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Avant-propos

Les articles regroupés dans ce volume ont tous été présentés au cours de la cinquième édition de CSSP, colloque de syntaxe et de sémantique qui s'est tenu à Paris en octobre 2003. Comme lors des précédentes éditions, le comité scientifique a sélectionné des travaux en syntaxe et en sémantique alliant à la fois le souci des problèmes empiriques et la recherche d'une présentation des données de langue dans un cadre formel et explicite.

Les éditeurs souhaitent remercier les membres du comité scientifique de CSSP (en dehors des éditeurs eux-mêmes, C. Beyssade, F. Corblin, D. Godard et J.-M. Marandin) pour leur aide dans la préparation de ce volume, et en particulier pour le travail de relecture auquel ils ont accepté de participer.

The articles collected in this volume have all been presented at the fifth edition of CSSP, the Conference on Syntax and Semantics that was held in Paris in October 2003. As for the previous editions, the scientific committee has selected papers on syntax and semantics that combine the study of an empirical problem with a presentation in a formal and explicit framework.

The editors wish to thank the members of the CSSP scientific committee (apart from the editors themselves, C. Beyssade, F. Corblin, D. Godard and J.-M. Marandin) for their help in the preparation of this book, and in particular for accepting to participate in the reviewing process.

Olivier Bonami & Patricia Cabredo Hofherr

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The distribution and interpretation of Welsh N-words*

Robert D. Borsley & Bob Morris Jones

1. Introduction

Like many languages, Welsh has a set of n-words, nominal or adverbial elements which seem to be semantically negative. These include *neb* 'no one', *dim byd* 'nothing', *ddim* 'not', *byth* 'never', and *nunlle* 'nowhere'. Unlike their English counterparts, Welsh n-words have a restricted distribution, being excluded from a variety of contexts. Although they are apparently semantically negative, a single negation interpretation is normal where a sentence contains two n-words. In this paper, we will show that there is a complex and challenging body of data here. We will argue, however, that a storage-based analysis of the kind that is developed within Head-driven Phrase Structure Grammar (HPSG) for French by De Swart and Sag (2002) can provide an illuminating account of this data. The analysis involves two main ideas: (a) that negative elements can only have certain clausal constituents as their scope, and (b) that a sentence with two negative elements can have a single negation interpretation if and only if they have the same scope.

There are considerable differences between formal or literary Welsh and informal or colloquial Welsh. Some work has concentrated on the former and some on the latter. We will focus here on informal Welsh, which, it seems to us, is particularly interesting in this area.[1]

The paper is organized as follows. In section 2, we provide some necessary background information about negative heads. Then, in section 3, we turn to n-words and consider their semantic status, and in section 4, we will look at their distribution. In section 5, we will outline the storage-based analysis. Next, in section 6, we will look at some data which seems problematic but which we will argue is no problem. In section 7, we will consider the possibility of a single negation interpretation for sentences with two n-words or an n-word and negative head. Finally, in section 8, we summarize the paper.

2. Negative heads

Before we can look in detail at n-words, we must say something about negative heads, which play an important role in Welsh negation.

* An earlier version of this paper was presented at the Fourth Celtic Linguistics Conference at the University of Cambridge in September 2003. The issues discussed here are discussed more fully in Borsley and Jones (forthcoming). In exploring these issues, we have benefited from comments from and/or discussion with a number of people, especially Danièle Godard and Manfred Sailer. Any bad bits are our responsibility.

[1] In our examples, some of the spellings are modified to reflect spoken forms (e.g. *welish* instead of formal *welais*). We discuss the differences between formal and informal negation in Borsley and Jones (forthcoming: chapter 2).

Welsh has a distinction between what we refer to in Borsley and Jones (forthcoming: chapter 3) as weak and strong negative heads. The former are always verbs and sometimes have a distinctive form but are often identical to positive forms. A situation where a weak negative head has a distinctive form is illustrated in (1). The more common situation is illustrated in (2).

(1)a. Mae Gwyn yn cysgu.
be.PRES.3SG Gwyn PROG sleep
'Gwyn is sleeping.'
b. Dydy Gwyn ddim yn cysgu.
NEG.be.PRES.3SG Gwyn NEG PROG sleep
'Gwyn is not sleeping.'
(2)a. Fydd Gwyn yn cysgu.
be.FUT.3SG Gwyn PROG sleep
'Gwyn will be sleeping.'
b. Fydd Gwyn ddim yn cysgu.
be.FUT.3SG Gwyn NEG PROG sleep
'Gwyn will not be sleeping.'

All the examples highlight the fact that Welsh is a VSO language, with verb-subject order in finite clauses. The distinguishing property of weak negative verbs is that they must be accompanied by a negative dependent. This may be either a post-subject adverb, as in (1b) and (2b), a subject, as in (3), or a complement, as in (4).[2]

(3) Does neb yn yr ardd.
NEG.be.PRES.3SG no one in the garden
'No one is the garden.'
(4) Welish i neb.
see.PAST.3SG I no one
'I saw no one.'

A distinctive weak negative form without an appropriate negative dependent is ungrammatical. (5) is ungrammatical because it does not contain a negative dependent, while (6) is ungrammatical because the negative dependent is not a complement but just part of the complement.

(5) *Dydy Gwyn yn cysgu.
NEG.be.PRES.3SG Gwyn PROG sleep
'Gwyn is not sleeping.'
(6) *Dydy Gwyn wedi gweld neb.
NEG.be.PRES.3SG Gwyn PERF see no one
'Gwyn hasn't seen anyone.'

In Borsley and Jones (2001, forthcoming) we propose that both post-verbal subjects and post-subject adverbs are complements and that the requirement on weak negative verbs is simply that they have a negative complement.

[2] *Does* is a form that appears in sentences with a negative subject, whereas *dydy* appears in other sorts of negative sentence. Some varieties of Welsh have *toes* and *tydy*.

Welsh has a number of types of strong negative head. One type is a verb in a subordinate clause preceded by the particle *na* (*nad* before a vowel).[43] (7) illustrates.

(7) Wn i [na fydd Sioned yn gweithio heno].
know.PRES.1SG I NEG be.FUT.3SG Sioned PROG work tonight
'I know that Sioned will not be working tonight.'

As this example makes clear, a strong negative head does not require a negative dependent. Another type of strong negative verb is certain distinctive negative forms of the copula found in southern dialects. (8) illustrates:

(8) Sa i 'n gwbod.
NEG.be.PRES I PROG know
'I don't know.'

Other strong negative verbs are the pure negative verb forms *peidio*, which is used to negate a non-finite clause, and *paid* and *peidiwch*, which form negative imperatives. These are illustrated by the following:[4]

(9) (Mi/Fe) geisiodd Gwyn [beidio (ag) ateb y cwestiwn].
AFF try.PAST.3SG Gwyn NEG with answer the question.
'Gwyn tried not to answer the question.'
(10) Paid/ Peidiwch (â) dod yma.
NEG.SG NEG.PL with some here
'Don't come here.'

As these examples show, these forms combine with a non-finite VP optionally preceded by the preposition *â* (*ag* before a vowel). Further strong negative heads are the preposition *heb* 'without' in (11) and the homophonous aspect marker in (12).

(11) Ma' Sioned wedi croesi'r fford heb edrych.
be.PRES.3SG Sioned PERF cross the road without look
'Sioned has crossed the road without looking.'
(12) Ma' Sioned heb gyrredd.
be.PRES.3SG Sioned without arrive
'Sioned has not arrived.'

(12) means the same as (13), which contains the basic negative adverb and the perfect aspect marker.

---

[3] We assume that *na*(*d*) forms a constituent with the following verb and that it may in fact be a prefix. However, this is not particularly important in the present context. Welsh also has negative subordinate clauses which are just like negative main clauses. Thus, we can have (i) instead of (7).
(i) Wn i fydd Sioned ddim yn gweithio heno.
know.PRES.1SG I be.FUT.3SG Sioned NEG PROG work tonight
'I know that Sioned will not be working tonight.'

[4] *Peidio* appears in (9) as *beidio* as a result of mutation, certain morphophonological alternations affecting initial consonants. Mutation is of little importance in the present context, and we will pass over most instances without comment.

(13) Dydy' Sioned ddim wedi cyrredd.
NEG.be.PRES.3SG Sioned NEG PERF arrive
'Sioned has not arrived.'

All the strong negative heads allow a negative dependent, as we will see in section 4.

3. The semantic status of n-words

We turn now to Welsh n-words and first their semantic status. At least three different views of the nature of n-words can be found in the literature. One view, developed, for example, in Zanuttini (1991), Haegeman and Zanuttini (1996), and De Swart and Sag (2002), is that they are negative quantifiers or operators. Another, advocated in such works as Laka (1990) Ladusaw (1992), Richter and Sailer (1998), and Rowlett (1998), is that they are indefinites which must appear within the scope of negation. A third view, advanced especially in Giannakidou (2000), is that they are universal quantifiers which must take scope over negation. It may well be that each of these views is right for n-words in some language. A number of considerations suggest that they are semantically negative in Welsh.

First, they can be used as an elliptical negative answer to a question. We have examples like the following:

(14) A: Pwy welest ti?
who see.PAST.2SG you.SG
'Who did you see?'
B: Neb.
'No one.'
(15) A: Be welest ti?
what see.PAST.2SG you.SG
'What did you see?'
B: Dim byd.
'Nothing.'
(16) A: Wyt ti 'n gweld Sioned y dyddiau 'ma?
be.PRES.2SG you.SG PROG see Sioned the days here
'Do you see Sioned these days?'
B: Byth.
'Never.'
(17) A: Lle fuost ti neithiwr?
where be.PAST.2SG you.SG last-night
'Where were you last night?'
B: Nunlle.
'Nowhere.'

This is only to be expected if n-words are semantically negative. In contrast, it seems problematic for alternative views of n-words, in which they are not negative.

Second, the fact that weak negative verbs are commonly identical in form to positive verbs means that an n-word is often the only element which distinguishes a negative sentence from an affirmative sentence. (2b) is a relevant example. On the face of it, it would be odd to claim that it is the verbs in such examples and not the n-words that are semantically negative.

Third, sentences with two n-words can often have a double negation interpretation, given the right intonation. Thus, the following are ambiguous, as indicated:

(18) Does neb yn deud dim byd.
NEG.be.PES.3SG no one PROG say nothing
'No one is saying anything.' (single negation)
'No one is saying nothing.' (double negation)
(19) Alla' i ddim gneud dim byd.
can.PRES.1SG I NEG do nothing
'I can't do anything.' (single negation)
'I can't do nothing.' (double negation)

Similar facts have been observed in French (De Swart and Sag 2002, Mathieu 2001). It is hard to see how double negation interpretations could arise if n-words were not semantically negative.

Thus, there is a variety of evidence that Welsh n-words are semantically negative. We will assume that the main n-words are negative quantifiers. Following De Swart and Sag's (2002) analysis of French *pas*, we will assume that the basic negative adverb, *ddim*, is a pure negative operator which does not bind any variables. We will also assume that strong negative heads are associated with this operator.[5]

Of course, if these elements are semantically negative, we need to explain how it is possible for a sentence with two n-words or an n-word and a strong negative head to have a single negation interpretation. We will consider this matter in section 7.

4. The distribution of n-words

As we noted at the outset, Welsh n-words are excluded from a variety of contexts.

First they are impossible in unambiguously affirmative declarative sentences. There are two main types of examples. The present tense of the copula has certain third person forms beginning with *m-*, which are confined to affirmative declarative sentences. We see one of these forms in (1a). This cannot co-occur with an n-word, as (20) shows:

(20) *Mae Gwyn ddim yn cysgu.
be.PRES.3SG Gwyn NEG PROG sleep
'Gwyn is sleeping.'

We have similar data with the third person plural form *maen*. Welsh also has two preverbal particles which may mark an affirmative declarative sentence, *mi*, which is typically used in northern areas,

[5] As we might expect, a double negation interpretation is also possible in at least some examples containing a strong negative head and an n-word. The following illustrate:
(i)a. Mi geisiodd Gwyn beidio (â) deud dim byd.
AFF try.PAST.3SG Gwyn NEG with say nothing
'Gwyn tried not to say anything.' (single negation)
'Gwyn tried not to say notthing.' (double negation)
b. Paid/ Peidiwch (â) gweld neb.
NEG.IMPV.2SG NEG.IMPV.2PL with see no one
'Don't see anyone.' (single negation)
'Don't see no one.' (double negation)

and *fe*, which is typically used in southern areas. (We saw these elements in (9).) They also cannot co-occur with an n-word. Thus, we have (21a) but not (21b) or (21c).

(21)a. Mi/Fe fydd Gwyn yn cysgu.
AFF be.FUT.3SG Gwyn PROG sleep
'Gwyn will be sleeping.'
b. *Mi/Fe fydd Gwyn ddim yn cysgu.
AFF be.FUT.3SG Gwyn NEG PROG sleep
'Gwyn will not be sleeping.'
c. *Mi/Fe fydd neb yn cysgu.
AFF be.FUT.3SG no one PROG sleep
'No one will be sleeping.'

Second, n-words are impossible in the infinitival complement of a finite verb.

(22) (Mi/Fe) geisiodd Gwyn [ddeud rhywbeth/*dim byd].
AFF try.PAST.3SG Gwyn say something nothing.
'Gwyn tried to say something/nothing.'

Third, they are impossible in an affirmative imperative.

(23) Ffonia/ Ffoniwch Gwyn/*neb.
phone.2SG phone.2PL Gwyn no one
'Phone Gwyn/no one.'

Thus, an analysis of Welsh n-words must exclude them from these contexts.

Where, then, can n-words occur? As we have seen, they can occur in a clause headed by a weak negative verb, and in fact one must occur. (1b), (2b), (3) and (4) illustrate. They can also occur in a constituent headed by a strong negative head although no n-word is required. (24) shows that an n-word can occur in a subordinate clause with a verb preceded by *na*(*d*). (25) shows that an n-word can occur with a southern negative form of the copula. (26) shows that a n-word can appear in an infinitival complement headed by the strong negative verb *peidio*. (27) shows that they can appear in imperatives with the strong negative verbs *paid*/*peidiwch*. Finally, (28) and (29) show that they can appear in a phrase headed by the strong negative preposition *heb* and the homophonous aspect marker.

(24) Wn i [na fydd Sioned ddim yn gweithio heno].
know.PRES.1SG I NEG be.FUT.3SG Sioned NEG PROG work tonight
'I know that Sioned will not be working tonight.'
(25) Sa i wedi gweld neb.
NEG.be.PRES I PERF see no one
'I haven't seen anyone.'
(26) (Mi/Fe) geisiodd Gwyn [beidio (â) deud dim byd].
AFF try.PAST.3SG Gwyn NEG with say nothing.
'Gwyn tried to say nothing/not to say anything.'
(27) Paid/ Peidiwch (â) ffonio neb.
NEG.SG NEG.PL with phone no one
'Don't phone anyone.'

(28) Groesodd Sioned y fford heb weld dim byd.
crossed Sioned the road without see nothing
'Sioned crossed the road without seeing anything.'
(29) Ma' Sioned heb fyta dim byd.
be.PRES.3SG Sioned without eat nothing
'Sioned has not eaten anything.'

These, however, are not the only contexts in which an n-word may appear.

We saw earlier that n-words are impossible in the infinitival complement of a finite verb. They can occur, however, in certain infinitival constituents. They can appear in an infinitival complement of non-finite verb, as (30) illustrates. They can also appear in an infinitival complement of an adjective (31), in a non-finite clause in subject position (32) and in a non-finite adverbial clause (33).
(30) Dw i 'n licio [gneud dim byd].
be.PRES.1SG I PROG like do nothing
'I like doing nothing.'
(31) Mae 'n well [deud dim byd].
be.PRES.3SG PRED better say nothing
'It's better to say nothing.'
(32) Ma' [byta dim byd] yn ddrwg i ti.
is eat nothing PRED bad for you(SG)
'Eating nothing is bad for you.'
(33) [ar ôl (gneud dim byd trwy 'r bore], mi weithiodd yn galed
after do nothing through the morning PRT worked ADV hard
yn y p'nawn.
in the afternoon
'After doing nothing in the morning, he worked hard in the afternoon.'

In all these cases, the infinitival constituent may contain the negative verb *peidio*, but it is not required.

There are two further contexts in which n-words may appear. First, they can appear in what are traditionally known as 'absolute clauses'. These are typically introduced by a coordinating conjunction, especially *a* 'and', and contain a subject and the kind of phrase that can appear as the complement of the copula, i.e. an aspect phrase containing an aspect marker and a non-finite verb, a predicate phrase containing the particle *yn* and an AP or NP, or a prepositional phrase. The bracketed absolute clause in (34) contains an n-word.

(34) O'n i 'n llithro yn araf dros yr ochr, [a Megan
be.IMPF.1SG I PROG slip slowly over the side and Megan
yn deud dim byd].
PROG say nothing
'I was slipping slowly over the side and Megan was saying nothing.'

Finally the adverb *ddim*, in addition to appearing in post-subject position, can appear as a premodifier of certain predicative constituents. (35) illustrates.
(35) Mae Sioned wedi bod [ddim yn dda].
be.PRES.3SG Sioned PERF be NEG PRED good
'Sioned has been not well.'

Whereas it is licensed by a weak or strong negative verb when it appears in post-subject position, we assume that it licenses itself here. It also licenses other n-words, as the following show:

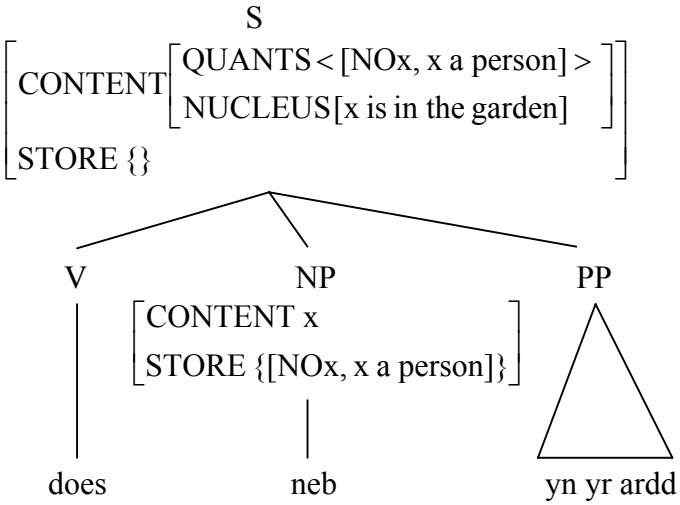
(36)a. Dw i'n dal [ddim yn gweld dim byd].
be.PRES.1SG I PROG continue NEG PROG see nothing
'I still can't see anything.'
b. Dw i'n cofio Mair [ddim yn helpu neb].
be.PRES.1SG I PROG remember Mair NEG PROG help no one
'I remember Mair not helping anyone.'

5. A storage-based approach

In this section, we will develop an HPSG storage-based approach to the data that we have just presented, drawing on De Swart and Sag's (2002) analysis of French.

