation of the event; however, if the verb inherently specifies something about that event, the event must be realised. Hale and Keyser propose a syntactically driven solution, suggesting that these verbs carry "manner tags" which must be licensed by an external argument.

5. Thanks to Yehuda Falk for pointing out to me the extent of the parallel between the English deleted object reflexives / reciprocals and the hitpa'el reflexives / reciprocals.

6. One would hope, eventually, to find a more satisfying account of the reflexive / reciprocal interpretation than lexical marking. Lexical marking ought to be associated with a high degree of randomness; but in fact, as noted above, the same verbs - verbs like *wash, shave, shower*, etc. - occur in a wide range of languages as intransitives with a reflexive or reciprocal interpretation. This suggests that the availability of these interpretations are due to some systematic properties of the verbs.

7. These last two pairs, and others like them, suggest that the hitpa'el is inducing an aspectual shift in the meaning of the verb. Futher investigation of the aspectual issue might cast additional light on the function of the hitpa'el.

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Discourse Grounding: A Constraint on Preposing

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1. Introduction

Modern Hebrew, an unmarked SVO language, displays a relatively free word order, in conformity with general discourse structure principles. Unlike a variety of other languages, it may show double preposings, as in (1) (from 1 clause) and (3) (from 2 clauses).[1] These fronted constituents have to occur in a certain sequence. Thus, (1) and (3) are well-formed but (2) and (4) are ill-formed:

(1) mismaxim kaele rak leruti ani mare.
documents such only to Ruthie I show
'I only show Ruthie such documents.'

(2)* rak leruti mismaxim kaele ani mare.
only to Ruthie documents such I show

(3) leima Selo afilu et hamarak hu hivtiax Sehu yoxal
to his even ACC the he promised that will eat
mother soup he
'To his mother even the soup he promised that he will eat.'

(from Ben Horin 1976)

(4) * afilu et hamarak leima Selo hu hivtiax Sehu yoxal
even ACC the soup to his mother he promised that will eat he

In this paper I will investigate the principles underlying the linearization constraints evident in the distribution of such constructions. It will be shown that notions such as Topic and Focus cannot shed light on the distribution in question and that an independently motivated concept of discourse grounding is required in highlighing the phenomenon at hand.

2. The Focus Topic constraint

It has been claimed that such distributional restrictions can be accounted for by utilizing the notions of Topic and Focus, such that only the sequence TOPIC FOCUS but not *FOCUS TOPIC is permissible (cf. Ben Horin 1976). Applying these notions to the sentences under consideration, Focus is marked by the so-called focusing adjuncts only (rak) and even (afilu), and Topic is defined in terms of Aboutness (as in Reinhart 1981). In (1) and (3), indeed, the Topics precede the Foci but in (2) and (4) the Foci precede the Topics. It should be emphasized, however, that this generalization, if true, is still arbitrary in that it does

not follow from any general principle. In the absence of such a principled motivation, it could have just as well been the other way round. Likewise, as the well-formedness of (5b) (following) indicates, the order Focus Topic is flawless when the Topic has not been fronted:

(5a) Who did they tell the whole truth?

(5b) rak leruti hem amru et kol haemet.
only to Ruthie they told DEF whole the truth
ACC

FOCUS TOPIC

So that as it is, the generalization concerning the ill-formedness of the sequence *Focus Topic makes the wrong predictions. It might be proposed that a reformulation of the constraint be introduced in terms of an ordering restriction on preposed constituents. Note that even this version of the generalization does not follow from any general organizing principle.

The analysis of interrogative entities (WH-equivalents) in terms of Focus, which has been widely assumed in the literature, appears at first blush to make the correct predictions.[2] Thus, on a par with the ill-formedness of the sentences in (2) and (4) with the fronted Focus Topic sequence, the order WH (Focus) preposed Topic is ill-formed, as is evident in sentences such as

(6) and (7):

(6)* matay et hasefer Selax hu yaxzir
when (FOC) ACC the book your he will return
'When will he return your book?'

(7)* lean im hamismaxim hu holex ?
where to with the documents he goes
'Where is he going with the documents ?'

For the parallelism between structures with so-called WH-Focus and other focus constructions to carry through, we would expect the same distributional pattern to show up in the Topic WH-Focus order as is evident in the cases where Topic precedes (non-WH) Focus sentence initially elsewhere in Modern Hebrew. Examination of the relevant sentences indicates that the parallelism is not full, as is evident from the questionable nature of (6') and (7'), with the sequence Topic WH (Focus):[3]

(6') ? et hasefer Selax matay hu yaxzir
ACC the book your when he will return

(7') ? im hamismaxim lean hu holex
with the documents where he goes

It is noteworthy, however, that the addition of the coordinating conjunctions and (ve) or but (aval) to the initial fronted constituent preceding the WH entity renders the questionable sentences flawless, as in:

(6") ve / aval et hasefer Selax matay hu yaxzir ?
and but ACC the book your when he will return

(7") ve/ aval im hamismaxim lean hu holex
and but with the documents where he goes

The status and effect of the coordinating conjunctions, thus, may shed light on the distributional phenomenon under consideration. The question may be raised whether they make the constituent with which they co-occur somehow more Topical (in that it is related to something which is given [4]), thereby conforming with the permissible Topic Focus sequence, or whether they assign Focus status to the initial constituent, the resulting structure in (6") and (7") thus being an instance, not of Topic Focus, but rather of Focus Focus. Incidentally, conjunctions and disjunctions were classified as structural focus markers (e.g. restrictive Focus in Erteschik-Shir 1986, Erteschik-Shir and Lappin 1983 and Taglicht 1984). However, adopting this hypothesis will leave unexplained the fact that these are the only focal entities which may occur in positions preceding the WH-Focus and

that other, better recognized focus constructions such as only X or even X, do not occur in such positions, as is evident in:

(8)* rak im ruti lean halaxtem ?
only with Ruthie where (you) went
'Only with Ruthie where did you go?'