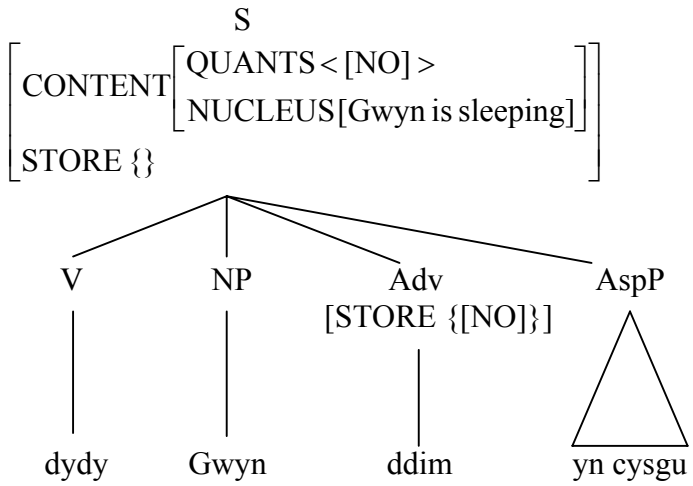
For HPSG, quantifiers, including negative quantifiers, are stored and retrieved from storage at certain clausal nodes which constitute their scope. Assuming this approach and assuming a flat structure analysis for VSO clauses, we can propose the following schematic representation for (3).

(37)



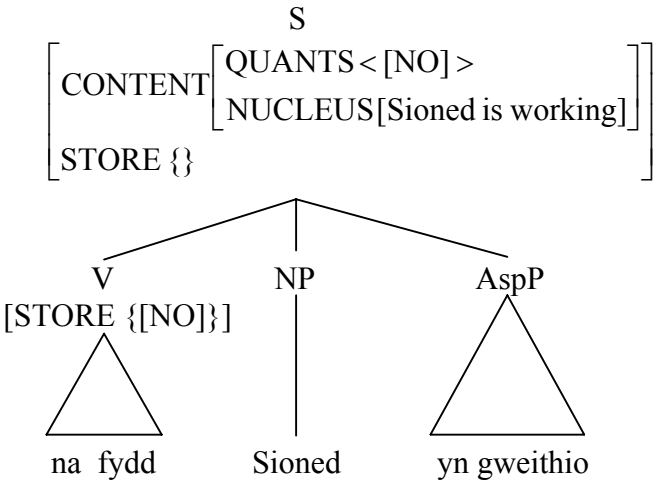
Here the CONTENT of the n-word *neb* is a variable but it is associated with a negative quantifier in storage. This quantifier is retrieved at the sentence level and incorporated into the value of QUANTS. We suggested earlier that the negative adverb *ddim* is a pure negative operator which does not bind any variables. This suggests that (1b) has something like the following representation:

(38)



We also suggested that strong negative heads include this operator as part of their meaning. This suggests that we have something like the following representation for the complement in (7).

(39)



A central question for this approach is: where can negative quantifiers be retrieved from storage? Clearly, they can only be retrieved at positions with an appropriate CONTENT value, hence only at a clausal node. However, there is more to be said here. We know that n-words are licensed in some contexts but excluded from others. We suggest that this is because the associated quantifier can only be retrieved at some clausal nodes.

The following examples suggest that the context that licenses an n-word is also the position which is the scope of the associated quantifier, the position, in other words, at which it is retrieved from storage:

(40)a. Dw i ddim isio i 'r dynion helpu neb.
be.PRES.1SG I NEG want to the men help no one
'I don't want the men to help anyone/no one.'

b. Dw i isio i 'r dynion beidio helpu neb.
be.PRES.1SG I want to the men NEG help no one
'I want the men not to help anyone/no one.'

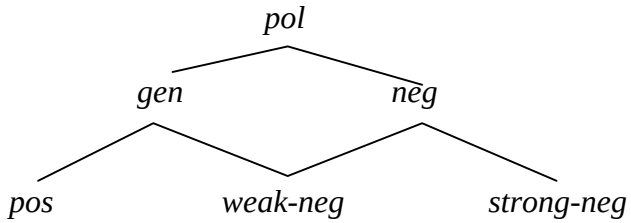
In (40a) *neb* is licensed by the weak negative verb *dw* in the main clause, whereas in (40b) it is licensed by the strong negative verb *beidio* in the subordinate clause. Alternative translations for these examples would be as follows:

(41)a. There is no one that I want the men to help.
b. I want there to be no one that the men help.

These translations make it fairly clear that we have a quantifier with the whole sentence as its scope in (40a) and a quantifier with just the subordinate clauses as its scope in (40b). Thus, it seems plausible to suggest that a context licenses an n-word if and only if it allows a negative quantifier to be retrieved from storage. Of course, we have to explain how the examples in (40) can have a single negation interpretation. We will consider this matter in section 7.

Assuming that the conclusion we have just reached is sound, an account of the data presented in the last section must restrict the contexts in which a negative quantifier can be retrieved from storage. How can we characterize the contexts which allow retrieval? Before we can answer this question we need a classification of heads. Simplifying somewhat, we will assume a feature POL(ARITY) with the following values:

(42)



Here we have thee fully specified values: *pos*(*itive*), *weak-neg*(*ative*), and *strong-neg*(*ative*), and a completely unspecified value *pol*(*arity*). We also have two partially specified values: *gen*(*eral*), which is equivalent to *pos* or *weak-neg*, and *neg*(*ative*), which is equivalent to *weak-neg* or *strong-neg*. The former provides for the many verb forms which are ambiguous between a positive and a weak negative status. The latter helps us to characterize the contexts which allow retrieval.

Assuming the feature values in (42), contexts headed by a weak or strong negative head can be characterized as follows:

(43)

$$\begin{bmatrix} \textit{phrase} \\ \text{HEAD[POL } \textit{neg}\text{]} \end{bmatrix}$$

This, then, is one context in which retrieval is allowed, exemplified by (1b), (2b), (3), (4) and (24)-(29)

A second context in which retrieval is possible is provided by certain infinitival constituents. It is not at all clear how those infinitival constituents which allow retrieval should be distinguished from those which do not. We will simply mark those contexts which allow retrieval as 'F'. We can say, then, that we have retrieval in the following context:

(44)

$$\begin{bmatrix} \textit{phrase} \\ \text{HEAD}\left[\text{VFORM } \textit{inf}\right] \\ \text{'F'} \end{bmatrix}$$

This is exemplified by (30)-(33).

Turning now to 'absolute clauses', we will assume that the various phrases that can appear as the predicate are all marked [PRED +]. This means that we have retrieval in the following context:

(45)

$$\begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{PRED} +] \\ \text{SUBJ} <> \end{bmatrix}$$

The [SUBJ <>] specification ensures that this is a clause. This context is exemplified by (34).

Finally we must consider constituents containing *ddim* as a premodifier. *Ddim* modifies a [PRED +] phrase. Thus, what we have here is a [PRED +] phrase whose first daughter is *ddim*. Thus, we can say that we have retrieval in the following context:

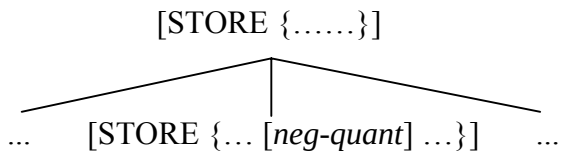
(46)

$$\begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{PRED} +] \\ \text{DTRS} < [\text{FORM } \textit{ddim}], \ldots > \end{bmatrix}$$

This context is exemplified by (35) and (36).

What we need to say is that if a negative quantifier is retrieved from storage then we have one of these four contexts. When a negative quantifier is retrieved from storage we have the following structure:

(47)



In other words, we have a constituent with no negative quantifier is storage, one of whose daughters has a negative quantifier is storage. Thus, we need to say that if we have this structure, then we have (43), (44), (45) or (46). This is what the following constraint says:

(48)

$$\begin{bmatrix} \text{STORE } \{.....\} \\ \text{DTRS} < ..., [\text{STORE } \{...[\textit{neg - quant}]...\}], ... > \end{bmatrix} \rightarrow$$

$$\left(\begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{POL } \textit{neg}] \end{bmatrix} \vee \begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{VFORM } \textit{inf}] \\ \text{'F'} \end{bmatrix} \vee \right.$$

$$\left. \begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{PRED} +] \\ \text{SUBJ} <> \end{bmatrix} \vee \begin{bmatrix} \textit{phrase} \\ \text{HEAD}[\text{PRED} +] \\ \text{DTRS} < [\text{FORM } \textit{ddim}], ... > \end{bmatrix} \right)$$

Given this constraint, the various ungrammatical examples that we have cited earlier will all have a negative quantifier in storage. We can assume that non-embedded or root constituents are required to have an empty STORE by the following constraint:

(49) [ROOT +] → [STORE {}]

This, then, is why the various ungrammatical examples are ungrammatical.

The combination of (48) and (49) accounts for the ungrammaticality of various examples. However, we have not in fact ensured that the context that licenses an n-word is also the position at which the associated quantifier is retrieved. There is no problem with the examples in (40) because both only have a single retrieval context. Consider, however, the following:

(50) Dw i ddim isio i 'r dynion beidio helpu neb.
be.PRES.1SG I NEG want to the men NEG help no one
'I don't want the men not to help anyone.'

This can be paraphrased as (51a) but not as (51b).

(51)a. I don't want there to be no one that the men help.
b. There is no one that I want the men not to help.

It seems, then, that the quantifier can only be retrieved in the subordinate clause although the main clause is also a retrieval context. It looks, then, as if we need to say that if a quantifier can be retrieved then it must be. We can do this by requiring that the contexts which allow retrieval may not have a negative quantifier in storage. The following constraint does this:

(52)

$$\left(\begin{bmatrix} phrase \\ \text{HEAD}[\text{POL } neg] \end{bmatrix} \vee \begin{bmatrix} phrase \\ \text{HEAD}\left[\text{VFORM } inf\right] \\ \text{'F'} \end{bmatrix} \vee \begin{bmatrix} phrase \\ \text{HEAD}[\text{PRED} +] \\ \text{SUBJ} <> \end{bmatrix}\right.$$

$$\left. \vee \begin{bmatrix} phrase \\ \text{HEAD}[\text{PRED} +] \\ \text{DTRS} < [\text{FORM } ddim], ... > \end{bmatrix}\right) \rightarrow \neg\,([\text{STORE } \{\ldots\ [neg\text{-}quant]\ \ldots\}])$$

This constraint is also very relevant in connection with premodifying *ddim*. This negates the following constituent. Thus, (53) has the meaning indicated and cannot mean 'Sioned has not been well'.

(53) Mae Sioned wedi bod ddim yn dda.
be.PRES.3SG Sioned PERF be NEG PRED good
'Sioned has been unwell.'

(52) entails that *ddim yn dda* must not have a negative quantifier in store. Hence the negation associated with *ddim* is restricted to this constituent. The constraint also ensures that the negative operator associated with a strong negative head has the associated phrase as its scope. This will be important below.

There is one further matter that we must consider here. De Swart and Sag propose that quantifiers are retrieved not at the phrasal level but at the lexical level. More precisely, they propose that the head of phrase may retrieve a quantifier from the store of one of the non-heads. This approach is viable where it is clear from the head that the phrase is one that can be negated. However, this is not the case in two of the contexts that are relevant here. The head of an absolute clause will be indistinguishable from the head of a [PRED +] phrase that is not the predicate of an absolute clause. Similarly, the head of [PRED +] phrase modified by *ddim* will be indistinguishable from a [PRED +] phrase not modified by *ddim*.[6] It seems, then, that some retrieval must take place at the phrasal level, and one might assume that all retrieval does.

6. An apparent problem

We want now to look at some data which seems problematic for the approach that we have just developed. We will argue that there is in fact no problem here.

Welsh has certain non-finite clauses introduced by what looks like the preposition *i* 'to', 'for', which resemble English *for-to* clause. The following illustrates:

[6] De Swart and Sag do not discuss French expressions like the bracketed sequence in (i), in which a negative adverb appears as pre-modifier.

(i) [Ne pas parler français] est un grand désavantage en ce cas.
NEG NEG speak French is a big disadvantage in this case
'Not speaking French is a big disadvantage in this case.'

Such expressions are rather like the bracketed sequences in (35) and (36) and seem to require retrieval at the phrasal level. Godard (forthcoming) proposes an analysis of such examples involving phrasal retrieval.

(54) Disgwyliodd Megan [i Sioned fynd adre].
expect.PAST.3SG Megan to Sioned go home
'Megan expected Sioned to go home.'

Such clauses can contain the negative verb *peidio*, as (55) shows:

(55) Disgwyliodd Megan [i Sioned beidio (â) mynd adre].
expect.PAST.3SG Megan to Sioned NEG with go home
'Megan expected Sioned to go home.'

This can license an n-word within the following predicate but cannot license an n-word in the preceding subject position.

(56)a. Dw i 'n disgwyl i Mair beidio (â) gweld neb.
be.PRES.1SG I PROG expect to Mair NEG with see no one
'I expect Mair not to see anyone.'
b. *Dw i yn disgwyl [i neb beidio (â) mynd i Aberystwyth].
be.PRES.1SG I PROG expect to no one NEG with go to Aberystwyth

An n-word in the subject position of such a clause can only be licensed by a negation in the main clause, as in (57).

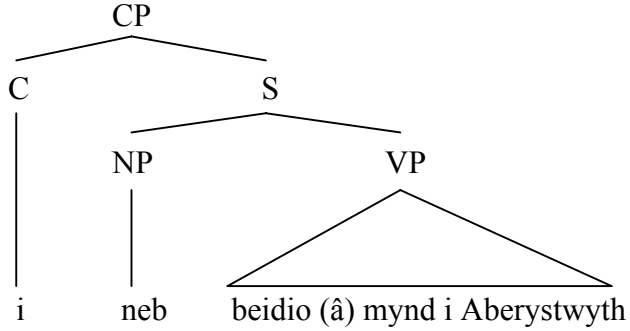
(57) Dw i ddim yn disgwyl [i neb beidio (â) mynd i Aberystwyth].
be.PRES.1SG I NEG PROG expect to no one NEG with go to Aberystwyth
'I don't expect anyone not to go to Aberystwyth.'

Notice now that the following French and Polish examples are grammatical:

(58) Personne n' est venu. (French)
no-one NEG is come
'No-one has come.'
(59) Nikt nie przyszedł. (Polish)
no-one NEG has-come
'No-one has come.'

In these examples, an n-word in subject position is licensed by a following negative verb. Thus, the ungrammaticality of (56b) is quite surprising. The obvious structure to propose for the subordinate clause in (56b) is something like the following:

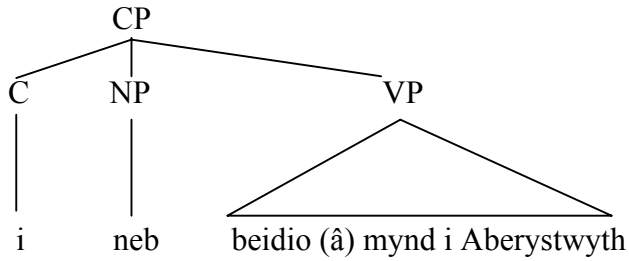
(60)



Given such a structure, one would expect (56b) to be grammatical. *Peidio* here is the head of the S. Hence, S will be [POL *neg*], and one would expect *neb* to be licensed. It looks, then, as if we have a real problem here.

In fact, we can argue that there is no problem here. Borsley (1999) argues on independent grounds that *i* in these clauses is a head which takes two complements, an NP and a VP. On this view, the subordinate clause in (56b) has the following structure:

(61)



A similar analysis is proposed in Sag (1997) for English *for-to* clauses. Assuming the structure in (61), *beidio* is only the head of VP. Hence only VP is [POL *neg*] and an n-word is only licensed within VP.

It seems to us that the situation here is like that in the following French examples, drawn to our attention by Danièle Godard:

(62)a. *Je vois personne ne venir. (French)
I see no-one NEG come
'I see no one coming.'
b. Je ne vois personne venir.
I NEG see no one come
'I don't see anyone coming.'

Here, a post-verbal n-word cannot be licensed by a following negative verb. We have a similar situation in the following Polish examples:

(63)a. *Znalazłem nikogo niezadowolonego. (Polish)
I-found no one displeased
'I found nobody displeased.'
b. Nie znalazłem nikogo niezadowolonego.
NEG I-found no one displeased
'I didn't find anybody displeased.'

Here, a post-verbal n-word cannot be licensed by a following negative adjective. These examples might be problematic if they involved a single clausal complement, but they will be no problem if they involve two separate complements. It seems to us that the Welsh examples are similar to these examples and not to the earlier French and Polish examples.

7. Single negation

We now need to consider how it is possible for a sentence with two n-words or an n-word and a strong negative head to have a single negation interpretation. We will adopt the approach developed by De Swart and Sag (2002).

De Swart and Sag propose that negative quantifiers that are retrieved in the same place can be combined to form a single quantifier complex. They propose that negative quantifiers that are retrieved in the same place can be combined to form a single quantifier complex. This means that it is possible to have not just (64a) but also (64b).

(64)a. $NOx_1 \ldots NOx_n$
b. $NOx_1 \ldots x_n$

We noted earlier that (18), repeated here for convenience, is ambiguous with the two interpretations indicated.

(18) Does neb yn deud dim byd.
NEG.be.PES.3SG no one PROG say nothing
'No one is saying anything.' (single negation)
'No one is saying nothing.' (double negation)

The two meanings can be represented as follows:

(65)a.

$$\begin{bmatrix} \text{QUANTS} < [\text{NOx, x a person}], [\text{NOy, y a thing}] > \\ \text{NUCLEUS}[\text{x is saying y}] \end{bmatrix}$$

b.

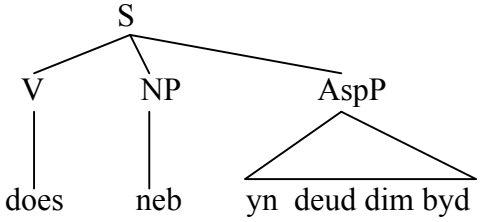
$$\begin{bmatrix} \text{QUANTS} < [\text{NOx, y, x a person, y a thing}] > \\ \text{NUCLEUS}[\text{x is saying y}] \end{bmatrix}$$

Thus, (18) has a single syntactic structure but two different CONTENT values.

This approach predicts that a sentence with two n-words or an n-word and a strong negative head can have a single negation interpretation or a double negation interpretation if the associated quantifiers are retrieved in the same position and can only have a double negation interpretation if the associated quantifiers are retrieved in different positions. This prediction seems to be correct.

Consider first (18). This will have something like the following structure:

(66)



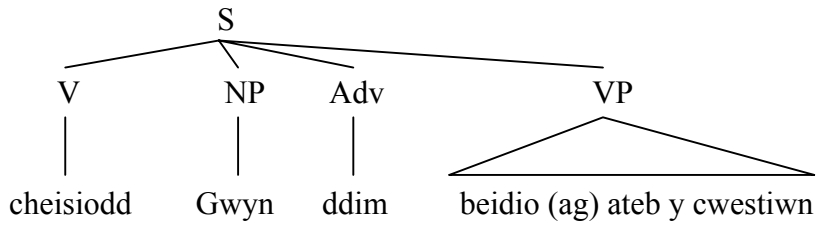
Here there is only one position in which negative quantifiers can be retrieved, namely the S node. Hence, the two negative quantifiers are retrieved in the same position and can form a single quantifier complex.

We can now consider some more complex examples, where negative quantifiers are retrieved in different positions, and where, as a result, a single negation interpretation is impossible. Consider first the following:[7]

(67) Cheisiodd Gwyn ddim [beidio (ag) ateb y cwestiwn].
try.PAST.3SG Gwyn NEG NEG with answer the question.
'Gwyn didn't try to not answer the question.'