(9)* afilu betel aviv lama lo nifgaStem ?
even in Tel Aviv why not (you) met
'Why didn't you meet even in Tel Aviv ?'

It is evident then that the analysis whereby Focus assignment is associated with the conjunctions raises more problems than its Topic assignment counterpart. At this stage in the present context some general remarks concerning the different conceptualizations of information structure notions like Topic and Focus are in order. It will soon become evident that these notions and the consequent assumptions on which they are based show certain misconceptions and require some modification.

3. Topic and Focus reconsidered[5]

The Praguian conception of Communicative Dynamism (CD) is clearly dependent on predictability in context, where +/- textual givenness seems to be the determining factor. This informativity

parameter is correlated with word order only very roughly, such that in the unmarked case the Theme element tends to occur first and the Rheme last. Halliday (1967) and Taglicht (1984) stress linearity, with Theme and Marked Theme designating the entity occurring initially in the unmarked and marked cases, respectively. Both attempt to divorce the linear considerations from the discourse considerations, or minimally not to make the latter criterial. Yet, Halliday suggests that Theme may be characterized in terms of Aboutness, or, more specifically, "what we are talking about now" as distinct from Givenness, or "what we were talking about". The relevant implication in the current context is the availability of New Theme.[8]

An alternative approach to Topic and Focus, which is represented by the studies of Chafe (1976), Prince (1981), Kuno (1987), Dik (1989), Lambrecht (1994) and Erteschik-Shir (ms.) inter alia, makes the discourse considerations with Givenness, Predictability, Salience, Dominance and Aboutness criterial. The various factors are only roughly correlated with word order. These studies indicate that there are gross oversimplifications in the attempts to lump together Givenness, Known Information, Predictability, Backgrounding as well as Aboutness as realized by Topic and as diametrically opposed to New, Salient, Accented, Foregrounded, Non-Predictable, Non-Presupposed and Focal information. Thus, Prince, for example, shows that information which is not mentioned in the text need not be conceived of as

New, but rather may still be treated as Given or Known (due to inferrability, or knowledge of the world) and in Dik's Functional Grammar, Topics may be New and not only Given, and Focus need not be just New, but it can also be Contrastive and thus partially predictable. Focus and Topic may display a partial functional overlap, especially in their New function.

Reinhart (1981) distinguishes Sentence Topic from Discourse Topic and provides a definition of Sentence Topic in terms of Pragmatic Aboutness. Her library catalogue metaphor captures the essence of her definition. The Sentence Topic is, accordingly, that constituent in the sentence which corresponds to the entry under which the proposition admitted to the relevant context set will be stored and with respect to which this proposition will be assessed. Note that the first of these features is a purely organizational characteristics, whereas the second one owes much to the philosophical view (e.g. Strawson 1964 and some version of Stalnaker 1978) whereby we assess truth of propositions before adding them to the relevant context set.[7],[8]

Vallduvi (1992) adopts an instruction approach to information structure and separating referential status of discourse entities from information packaging, he is careful not to define Focus and Topic in terms of referential status. Adopting the filing and storing metaphor, he divorces it from the necessary Aboutness characteristics (making Aboutness a derivative and not a basic notion) and establishes the contrast

betweren Ground and Focus, where Ground handles the storing mecahnism and Focus is the informative part that has no organizational function. The Ground has a Link (Address) part (which is initial) and a Tail part (indicating how to store the information under the appropriate address.) Link is then Address with Aboutness following from this property.

In his book Information Structure, Lambrecht (1994) severes the connection between New/Given and sentence segments. He adopts a definition of Topic in terms of Aboutness, and allows for degrees of topicality and multiplicity of topics and does not require that every sentence have a Topic. For him scene setting devices are Topics. In Lambrecht's framework, every sentence has to have a single Focus. The Focus distinguishes the assertion from the presupposition, and it is not co-extensive with the accented entity.[9]

4. Grounding First

With this background we may return to the distributional problem presented by the Modern Hebrew data. The question is how to account for the restrictions on the double frontings. I would like to propose that the constraint in question pertains to discourse connectedness in a wide sense, and not merely to questions of Aboutness and Address. The relevant principle will be shown to be functional in textual organization in general.

The fronted initial position in Modern Hebrew (marked Theme in the Halliday/Taglicht framework) can host entities with the following informational role:

ABOUTNESS
ANCHORING
SCENE SETTING
PERSPECTIVE
FOCUS[10]

It is important to point out that some of these functions may, but need not, converge on the same entity. Part of the problematicity evident in previous treatments lies in their necessarily collapsing the subsets of these functions. Thus, Aboutness may be realized by preposed Topics, which, in turn, may either anchor the information (relating it to the previous discourse or to the discourse situation, in Prince's (1981) terms, as is evident in the use of such in (1) above), or else introduce new entities, as in some instances of Left Dislocation (as in the Hebrew counterpart of the following):

(10) A guy that works for IBM, they told me he won in the recent lottery.

Anchoring could occur without Aboutness, as in (11) and (12):

(11) nasanu bamxonit. lecidey haderex raiti hamon praxim.
(we) drove in the car at the sides of the road (I) saw a lot flowers
ANCHORING

(12) nixnasti habayta.
(I) entered home

al yad hamitbax xalacti naalayim venixnasti beSeket
near the kitchen (I) took off shoes and entered silently
ANCHORING (non-topical)

Scene setting devices (mostly spatio-temporals) need not be construed as Topics (contra Lambrecht). They simply set the proper spatio-temporal framework for the state-of affairs described.[11] Such a non-topic scene setting function is evident in the following sentence:

(13) etmol axarey hastohorayim partsa Sam srefa
yesterday after noon broke there fire
'Yesterday afternoon a fire broke there.'

Perspectivizing adjuncts can be found initially in sentences of

the following type:

(14) Pedagogically, this is a major mistake.

where the initial entity restricts the relevant domain of discussion or its perspective. In this function they are clearly neither anchors nor aboutness markers, if these notions are not to be needlessly stretched.[12] This range of options indicates, then, that the various functions associated with the fronted initial position in Modern Hebrew need not converge on the same entity.

Going back to the putative Focus Topic restriction on word order, underlying the distributional constraint in question seems to be the following organizational principle:

(15) Grounding (or anchoring) first:
The initial fronted constituent must be anchored in the discourse, if any fronted entity is.

According to this principle, entities that anchor the current proposition in the discourse ought to precede entities that do not have such anchoring function. The conjunctions, specifically designate such anchoring; using them the speaker is adding, contrasting or comparing material to already existing entities. The intuition underlying the judgment evident in the questionable

sentences in (6') and (7') vis a vis their improved counterparts with the explicit conjunctions in (6") and (7") is explicable on this basis; the anchoring instantiated by the conjunctions enhances the acceptability in the case of the constituents preceding the WH Foci. The grounding first generalization provides an explanation for yet another distributional tendency, the naturalness of the preposed Topic Focus organization. This ordering preference appears to be due to the frequency with which Topics are associated with anchoring via aboutness (if they are not new).[13]

It is noteworthy at this point that the grounding/anchoring first principle is in line with organizational principles evident elsewhere. Thus, Reinhart's (1980) schematic portrayal of text coherence factors proposes that connectedness and cohesion be established in terms of some forms of Linking devices. Likewise, Ward and Birner's (1994) studies of word order alternations in English indicate that linking constitutes a major organizational motivation. Hence:
Inversion as in the following:

(16a) We pulled off, and right at the end of the exit was an Amoco.

(16b) We have complimentary soft drinks, coffee Sanka, tea and milk. Also complimentary is red and white wine.

Topicalization as in:

(16c) In the early days, our productions were cheap and cheerful... The client would walk out with a tape that day. Today's tapes may still be cheerful, but cheap they are not.

(16d) The colonel had delivered to Chambers six rugs, which he directed Chambers to present as gifts to the members of the ring who had been most cooperative. One of these rugs Chambers delivered to Dexter White.

and VP preposing:

(16e) He said he would object to your proposal and object he did.

all exemplify this anchoring or grounding characteristics as an organizational principle.[14]

5. Integrating Grounding in Information Structure Theories

In this section I will briefly attempt to outline ways to integrate the grounding restriction in some of the existing information structure theories. Dik's (1989) Functional Grammar with its general linearization scheme: LIPOC (Language

independent preferred order of constituents)

P2	P1	(V)	S	(V)	O	(V)	P3
LD	WH						RD
	Top, Foc						
	rel Pron						
	Sub conj						

would have to cope with double frontings such as in (1) and (3) by claiming that the Topic occurs in P2 and the Focus in P1, thus neutralizing the FG distinction between clausal and extra-clausal entities (since the only other P2 position element is the extra clausal Left Dislocated constituent). Note that Left Dislocation shows the relevant distribution as in:

(17a) * matay Roni nipageS ita ?
when Roni$_i$ (we) will meet with her$_i$

(17b) Roni, matay nipageS ita ?

(18a) Roni, rak etmol raiti ota bauniversita.
Roni only yesterday (I) saw her at the University

(18b)* rak etmol roni raiti ota bauniversita.

The material preposed with the coordinating conjunction (as in (5") and (6")) would seem to display the same pattern, suggesting that this would be a link between the sentence and the discourse. The alternative would be to add an additional initial (non-subject) position for languages like Hebrew. Note, in this connection, that there are sentences like (19) with three presubject postions:

(19) bederech klal sfarim kaele rak leruti ani makri.
usually books such only to Ruthie I read
Scene setting Topic Focus

a state of affairs which would seem to require an additional slot in the existing LIPOC pattern.

The proper formulation of this Discourse Linking restriction requires a significant revision of Vallduvi's (1992) Theory of Informatics. Vallduvi acknowledges the significance of Ground in information Structure but divides it into Link and Tail (e.g. Right Dislocation) where Link denotes an address in the knowledge store under which the information is to be entered and Tail provides specifications as to how the information is to be entered under the given address. These are instructions and not information. Vallduvi fails to distinguish preposed from non-preposed initial entities, and assumes that the Link part of the

Ground necessarily amounts to an Address instruction. Clearly, Address and Store are irrelevant instructions in the case of scene-setting and discourse linking of the type evident in (11) and (12). So the overly simplistic metaphor of communication evident in this framework requires modification. Modification is also required in Lambrecht's (1994) Information Structure Theory which subsumes scene setting devices under Topics. This is a non-insightful and I would like to maintian needless stretching of the concept of Aboutness.[15]

A general framework of discourse coherence of the type evident in Grosz and Sidner's Attentional State Model of discourse (1986) would seem to be extendable with the proper modifications and augmentations to the expression of the discourse linking in terms of grounding discussed in the present context. Particularly relevant are its Local (Centering theory) subcomponent, where there are forward (Cf) and backward (Cb) looking centers, which are essentially links by means of referential entities forward and backward in the discourse. Inferrability and situational context (which are part of the Global Focus of attention in this theory) would have to be resorted to in accounting for the Linking restriction in cases where the link is to a situational or a non-locally bound, non-adjacent entity.[16] Modification seems to be required also in the non-referential cases e.g. scene-setting devices. Again, these may be trivially construed as linked to knowledge of the world.

In summing up the distributional restriction in Modern Hebrew examined in the current paper, we have seen that distinctions ought to be recognized between fronted and non-fronted Topics and Foci, as well as between Aboutness considerations and Grounding devices, giving rise to fronted and non-fronted, Ground and non-ground Topics and Foci. The failure to distinguish these concepts results in both the wrong distributional predictions and arbitrary ordering constraints in terms of Topic and Focus. The relevant distributional facts follow naturally once these distinctions are adopted. The constraint in question is explicable in terms of an overall processing principle which decrees that when fronted, grounding ought to occur first.

NOTES

1. In fact, the number of preposed entities is not restricted to two, and there are sentences displaying 3 and even 4 preposed elements Cf. sentence (19) in the text. The more complicated examples, however, seem to abide by the same linearization restriction as the one proposed in this paper.