This can only have the double negation interpretation indicated. It will have something like the following structure:

(68)



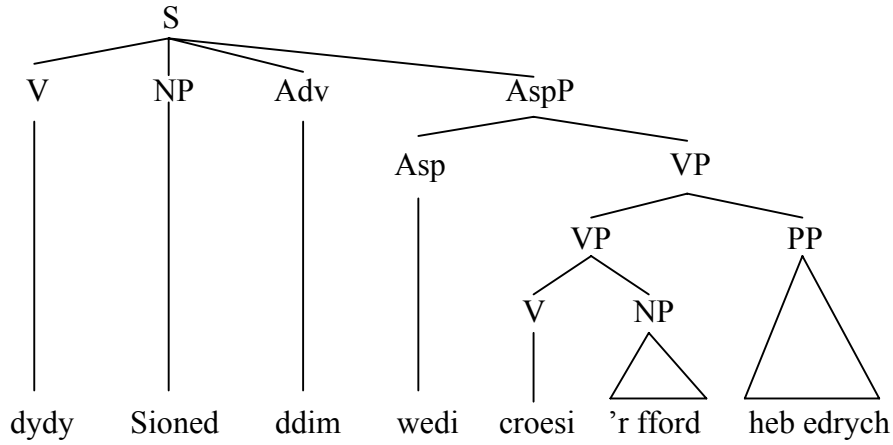
Here, the negative operator corresponding to *ddim* is retrieved at the S node while the negative operator corresponding to *peidio* is retrieved at the VP level. Hence, there is no possibility of a single negation interpretation. Consider now the following:

(69) Dydy Sioned ddim wedi croesi'r fford heb edrych.
NEG.be.PRES.3SG Sioned NEG PERF cross the road without look
'Sioned hasn't crossed the road without looking.'

(70) Dydy Sioned ddim heb gyrredd.
NEG.be.PRES.3SG Sioned NEG without arrive
'Sioned has not not arrived.'

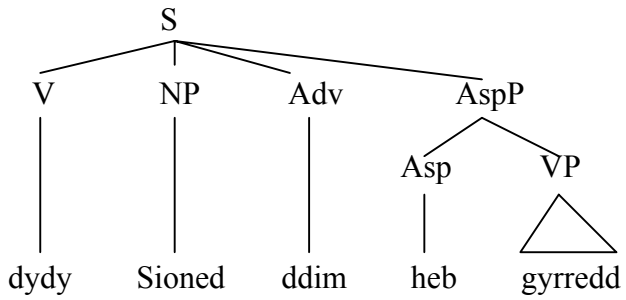
Again, we only have double negation interpretations. (69) will have the structure in (71), and (70) will have that in (72):

(71)



[7] *Cheisiodd* here is another distinctive weak negative verb form. The positive form is *geisiodd* seen in (9), (22) and (26).

(72)

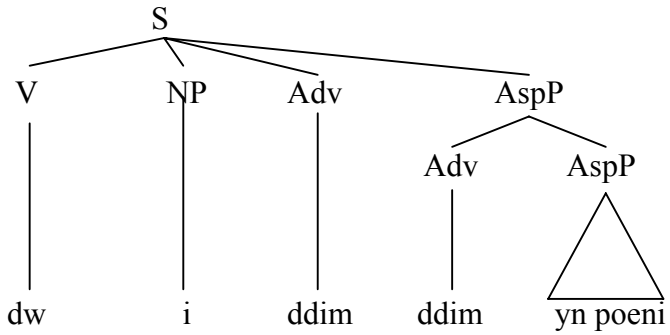


In (71), the negative operator corresponding to *ddim* is retrieved at the S node while the negative operator corresponding to *heb* is retrieved at the PP node. In (72), the negative operator corresponding to *ddim* is retrieved at the S node while the negative operator corresponding to *heb* is retrieved at the AspP node. Hence, there is no possibility of a single negation interpretation in either case. Consider finally (73).

(73) Dw i ddim ddim yn poeni.
be.PRES.1SG I NEG NEG PROG worry
'I don't not worry.'

Here we have *ddim* both as a post-subject adverb and as a premodifier of a predicative phrase. Again, we only have a double negation interpretation. This will have the following structure:

(74)



Here, the negative operator corresponding to the first *ddim* is retrieved at the S node while the negative operator corresponding to the second *ddim* is retrieved at the higher AspP node. Once more, then, there is no possibility of a single negation interpretation.

8. Conclusion

In this paper, we have looked at the main properties of Welsh n-words. We have shown that they have restricted distribution, being excluded from certain contexts but allowed in a number of others. We have also seen that there is evidence that they are semantically negative but that a sentence with two n-words or an n-word and negative head can have a single negation interpretation. The facts are quite complex, but we have argued that an HPSG storage-based approach to n-words permits a straightforward account of both the distribution of Welsh n-words and important aspects of their interpretation.

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Structure-Preserving Extraction without Traces

Wesley Davidson*

1 Introduction

In this paper I present a trace-free analysis of unbounded dependency constructions (UDCs) couched in the HPSG framework. The approach described here differs from previous trace-free HPSG accounts of UDCs in two significant ways. First, unlike the analysis in Pollard and Sag (1994), it handles extraction uniformly from both root and embedded clauses alike, regardless of the grammatical function of the gap. Secondly, unlike the analysis in Bouma *et al.* (2001), it in principle permits extraction of any non-head constituent, whether or not that constituent is present on the valence list of some lexical head.

The benefits of the first distinguishing property have been discussed at length elsewhere (Hukari and Levine 1995; Bouma *et al.* 2001), so I do not belabor the point here. The benefits of the second property, however, have been less recognised (but see Levine (2003)) and even denied (Bouma *et al.* 2001), so I spend some time examining them below (section 3).

The presentation is organised as follows. First, in section 2, I review the proposal in Bouma *et al.* (2001) (hereafter BMS), focussing on their treatment of adjunct extraction. Then, in section 3, I present some data from English that appears problematic for the BMS approach to adjunct extraction. In section 4, I present an analysis of UDCs which is fully compatible with the problematic data discussed in section 3, and conclude the section with a short demonstration of how it one can use this theory to characterise morphosyntactic reflexes of extraction in Chamorro. Finally, in section 5, I discuss the prospects for certain extensions to the current analysis.

2 Bouma, Malouf, and Sag (2001)

In essence, the heart of the BMS account of UDCs is the postulation of a series of three kinds of head-borne lists, where each kind of list expresses a distinct relation that a head bears to other elements in its projections. We can call these three relations the *argument structure* of a head, its *dependency structure*, and its *valence*.

Of the three relations, argument structure is taken to be the most primitive; the argument structure of a head is given by its lexical entry, where it is encoded as the list-value of the *category* feature ARG-ST.

*The ideas presented here would be worse without the criticism and other kind advice of Danièle Godard, Rich Janda, Bob Levine, Vanessa Metcalf, Carl Pollard, and especially Detmar Meurers. I alone am responsible for anything untrue, invalid, or otherwise offensive.

An ARG-ST list, roughly speaking, contains the SYNSEM values of a word's semantic arguments. It is to this level of structure that HPSG's binding theory applies.[1]

As is by now standard, a lexical head's SUBJ and COMPS (and SPR) features represent its valence, and so drive its projections' selection of any realised arguments. For example, in a head-complement phrase any elements on the head-daughter's COMPS list must be realised as sisters to that head.

The argument structure of a word determines in large part its valence, and it is as a sort of intermediary between these two levels that BMS introduce the novel level of dependency structure. The list-valued *category* feature DEPS, present on words, represents this level.

As noted above, the argument structure of a word determines its valence to quite a large extent. However, the BMS analysis of adjunct extraction crucially supposes that the extent of this determination is somewhat less than usually assumed.

In particular, serving as middleman between ARG-ST and valence lists, not only does the DEPS list of a verb include all of its arguments, but furthermore it may also include an arbitrary number of modifiers.

BMS's constraint Argument Structure Extension permits this as follows:

(1) Argument Structure Extension:

$$\begin{bmatrix} \textit{word} \\ \text{HEAD}\ \ \textit{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD} & \boxed{2} \\ \text{DEPS} & \boxed{1} \oplus \textit{list}\left(\left[\text{MOD}|\text{HEAD}\ \ \boxed{2}\right]\right) \\ \text{ARG-ST} & \boxed{1} \end{bmatrix}$$

This constraint states that the DEPS list of a verb is its ARG-ST list prefixed to a (perhaps empty) list of modifiers.

Consistent with the above constraint, for example, both descriptions below describe legitimate transitive verbs; the first is a transitive verb without any dependent modifiers, and the second is one with a single dependent modifier:

(2) Two transitive verbs:

a. The verb *tied*, as in *Kim tied her shoes*.

$$\begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{DEPS} & \langle \boxed{1}\text{NP}, \boxed{2}\text{NP} \rangle \\ \text{ARG-ST} & \langle \boxed{1}, \boxed{2} \rangle \end{bmatrix}$$

b. The verb *tied*, as in *Kim tied her shoes with one hand*.

[1] As Danièle Godard has pointed out (p.c.), given that HPSG's binding theory is formulated in terms of ARG-ST elements, ARG-ST lists must also contain expletive arguments playing no semantic role, at least when such elements control the agreement features of anaphors. For instance, in the French example below (i), the expletive impersonal subject clitic *il* controls the agreement features of the third person reflexive clitic *se*.

(i) Il ne s'est trouvé que nous d'heureux.
It NE SE found only us happy
'Only we turned out happy.'

This detail of ARG-ST values, however, plays no part in the discussion in this paper.

$$\begin{bmatrix} \text{HEAD} & \boxed{3}\,\textit{verb} \\ \text{DEPS} & \left\langle \boxed{1}\,\text{NP}, \boxed{2}\,\text{NP}, \left[\text{MOD}|\text{HEAD}\ \boxed{3}\right] \right\rangle \\ \text{ARG-ST} & \langle \boxed{1}, \boxed{2} \rangle \end{bmatrix}$$

As a consequence of their differing dependency structures, these two verbs should potentially head differently structured verb phrases. BMS accomplish this by determining the valence of a head from its DEPS value with the following constraint on words' SUBJ and COMPS lists, which they name Argument Realization (3, below). (The type *gap_ss* mentioned in (3) is a subtype of *synsem* object disjoint to *canonical_ss*, where only *canonical_ss* is an appropriate value for a sign's SYNSEM attribute.)

(3) Argument Realization:

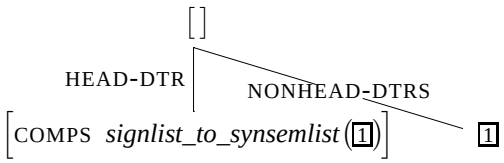
$$\textit{word} \rightarrow \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \boxed{2} \ominus \textit{list}(\textit{gap\_ss}) \\ \text{DEPS} & \boxed{1} \oplus \boxed{2} \end{bmatrix}$$

This Argument Realization constraint (along with the assumption that all verbs have a singleton SUBJ list) ensures that a verb's subject will be the first element on its DEPS list, and any COMPS list elements will be elements of the rest of the DEPS list.

Assuming the DEPS lists in the above (2) descriptions contain no *gap_ss* elements, and a head-complement schema as follows, then each of the verbs in (2a,b) can head only the structures in (5a) and (5b) respectively.

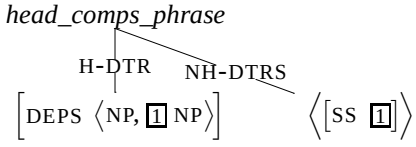
(4) Head-complement schema:[2]

head_comps_phrase →

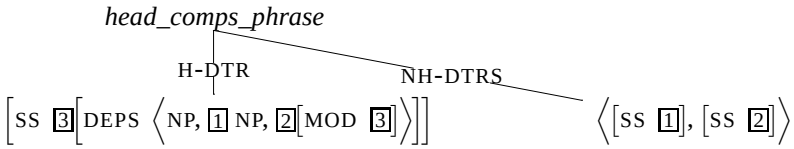


(5) Two head-complement phrases:

a. transitive verb with its direct object



b. transitive verb with its direct object and a modifier



[2]This schema's formulation presupposes a valence principle (or some set of valence principles) that ensures *head_comps_phrase*s are COMPS <>.

On the other hand, suppose one extends the description in (2b) as in (6a) or as in (6b). One obtains descriptions of verbs which cannot head the VP in (5b), since neither non-head daughter in (5b) can have a SYNSEM value of type *gap_ss*.[3]

(6) Two extensions of a verb with a direct object and modifier:

a. The verb *tied*, as in *Her left shoe, Kim tied with one hand*.

$$\begin{bmatrix} \text{HEAD} & \boxed{3}\ \textit{verb} \\ \text{DEPS} & \left\langle \text{NP},\ \text{NP}\left[\textit{gap\_ss}\right],\ \begin{bmatrix} \textit{canonical\_ss} \\ \text{MOD}|\text{HEAD} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

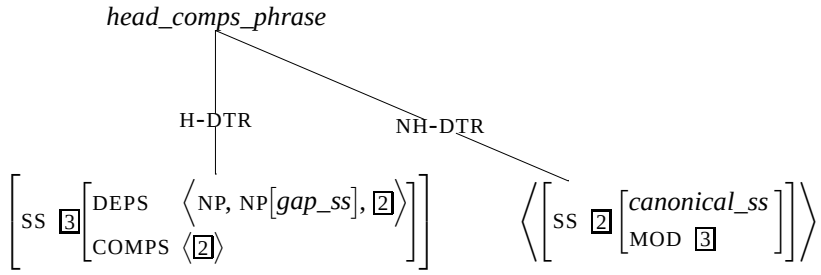
b. The verb *tied*, as in *With her right hand, Kim tied her left shoe*.

$$\begin{bmatrix} \text{HEAD} & \boxed{3}\ \textit{verb} \\ \text{DEPS} & \left\langle \text{NP},\ \text{NP}\left[\textit{canonical\_ss}\right],\ \begin{bmatrix} \textit{gap\_ss} \\ \text{MOD}|\text{HEAD} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

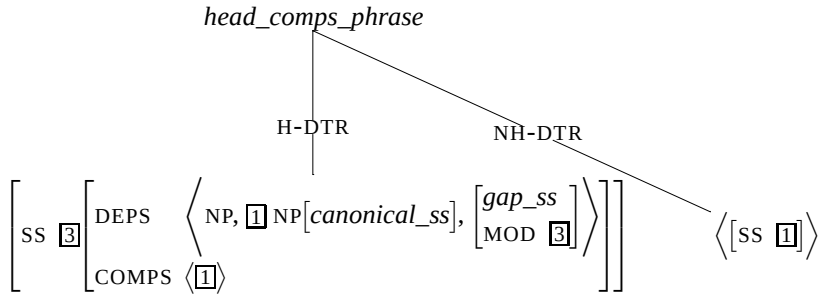
Nonetheless, the verbs in (6a,b) can respectively head the VPs in (7a,b) since (consistent with Argument Realization) their COMPS lists need not include any *gap_ss* dependent.

(7) Two head-complement structures with gaps:

a. head-complement phrase with a gapped direct object



b. head-complement phrase with a gapped modifier



One may obtain an illustration of how BMS model extraction by comparing the descriptions of the heads of the distinct VPs in (5b), (7a), and (7b), and then noting that each of them extends the description in (2b); the fact that a verb's dependent may be extracted is modelled by the fact that such a dependent may be a *gap_ss*, and hence absent from the COMPS list and not realised as a complement-sister. (We ignore BMS's analysis of subject extraction here.)

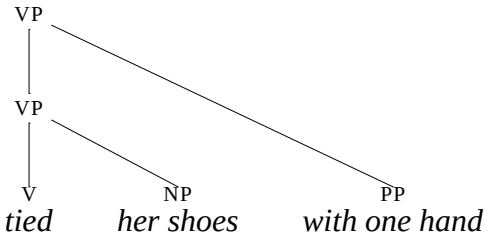
[3]We elide ARG-ST from now on, since it plays no further part in the discussion.

In particular, with respect to the extraction of adjuncts, comparison of the head-daughter's COMPS list in (7a) with the head-daughter's COMPS list in (7b) reveals how BMS's proposal handles the extraction of modifying adjuncts—by analysing it as complement extraction.

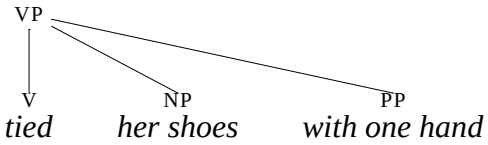
This, of course, requires that they treat extractable modifiers as phrase-structural complements, not as adjuncts. That is, rather than analysing modified VPs like *tied her shoes with one hand* as a head-adjunct structure, as in (8a), BMS assume that such VPs have the flat constituent structure in (8b).[4]

(8) Two conceivable structures for a modified VP:

a. adjoined modifier



b. modifier as complement



In the next section, we present evidence that this structural consequence may be problematic.

3 Verbal Anaphora and Constituency

As established in the previous section, BMS commit to a flat-VP analysis of sentences like (9a).

(9) a. Kim tied her shoes with one hand.
b. With which hand did Kim tie her shoes?
c. With just her left hand, I doubt that Kim will be able to tie both her shoes.

Examples (9b) and (9c) show that *with one hand* in (9a) is, in fact, extractable and hence treated as a complement by BMS.[5]

But given this flat analysis of the constituent structure of VPs in examples like (9), it is difficult to see how they can provide two of the interpretations of (10) below.

[4]See Bouma (2003) for the details of how they manage to ensure correct semantic scope for multiple modifiers, and see Levine (2003) for detailed discussion of problems with such an approach.

[5]One might question whether the ostensibly extracted phrase in (9c) is truly extracted. Instead, one might suppose that *with just her left hand* is an *in situ* modifier of the matrix clause, with an interpretation something like that of the absolutive *supposing that Kim employs just her left hand*. I do not address such a possibility in the main text.

However, proponents of such a view will need to contend with the fact that putative matrix modifiers like *with just her left hand* in (9c) have an instrumental reading just in case there is a verb in the sentence that admits instrumental modifiers.

(i) Supposing that Kim employs just her left hand, I doubt that Kim will be able to tie both her shoes.

(10) Kim tied her shoes with one hand before Sandy did.

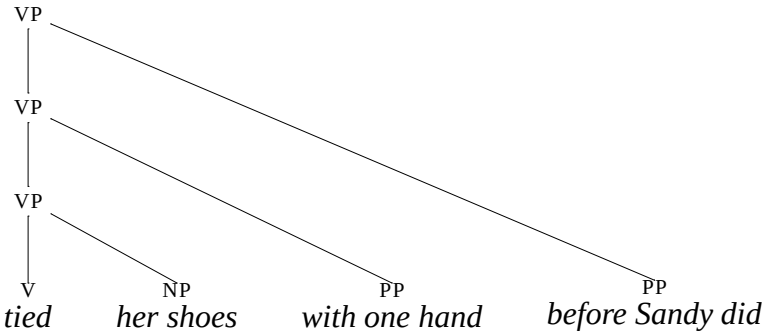
Any analysis that treats the structure of iterated modification like that in (10) in terms of nested adjunctions will have little problem handling the readings of (10) paraphrased in (11):

(11) a. Kim tied her shoes single-handedly before Sandy tied her shoes single-handedly.
b. Kim tied her shoes single-handedly before Sandy tied her shoes (at all).

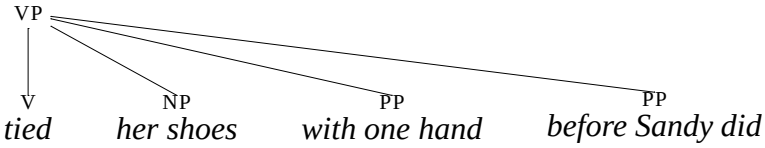
That is, if (10) has the structure in (12a), below, then there are constituents—*tied her shoes with one hand* and *tied her shoes*—to serve as potential antecedents for the anaphoric pro-verb *did*, yielding the readings in (11).

(12) Two conceivable structures for a doubly modified VP:

a. adjoined modifiers



b. modifiers as complements



On the BMS analysis, however, the structure of (10) is the flat structure in (12b), and neither *tied her shoes with one hand* nor *tied her shoes* is a constituent. That is, no antecedent linguistic expression has the meaning borne by *did* under the interpretations given in (11).