2. Cf. Rochemont 1978 and 1986, Culicover and Rochemont 1983, and Taglicht 1984, inter alia. Among the relevant features are: non-presuppositionality, salience and indication of the open-proposition. There are, nevertheless, clear differences between

the two. The main difference pertains to the WH-Focus being necessarily the tie to the following material (the preferred forward looking center, Cp, in Grosz and Sidner's (1986) conception), and the regular non-WH-Focus not being similarly restricted. Erteschik-Shir (1986 and ms.) lists additional distinctions between the two.

3. It was pointed out to me (by Ziva Weil at the IATL. workshop on February 5, 1996) that there are flawless instances where Topic precedes a WH-Focus as in the following:

(i) im xaverin kaele mi tsarix oyvim ?
with friends such who needs enemies
'With such friends, who needs enemies?'

The acceptability of such sentences will be shown to follow from the grounding constraint to be proposed in this paper.

4. Coordinating to that which already occurs in the discourse necessarily relates that which is added to that which is given. Note the scalar concept of Topicality implicit in this view.

5. The following is not intended as an exhaustive characterization, but only as a sketch of the major features underlying the use of these concepts in the relevant literature.

6. Incidentally, Halliday uses the description: "the point of departure for the clause as a message" along with his aboutness

characterization in portraying the nature of Theme, but, in fact, the two need not co-incide. As I will argue shortly, the departure could be carried out by chaining to the preceding material, but it does not necessarily have to coincide with Aboutness. Unfortunately, the same confusion is evident elsewhere.

7. I not sure that Truth is indeed the relevant parameter by means of which assessment of propositions is made in natural language understanding, although I am willing to concede that something like assessment of consistency and relevance are functional. The Truth parameter is still a remnant of the philosophical tradition with which we apparently cannot break.

8. Erteschik-Shir's study of the dynamics of focus structure (ms.) utilizes the file change metaphor of Topic Focus assignment as well as the truth assessment parameter. In Shir's version, the Aboutness characterization of Topics amounts to an instruction to the hearer to locate on top of his file an existing card (or set of cards) with the relevant index and heading (so there are no NEW topics), and the Focus (indicated by accent) instructs the hearer to either open a new card, assign an index and heading to it and put it on top of the file (if indefinite) or locate an existing card and put it on top of the file (if definite). There is, accordingly, a partial overlap between the organizational functions of Topic and Focus, in locating an existing File.

9. Lambrecht stresses that accent is used to indicate focus as well as to reactivate a discourse referent which is not focal. In addition, Lambrecht points out the existence of default accentuation; a procedure by which assignment of pitch prominence avoids erroneous pragmatic construal.

10. There are strict constraints on the nature of the Focus in this position. It is noteworthy that the statement in the current context is linear and pertains to the order of the overt constituents.

11. Trivially, they may be (and, in fact, implicitly, have been) construed as anchors to time and place which are always available conceptually.

12. They were, however, analyzed by Chafe (1976) as Topics in Chinese

13. In fact it is this overwhelming tendency which gave rise to the conceptual confusion evident in the literature associating Topics in terms of Aboutness with Anchors, necessarily.

14. Incidentally, the grounding restriction could also be used to account for the distinctions evident between pairs of sentences with distinct Foci indicators. Thus, the difference between:

(i) afilu im Roni rak al habeayot Seli ani medaber
even with Roni only on the problems my I talk
'Even with Roni only my problems I discuss.'

(ii)*rak al habeayot Seli afilu im Roni ani lo medaber
only on the problems my even with Roni I not talk

could be explicable, if it is proposed that even is more grounded than only, in that it is more relevant in terms of expectancy. If someone is least likely to do X, you expect that he wouldn't; but in excluding some entity from some domain, it need not necessarily be conceptually there in terms of expectancy, prior to the explicit exclusion.

Likewise, WH-Foci explicitly grounded by conjunctions are considerably improved when they function as echoes, as in the following:

(iii) leroni ata noten et hasefer haze, lexayim et haSeni,
to Roni you give ACC the book this to Chayim the second

velemi et hasefer Seli ata noten ?
and to whom ACC the book mine you give

Echoes would seem to be clear instances of grounded material. The difference between the same sequence in echoic and non-echoic circumstances thus lends credence to the grounding explanation.

Finally, re-examining the well-formedness of the Topic WH-focus in the example in footnote 3, the Topic with such friends is clearly marked as grounded by the occurrence of such.

15. Cf. Ziv (forthcoming) for a review of Lambrecht's approach.

16. Cf. Ziv and Grosz (1994) where related modifications in the Attentional State Model were proposed.

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Semantic universals and formalisms for semantics: a case study

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0. Introduction

The search for an adequate description of the great variety of semantic phenomena has led to a multiplication of formal tools and techniques used in linguistic semantics. By now, various non-standard tools such as logics with truth-value gaps, many-valued logics, dynamic logics or non-monotonic logics are in wide use. The purpose of this paper is to show that many of these tools become unnecessary, at least for the treatment of many important classes of semantic phenomena, if one accepts the existence of semantic universals. The main idea is that semantic universals impose strong constraints on what is linguistically relevant and thus sharply limit the range of all logically possible cases which should be taken into consideration in linguistic semantics.

Two semantic phenomena will be studied from this point of view: semantic assertion and semantic presupposition. There are many reasons for this choice. The first is that for the treatment of these problems all the above mentioned logical tools have been used. For instance, presupposition is "classically" defined as in (1) and assertion as in (2):

(1) S presupposes T iff S entails T and non-S entails T
(2) S asserts T iff S entails T and non-S entails non-T

Obviously if the negation "non" has the ordinary Boolean interpretation then one gets by (1) only logical truths as presuppositions and (2) implies that sentences assert only sentences logically equivalent to them. But as is well-known there are non-trivial assertions and non-trivial presuppositions.

The second reason is that I consider semantic presupposition and assertion as an universal phenonema in the sense that all languages contain semantic presuppositions and assertions. In addition presupposition and assertion are on the base of privative oppositions (cf. Zuber 1980) which are considered as giving rise to language universals (cf. Greenberg 1966). Presuppositions were considered as universal also by some psycholinguists.

My illustration will be developed in the framework of generalized quantifiers (GQ) theory and Boolean semantics (cf. Keenan and Faltz 1985). So I will follow the following plan. First, I will discuss two types of assertions and of presuppositions (on the propositional level) and then show how they can be described using very simple notions from GQ. Then, using some observations from Zuber (1996), I will generalize the notion of assertion and presupposition to the sub-propositional level using the notion of generalized entailment, i.e. of Boolean order. In this generalisation the notion of intersecting functions will play essential role (cf. Keenan and Faltz 1985). It will follow from this generalization that negation is but a particular case of the presupposi-tion detecting operator. Finally I will show how these considerations on assertion and presupposition lead to a distinction between a purely logical interpretation, incompatible with linguistic universals and linguistic interpretations taking into account such universals.

1. Subject induced vs. predicate induced information

Presuppositions and assertions of sentences of the form *Det CN VP* can be divided into two types: (1) *subject-induced* (SI), roughly those which originate in the semantic content of the subject NP (=*Det CN*) and are independent of that of the corresponding *VP* and (2) *predicate-induced* (PI), roughly those whose semantic content originates in the content of the *VP,* and is independent of the content of the corresponding subject *NP (Det CN).* One can illustrate the above distinction by the sentence in (3):

(3) This surgeon is an actress

This sentence has a SI-presupposition, the one in (3a), and a SI-assertion, the one in (3b); similarly it has a PI-presupposition, the one in (4a), and a PI-assertion, the one in (4b):

(3a) There is (exists) some surgeon
(3b) This doctor is an actress
(4a) This surgeon is a woman
(4b) This surgeon is an actor

In general, PI-information is related to particular operators applying to verb phrases. This is the case, for instance, with the so-called implicative verbs: (5) SI-presupposes (5a) and SI-asserts (5b). Furthermore, (5) PI-presupposes (6a) and PI-asserts (6b), (supposing that *a logician* is *a scholar*):

(5) The logician I met managed to solve the problem
(5a) The logician I met exists (I met some logician)
(5b) A scholar I met managed to solve the problem
(6a) The logician tried to solved the problem
(6b) The logician solved the problem

Another example, more idiosyncratic, of the above distinction is furnished by the *recent past tense* in French, where the auxiliary verb *venir de* is used. Thus (7) PI-presupposes (7a) and PI-asserts (7b):

(7) Pierre vient de partir (Pierre has just left)
(7a) Pierre est parti (Pierre has left)
(7b) Pierre est parti récemment (Pierre left recently)

Roughly speaking, SI-presuppositions correspond to existential presuppositions and PI-presuppositions correspond to lexical presuppositions and for this reason can be idiosyncratic (cf. Fillmore 1969, Bierwisch 1970, Zuber 1972, Zuber 1989);

2. Formal preliminaries

The following notation will be used: PMON, PERS and WEAK denote the class of monotone increasing (with respect to the second argument), persistent and weak determiners respectively (cf. Barwise

and Cooper 1981). I will assume that all determiners are conservative. By E we will denote the universal property interpreting the constant *exist*. By **neg-C** we will denote the Boolean complement of C in the corresponding Boolean algebra to which C belongs. Thus simple quantifiers have two complements: (1) Boolean complement **neg-D(S)**, and (2) post-complement **D(S)-non**, which is defined as: **(D(S)-non)(P)=D(S)(neg-P)**.

Given some particular constructions containing a conjunction of proper names, a general way of refering to such conjunctions is needed. Consequently **Cpr** will refer to any conjunction of (one or k, k finite) proper names (as found, for instance, in the determiner *All...but Bill, Jo and Leslie* or in the sentence *John is happy*), and **StCpr** is the interpretation of such conjunctions, i.e. to the set of individuals denoted by the proper names occuring in the conjunction **Cpr**.

Given these specifications we can now give more precise versions of the classical definitions of presupposition and assertion:

Let sentence S have the form $Det_1\ CN_1\ VP_1$ and sentence T the form $Det_2\ CN_2\ VP_2$. Then:

D1: Sentence S *classically presupposes* sentence T iff T is a semantic consequence of S and T is also a semantic consequence of the internal negation of S.

D2: Sentence S *classically asserts* sentence T iff T is a semantic consequence of S and the internal negation of T is a semantic consequence of the internal negation of S.

Our purpose is now to define SI-presuppositions and SI-assertions and to show that they are related to classical presuppositions and assertions. For simplicity, instead of forms of the object language like *Det CN VP*, we will use the symbols of the logical language which interprets the corresponding symbols of the natural language. Additionally, sometimes the same symbols will be used to represent schemas of sentences either of the object language or of the interpreting metalanguage. For instance, we will use the forms **D(S)(P)**, **D(S) (are)(P)** or even **Cpr are P**, where **Cpr** is an individual or a conjunction of individuals. This last sentence is supposed to

interpret or rather schematically represent sentences like *PrN VP* or *(PrN and PrN) VP*, where *PrN* is a proper name. With this proviso we have the following definitions of SI-information:

(D3) Sentence **D(S)(P)** SI-presupposes sentence D'(S')(P') iff D(S)(X) entails D'(S')(P') for all properties X.
(D4) Sentence **D(S)(P)** SI-asserts sentence D'(S')(P) iff D(S)(X) entails **D'(S')(X)** for all properties X.

Clearly any sentence SI-asserts itself. Furthermore we have various other properties of SI-assertions and presuppositions. In particular, SI-assertion is transitive, any consequence of a SI-presupposition is a SI-presupposition and any SI-presupposition of a SI-assertion is a SI-presupposition of the asserting sentence.

Before giving various examples of constructions satisfying the above definitions I would like to show what do they have in common with "classical" definitions as given in (D1) and (D2). The following propositions establish the needed relationship:

Proposition 1a: If the sentence **D(S)(P)** SI-presupposes the sentence D'(S')(P') then **D(S)(P)** classically presupposes D'(S')(P').