One might question whether such examples constitute a true problem for the BMS account, since their status as counterexamples to flat modificational structures rests on the assumption that *did* requires a linguistic antecedent.[6]

That is, (i) is a sufficient paraphrase of one reading of (9c) because the *with*-phrase in (9c) has an instrumental reading. And, on the other hand, (iii) seems to fail as a sufficient paraphrase of any reasonable reading of (ii) precisely because the *with*-phrase in (ii) lacks an instrumental reading.

(ii) With just her left hand, I doubt Kim enjoys baseball.

(iii) Supposing that Kim employs just her left hand, I doubt Kim enjoys baseball.

Those supporting an analysis of (9c) wherein the *with*-phrase is exclusively a matrix modifier will require some explanation of why (iii) is a such poor paraphrase of (ii). My assumption that such material fills a gap in the subordinate clause provides an immediate explanation for this correspondence between instrumental readings and instrument-appropriate subordinate predicates.

[6] Miller (1992:Chapter 3) develops an HPSG treatment of English auxiliaries as VP anaphors which features an account of the pseudogapping phenomenon exhibited by examples like (i), below.

With respect to this question, however, the contrast in acceptability of the response in (13a) compared to the response in (13b) suggests that *did* is indeed a pro-verb that is happiest when it has an antecedent sign whose meaning it depends on.

(13) a. **A:** Hey, the door is locked.
B: I know. *I did.
b. **A:** Hey, someone locked the door.
B: I know. I did.

In the next section, we will present an analysis of UDCs that preserves the nested constituency of examples like (10).

4 Structure-Preserving Extraction

In this section I propose a trace-free theory of UDCs that in principle permits extraction of any non-head constituent, regardless of whether that constituent is the valent of any lexical head. Hence, in particular, the theory presented here can license extraction of true adjuncts, without reanalysing them as modifying complements.

The section is organised into the following parts: Section 4.1 introduces the primitive entities used by the theory, and illustrates how they permit the theory to license gapped phrases. Section 4.2 illustrates how these primitives can be used to characterise various sorts of phrase. Section 4.3 describes how information about the presence of a gapped phrase is piped up through phrase-structures to phrases properly containing the gapped phrase, as appropriate, via the familiar set-valued feature SLASH. Section 4.4 describes how the upward percolation of SLASH elements may be halted through the use of constraints pertaining to particular phrasal types, and reliance on the peculiar fact that the projections of most parts of speech never fail to pass their entire SLASH values up to an immediately dominating phrase. Finally, in section 4.5, we briefly discuss how the theory presented here can accomodate the morphological registration of gap-binding domains in Chamorro.

4.1 Dependents, Gaps, and Non-Head Daughters

The heart of the present proposal is the primitive assumption that phrases (and not words) have dependents. Each dependent is in one of two possible states: *realised* or *unrealised*. A realised dependent is, by definition, a non-head daughter of the phrase it depends on. An unrealised dependent, on the other hand, is not, and (again by definition) constitutes a gap in the phrase it depends on. The two head-adjunct phrases below exemplify how a phrase with a dependent in either of these states is described.[7]

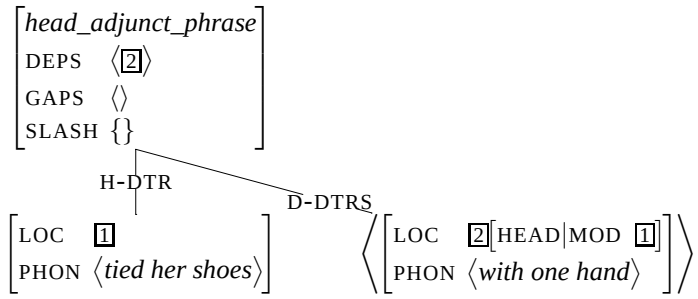
(i) I'm sure I would like him to eat fruit more than I would cookies.

Absent an account like Miller's, such examples would be ostensible counterexamples to the assumption that *did* requires a linguistic antecedent in examples like (10).

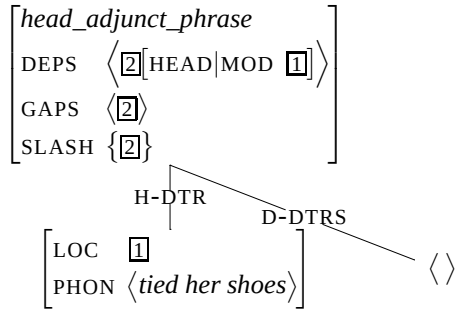
[7] D-DTRS is a feature of phrases whose value is the list of non-head (i.e. dependent) daughters of that phrase. That is, D-DTRS is simply another name for the N(ON)H(EAD)-DTRS feature.

(14) head-adjunct phrases:

a. head-adjunct phrase with a realised dependent



b. head-adjunct phrase with an unrealised dependent



As is apparent from the descriptions in (14), my analysis assumes two new features of phrases: DEPS and GAPS. The DEPS value of a phrase is a list of *local* objects called the *dependents* of that phrase, and the GAPS value of a phrase is likewise a list of *local* objects.

The following constraint ensures that the GAPS of a phrase are precisely its unrealised dependents:

(15) definition of GAPS:[8]

$$\textit{phrase} \rightarrow \begin{bmatrix} \text{DEPS} & \boxed{1} \bigcirc \textit{signlist\_to\_local\_list}(\boxed{2}) \\ \text{GAPS} & \boxed{1} \\ \text{D-DTRS} & \boxed{2} \end{bmatrix}$$

This constraint states that one can obtain the list of dependents of any phrase by shuffling the list of its gaps with the list of LOCAL values of its non-head daughters.

One can verify that both head-adjunct phrases described in (14) satisfy this constraint. In one, the sole dependent is realised, and hence the head-adjunct phrase has no gaps. In the other, the sole dependent is unrealised, and hence the head-adjunct phrase has a single gap, represented as the sole element of its GAPS value.

The two head-adjunct structures in (14) also illustrate what is probably the most salient difference between the function of the DEPS feature assumed by BMS, and the homonymous feature assumed here. For BMS, DEPS mediates the relationship between a lexical head's argument structure and its

[8] ◯ stands for the *shuffle* relation defined in Kathol (1995:p. 88). Informally, shuffling two lists is like shuffling two decks of cards (just once). The function *signlist_to_loc_list* takes a list of signs and returns the list of LOCAL values of those signs.

valence, whereas here the phrasal feature named DEPS mediates the relationship that holds between (on the one hand) the sorts of non-heads that distinguish some particular sort of phrase (e.g., having an adjunct non-head is distinctive of head-adjunct phrases) and (on the other) the non-heads which happen to be realised as daughters of any particular instance of that sort of phrase (e.g. adjunct-daughters).

4.2 Phrasal Schemata

With these features in hand, we can now characterise various sorts of phrase in terms of their dependents.

For example, to license the two phrases in (14), the following head-adjunct schema will suffice:

(16) Head-Adjunct Schema:

$$\textit{head\_adjunct\_phrase} \quad \rightarrow \quad \left[\text{DEPS} \left\langle \left[\text{CAT}|\text{HEAD}|\text{MOD} \ \boxed{1}\right] \right\rangle\right] \quad \text{H-DTR} \quad \left[\text{SS}|\text{LOC} \ \boxed{1}\right]$$

According to this constraint, a *head_adjunct_phrase* is a phrase whose sole dependent's MOD element is identical to the LOCAL value of its head daughter. The reader may verify that both examples in (14) are instances of this schema, one with a realised dependent, and the other with an unrealised one.

Any other sort of phrase may be defined analogously, by constraining what shape its dependents must take via constraints on its DEPS feature, and by parameterising such constraints to the value of the relevant feature of the phrase's head-daughter. For example, assuming that DEPS values are always non-empty lists, the following constraint suffices for a head-subject schema:

(17) Head-Subject Schema:

$$\textit{head\_subject\_phrase} \quad \rightarrow \quad \begin{bmatrix}\text{SS}|\text{LOC}|\text{CAT}|\text{SUBJ} \ \langle\rangle \\ \text{DEPS} \ \boxed{1}\end{bmatrix} \quad \text{H-DTR} \quad \left[\text{SS}|\text{LOC}|\text{CAT}|\text{SUBJ} \ \boxed{1}\right]$$

As the reader may verify, due to the constraint in (15) the identity enforced by the above schema between the head-daughter's SUBJ value and the *head_subject_phrase*'s DEPS value ensures that the subject of any such phrase will either be realised (and hence the non-head daughter) or unrealised (and hence the sole element of the *head_subject_phrase*'s GAPS value).

Likewise, the following constraint serves as a head-complement schema:

(18) Head-Complement Schema:

$$\textit{head\_complement\_phrase} \quad \rightarrow \quad \begin{bmatrix}\text{SS}|\text{LOC}|\text{CAT}|\text{COMPS} \ \langle\rangle \\ \text{DEPS} \ \boxed{1}\end{bmatrix} \quad \text{H-DTR} \quad \left[\text{SS}|\text{LOC}|\text{CAT}|\text{COMPS} \ \boxed{1}\right]$$

One detail of these schemata (in particular the head-complement schema) which may have surprised those readers familiar with previous HPSG accounts of missing object (MO) constructions (such as *tough* constructions), is the fact that valence lists (e.g. the COMPS list) are here taken to be lists of *local* objects, rather than *synsem* objects. Thus, on the present analysis, lexical heads cannot select via their valence lists for valents bearing some particular SLASH value (since SLASH is not a *local* feature, but rather a *non_local* one). This assumption, that SLASH information is absent from valence list elements both poses a descriptive challenge and possesses explanatory power. To see this, however, a brief review of the standard HPSG analysis of *tough* constructions is in order.

Previous HPSG analyses of *tough* constructions (e.g. Pollard and Sag (1994)) have assumed that MO predicates like *easy*, which bind a SLASH element of one of their complements and co-index said SLASH element with their subject, have a lexical entry as in (19):

(19) A schematic representation of a *tough* adjective's traditional lexical entry:

$$\begin{bmatrix} \textit{word} & \\ \text{SUBJ} & \left\langle \text{NP}\left[\text{INDEX } \boxed{1}\right] \right\rangle \\ \text{COMPS} & \left\langle \ldots, \text{VP}\left[\text{SLASH } \left\{ \boxed{2}\, \text{NP}\left[\text{INDEX } \boxed{1}\right] \right\}\right], \ldots \right\rangle \\ \text{TO-BIND} & \{\boxed{2}\} \end{bmatrix}$$

Analyses which assume lexical entries like the one above depend on the fact that a head's complements' SLASH values are accessible via the COMPS list, in order to ensure that the MO predicate's TO-BIND value binds a SLASH element from the correct complement (here, the specified VP complement).

What such previous analyses have failed to explain, however, is the fact that there appear to exist no MO predicates which bind a SLASH element of any non-verbal complement. That is, if lexical heads had access to their complements' SLASH specifications, one would expect to encounter MO predicates just like the one above, but which bind a SLASH element on some PP complement (say) instead of a VP complement. But no such MO predicates seem to exist.

For example, there is no *tough*-type adjective in English that behaves like the hypothetical adjective *creasy* in (20b), below.

(20) a. Kim is easy/tough/good [for Sandy] [to love _].

b. Kim is creasy [for _] [to love Sandy]

In fact, it appears to be the case that (in English, at least) for any phrase wherein a daughter's SLASH value fails to be inherited, the daughter bearing the bound (i.e. uninherited) SLASH value is an infinitival or finite verbal projection.

If one depends on this generalisation, then, the lexical entry in (19) is redundant. That is, provided that the lexical item described has a non-empty TO-BIND value, we already know that a particular one of its complements bears a SLASH value which gets bound—namely, the infinitival (or finite) one.

In section 4.4.1 we explain how relying on this generalisation removes the apparent difficulty raised by assuming that the objects of valence are *local* values.

4.3 SLASH Inheritance

Thus far, the discussion has only covered how we license phrases which are gapped (i.e. which have an unrealised dependent); I have not yet indicated how phrases containing a gapped phrase get distinguished from those which do not. That is, I have not yet explained how one can force the distribution of the sentence [*Sandy loves* _] to differ from the distribution of the sentence [*Sandy loves Kim*], due to the fact that the first contains a gapped VP whereas the second does not.

I now turn to this question.

As is familiar from other HPSG theories of UDCs (e.g. Pollard and Sag (1994)), we assume that phrases bear a set-valued feature called SLASH, where each element of a phrase *P*'s SLASH value corresponds to some gap in a phrase dominated by *P*.[9] In the usual case, we cause the SLASH value of a phrase to be the union of the SLASH values of its daughters. Furthermore, we assume that phrases bear a set-valued feature TO-BIND, which we use to prevent SLASH values from being inherited at appropriate points in a sign's phrase-structure.

Specifically, the SLASH value of a phrase is defined as follows:

First, it is necessary to ensure that gapped phrases (i.e. those with an unrealised dependent) bear SLASH elements corresponding to their gaps:

(21) GAPS-to-SLASH constraint:

$$\textit{phrase} \rightarrow \begin{bmatrix} \textsc{slash} & \boxed{S} \\ \textsc{gaps} & \boxed{1} \end{bmatrix} \wedge \textit{list\_to\_set}(\boxed{1}) \subseteq \boxed{S}$$

This constraint simply requires that the set-analogue of a phrase's GAPS list be a subset of its SLASH value. Recall that a phrase's GAPS value is nonempty iff it has an unrealised dependent, due to the constraint defininig GAPS (15). Thus, the present constraint (21) requires a phrase's unrealised dependents to be elements of its SLASH set.

Then, we ensure that the SLASH values of a phrase's daughters contribute appropriately to its own SLASH value:

(22) SLASH Inheritance constraint (*prose version*):

> The union of the SLASH values of a phrase's daughters with the set-analogue of its GAPS value is the disjoint union of the SLASH value of that phrase with its head-daughter's TO-BIND value.

(23) SLASH Inheritance constraint (*AVM version*):

$$\textit{phrase} \rightarrow \begin{bmatrix} \textsc{slash} & \boxed{S} \\ \textsc{h-dtr} & \boxed{1}\begin{bmatrix}\textsc{to-bind} & \boxed{B}\end{bmatrix} \\ \textsc{d-dtrs} & \boxed{2} \\ \textsc{gaps} & \boxed{G} \end{bmatrix} \wedge \textit{list\_to\_set}(\boxed{G}) \cup \textit{collect\_slashes}(\boxed{1} \oplus \boxed{2}) \doteq \boxed{S} \uplus \boxed{B}$$

[9] We further assume phrases are the *only* sort of sign defined for SLASH. In particular, we assume that *words* are not defined for this feature.

This constraint is quite a mouthful. Informally, it says that the SLASH value of a phrase is the largest set containing just its GAPS elements, the SLASH elements of its daughters, but minus any TO-BIND elements on its head-daughter. Furthermore, it requires that any TO-BIND element of *P*'s head-daughter be either one of *P*'s GAP elements or a SLASH element of one of *P*'s daughters.

This constraint (together with the GAPS-to-SLASH constraint above and the assumption that TO-BIND values are at-most-singleton) ensures several things:

- A phrase whose head-daughter has an empty TO-BIND value will inherit all the SLASH values of its daughters.
- A *local* object *B* is the TO-BIND element of *P*'s head-daughter only if *B* is an element of the SLASH value of one of *P*'s daughters. This ensures that forcing a phrase's head-daughter to bear a non-empty TO-BIND value will cause that phrase to have some slashed daughter.
- If *S* is an element of the SLASH value of a daughter of *P*, then *S* is absent from the SLASH value of *P* iff *S* is the TO-BIND element of *P*'s head-daughter. This ensures that forcing a phrase's head-daughter to bear a non-empty TO-BIND value will effect a reduction in the slashes inherited by that phrase.

Thus, we are now in the position where (i) if we want a phrase to inherit all its daughters' SLASH elements, we must ensure that the head of that phrase has an empty TO-BIND value, and where (ii) if we want a phrase to fail to inherit some SLASH element from one of its daughters, then we must ensure that the head of that phrase has a non-empty TO-BIND value.

One way to accomplish this is to do so on a per schema basis.

4.4 SLASH-Binding Constructions

There are at least two sorts of constructions where it is conceivable that one would want to ensure that some SLASH value fails to get inherited from a daughter: head-complement phrases headed by a *tough*-adjective, and head-filler structures (such as WH-relative clauses, constituent questions, etc.).[10]

We will discuss both of these in turn, beginning with *tough*-constructions.

4.4.1 *Tough*-Constructions

In a head-complement phrase, we permit the lexical entry of the head to determine what sort of TO-BIND value the head has.[11] Predicates like *hard* as in *hard for the cops to figure out that Kim vandalised _ last year* are lexically specified with non-empty TO-BIND values, whereas other lexical items (e.g. *eager* as in *eager for it to rain*) are lexically specified as bearing empty TO-BIND values.

[10] English bare relatives constitute a case of gap-binding that is subsumed by neither of the two cases considered here in any obvious way. Space considerations, however, preclude their discussion.

[11] In this respect our treatment is identical to the treatment of *tough*-constructions presented in Pollard and Sag (1994:166–171).

(24) partial lexical entries for *hard* and *eager*:

a. *hard*, (a *tough*-adjective)

$$\begin{bmatrix} \textit{word} & \\ \textsc{subj} & \left\langle \textsc{np}\left[\textsc{index}\ \boxed{1}\right] \right\rangle \\ \textsc{comps} & \left\langle \textsc{pp}[\textit{for}],\ \textsc{vp} \right\rangle \\ \textsc{to-bind} & \left\{ \textsc{np}\left[\textsc{index}\ \boxed{1}\right] \right\} \end{bmatrix}$$

b. *eager*, (not a *tough*-adjective)

$$\begin{bmatrix} \textit{word} & \\ \textsc{subj} & \langle \textsc{np} \rangle \\ \textsc{comps} & \left\langle \textsc{pp}[\textit{for}],\ \textsc{vp} \right\rangle \\ \textsc{to-bind} & \{\ \} \end{bmatrix}$$

The lexical entry above in (24a) and the constraints on SLASH values defined in (21–23) are sufficient to ensure that one of the complements of the *tough*-adjective *hard* has a non-empty SLASH value.

To see this, suppose that *hard*, as described above in (24a), heads a head-complement phrase. Call that phrase *P*, and let *b* be the sole TO-BIND element of *hard*. Then, consider the SLASH Inheritance constraint (23). We know that the disjoint union of *P*'s SLASH value with $\{b\}$ is defined. Hence we know that *b* is either (i) an element of *P*'s GAPS list or (ii) an element of the SLASH value of one of *P*'s daughters. But case (i) is impossible: *b* is not in *P*'s SLASH value (since the disjoint union mentioned above is defined) and hence, by the GAPS-to-SLASH constraint, *b* can't be in *P*'s GAPS list. So *b* is a SLASH element of one of *P*'s daughters. (That is, we know that case (ii) holds.) And, since the head-daughter is a word, we know that *b* is a SLASH element of one of the complement-daughters.

However, which of the complements bears a SLASH value containing *b* is still not determined. This due to the fact that, in contrast to the more traditional analysis of *tough*-adjectives given in (19) wherein the *tough* predicate is lexically specified as selecting a slashed *synsem* valent, the present analysis assumes that the objects of valence are *local* objects, bearing no information regarding the SLASH values of the signs to which they belong.