Proposition 1b: If a sentence **D(S)(P)** SI-asserts a sentence **D'(S')(P)** then D(S)(P) classically asserts D'(S')(P)

Propositions 1a and 1b show that definitions (D3) and (D4) define a subclass of classical cases of presupposition and assertion.

3. SI-presuppositions

In spite of the relation indicated by propositions 1a and 1b, the definitions (D3) and (D4) are very general and it is not obvious that they guarantee the existence of non-trivial SI-presuppositions and SI-assertions. In particular they do not make any distinction between various determiners D which may contribute in different ways to the presupposed or asserted content. So our move will now be to consider various classes of determiners in their relation to SI-information. The

following proposition guarantees the existence of SI-presuppositions for (conservative) increasing monotonic determiners:

Proposition 2: If D$\in$ PMON then D(S)(P) SI-presupposes D(S)(S)
Proof: Consider the sentence D(S)(X). By conservativity it is equivalent to D(S)(S$\cap$X), which by monotony entails D(S)(S) for every X. So D(S)(P) SI-presupposes D(S)(S).

The sentence D(S)(S) need not be a logical truth; for so-called *weak* determiners it is a contingent sentence, whose truth depends on the existence in the model of the objects having the property S.

Proposition 2 can be illustrated for instance by examples (3) and (3a). There are many other determiners which satisfy the conditions of Proposition 2. Some of them are precisely those which have usually been discussed in the literature concerning existential presuppositions. I will briefly, mainly for illustrative purposes, discuss here two types of such determiners: (1) determiners giving rise to possesive constructions, and (2) determiners giving rise to definite descriptions.
Consider first the possessive determiners like *Jim's*, or *Susan's youngest brother's* which can combine with an CN in singular to give a singular NP. Since both these determiners are monotonic increasing and weak (and conservative), Proposition 4 applies to them. For this reason we can say that for instance (8a) SI-presupposes (8b) and that (8a) SI-presupposes (8b). Furthermore, given Proposition 1 and the fact that (9b) entails (9c), it is also true that (9a) SI-presupposes (9c):

(8a) Jim's bicycle is very old/blue/comfortable
(8b) Jim's bicycle is a bicycle (=Jim's bicycle exists)
(9a) Susan's youngest brother's girlfriend is not a student/is intelligent
(9b) Susan's youngest brother has a girlfriend
(9c) Susan has (or had) at least two brothers

In order to discuss the application of Proposition 2 to definite descriptions, or at least to some of their forms, it is useful to recall

their semantics first. We will consider sentences of the form **The n(S)(P)**. Sentences of this form are true only if Card(S)=n and $S \subseteq P$. Given this semantics and the fact that the determiner The n is monotone increasing and conservative, we obviously conclude that sentences of the form **The n (S)(P)** SI-presuppose **There are exactly n S**. For this reason (11a) presupposes (11b), (11c) and (11d):

(11a) The umbrella Susan bought on her visit to Paris is dangerous
(11b) There is exactly one umbrella that Susan bought on her visit to Paris
(11c) Susan bought an umbrella in Paris
(11d) Susan visited Paris

The examples discussed up to now, given Proposition 2, involve all monotone-increasing determiners. It is possible to distinguish two other classes of determiners which, although non monotonic, give also rise to SI-presuppositions. These are classes of generalized existential GEXT determiners and a class of exception EXPT determiners which is a subclass of generalized universal determiners (cf. Keenan 1993).
Concerning GEXT class we will use the following property:

(12) If $D \in$ GEXT then for all S, P, D(S)(P) is true only if $S \cap P \neq \emptyset$

So in the GEXT class we find not only the already discussed **Some** or **At least n** but also **no...but Bill and Sue, some...but not all**, etc. For them, we have obviously the following property:

Proposition 3: If $D \in$ GEXT then D(S)(P) SI-presupposes **Some(S)(S)**

Notice furthermore, given (12) that generalized existential determiners with exception phrases like **no... but Bill** or **no...but n** have more specific SI-presuppositions, which entail **Some(S)(S)**. They are specified in the following propositions:

Proposition 4a: Sentence **No (S) but n (are) (P)** SI-presupposes **n(S)(S)**.

Proposition 4b: Sentence **No (S) but Bill (is) (P)** SI-presupposes **Bill is S**

Proposition 4a is true because sentences of the form **No (S) but n (are) (P)** are true iff Card(S∩P)=**n** and Proposition 4b is true because sentences of the form No (S) but Bill (is) (P) are true iff S∩P={**Bill**}

Thus it follows from the above propositions that (13a) SI-presupposes (13b) and (13c) SI-presupposes (13d):

(13a) No poets but Bill and Sue went to the meeting
(13b) Bill and Sue are poets
(13c) No poets but three won at the lottery
(13d) There are (at least) three poets

It remains to consider SI-presuppositions related to exception determiners; they give rise to sentences like **All S but Bill and Sue (are) (P)** or **All S but n (are)(P)**. We will assume that their semantics satisfies the following conditions:

(14a) The sentence All **S but Cpr (are)(P)**, is true iff **S-P=stCpr**
(14b) The sentence All **S but n (are)(P)** is true iff Card(S-P)=**n**

The following propositions follow immediately from (14a) et (14b):

Proposition 5a: The sentence **All S but Cpr (are)(P)** SI-presupposes **Cpr are (S)**

Proposition 5b: The sentence All S but n (are)(P) SI-presupposes **n(S)(S) (There are n S)**

Thus for instance (15a) SI-presupposes (15b):

(15a) All poetesses but Leslie are happy
(15b) Leslie is a poetess

There exists an interesting class of complex determiners which gives rise to *inclusion clauses,* and thus parralels just discussed generalized universal and existential quantifiers. These determiners have the form

D, **including Cpr**. Let me first describe the semantics of sentences containing such inclusive clause, where D is Some:
(16) Sentences of the form **Some(S), including Cpr, (are)(P)** are true iff **stCpr$\subseteq$ (S$\cap$P)** and **card(S$\cap$P)> card(stCpr)**

What (16) says is that a sentence of the form **Some(S), including John, (are)(P)**, for instance, is true iff the set of objects having both properties, **S** and **P**, includes **John** and at least one other object.

By varying the main determiner and keeping fixed the complement **including Cpr** one can obtain other *inclusive determiners* such as **Most ... including Cpr** or **All...including Cpr.** The semantic description of such determiners is easily obtained from (16) by replacing the part corresponding to **Some** by the semantics of the corresponding determiners which replaced **Some**. Given this semantics, it is easy to obtain, via definitions (D3) and (D4), the SI-information for sentences with inclusion clauses: (17) SI-presupposes (17a):

(17) Some/All/Most actresses, including Robin, are quite intelligent
(17a) Robin is an actresses and there are other actresses

4. SI-assertions

The case of SI-assertions also needs a similar development as SI-presuppositions since the definition (D4) does not guarantee the existence of SI-assertions. In this case it is also possible to distinguish various determiners which give rise to SI-assertions. First consider persistent determiners. For them one has:

Proposition 6: If D$\in$PERS then **D(S)(P)** SI-asserts **D(S')(P)** for all **S'** such that **S$\subseteq$ S'**

The following examples, in addition to (3) and (3b), illustrate Proposition 6: (18a) SI-asserts (18b) and (19a) SI-asserts (19b):

(18a) A young dentist is sleeping
(18b) A dentist is sleeping
(19a) At least five students who failed the exam went to the party
(19b) At least five students went to the party

Furthermore, given the fact that (20a) SI-asserts (20b) and that (20c) is entailed by (20a) and entails (20b), it follows from definition (D4) that (20a) asserts (20c):

(20a) Ten bold students are poets
(20b) Ten students are poets
(20c) Ten students are bold poets

Proposition 6 concerns a large sub-class of generalized existential quantifiers, roughly speaking those which do not contain the "exception clause". The sentences which they form have a very simple semantics: D(S)(P), where D is an existential quantifier without an exception clause, is true iff $S \cap P \neq \emptyset$. It follows from this that such quantifiers are persistent and consequently that proposition 6 applies in this case. It is interesting, however, that the whole class of GEXT quantifiers, even those which are not persistent, give rise not only to SI-presuppositions but also to SI-assertions. Let us analyse them briefly.

According to the condition indicated in (12) concerning the semantics of GEXT quantifiers with an exception clause, the SI-assertions which are related to them can be specified as follows:

Proposition 7a: Sentence No(S) but n (is)(P) SI-asserts **Exactly n (S) (are)(P)**
Proposition 7b: Sentence No(S) but Cpr (are)(P) SI-asserts **Cpr (are)(P)**

As an illustration of these properties one can notice that for instance (13a) SI-asserts (19) and that (13c) SI-asserts (20):

(21) Bill and Sue went to the meeting
(22) Exactly three poets won at the lottery

An important remark should be made in connection with the above examples. One notices that the determiner No...but Cpr is symmetric: **No(S) but Cpr (are)(P)** iff **No(P) but Cpr (are)(S)**. Since SI-presupposition depends on the subject property and SI-assertion

depends on the predicate property, this means that that there are logically equivalent sentences which differ by their SI-presuppositions and SI-assertions.

The sub-class of universal generalized quantifiers which have been denoted by EXPT above give also rise to particular SI-assertions. They can easily be deduced from the definition of SI-assertion and the statements in (14a) and (14b) indicating the semantics of sentences with such constructions. The content of these assertions is specified in what follows:

Proposition 8: A sentence of the form All(S) **but Cpr (are)(P)** or of the form **All(S) but n (are)(P)** SI-asserts **not-All(S)(are)(P)**

Proposition 8a: The sentence **All(S) but Cpr (are)(P)** SI-asserts the sentence **Cpr (are)(neg-P)**
Proposition 8b: The sentence **All(S) but n (are)(P)** SI-asserts the sentence **Exactly n(S)(neg-P)**

It is easy to construct from the examples above those which illustrate propositions (8a) and (8b).

Concerning the inclusion clauses it is easy to see, given the semantics of sentences with such clauses indicated in (16), that (17) SI-asserts (23a) and (23b):

(23a) Some/All/Most actrices are quite intelligent
(23b) Robin is quite intelligent

5. Generalized categorial information

Instead of discussing PI-information I will now generalize the notions of presupposition and assertion in such a way that we will be able to speak about presuppositions and assertions of (theoretically) *any* syntactic category. The empirical reasons for such a generalisation are simple. It seems natural to say that, for instance, the common noun *poetess* presupposes the common noun *woman* and asserts *poet*. Similarly the (non-emotive) factive "verb" *to know that* presupposes *to be true that* and asserts *to know whether*. The emotive factive *to*

regret that presupposes *to know that* and asserts *not to like that.* It follows also from the preceding sections that noun phrases and even determiners can have assertions and presuppositions corresponding to their category. For instance *most... including Bill* presupposes *Bill, who is a...* and asserts *most...* Similarly *all (students) but Bill* presupposes *the (student) which Bill is* and asserts *not all (students).*

In fact when one looks at the definition D3 for instance, one realizes that it can be considered as defining a propositional presupposition of the subject noun phrase since the it defines the presupposition of a sentence form for all possible values of the predicate. Furthermore, one observes that the presupposition of such noun phrases although given in the form of a sentence cxan be transformed into a noun phrase. For instance, the sentence *Bill is a poet* can be transformed in a noun phrase *a poet who is Bill* or *Bill, who is a poet.*

As we have seen, SI-assertions and presuppositions are just particular entailments; they are entailments which should hold between a family of sentences and a particular sentence. So we have to generalize the notion of entailment in such a way that we could say it holds between two expressions of a given category C. This generalisation has already been done: the needed relation is just the Boolean order in the Boolean algebras formed by the denotations of expressions of the category C (cf. Keenan and Faltz 1985). Since a priori not all expressions of a given category presuppose and assert, we need to consider only Boolean algebras of a particular kind: those which are used to interpret only presupposing and asserting expressions. Since, as I will argue, expressions formed by a specific *modifier* presuppose and assert, we will be mainly concerned by *restricting and intersecting algebras* . Let me recall the necessary technical notions related to them.