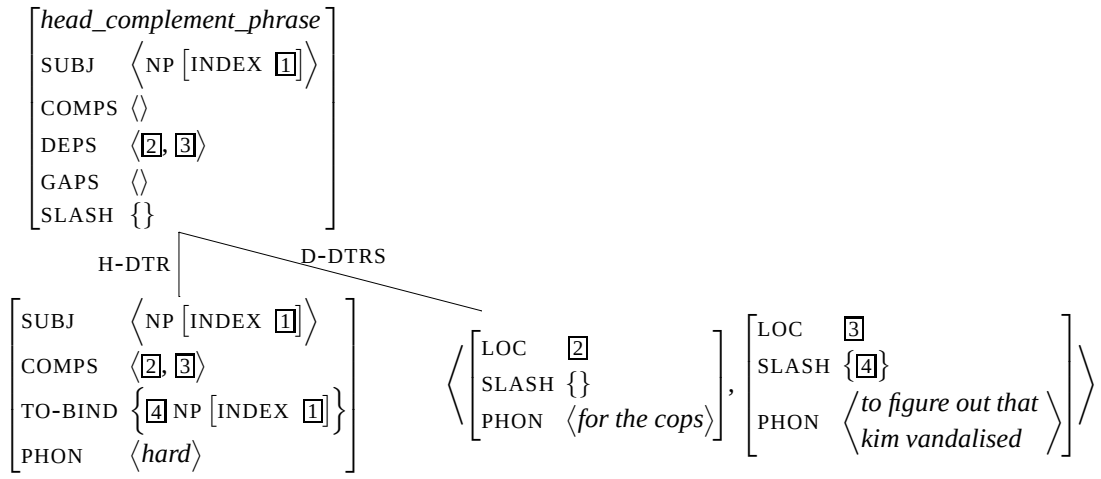
Nonetheless, there is a non-lexical way of ensuring that the TO-BIND element of the lexical entry in (24a) is an element of the correct complement-daughter's SLASH value. Namely, the generalisation that whenever a phrase fails to inherit a SLASH element from one of its daughters, that daughter is a verbal projection.

I will not formulate here a constraint that expresses this generalisation, but provided with one the present theory disallows example (25b), where the wrong complement of a *tough*-adjective is slashed, and ensures the following structure in (26) for the bracketed head-complement phrase in (25a).

(25) a. That statue will be [hard for the cops to figure out that Kim vandalised] (since she did so in invisible ink).

b. * Those cops will be [hard for _ to figure out that Kim vandalised that statue].

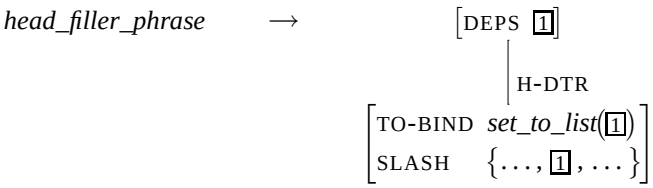
(26) example of a licensed *tough*-construction:



4.4.2 Head-Filler Phrases

Clearly, a head-filler phrase should bind a SLASH element on its head-daughter. The following schema will ensure this:

(27) Head-Filler phrase schema:[12]



This schema requires that its sole dependent has a LOCAL value identical to some SLASH element on the head-daughter.[13] Furthermore, since the schema further requires this *local* object to be the head-daughter's TO-BIND value, the SLASH value of the head-filler phrase will not inherit it.

It is worth noting also that this constraint forces the dependent to be realised as a daughter; its LOCAL value is token-identical to the TO-BIND value of the head-daughter, and hence must be absent from the SLASH value of the head-filler phrase. Hence, by the GAPS-to-SLASH constraint, it must also be absent from the head-filler phrase's GAPS list.

4.5 Morphological Registration of Gap-Binding Domains in Chamorro

Chamorro is a VSO Austronesian language spoken on the Mariana Islands in the western Pacific.

It is one of a number of languages including French, Irish, Icelandic, and Palauan in which a clause may exhibit distinctive morphosyntax when it dominates a slashed phrase but not the phrase within

[12] Note that since TO-BIND values are at-most singleton, the functional relation *set_to_list* need only map the empty set to the empty list, and singleton sets to singleton lists.

[13] There must be exactly one dependent, since DEPS must be nonempty, and TO-BIND is at-most singleton.

which that slash element becomes bound.[14] Of such languages, Chamorro is particularly interesting due to the relative sensitivity to the grammatical function of the conditioning slashed constituent exhibited by such morphosyntactic reflexes.

In Chamorro the morphological paradigms appropriate for the lexical head of a slashed finite clause are determined by which one of its dependents it inherits its SLASH element from.[15] There appear to be at least five different cases to consider, determined by whether the slashed dependent is the subject, direct object, indirect object, or one of two classes of modifier. In this section, I demonstrate how the present analysis of unbounded dependencies can be adapted to characterise the first of these cases, wherein a verb inherits a SLASH element from its subject.

The examples below in (28) illustrate how slashed subjects are morphologically registered. The head verb in example (28a) exhibits the morphology appropriate for a verb whose projections have no slashed dependents, whereas in example (28b) the head verb exhibits the infix *-um-*, which is the morphology distinctive of finite verbs with a slashed subject.[16,17]

(28) a. Ha-fa'gasi si Henry i kareta ni häpbun
AGR(2.SG.RT)-wash UNM Henry the car OBL soap
'Henry washed the car with soap.'

b. Hayi f*um*a'gasi _ i kareta
who? AGR(WH.SBJ).wash GAP the car
'Who washed the car?'

Of course under the present analysis, only realised subjects can technically be slashed (i.e. bear nonempty SLASH values), since unrealised subjects are merely *local* objects. Therefore, to remain faithful to our ontology, a better description than that in the previous paragraph of the head verb in (28b) would be to say that it bears the morphology distinctive of a verb which is the lexical head of a head-subject phrase whose SLASH set properly subsumes its head-daughter's.[18]

The next pair of examples, in (29), demonstrate that this description is indeed accurate; not only do subjects which are gaps themselves (as in (28b)) trigger *-um-* infixation, but so do realised subjects with non-empty SLASH values (like the matrix subject in (29b)). That is, taken together, the examples in (28) and (29) demonstrate that *-um-* infixation on a verb reflects the fact that its subject contributes a SLASH element to its clause.[19]

[14] See Hukari and Levine (1995) for a survey of this phenomenon in a number of languages.

[15] The analysis given here is based on the facts of Chamorro as presented in Chung (1998).

[16] In the interest of expediting the discussion, this statement glosses over the fact that it is only verbs which are realis and transitive (as *fa'gasi* 'wash' is in examples (28a,b)) whose morphology reflects the presence of a slashed subject.

[17] The Chamorro examples and glosses in (28–29) are taken from Chung and Georgopolous (1988:252–3, 259). The gloss RT indicates *realis and transitive*, while RI indicates *realis and intransitive*. The case marker *si* marks the so-called *unmarked* case, appropriate for subjects and direct objects, and glossed as UNM. The case marker *ni* marks oblique arguments.

[18] For ease of exposition, we pass over the problems associated with talking about head-subject structures in a VSO language.

[19] N.B.: The non-subject argument of the verb *malägu'* 'want' is not a direct object. Hence, its extraction in example (29b) triggers oblique WH-agreement on the lexical head of the subordinate clause.

(29) a. Ha-istotba yu' [na malägu' i lahi-hu kareta]
AGR(3.SG.RT)-disturb me AGR(SG.RI).want the son-my car
'That my son wants the car bothers me.'

b. hafa *um*istotba hao [ni malago'-ña i lahi-mu _]
what? AGR(WH.SBJ).disturb you AGR(WH.OBL).want-3.SG the son-your GAP
'What does it bother you that your son wants? (*Lit.* What [[that your son wants _] bothers you]?)'

Before moving on to its analysis, there is one final aspect of this phenomenon that deserves mention. Whereas the paradigm the verb in (28b) instantiates is the only grammatical one (given that its subject is a gap), the morphology exhibited by the matrix verb in (29b) is not the only grammatical option in the case when a verb's subject properly contains a gap.[20] In the latter case, *-um-* infixation is optional; the alternative paradigm is the one exhibited by verbs heading only unslashed projections, as in (29a) (although Chung (1994) reports that acceptability of this alternative is irretrievably marred when the filler is nonreferential). This optionality is included in the analysis, to which I now turn.

We assume that verbal HEAD objects in Chamorro bear a boolean-valued feature SLASHED-SUBJ, where verbs with the morphology distinctive of a slashed subject are lexically specified as [HEAD|SLASHED-SUBJ +] and all others are [HEAD|SLASHED-SUBJ −]. The proper distribution of [SLASHED-SUBJ +] verbs can now be guaranteed as follows.

First, we require that when a head-subject phrase's SLASH value is identical to its head-daughter's SLASH value, then it must be [HEAD|SLASHED-SUBJ −]:

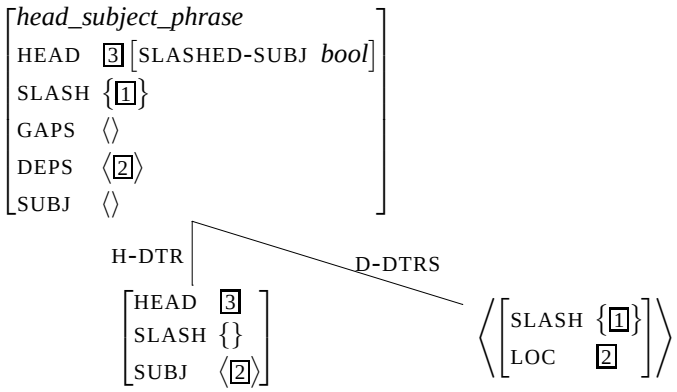
(30) constraint on the HEAD value of verbs with unslashed subjects

$$\begin{bmatrix} \textit{head\_subject\_phrase} \\ \text{SLASH} \quad \boxed{1} \\ \text{H-DTR}|\text{SLASH} \quad \boxed{1} \end{bmatrix} \quad \rightarrow \quad \left[\text{SS}|\text{LOC}|\text{CAT}|\text{HEAD}|\text{SLASHED-SUBJ} \; -\right]$$

The constraint above in (30) ensures that whenever a head-subject phrase's dependent fails to contribute a new SLASH element, then both that head-subject phrase and (by the Head Feature Principle) its lexical head will be [HEAD|SLASHED-SUBJ −] and fail to bear slashed subject morphology. On the other hand, should a head-subject phrase's dependent contribute a new SLASH element, then either value for SLASHED-SUBJ (and hence either morphological paradigm) is appropriate. Thus, we have accounted for the optional case of morphological registration of slashed subjects, when the subject is realised as in (29b). The reader may verify that we have achieved this by checking that, in the head-subject structure below, neither value for SLASHED-SUBJ violates the constraint in (30).

[20] Actually, according to Chung (1994), for example (29b) to be acceptable without *-um-* infixation on the matrix verb, the filler would need to have more descriptive content than *hafa* provides. So with that particular filler, the matrix verb in (29b) does in fact exhibit the only acceptable morphology.

(31) head-subject phrase with a realised, slashed subject



It now remains necessary to ensure that verbs like the matrix verb in (28b), whose subject is unrealised, are obligatorily [HEAD|SLASHED-SUBJ +]. The following constraint does precisely this:

(32) constraint on the head value of verbs with gapped subjects

5 Conclusion

In the confines of this paper, I have presented the elements of a trace-free theory of UDCs whose distinguishing claim is that being a phrase-stuctural adjunct and being extractable are not inconsistent properties.

Obviously, much work remains to be done before its adequacy as a framework for complete theories concerning the UDCs of particular languages can be evaluated. In particular, I have left unaddressed here the question of whether it is compatible with the considerable body of existing work in the HPSG framework regarding filler-gap constructions, such as Sag (1997)'s comprehensive treatment of English relative clauses and Ginzburg and Sag (2001)'s analysis of interrogative structures. Furthermore, although I have demonstrated that it is capable of characterising one of the classes of Chamorro gap-binding domain registration (namely the case of slashed subjects), it remains an open question whether all five classes may be analogously described.

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A Semantics for Temporally-dependent Referring Expressions

Pascal Denis & Philippe Muller*

In this paper, we sketch a new approach to the problem of the temporal interpretation of nominal predicates. The approach differs from previous analyses (e.g., Enç (1986), Musan (1999), Tonhauser (2002)) in that it is grounded in a different ontology, namely one that regards individuals as spatio-temporal entities (a.k.a. 'spatio-temporal worms') (Heller (1990), Sider (1997), *inter alia*): roughly, the idea is that individuals have temporal parts (or stages) —and are indeed like events, for that matter— in the same way they have spatial parts. As we will show, this view, known in the philosophy literature as *four-dimensionalism*, has interesting repercussions for formal semantics in general, and for the formal treatment of temporal NPs in particular.

1 Background on temporal NPs

1.1 The problem

The task of computing the temporal interpretation for a natural language utterance is often taken to be a fairly simple matter. That is, computing the temporal interpretation for an utterance would basically boils down to giving a temporal interpretation to its verbal predicate, or, to be more precise, to its inflected projection. A direct consequence of this view is that all the other predicates present in a sentence, including nominal predicates (but also, as we shall discuss adjectival and prepositional ones) are implicitly taken to be atemporal. Thus, asked to give a logical form for a sentence like (1) an intro-to-semantics student is most likely to produce something like (2) —where x ranges over the domain of individuals, t over the domain of time instants, and '$<$' stands for temporal precedence:

(1) A man snored.

(2) $\exists x,t(man(x) \wedge snore(x,t) \wedge t < \mathsf{now}))$

In the logical representation (2), the only thing that is located in time is the property 'snore' expressed by the verbal predicate *snored*: it is located at some time prior to the utterance time (symbolized here by now); and we know this thanks to the past morphology carried by the verb.

A couple of things are missing from the logical form above. For one thing, one has no indication regarding the precise domain of quantification. Secondly, and more importantly to our present concern,

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the representation in (2) says nothing about *when* the nominal predicate in this restrictor has to be true of the quantified-over individuals (i.e., when these individuals belong to the class of men). This question, of course, makes little sense when talking about properties such as *man* (i.e., leaving aside sex change operations, men are always men as long as they are alive). But consider examples like (3) and (4):

(3) Every art student visited the MoMA.

(4) President Bush will receive the hostages at the White House.

Properties such as 'art student', and 'hostage' have clearly not the same flavor as 'man': roughly speaking, the latter property is permanent, whereas the latter are transient (well, hopefully). Different names have been offered in the linguistic and philosophical literature to capture this distinction (e.g., Carlson's individual-level vs. stage-level predicates Carlson (1980) or Wiggin's substantial vs. non-substantial distinction Wiggins (1980)).

1.2 Existing accounts

The fact that some properties do not hold permanently of individuals raises the question of their temporal interpretation (i.e., of when they can be predicated of the individuals). The null hypothesis is to consider that the properties expressed by the predicates present in a sentence are dependent upon the time given by the verbal inflection. This line of research has been both pursued and rejected by Mürvet Enç (see Enç (1981), Enç (1986)). In her discussion, Enç first assumes that tense morphology gets translated into the Priorian modal operators **P** (for Past) and **F** (for Future) that take scope over the sentence. In its most naive form, this hypothesis then predicts that the different predicates in a sentence are interpreted at the verbal time (i.e., they are in the scope of the tense operator). For sentence (3), this approach yields a reading where the two predications 'visit-the-MoMA' and 'be-an-art-student' are true at the same time of a (contextually restricted) set of individuals; that is, roughly, these individuals are art students when they visit the MoMA. It is easy to see that this analysis is at best incomplete. For there is another possible reading for sentence (3), one that one could paraphrase as follows: every *current* art student visited the MoMA. There is of course a nice way to capture this second reading, namely to assume that NPs are able to raise out of the scope of the past operator and are interpreted at utterance time.[1] But this cannot be the whole story, as was noted by Enç. Thus, sentence (3) has probably a third (mixed) reading under which all past *and* present art students made the visit to the MoMA. Crucially, a quantifier-raising analysis breaks down on this kind of example, since one would in effect need the predicate *student* to be at the same time out of the scope of the past operator (to get the current students) *and* in its scope (to get the former students).[2]

Another problem, pointed out by Enç, with the assumption that the temporal interpretation of NPs depends upon that of the verbal predicate, is illustrated by example (4). To put it roughly, the problem is that, under the preferred reading for this sentence, the individuals picked up by the nominal predicate 'hostages' will have this property neither at the verbal predicate time, nor at the utterance time. Most likely, the hostages we are talking about in (4) have been liberated at some point before the

[1] This goes with the implicit assumption that there is an operator for the utterance time, higher up in the structure.

[2] Note that there is yet another, slightly more difficult to get reading for this sentence; namely one, where the individuals that visited the MoMA did not have the property of being students yet (i.e., they visited the museum before becoming art students.)

utterance time. The problem is simply that there is nothing in the sentence that can trigger this past interpretation. (Note that this example also shows that syntactic position is irrelevant to the problem of temporal NPs, since the NPs that has a 'shifted' interpretation is here in object position.)

1.2.1 Enç's account

Given the above problems,[3] Enç arrived at the conclusion that the temporal interpretation of NPs should be free from the operator given by the verbal inflection. More precisely, she argues that: (i) NPs like verbs should be given their own temporal argument, and (ii) this argument should be entirely resolved through context, so that a nominal can in effect refer to *any* set of individuals ((Enç, 1981, p.37)). To give an example, the logical form for sentence (3) will look like (5) —where the NP *MoMA* is treated as a constant, for simplicity:

(5) $\forall x[\exists t(art\_student(x,t)) \rightarrow \exists t'(visit(x,\mathsf{MoMA},t') \wedge t' < \mathsf{now})]$[4]

Opening a brief parenthesis here, note that 'temporalizing' nominal predicates the way Enç does (i.e., treating them like verbal ones by providing them, with a temporal argument) receives support from at least two sources. First, and this is well-known, nominals like verbs have temporal modifiers. In the nominal domain, we think of adjectives like *former*, *current*/*present*, *future*.

Furthermore, some adverbs can be used with both verbs and nominals (e.g., *in the eighties*, or even *then* as in *the then doctor*); this actually makes the term ad*verb* somewhat of a misnomer for these modifiers are restricted to predicative categories (and not only to verbs). Second, it is also known that in some languages, nouns carry temporal morphology (see Sadler and Nordlinger (2001) for an overview).[5]

1.2.2 Some recent proposals

Enç's claim above amounts, in effect, to saying that all NPs are *indexicals*; that is, the temporal interpretation of NPs is not constrained but by context. This very liberal view has been recently challenged in the literature. There are actually two main (and rather distinct) lines of criticisms. The first caveat, emerging from the work of Musan Musan (1999) is that not all NPs, according to her, are allowed to have an interpretation that is independent from that of the verbal predicate; that is, there is a class of NPs (so she claims) that would always be *temporally dependent*. According to Musan, this class consists of so-called *cardinal weak NPs* (i.e., NPs with determiners like *some*, *few*, *many*, *two* under their *cardinal reading*). Musan, following work by Milsark, opposes the cardinal reading of these quantifiers to their so-called partitive reading. This opposition can be viewed as follows: partitive weak NPs are presuppositional (i.e. roughly speaking, they have a hidden definite built into them), whereas cardinal do not. That is, the NP *some men* for instance, under its partitive reading, means *some of the men*, whereas this NP means roughly *a small number of men* under its cardinal reading.

[3] See Enç (1986) and Tonhauser (2000) for a more exhaustive survey of Enç's arguments.

[4] Different interpretations will arise depending on the relation between t and t'.

[5] Sadler and Nordlinger (2001) actually distinguish between two phenomena. The first one, found in a language like Lardil (Australia), is where nominals carry temporal information that is relevant to the whole proposition. The second one, which is more directly relevant, is found in Tariana (Brazil): in this language, nominals carry information intrinsic to the NP itself.

Note that this claim is far from uncontroversial. Thus, Tonhauser (2000, 2002) rejects it altogether, arguing that even cardinal NPs can have a temporally independent interpretation[6]. The main example she proposes goes as follows:

(6) Context: at a reunion of the survivors of the Titanic disaster.

(7) Look, there are even *some crew members* here.

We do not think that this sort of examples constitutes a valid rebuttal of Musan's claim, for the NP in (7) does not qualify as a cardinal NP. This, we argue, because the head noun *member* has an implicit argument, which if not overtly realized has to be contextually 'bridged'. The most salient candidate for bridging is the definite NP *the Titanic*; this in effect means that the NP *some crew members* has an hidden definite (i.e., it means 'some crew members of the Titanic'), hence cannot be a cardinal NP.

Before we examine Tonhauser's proposal in more details, note that Musan's account contains another novelty that is worth mentioning here. That is, Musan notes that the question of interpreting NPs temporally also depends upon the type of nominal predicates we are dealing with, a point alluded to at the beginning of this introduction. In particular, she notes that NPs which realize an existence-independent argument of the verbal predicate will be temporally dependent/independent if and only if they quantify over stages/individuals. As we will see in the coming sections, a feature of the present paper will be to pay more attention to the different ontological categories of predicates, as well as to give them a proper formal representation.

The second line of departure from Enç's original account comes from Tonhauser (2000, 2002). To a certain extent, Tonhauser (2002) can be better viewed as a direct refinement of Enç's account, for this work proposes ways to constrain the interpretation of the temporal index associated with nominals. This account is couched in dynamic semantics, in DRT more precisely. The way Tonhauser proposes to 'tighten' Enç's account is by suggesting that, although nominals can receive various temporal interpretations given the appropriate context, they are *by default* interpreted at the same time as the verbal predicate. This claim is rather intuitive and allows Tonhauser to make some interesting predictions. Space precludes here to go over the formal details of Tonhauser's proposal. It will suffice here to notice that her DRT account comes with a number of minor problems. For one thing, her account predicts that plural entities should be alive at the same time, which cannot be right given that we have no problem to talk about entities like *Socrates and Russel*. Maybe even more problematic is the fact that Tonhauser fails to provide any substantial evidence as for why the verbal time should be the default interpretation for nominals. Thus, there are cases where it is the utterance time and not the verbal time that seems to serve as the default. A good example is, we think, given by possessives. The NP *my wife* as in, say, *My wife went to College at Yale*, has probably a first interpretation where the possessive relation holds true now.[7] Note that we are not claiming here that the utterance time should now become the default interpretation, but rather that Tonhauser's starting assumption is highly questionable.

[6] Besides, De Cuyper (2002) indicates there may be more constraints on the possible readings, at least in the case of Dutch.

[7] Further argument for that claim maybe comes from the following minimal pair:

(8) My wife went to college at Yale.

(9) My *then* wife went to college at Yale.

Beyond the numerous objections and questions raised above, there is a more fundamental, *ontological* question; namely: What kinds of referents should be appealed to? What are nominals referring to? All three accounts discussed above are both rather elusive and conservative as far as ontology is concerned. Basically, they assume that (common) nouns, much in the same way as verbs, are now interpreted with respect to a temporal index; and the question of interpreting nominals roughly boils down to determining the relation between the temporal index of the noun and that of the verb. That is, the ontology is very 'classical', consisting of a single domain of individuals; the expressions denoting these individuals either remain atemporal (this is the case of proper names, for instance), or they can be 'temporalized' (i.e., be interpreted with respect to some temporal index). In this paper, we would like to take the idea of temporalizing nominals one step further, and this involves taking a different ontological stand. That is, we will investigate the consequences of recasting the problem of the temporal interpretation of nominals in a different ontological framework; namely, a framework where entities are no longer distinct from their (spatio-)temporal realizations, where objects (like events, for that matter) are no more than (spatio-)temporal regions (see also Carlson (1980)).

1.3 Plan of the paper

The rest of this paper will be divided as follows. In section (2), we describe in more formal detail the core of the proposal, along with its philosophical justifications. Section (3) briefly discusses how we capture, within our new ontology, the distinction between individual- and stage-level predication. In section (4), we consider in some details the consequences of our ontology on the syntax-semantics interface; we go in some detail through a number of concrete examples, emphasizing the new predictions. This section also discusses adjectival modification. Next, in section (5), we raise a number of open questions which might be handled by our account given some minor improvements; these include for instance questions regarding anaphora and predications types.

2 An Alternative Ontology

As discussed above, the solutions given in the literature to the problem of temporal noun phrases all involve providing nominals with an additional temporal argument. That is, this change remains rather minimal, in that it basically maintains the ontology commonly used by formal semanticists at least since Montague Grammar. This classical ontology, roughly, consists of the following basic elements:

- a domain of entities, D
- a domain for times (instants or intervals), T
- a domain for space, S
- (there might a domain of events, E, too)

Under this ontology, predicates are either atemporal, in which case they are sets of elements of D (e.g. proper names), or 'temporalized' (i.e., they have an argument slot for time), in which case they are sets of elements of $D \times T$. Under such a view, temporal effects are obtained through interpretation, as follows —where P is some binary predicate and now stands for time of utterance (cf. Musan (1999)):

(10) $[\![P(x,t) \wedge PAST(t)]\!] = 1$ iff *x is* $\in$ *P's denotation at t* & $t < \mathsf{now}$

2.1 Problems with the 'Classical' Ontology

An apparent puzzle for this kind of account has to do with the fact that a lot of predicates (e.g., motion, spatial properties, ...) deal with questions of *material existence*; that is, they need to be related to the concrete referents in the world. A material referent can be viewed as a function $(D \times T) \rightarrow S$. This function has to be *partial*, since most things have only a limited life-span.

What this means is that when existence is necessary, it has to be stated explicitly in our logical forms. Put another way, one has to supplement the usual ontological framework with a predicate of existence-at-a-time (so that one is able to distinguish being '*not*(P) at t' with 'not being at t').

This solution is illustrated on the following example:

(11) The King of France is bald.

The logical form for this sentence would be something like the following, where two different types of existence have to be postulated:

(12) $\exists!x(king\_of\_france(x) \wedge bald(x) \wedge exists(x, \mathsf{now}))$

The classical ontology seems undesirable, for it commits us to two different kinds of existence: one logical rendered by the existential quantifier and one material rendered by an explicit *exists* predicate (see also Simons (1987)). This is indeed not very satisfactory from a metaphysical point of view.

To give another illustration of the problems faced by the 'classical' ontology, consider Geach's well-known example:

(13) The ring is new but the gold it's made of is old.

The problem with this type of examples is that we seem to make contradictory predications (new/old) over the same object. The solution provided in Link (1983) basically involved distinguishing an object from its substance or an object from the sum of its parts. Note that this solution basically builds upon the classical ontology. Thus, Link's idea was to consider a function from the domain of objects to a domain of substances: *ring* and *new* are directly predicated of the object while *gold* and *old* are predicated of the object's substance. The problem with this solution is that it is not clear at all that every object has a unique substance. Thus, different substances can be considered for the very same object. For instance, what is a snowman made of? Is it made of snow, of water, of molecules, or of atoms?

2.2 Entering the Fourth Dimension

To address these ontological problems, we take a different stand where instead of a separation between objects and their temporal or spatio-temporal extent, we assume the existence of objects within a unique spatio-temporal domain (the domain of all 'histories' of all material objects).

This alternative ontology, sometimes referred to as *four-dimensionalism*, has a long history and can actually be traced back to works by Russell, Whitehead (1929) and Quine (1960). These authors hold the view that every material object reduces to a spatio-temporal process. That is, everything is a spatio-temporal region (i.e., an 'S-T event' for Russel, a 'worm' for Quine). More precisely, this means that predicates hold of "stages", and that persistent objects are mental reconstructions from perceptions of "reality". Recently, '*4-D*' has known somewhat of a revival through the work of philosophers like Heller, Noonan, and Sider (Heller (1990), Noonan (1976), Sider (1997, 2001)). In a similar vein than earlier studies, these studies describe entities we speak about as essentially temporal entities.

It is easy to see that an intrinsically temporal ontology like 4-D will have no problem with material existence or with object and substance(s). In the latter case, we don't have to distinguish between objects and substances as different *a priori* types, but only between different spatio-temporal histories.

As far as we know, most of these ideas developed by four-dimensionalists (except, of course, for the distinction between entities and stages) and their implications for formal semantics have been so far overlooked by linguists. However, they seem to suggest a very natural revision of classical semantic interpretations,[8] one that allows temporal relations on predicate arguments to be expressed.

2.3 More formally

In a temporal ontology for concrete objects, the domain of objects will be the set of all possible space-time histories, or space-time "worms". Thus, the referent of, say 'a dog', will be all the positions the dog occupies in space-time during its lifetime. Now predicating something of that referent, e.g. that it 'walked' (treated here as another space-time worm), will amount to say that the intersection of the two worms is not empty. This is illustrated graphically in the Figure 1 below.

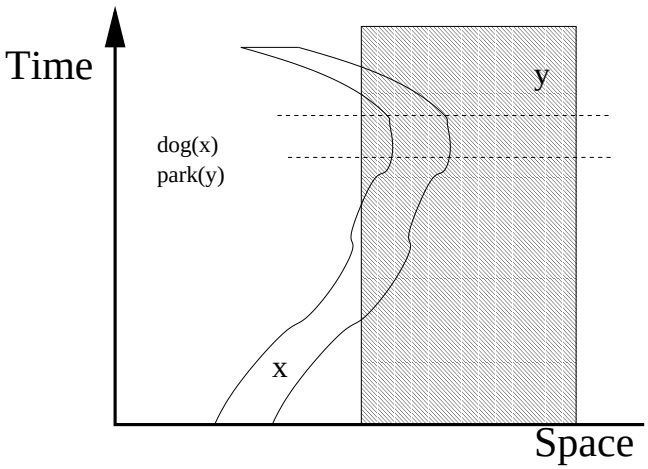


Figure 1: A dog (temporarily) walking in a park, in space-time.

Let us now look at the ontology more formally. First, let us call $\mathscr{M} = \langle E, \prec, \approx, ||\cdot|| \rangle$ a model and g be a variable assignment from D to $\wp(E)$, the power set of E, i.e. $g : D \rightarrow X \in \wp(E)$. These are such that:

[8] Such a revision is briefly alluded to in Carlson (1980).

- D is the set of variables of the language.
- E is a set of spatio-temporal "points" (the most fine-grained spatio-temporal events),
- $\approx$ is a contemporaneity relation on spatio-temporal points
- $\prec$ is a total linear ordering on classes of equivalence of E with respect to $\approx$.
- $||\cdot|| \rightarrow \{0,1\}$ is an interpretation function.

Note that a maximal set of contemporaneous points can be interpreted as an “instant”.

The formal language also includes the relations ‘$<$’ ‘is before’, ‘*stage*’ ‘is a stage of’, ‘$\subseteq_t$’ ‘is temporally included in’, which will be interpreted as follows:

- $||x < y||_g = 1$ iff $\forall \alpha \in ||x||_g \forall \beta \in ||y||_g (\alpha \prec \beta)$
- $||x \subseteq_t y||_g = 1$ iff $\forall \alpha \in ||x||_g (\exists \beta \in ||y||_g \alpha \approx \beta)$
- $||stage(x,y)||_g = 1$ iff
  $||x||_g \subseteq ||y||_g \wedge \forall \alpha \in ||y||_g [(\exists \beta \in ||x||_g \beta \approx \alpha) \rightarrow \alpha \in ||x||_g]$[9]
- in addition, the sum of objects (‘+’) is defined as set union: $||x+y||_g = ||x||_g \cup ||y||_g$.

We do not precise the model any further, since various properties could be discussed that are not necessarily relevant at this point. An axiomatization of a type of models where space is considered along with time in a same topology has already been proposed in Muller (1998).

Note finally that one might also want a model in which the other relations besides temporal ones are mereological. We will use a part-of relation, which could be interpreted in various ways, but formally corresponds to the following for now:
$||PART(x,y)||g = 1$ iff $||x||_g \subseteq ||y||_g$.

3 Types of predication

In this section, we show how the different sorts of predicates are represented in the context of the above ontology.

If there is one ontological distinction between predicates that is well-known to linguists, it is undoubtedly the distinction between *stage-level predicates* and *individual-level predicates*. Very grossly, the distinction separates transient properties from permanent ones. The reason this distinction is so well-known to linguists is because many grammatical phenomena are sensitive to it (e.g., Milsark (1974), Carlson (1980), Rapoport (1991), Kratzer (1995)). We briefly look at three of these phenomena: bare plurals, English progressive, and secondary (depictive) predication.

Let’s begin with the facts on bare plurals, first observed by Carlson (1980). Consider the two following sentences:

[9] We will thus assume that the *stage* relation is *reflexive* (i.e., anything is a stage of itself), *antisymmetric* (i.e., if x is a stage of y and y is a stage of x, then x and y are the same object), and *transitive* (i.e., if x is a stage of y, and y a stage of z,then x is also a stage of z).

(14) Phonologists are obnoxious.

(15) Phonologists are at the party.

There is a clear contrast between these two sentences. While the sentence featuring the stage-level (14) is ambiguous between a generic reading and an existential reading, (15) only has the existential reading.

Another well-known contrast comes from the English progressive. There, verbal stage-level predicates can be used with the progressive in English, whereas verbal individual-level ones cannot. This is illustrated with the following pair of examples:

(16) Jerry is smoking.

(17) *Jerry is knowing French.

Yet another grammatical reflex of this distinction comes from secondary depictive predication. As with the progressive, stage-level predicates but not individual-level ones are felicitous in this context (see, however, McNally (1994), for some counter-examples):

(18) Angelika gave the talk naked.

(19) *Angelika gave the talk intelligent.

Within the classical ontology, augmented with events, one way to capture the distinction between stage-level and individual-level predicates has been, following Kratzer (1995), to assume that the two types of predicates have a different argument structure. According to Kratzer, stage-level predicates bear a (neo-)Davidsonian argument, whereas individual-level lack such an argument. In effect, this makes stage-level predicates sets of events, while individual-level predicates remain sets of (tuples of) individuals. Under her account, the contrast between (18) and (19) is amenable to a simple arity explanation: a predicate like *intelligent* simply doesn't have an (event) argument, and so there is no event variable to be 'co-identified' with that of the VP *gave the talk*.

Note that Kratzer's proposal would make no sense, given our ontology. For this ontology starts with the assumption that is no distinction between individuals and events. In the context of four-dimensionalism, the distinction between stage-level and individual-level predicates will be captured as follows. The proposal is going to be very similar, at least in spirit, to Carlson (1980). Intuitively, a *stage-level predicate* is one that does not necessarily apply to the whole lifespan of an entity, but only to a part of that lifespan (e.g. *naked*, *student*). An *individual-level* predicate, by contrast, must be true at any time during an entity's lifespan (e.g., *intelligent*, *man*). More precisely now, we propose to capture the contrast as follows —where P_{stage} and P_{indiv} denote any stage-/individual-level predicate, and P'_{stage} and P'_{indiv} their respective denotations:

(20) $[\![P_{stage}]\!] = \lambda y[\exists x P'_{stage}(x) \wedge stage(x,y) \wedge x \neq y]$

(21) $[\![P_{indiv}]\!] = \lambda y[\exists x P'_{indiv}(x) \wedge stage(x,y) \wedge x = y]$

In words now, (20) says that P_{stage} only applies to slices of objects, whereas (21) says that P_{indiv} only applies to entire objects. Taking some concrete examples, now:

(22) $[\![student]\!] = \lambda y[\exists x\ student(x) \wedge stage(x,y) \wedge x \neq y]$

(23) $[\![man]\!] = \lambda y[\exists x\ man(x) \wedge stage(x,y) \wedge x = y]$

These denotations correctly capture the intuition that when we refer to an individual by calling him/her student, we are in fact only predicating over one slide of his/her history. By contrast, when we refer to an individual by calling him/her man/woman, we are predicating over his/her whole history.[10]

The next section will show in detail the predictions one obtains by using these denotations. As we will see there, the present account also provides a very natural explanation for the contrast between (18) and (19).

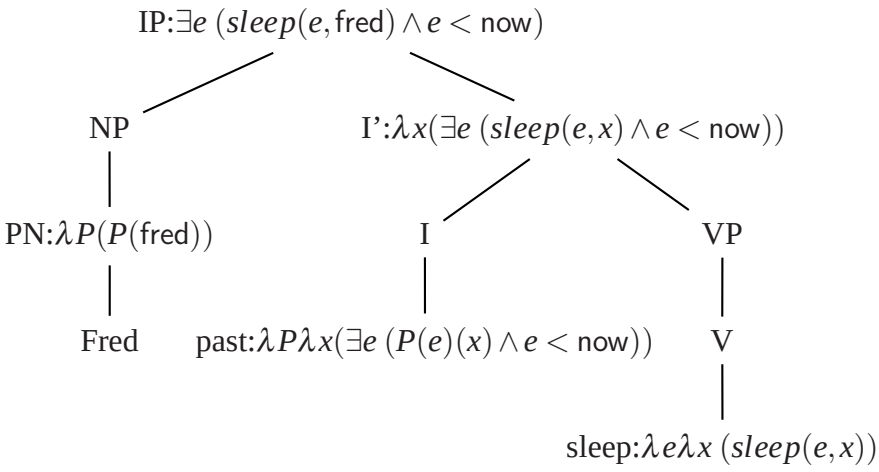
4 The syntax-semantics interface revisited

In this section, we consider the repercussions of using our new ontology on the syntax-semantics interface. We start by briefly considering the classical account.

4.1 The classical account

Below is the semantic derivation for the sentence *John slept*, under the 'classical account'. In this account, close in spirit to Heim and Kratzer (1998) (augmented with events), NPs are functions ranging over sets of individuals (i.e., generalized quantifiers), while VPs are functions from events to functions over individuals. Inflections, finally, are functions from VP denotations to functions over individuals.

(24) Fred slept.



[10] Note that the denotations for verbal stage- and individual-level predicate will have to be slightly different from (20) and (21), for verbal projections combine with inflections. See next section.

4.2 Revisiting ...

The new ontology we are assuming gives a life-span to every object, therefore allowing it to be predicated over by temporal relations. More concretely, consider the revised denotations for the past inflection, the verb *sleep*, and the NP *Fred*:

(25) a. $[\![past]\!] = \lambda Q \lambda x(\exists y\, Q(y)(x) \wedge y < \mathsf{now})$
b. $[\![sleep]\!] = \lambda y \lambda x(stage(y,x) \wedge sleep(y) \wedge y \neq x)$
c. $[\![Fred]\!] = \lambda P\, P(\mathsf{fred})$

These denotations do not seem to have changed drastically, but remember that we are now quantifying over a single and very distinct domain, namely a domain of spatio-temporal points. Note that there is a further revision regarding the denotation of the verb *sleep*, Namely, the new denotation now explicitly encodes the fact that *sleep* is a transient property; i.e., in the present framework, it is a function ranging over stages.

Given these new denotations, the semantic composition yields the following logical form for the sentence *Fred slept*:

(26) $[\![Fred]\!]([\![past]\!]([\![sleep]\!])) = \exists y(stage(y, \mathsf{fred}) \wedge y < \mathsf{now} \wedge sleep(y) \wedge \mathsf{fred} \neq y)$

That is, in words, *Fred slept* is true if and only if there is a (spatio-)temporal stage (distinct) of the entity *fred* in the past that also belonged to the sleep history (i.e., there was a sleeping episode in Fred's history).