Modifiers are expressions which combine with those in category C to form expressions in category C and so they have the category C/C for various choices of C. Thus semantically modifiers are interpreted by functions from an algebra (interpreting the category C) into itself.

Algebras of such functions will be denoted by CfC. Again, as in the case of determiners, not full algebras CfC are necessary for the semantic interpretations of natural language expressions: they are restricted by semantic language universals. For instance, concerning (extensional) adjectival and adverbial modifiers one can suppose (cf. Keenan and Faltz 1985) that the set F of all functions which interpret such modifiers are (positively) restricting in the following sense: $a \geq f(a)$, where $f \in CfC$ and $a \in C$. An important sub-class of restricting functions is constituted by *intersecting functions.* They are defined as follows:

D5: $f \in BfB$ is *intersective* iff $f(a)=a \cap f(1)$, for all $a \in B$

Restrictive and intersective functions have their *negative* counterparts: these are *negatively restrictive* and *negatively intersective* functions (cf. Zuber, forthcoming) defined as follows:

D6: $f \in BfB$ is negatively restrictive iff $n\text{-}a \geq f(a)$, for all $a \in B$ (where n-a is the complement of a in B).

D7: $f \in BfB$ is negatively intersective iff $f(a)=n\text{-}a \cap f(0)$

What is the linguistic relevance of these particular modifiers? The reason for distinguishing the sub-class of intersecting functions is the particularity of the so-called *absolute* adjectives such as *male, french* or *green* as opposed to *tall* or *young*. Absolute adjectives determine the essential property and can be said to modify the presupposed feature of the common noun to which the apply (cf. Zuber 1972, Zuber 1973). In addition to absolute adjectives intersective functions interpret various semantically important linguistic constructions such as locatives sentences, and relative clauses (cf. Keenan and Faltz (1986). Now, relative clauses have been always considered as clearest examples of presupposing constructions. And what can be shown is that all examples discussed above can be seen as cases of some "general relative clause" interpreted by an intersective function. The case of monotonic determiners in the Proposition 2 is a bit particular since it involves a technical notion of relativisation of quantifiers (cf.

Westerstahl (1985) and so I will not discuss it here in detail. One can notice, however, that most examples used to illustrate this proposition are in fact examples of relative clauses. This is in particular the case of definite descriptions and possesisve clauses. For instance possessive noun phrase like *Bill's bicycle* is equivalent to the clause *the bicycle that Bill has* (or *the bicycle to which Bill has a particular relationship*).

Concerning non-monotonic determiners one finds in exclusion and inclusion clauses one realizes that they have forms of modified determiners. For instance the determiner *No...but Bill* can be considered as a modified determiner obtained as a result of application of the exclusion clause *except Bill* to the determiner *No*. Similarly with the inclusion determiner like *Most... including Bill*. One notices that an inclusion clause behaves like a (positive) modifier and an exclusion clause like a negative modifier. Thus, *Most/some/all... including Bill* entails *Most/some/all*. Given these observations and the semantic relations pointed out in the preceding sections we have the following definitions of generalized presupposition and assertion:

D8: Expression E (of the category C) presupposes the expression F (of the same category C) iff E is a modified expression of the form M(A) which denotes $a \cap f(1)$ (or $a \cap f(0)$), where a is the denotation of A and f is an intersective (or negatively intersecting) function interpreting the modifier M, and F denotes f(1) (or f(0)).

The definition of generalized assertion can be given in a similar way. Roughly speaking the assertion of a modified expression will be either the expression to which the positive modifier applies or its negation depending on whether one uses an intersective or negatively intersective function to interpret the modifier.

Now if we show that the modifier*except Bill* is interpreted by a negative intersecting function than it will be clear that the determiner *All... except Bill* asserts *Not all* and presupposes *the...which is Bill*. Similarly *poetess* presupposes *woman* and asserts *poet*.

6. Conclusion

I have shown that the old and useful distinction between asserted and presupposed meaning usually discussed at the propositional level can be easily extended to sub-propositional level. I have presented such extended cross categorial definitions in the GQ framework enriched by Boolean models and the proposed definitions do not use explicitly the notion of negation. It follows from these definitions that presuppositions and assertions are just generalized (i.e. corresponding to the Boolean order) entailments satisfying some additional conditions. These additional conditions came from various constraints imposed on interpreting functions such as conservativity, monotony or intersectivity. Although all these constraints have non-logical character they are usually considered as linguistically universal (cf. Barwise and Cooper 1981, Keenan and Stavi 1986, Keenan and Faltz 1985). This approach has many important consequences. First of all there is no need for non-standard logical systems to account for various pheno-mena giving rise to assertions and presuppositions. Secondly it explains why there are presuppositions and assertions: according to the proposal made here the source of presuppositions and assertions is to be found in semantic universals constraining natural language interpetations. According to this line of thought, one can predict that there might be various natural readings of linguistic units which must be related to language universals and not just to logical possibilities. Thus, to take an example discussed in the context of presupposition, the reading of (24a) given in (24b) should be considered as natural and opposed to the reading given in (24c), which has only logical motivation:

(24a) Bill wants to sell his bicycle
(24b) Bill has a bicycle and he wants to sell it
(24c) Bill thinks that he has a bicycle and he wants to sell it

Finally the fact that presuppositions and assertions are generalized entailments means that they are entirely determined by the truth conditions (or more generally by denotation conditions) of the presupposing and asserting expressions. Consequently any possible

controversy concerning the semantic content of presupposition or of the projection of presuppositions will in fact concern the content and the projection of the corresponding (generalized) entailments. Although I have not provided here any rule of composition for presupposition and assertion (some such rules can be found in Zuber 1996), it is obvious that they are independently needed insofar as the rules for calculating entailments are needed in formal semantics.

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