In the following, we consider the amendments to be made to the denotations of the other parts of speech.

4.2.1 Nouns and quantifiers

We already discussed the denotations to give to stage-level and individual nominals in section (3); as in the classical account, noun denotations are very similar to those of (intransitive) verbs. Below are some other examples:

(27) a. $[\![hostage]\!] = \lambda y(\exists x\, hostage(x) \wedge stage(x,y) \wedge x \neq y)$
b. $[\![man]\!] = \lambda y(\exists x\, man(x) \wedge stage(x,y) \wedge x = y)$

That is, *hostage* holds of temporal slices of entities, while *man* assumes the whole history of the referred entity.

What is the denotation for quantifiers? Well, one can basically assume that quantifiers keep the same sort of denotations as in the classical account; e.g.:

(28) $[\![a]\!] = \lambda P \lambda R(\exists x(P(x) \wedge R(x)))$

Given the above denotations, we are now in a position where we can derive semantic representations for sentences which involve multiple predicates like, say, *A man slept* —where we are temporally relating an individual-level nominal and a stage-level verbal predicate:[11]

[11] Note that the variables *e* and *x* will be used below for ease of notation, but it is worth remembering that these variables range here over the same domain (i.e., they don't have their usual implicit event and object interpretation).

(29) $[\![A\ man\ slept]\!] = [\![a]\!]([\![man]\!])([\![slept]\!])$
$= \exists x \exists s \exists s'\ (man(x) \wedge stage(s,x) \wedge s = x \wedge sleep(s') \wedge stage(s',x) \wedge s' < \mathsf{now} \wedge s' \neq x)$
$= \exists x \exists s\ (man(x) \wedge sleep(s) \wedge stage(s,x) \wedge s < \mathsf{now} \wedge s \neq x)$

Literally, *A man slept* is true if and only if there is a object that is a man and there is a sleeping stage as part of his history. Contrast the above representation with the one we get for the sentence *An hostage slept* —where we combine two stage-level predicates:

(30) $[\![An\ hostage\ slept]\!] = [\![a]\!]([\![hostage]\!])([\![slept]\!])$
$= \exists x \exists s \exists e\ (stage(s,x) \wedge hostage(s) \wedge s \neq x \wedge stage(e,x) \wedge sleep(e) \wedge e < \mathsf{now} \wedge e \neq x)$

The sentence *an hostage slept* is true if and only if there is an object x, such that this object has as part of its history both an hostage episode and a sleeping episode. Crucially, the temporal relation between these two episodes is left underspecified. This is correct since, as already observed, one might want $e \subset_t s$ (in which case x is an hostage during the time of the sleeping) or an empty temporal intersection: $e \cap_t s = \emptyset$ (in which case, x was no longer an hostage at the time of the sleeping). In other words, we leave it to the discourse context (rhetorical relations, maybe) to fill in the temporal relation between the two episodes in this case.

4.2.2 Universal quantification and the question of identity across time

Note that the present account has a potential problem with universal quantification. The problem is the following. Assume we simply 'copy' the old denotation of *every* into our account, i.e., we assume the following denotation:

(31) $[\![every]\!] = \lambda P \lambda Q(\forall x(P(x) \rightarrow Q(x)))$

Recall that we are now quantifying over (spatio-)temporal slices of individuals. Consequently, what a phrase such as *every man* means in this context is roughly every temporal slice of an object with the property "man".

But this cannot be quite right. Consider the following sentence, along with its tentative logical form (leaving out tense):

(32) a. Every man had one drink (only).
b. $\forall x(man(x) \rightarrow had\_one\_drink(x)))$

This formula does not quite give us what we want. For it seems that it allows us to quantify over slices of the same man. Indeed, "man" is an individual-level property, so every temporal slice of something that has the property "man" also has the property:

$$\forall x, y(man(x) \wedge stage(y,x)) \rightarrow man(y)$$

Let's say we have a man x; from (32-b) we know he had one drink. Let's consider now two disconnected different stages x_1 and x_2 of the same man x: from (32-b) again, they each had one drink, so x actually had two drinks !

This suggests that *every man* should rather be interpreted *maximally* with respect to the context (i.e., we are quantifying over maximal slices); that is, one should instead assume the following logical form:

(33) $\forall x(man(x) \rightarrow$
$(has\_one\_drink(x) \wedge \forall y\,[stage(y,x) \wedge has\_one\_drink(y)] \rightarrow x = y))$

And we should change the semantics of *every* for

$$[\![every]\!] = \lambda P \lambda Q(\forall x(P(x) \rightarrow (Q(x) \wedge \forall y\,[stage(y,x) \wedge Q(y)] \rightarrow x = y))$$

A similar solution to this problem is informally suggested by Noonan (1976).

4.2.3 Adjectives and adjectival modification

Let us now turn to adjectival denotation and the thorny problem of adjectival modification. First, let us get the verb *be* out of the way. We will assume here that the denotation of this verb is simply the identity function:

(34) $[\![be]\!] = \lambda P.P$

Consider the following example:

(35) Olga went to the party sick/*Polish.

As this example makes clear, *sick* and *Polish* are stage- and individual-level predicates, respectively. That is, in our framework, they receive the following distinct denotations:

(36) $[\![sick]\!] = \lambda y \lambda z(sick(z) \wedge stage(z,y) \wedge z \neq y)$

(37) $[\![Polish]\!] = \lambda y \lambda z(polish(z) \wedge stage(z,y) \wedge z = y)$

These are, *mutatis mutandis*, the same denotations as for verbal stage- and individual-level predicates. Rather unexpectedly, the semantic derivation for *Olga was sick* looks very similar to *Fred slept*; that is:

(38) $[\![Olga\ was\ sick]\!] = [\![Olga]\!]([\![PAST]\!]([\![be]\!]([\![sick]\!])))$
$= \exists s(stage(s, \mathsf{olga}) \wedge s < \mathsf{now} \wedge sick(s) \wedge \mathsf{olga} \neq s)$

Now, what about *Olga was Polish*?

(39) $[\![Olga\ was\ Polish]\!] = [\![olga]\!]([\![PAST]\!]([\![be]\!]([\![Polish]\!])))$
$= \exists s(stage(s, \mathsf{olga}) \wedge s < \mathsf{now} \wedge polish(\mathsf{olga}) \wedge \mathsf{olga} = s)$

Now, notice that the above denotations make the prediction that *sick* and *Polish* cannot be conjoined —at least under standard coordination, i.e., where $[\![and]\!] = \lambda P \lambda Q(\lambda \vec{x}(P(\vec{x}) \wedge Q(\vec{x})))$. The observation that stage-level predicate and individual-level predicate are hard to coordinate goes back to Vendler (1967) (it is also found in Larson (1998)). The reason why such cases of coordination are ruled out under our account is because they would simply yield a contradiction; e.g.

(40) # Olga was sick and Polish

would yield:

(41) $\exists s(s < \mathsf{now} \wedge sick(s) \wedge stage(s, \mathsf{olga})) \wedge s = \mathsf{olga} \wedge s \neq \mathsf{olga} \models \bot$

It is worth noting here that the above explanation can be extended to the infelicitous cases of individual-level predicates in depictive predications, noted by Kratzer. Depictives as in *Angelica gave the lecture intelligent* can indeed be analyzed as a case of (generalized) coordination. Therefore, this sentence is out because *gave a lecture* and *intelligent* clash in the the same way as *sick* and *Polish*.

There is another prediction we get for free with our ontology; namely, asserting that a individual-level property no longer holds of an individual entails that this individual no longer exists. For instance, *Olga was Polish* has the implicature that Olga is dead:

(42) Olga was Polish/a woman $\Rightarrow$ Olga is dead

This is a consequence of our system, because then:

(43) $(s < \mathsf{now} \wedge polish(s) \wedge stage(s, \mathsf{olga}) \wedge s = \mathsf{olga})$

which is equivalent to:

(44) $polish(\mathsf{olga}) \wedge \mathsf{olga} < \mathsf{now}$

If Olga's history is in the past of the speech time, it means she's dead.

Let us turn to the case of ambiguous adjectives like *beautiful* noted by Larson Larson (1998). Under his account, these can be predicated of objects or events:

(45) Olga is a beautiful dancer.

The two readings proposed by Larson are:

(46) a. $beautiful(x) \wedge olga(x) \wedge dancer(x)$
b. $olga(x) \wedge (\forall e(dance(x,e) \rightarrow beautiful(e))$

The way Larson proposes to produce these two readings is slightly *ad hoc*: it is based on the idea that during the composition, the variable introduced by adjective *beautiful* can either be 'co-identified' with the individual variable or with the event variable introduced by the nominal *dancer*.

Under our ontology, there is no difference between objects and events. So, we have to resort to some other explanation. (This explanation isn't yet totally worked out.) Within our semantics, it is reasonable to assume that the adjective and the noun each introduce a stage (since both *beautiful* and *dancer* denote transient properties). In turn, these two stages, as in the case of *the hostage slept*, can but need not to, refer to the same stage. That is, the two readings proposed by Larson are also predicted by our account:

(47) a. $\ldots \wedge stage(z, \mathsf{olga}) \wedge dancer(z) \wedge beautiful(z)$
b. $\ldots \wedge stage(z, \mathsf{olga}) \wedge dancer(z) \wedge beautiful(\mathsf{olga})$

5 Open questions

A number of constructions are still out of the reach of the proposal made in this paper. In the following, we briefly review some of these problematic cases that we intend to address later.

5.1 More on Adjectival modification

Our major concern regards adjectival modification. As we noted above, we don't yet have a fully worked-out solution for the *beautiful dancer* examples. But there are many other puzzling examples. Consider first the followings:

(48) A hungry hostage attended the dinner.

This example is interesting because the different predicates in the NP are interpreted at different times. That is, roughly, the adjective *hungry* is interpreted at the verbal time, while *hostage* is interpreted at some previous time. Notice that this type of mismatch is beyond the scope of traditional accounts of adjectival modification; crucially, these assume that the nominal argument and the adjectival one are 'co-identified' (cf. Higginbotham (1985), Kratzer (1995)). It is worth noting that this type of mismatch does not seem incompatible with the present account, since more temporal structure has actually been built into lexical meaning. More work is however required to figure out how Adj and N should be composed. What already seems clear is that something like rhetorical relations might be needed to actually compute the temporal relation between the stages involved.

There seems to be a strong similarity between the above examples and depictives and absolutives, although the adjective is NP-internal (and not at the clause periphery). That depictive feel is reinforced by the following contrast:

(49) (50) An happy Olga entered the room.

(51) # A Polish Olga entered the room.

This contrast between stage- and individual-level is probably amenable to the same explanation as for the depictives.

Another case where there seems to be mismatch between syntax and semantics is with so-called *hypallages*; i.e., a figure where a predicate (typically, an adjective) modifies one noun syntactically but another noun semantically. Literary examples include the following:

(52) Darksome wandering by the solitary night [Angel Day]

(53) The knight raised a vengeful hand

But we have also managed to find real-life examples:

(54) We had a sad dinner.

(55) The house was sad, since Fido's death.

A question we leave here is: Is it hypallage or rather metonymy: i.e., *dinner* is used for the people attending it, and *house* for the people living in it.

The following contrast should also be explained:

(56) Tired, the boys didn't go to the party. (they didn't)

(57) The boys didn't go to the party tired. (they did)

In particular, one has first to explain how the predication in the 'dislocated' AP *tired* is related to the predication of the matrix clause. The interpretation for these examples suggests that the secondary predication is outside the scope of negation in the first example, but inside it in the second example. What is remarkable in the latter example is that it is the secondary predication *alone* that is negated (i.e., there is an implicature that the boys did go to the party).

5.2 Anaphora and predicate types

Beside adjectival modification, our plan is to go beyond sentences and also consider anaphora. As shown by the following examples, there seem to be interesting interactions between predicate types and anaphoric possibilities:

(58) a. The man was drunk an hour ago. He is sober now.

b. The man was drunk an hour ago. # He is a woman now.

c. The drunk was sleeping. ? He is sober now.

d. The man had an operation. He is a woman now.

e. The drunk jumped into the pool. ? He is sober now.

These facts seem beyond the scope of dynamic semantics account, such as Kamp and Reyle (1993), Groenendijk and Stokhof (1991) or Asher and Lascarides (2003).

6 Conclusion

We started our study with some known problems related to the temporal interpretation of certain noun phrases, and the unpalatable properties of the ontological framework generally assumed to solve these problems. We have shown here how to consistently change an atemporal ontology into a temporalized one in order to deal with temporal aspects of the semantics of noun phrases. This ontology had been suggested in the past, but had never fully adopted and put to work in a semantic framework. This is an attempt to unify a few semantic problems related to predication over events and concrete objects. While there are still some aspects in need of a more precise analysis, we hope that this kind of approach is a promising, coherent path to deal with temporal side-effects of predications other than verbal.

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Naming and Economy*

Hans-Martin Gärtner

Each of us so deep and so superficial, Joni Mitchell

1. Introduction

The aim of this paper is to provide a semantic alternative to the account of modified proper names discussed in Kayne (1994). Whereas the latter takes the relevant facts to speak in favor of a head-raising analysis of relative clauses, the semantic alternative offered here can do without such an analysis.
The main ingredients of the theory developed below are (i) a generalization of the "blocking principle" of Chierchia (1998) and (ii) an appeal to a part/stage ontology for the analysis of the meaning of proper names along the lines of Paul (1994).

2. The Linear Correspondence Axiom, relative clauses, and proper names

Kayne (1994) argued for an asymmetry of hierarchical and linear notions of syntactic constituent tree structure. In particular, he showed how to derive the linearization of terminal nodes from the asymmetric c-command relation in terms of the "Linear Correspondence Axiom" (LCA). I state the LCA in simplified form in (2). (1) provides the familiar ingredients of constituent structure trees (cf. Partee, ter Meulen and Wall 1993:441).

(1) a. $\mathbb{N}$ = the set of nodes
b. $\mathbb{T}$ = the set of terminals ($\mathbb{T} \subset \mathbb{N}$)
c. $\mathbb{D}$ = the dominance relation (weak, partial) [$\subseteq \mathbb{N} \times \mathbb{N}$]
d. $\mathbb{P}$ = the precedence relation (strict, partial) [$\subseteq \mathbb{N} \times \mathbb{N}$]

(2) *Linear Correspondence Axiom* (LCA) (cf. Kayne 1994)[1]
a. $\mathbb{P}\lceil\mathbb{T}$ is a strict linear order
b. $\forall x,y \in \mathbb{T}\ [<x,y> \in \mathbb{P} \leftrightarrow$
$\exists v,w \in \mathbb{N}–\mathbb{T}\ [<v,x> \in \mathbb{D} \wedge <w,y> \in \mathbb{D} \wedge <v,w> \in {}^{-}\mathbb{ACC}]]$

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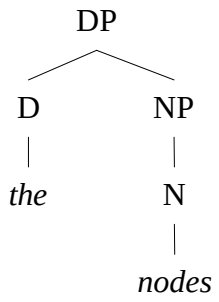
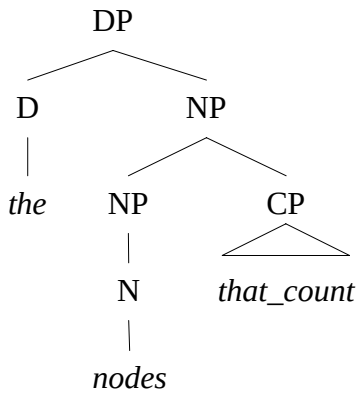
[11] "$\mathbb{P}\lceil\mathbb{T}$" denotes the restriction of relation $\mathbb{P}$ in $\mathbb{N} \times \mathbb{N}$ to its subrelation in $\mathbb{T} \times \mathbb{T}$. "${}^{-}\mathbb{ACC}$" denotes the asymmetric c-command relation ($\mathbb{ACC}$), which is a relation in $\mathbb{N} \times \mathbb{N}$, restricted to its subrelation in ($\mathbb{N}–\mathbb{LS}$) $\times \mathbb{N}$, where "$\mathbb{LS}$" denotes the set of "lower segments," i.e. non-highest segments, of adjunction structures. The use of ${}^{-}\mathbb{ACC}$ is a rather *ad hoc* method for allowing leftward adjuncts, which do double duty as adjuncts and specifiers, to comply with the LCA. For more comprehensive discussion, see Kayne (1994, chapter 3), and for a formal approach to adjunction structures, see Kracht (1999).

The tree structures in (3) illustrate the structural consequences of these assumptions for modification of an NP/DP by a relative clause.

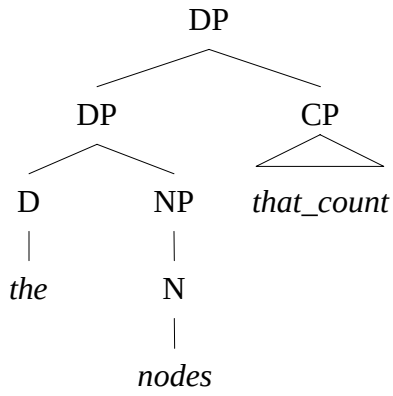
(3) a.



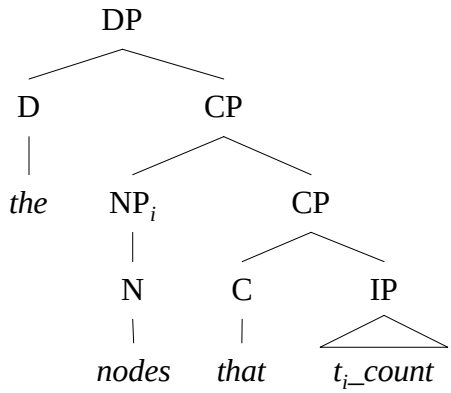
b. *



c. *



d.



Crucially, analyses that rely on righthand adjunction, i.e. (3b)/(3c), are incompatible with the LCA. (4a)-(4d) spells out asymmetric c-command for (3a)-(3d), respectively. Pairs that induce a linear order diverging from the one shown in (3) are marked by *.[2]

(4) a. $\neg\mathbb{ACC}$(3a) = {<D,N>}
b. $\neg\mathbb{ACC}$(3b) = {<D,N>,*<CP,N>}
c. $\neg\mathbb{ACC}$(3c) = {<D,N>,*<CP,D>,*<CP,NP>,*<CP,N>}
d. $\neg\mathbb{ACC}$(3d) = {<D,N>,<D,C>,<D,IP>,<NP,C>,<NP,IP>}

Clearly, (3d), which illustrates (a variant of) the "head raising analysis" (HRA) of relative clauses, is LCA-compatible. This is the structure endorsed in Kayne (1994):

"Summing up this section so far, the raising/promotion analysis of relatives, which is by far the most natural analysis of relatives from an LCA perspective, has led me to propose that [. . .] [*the nodes that count*] [. . .] involve[s] movement to the specifier of CP that is a sister to D = *the*" (Kayne 1994:91).

[2] Note the absence of <CP,N> from $\neg\mathbb{ACC}$(3d), which is due to the fact that the lower segment of CP is not a member of $\mathbb{N}$–$\mathbb{LS}$. The higher one does not even c-command N.

In a footnote it is remarked that a restricted variant of what is called the CN+S analysis of relative clauses in the Montagovian tradition (cf. Janssen 1982) would be another LCA-compatible alternative.

"In the only alternative configurationally permitted by the LCA, the relative clause would be a complement of N°" (Kayne 1994:155fn.17).

This analysis is shown in (5).[3]

(5) [$_{DP}$ *the* [$_{NP}$ [$_{N°}$ *nodes*] [$_{CP}$ *that count*]]]

Interestingly, Kayne (1994) cites the following contrast involving proper names in favor of a (3d)-style HRA.

(6) a. * *the Paris*
b. *the Paris that I read about*

"The approach to relatives [. . .] being developed here permits one to understand straightforwardly why [. . .] a proper noun (NP) is prohibited in English from being the sister phrase to a definite article" (Kayne 1994:103).

(7) shows the specific assumptions one has to make under an HRA of (6b).

(7) a. [$_{DP}$ *the* [$_{CP}$ *that* [$_{IP}$ *I read about Paris*]]] (D-Structure)
b. [$_{DP}$ *the* [$_{CP}$ *Paris*$_i$ *that* [$_{IP}$ *I read about* t$_i$]]] (S-Structure)

Crucially, nowhere in the analysis would the proper name *Paris* be a sister of, and thus combine directly with, the definite determiner.
Of course, this can only be a partial vindication of the HRA, given the coexistence of structures (3a) and (3d) in the domain of common nouns. However, instead of dwelling on the HRA here, I will give an alternative semantic account of the facts in (6). On the basis of that account, HRA will be dispensible in the domain of modified proper names, and arguments in its favor would have to be sought elsewhere.

3. Generalized Blocking and the modification of proper names

3.1 Generalizing the "Blocking Principle"

My alternative approach to the contrast in (6) will rely heavily on the theory of constrained type-shifting developed in Chierchia (1998). Accordingly,

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[3] However, the general CN+S approach, according to which the category CN can be arbitrarily complex due to adjectival modification, cf. (i), is not LCA-compatible.
(i) [$_{T}$ *the* [$_{CN}$ [$_{CN}$ [$_{A}$ *terminal*] [$_{CN}$ *nodes*]] [$_{S}$ *that count*]]]
Another LCA-compatible approach to righthand modifiers could postulate conjunction-like structures, cf. (ii), where "MP" stands for a "modification phrase."
(ii) [$_{DP}$ *the* [$_{MP}$ [$_{NP}$ *nodes*] [$_{M'}$ M° [$_{CP}$ *that count*]]]
For additional discussion of LCA and HRA, see a.o. Borsley (1997) and Bianchi (2000).

"[l]ocal type mismatches can be solved through a highly constrained set of universally available type shifting operations. These apply either in the lexicon or, possibly, as part of the compositional interpretation of phrases" (Chierchia 1998:340).

The crucial economy constraint involved in regulating type-shifts is formulated in (8).[4]

(8) *Blocking Principle* ('Type Shifting as Last Resort') (Chierchia 1998:360)
For any type shifting operation τ and any X: *τ(X),
if there is a determiner D such that D(X) = τ(X)

(8) accounts for the free availability in English, where defined, of the $\cap$- and $\cup$-operator, shifting properties (<s,<e,t>>) to kinds (e) and vice versa, while ι and $\exists$ are usually blocked by the availability of *the* and *a*.[5] One example of this is shown in (9).

(9) a. *Dogs are widespread* ⟩⟩ WIDESPREAD($\cap$DOGS)
b. * *Dog is barking* ⟩⟩ $\exists$DOG(IS_BARKING)
c. *A dog is barking* ⟩⟩ (λPλQ$\exists$x[P(x)&Q(x)](DOG))(IS_BARKING)

For the purpose at hand, (8) will have to be generalized as in (10).[6]

(10) *Generalized Blocking Principle* (GBP)
For any pair of expressions E_1 and E_2, such that
(i) $||E_1|| = ||E_2||$, and
(ii) E_2 involves type shifting operator τ, while E_1 doesn't,
E_1 *blocks* E_2.

(10) yields the same results as (8) for the case in (9), since while (9b) involves $\exists$, (9c) doesn't, and given that ||(9b)|| = ||(9c)|| , (9c) blocks (9b), i.e. *(9b).

3.2 Modifying proper names

In addition to the GBP I will adopt the approach to modified proper names in terms of a part/stage ontology put forward in Paul (1994).

"Under this analysis proper names denote sets of spatio-temporal parts of individuals as suggested by Quine (1960). This will give us a semantically satisfying analysis of the above modified proper names under which they pick out certain parts of those sets" (Paul 1994:269).

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[4] I have slightly simplified that definition. In the original there is the additional condition that *D* be defined for argument *X*.

[5] I cannot go into a full-fledged discussion of this approach. For recent criticism of as well as alternatives, see Krifka (2003) and Longobardi (2001).

[6] The formal shape of expressions E_1 and E_2 is likely to have to be further constrained in order to prevent unwelcome consequences. This is the well-known problem of defining "reference-sets" for economy principles to apply to. For an interesting discussion of the latter problem in the domain of minimalist syntax, see Sternefeld (1997). See also the debate of CCG type-raising in section 4.2 below for some potential refinements.

In particular, I will rely on the following ontological and model-theoretic assumptions made by Paul (1994:275f).

(11) a. D is a non-empty set, namely our semantic domain, and ID a non-empty subset of D, namely the set of all individuals i, i', i", . . . in D;
b. D is partially ordered by a spatio-temporal part relation $\leq_{st}$, such that $\leq_{st}$ is reflexive, transitive, and antisymmetrical;
c. For each $i \in D$, there is a set $P_i := \{x \mid x \leq_{st} i\}$ of i's parts which contains more elements than just i and forms a complete join semilattice under $\leq_{st}$, i.e., it is partially ordered by $\leq_{st}$ and each non-empty subset P' of P_i has a supremum in P_i.

(12) A model **M** is a structure $\langle D,ID,\| \|,f_{\leq}\rangle$, where
a. D and ID satisfy the conditions stated under [(11)];
b. $\| \|$ is an interpretation function that maps nouns and intransitive verb phrases onto subsets of D, in particular proper nouns onto some P_i for an individual $i \in ID$, and modifiers and qualifiers onto functions from D to D;
c. $f_{\leq}$ is a function that gives for each noun N a partial order on ||N||; for proper nouns this partial order will be given by $\leq_{st}$.[7]

There is, however, one subtle but important difference between my proposal and Paul's. The latter doesn't seem to differentiate between proper names in the natural language and their counterparts in the interpreted formal language. Here such a difference will be crucial. Thus, denoting (maximal) sets of parts/stages as stated above will be a property of proper names in the formal language. For example, $\|\text{PARIS}\| \in \{0,1\}^D$. However, proper names of natural language will be translated as "Sharvy-style" definite descriptions, such as indicated in (13a).[8]

(13) a. *Paris* $\rangle\rangle$ ι(PARIS)
b. ιX = the largest member of X if there is one (else, undefined)

This proposal preserves the intuition that natural language proper names are "referring expressions" by default and that modified proper names are somehow "marked."
Let us further assume $^{\cup\circ}$, a variant of Chierchia's "up" (Chierchia 1998:350), to be a type-shifting operator from individuals (members of ID) to the set of their parts. Also, take the definite determiner *the* to be translated as ι. Then, on the basis of GBP the contrast in (6) will be accounted for by blocking, i.e. *Paris* blocks *the Paris*, as shown in (14).

(14) a. *Paris* $\rangle\rangle$ ι(PARIS)
b. * *the Paris* $\rangle\rangle$ $\iota(^{\cup\circ}(\iota(\text{PARIS})))$
c. $\|\iota(\text{PARIS})\| = \|\iota(^{\cup\circ}(\iota(\text{PARIS})))\|$

Conversely, a type-shift via $^{\cup\circ}$ will be necessary in order to make *Paris* available for "intersection" with a modifier, as shown in (15).

(15) $[_{NP}\ [_{NP}\ \textit{Paris}\ ]\ [_{CP}\ \text{Op}_i\ \textit{that I read about}\ t_i\ ]\ ] \rangle\rangle\ (^{\cup\circ}(\iota(\text{PARIS})) \cap \lambda x(\text{I\_READ\_ABOUT}(x))$

[7] For a more elaborate vindication of such an approach, see (Link 1998).
[8] See Sharvy (1980). The definition of ι is taken from Chierchia (1998:346).

Now, in order to turn the resulting complex expression into a referring expression we need to apply a type-shift via ι again. This time, GBP will favor using *the*, which is available in the English lexicon, over using just ι, i.e. (16a) blocks (16b) where both are translated as (16c).

(16) a. *the Paris that I read about*
b. * *Paris that I read about*
c. $\iota(^{\cup\circ}(\iota(\text{PARIS})) \cap \lambda x(\text{I\_READ\_ABOUT}(x)))$

3.3 Defending the account

Subtle though the differences might be, there seems to be a clear advantage of this account over the one in Paul (1994). There the referential reading of proper names is accounted for in terms of a phonologically empty definite determiner (cf. Paul 1994:276), as indicated in (17).

(17) $\varnothing$*Paris* $\rangle\rangle$ $\iota(\text{PARIS})$

While it may not be fully straightforward to defend this assumption in the first place, the availability of $\varnothing$raises the question as to why (16b), reanalyzed as (18), couldn't have the meaning in (16c) after all, and thus coexist with, if not block, (16a).

(18) $\varnothing$*Paris that I read about*

This has to be prevented by stipulation. In contrast, on my account the logic of the argument is reversed. One ι comes for free by lexical stipulation, but any additional one will have to be introduced by the overt determiner. In fact, the GBP-based account is founded on cross-linguistic evidence (cf. Chierchia 1998). In particular it is compatible with the claims made at length by Longobardi (1994; 2001) against null determiners in English as opposed to Italian.
The facts in (19) are a case in point.

(19) a. *Dogs are rare* b. *Leo ate potatoes*
c. * *Cani sono rari* d. *Leo ha mangiato patate*

Thus, the free availability of bare plurals in governed, (19b), as well as ungoverned position, (19a), distinguishes English from Italian, (19d) vs. (19c), the assumption being that null determiners have to be formally licensed by government much like other empty categories.[9]
Summing up so far, I have shown how to provide a semantic account for the contrast in (6): I assume that (6a) involves a superfluous addition of *the* given the translation of *Paris* as ι(PARIS), while such an addition is necessary in the case of (6b) in order to return to a referential expression from a set denoting one. As a consequence, contrary to what is suggested in Kayne (1994), no HRA of relative clauses is required for dealing with these facts.[10]

[9] For a wealth of additional facts and considerations I refer the reader to the cited works by Longobardi.
[10] An equivalent account of these facts can be given if one starts from an inherent GQ-denotation of proper names (cf. Muskens 1995). For an independent vindication of the HRA, see Bhatt (2002). Given the discussion in Hulsey&Sauerland (2003) and Heycock (2003), however, it is unclear whether that defense of the HRA is more compelling. Still, HRA-afficionados could interpret chain formation in (3d) to trigger the type-shift via $^{\cup\circ}$.

4. Two challenges to Generalized Blocking: "Avoid Structure" and optionality

4.1 Avoid Structure

Let me finish this paper by pointing out two issues that may seem problematic from the perspective developed so far. First, in addition to the blocking principle in (8), Chierchia (1998:393) appeals to the economy constraint "Avoid Structure," formulated in (20).

(20) *Avoid Structure* (AS): Apply SHIFT at the earliest possible level

This principle is argued to be responsible for the contrast in (21).

(21) a. *Dogs are widespread*
b. * *The dogs are widespread*

In particular, it is claimed that

"English, given its category-type map, can apply SHIFT at the NP level [. . .]. Evidently, when this option is available, it must be chosen over one which involves projecting D" (Chierchia 1998:393).

English NPs are taken to be categorially parameterized for licensing in syntactic, and therefore also semantic, "argument positions." Thus, the ∩-operator, which turns pluralities (e.g. DOGS) into "plural kinds" (e.g. ∩DOGS), *can*, and by the workings of (20) *must* apply at the NP level. This licenses translation (22) for (21a).

(22) WIDESPREAD(∩DOGS)

The argument for AS in addition to GBP presupposes that the kind reading at stake in (21) could alternatively be arrived at by means of an intensionalized plural definite description, as provided in (23) (Chierchia 1998:392).

(23) WIDESPREAD(^ιDOGS)

Such a reading could in principle be contributed by a definite determiner, as the Italian translation of (21) shows.

(24) *I* *cani* *sono* *diffusi*
the dogs are widespread

So, why doesn't the GBP apply, predicting reverse grammaticality facts for (21)? The answer is that

"the definite article as such does not mean the same as ∩. Only an overt morpheme whose meaning is identical to one of the available shifters blocks that shifter from being used covertly. Hence, use of ∩ [. . .] is unaffected by the presence of the definite article" (Chierchia 1998:393).

If we accept this account, we need AS in order to rule out (21b). Since *the* and ∩ don't seem to block each other in the sense of the GBP, it is the avoidance of structure, i.e. not projecting a DP-layer, which gives ∩ its advantage over *the*. In the light of this reasoning, let us consider (25).

(25) a. *Dogs that interbreed with wolves are rare*
b. * *The dogs that interbreed with wolves are rare*

Clearly, modification by a relative clause preserves the NP-status of the resulting constituent. Consequently, the same effect of AS can be seen in (25) as well.
The potentially worrisome point of this account is that it may jeopardize the GBP approach to the contrast in (16), and, *mutatis mutandis* the contrast in (9b) vs. (9c). Thus, assume that a covert ι is able to bring about the type-shift from (15) to (16c) *at NP-level*. Then AS and GBP make conflicting predictions about the facts in (16). The former would, contrary to observation, predict (16b) to be fine and (16a) to be out, while GBP, as we have seen, makes the correct predictions. Clearly, further assumptions are needed.
Thus, either one resorts to direct stipulation, such as the one in (26).

(26) Application of covert ι requires projection of a syntactic DP-layer

An alternative way of defusing the power of AS for the case at hand would be by appeal to an OT-style ranking, such that GBP outranks AS.

(27) GBP >> AS

Although my impression is that this second approach is more congenial to the purposes of Chierchia (1998),[11] I will have to leave exploring its consequences for further research.

4.2 Optional type-shift*?*

A second issue concerns the application of type-raising in "Combinatory Categorial Grammar" (CCG) (cf. Steedman 1996; 2000). The availability of type-raising (**T**$_{\wedge}$) allows for alternative derivations of one and the same sentence.[12] (28) gives an example. "**E**$_{/}$" and "**E**$_{\backslash}$" denote forward and backward "slash elimination," respectively, "**C**$_{>}$" denotes "forward composition."

(28) a. $\mathbf{E}_{/}(\mathbf{C}_{>}(\mathbf{T}_{\wedge}(Anna_{NP})(married_{(S\backslash NP)/NP}))(Manny_{NP}))$
b. $\mathbf{E}_{\backslash}((Anna_{NP})\mathbf{E}_{/}((married_{(S\backslash NP)/NP})(Manny_{NP})))$

From the perspective of GBP, one might expect (28a) to be blocked by (28b), given the absence of **T**$_{\wedge}$ in the latter. One way out would be to take information-structure into consideration as relevant for establishing "likeness of meaning." As argued at length in Steedman (2000), the alternative

[11] This solution would be further grist on the mill of "OT-semantics" (cf. Hendriks and de Hoop 2001).
[12] The definition of type-raising is given in (i). T is a variable over categories. I sidestep further restrictions, as well as the semantic side of this operation.
(i) *Type-raising* (**T**$_{\wedge}$) (Steedman 1996:36)
a. $X \Rightarrow T/(T\backslash X)$
b. $X \Rightarrow T\backslash(T/X)$
The example discussed in the text is oversimplified and used for purely demonstrative reasons. Thanks to Mark Steedman (p.c.) for clarifying this issue.

bracketings in (28) have information-structural import. Thus one could reconcile type-raising in (28a) with the GBP by attributing different "meanings" (μ) to the two derivations, i.e. μ(28a) ≠ μ(28b).
This approach, however, is immediately challenged by the alternative "bracketing-preserving" derivation of (28b) provided by Steedman (1996:37), which is shown in (29).

(29) $\mathbf{E}_{/}(\mathbf{T}_{\wedge}(\mathit{Anna}_{\mathrm{NP}})\mathbf{E}_{\backslash}((\mathit{married}_{(\mathrm{S}\backslash\mathrm{NP})/\mathrm{NP}})\mathbf{T}_{\wedge}(\mathit{Manny}_{\mathrm{NP}})))$

Instead, one could therefore add a condition on "form" (φ) to the GBP, where by "form" I mean the string of terminals of an expression. Thus, if it is required that $\varphi(E_1) \neq \varphi(E_2)$, (28) will not fall under the rule of the GBP, and (28a) and (28b) can coexist.
As far as I can see, this extra condition is compatible with the applications of the GBP so far, as all of these involve competition between covert type-shifters and overt determiners. A slightly more sophisticated notion of "form" will be required to distinguish covert shifters from phonologically empty determiners, a move that may be necessary for Chierchia's (G)BP-approach to Italian.

5. Conclusion

In this paper I have shown how to provide a semantic account for the contrast in (6), repeated below for convenience.

(6) a. * *the Paris*
b. *the Paris that I read about*

I assume that (6a) involves a superfluous addition of *the* given the translation of *Paris* as ι(PARIS), where, following assumptions made in Paul (1994), PARIS denotes the set of spatio-temporal parts of Paris. Formally, superfluousness is turned into ill-formedness by the Generalized Blocking Principle, (10), which is a generalization of the blocking principle proposed by Chierchia (1998).
The proper translation of *the Paris*, i.e. $\iota(^{\cup\circ}(\iota(\mathrm{PARIS})))$, would involve an intermediate upward-shift to a set denotation. This, however, is blocked by the GBP.
Crucially, the addition of the definite determiner *the* is necessary in the case of (6b) in order to turn a set denoting expression into a referential one. This involves an unavoidable prior shift of ι(PARIS) to the modifiable set denoting $^{\cup\circ}(\iota(\mathrm{PARIS}))$. Again, the GBP is involved, blocking a covert application of ι, which could have derived the unacceptable (16b).

(16) b. * *Paris that I read about (is beautiful)*

As a consequence, and contrary to what is suggested in Kayne (1994), no head-raising analysis of relative clauses is required for dealing with these facts.[13]

[13] Ora Matushansky (p.c.) pointed out that the analysis of proper names in terms of a part/stage ontology is incompatible with taking them to be rigid designators. In order to decide this difficult issue, one has to look at attempts of applying the notion of rigidity to kind terms, given that the account defended here assimilates proper names to kind terms. One of the less naive approaches in terms of "essentialist predicates" is sketched in Soames (2002:251):
"EP. A predicate P is essentialist iff for all possible worlds w and objects o, if P applies to o with respect to w, then P applies to o in all worlds in which o exists."

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An exploration of whether a satisfactory account can be built along such lines is beyond the scope of this paper (for further relevant discussion, see for example Carlson 1991). An alternative would lie in taking the rigidity of proper names be a derived notion.

"Even in the case of proper names, it can be argued that their rigidity is the result of other, more fundamental, semantic properties that they possess. More specifically, the doctrine that names are rigid designators may be viewed as a corollary of the more central thesis that they are nondescriptional, together with an account of how their reference is fixed in the actual world" (Soames 2002:264).

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Connectives, Indeterminates, and Quantificational Variability*

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George Tsoulas

1. Introduction

It is a well known fact that a number of languages, mainly from East and South Asia form quantificational expressions not (or not exclusively) through the use of determiner-like elements combined with a restrictive expression. Rather, in these languages, a so-called *indeterminate* pronoun[1] (which is homophonous to a *wh* word) combines with a suffixal element, whose nature varies, and thus the indeterminate acquires a particular quantificational force. In this paper we will mainly concentrate on two issues arising form the combination of indeterminates with disjunction and conjunction denoting morphemes, and the particular force taken by the indeterminate through this combination. Our point of departure here is double. First, the observation that the quantificational force acquired by an indeterminate after it has combined with disjunction is not crosslinguistically uniform. On the other hand we also observe that the combination indeterminate + conjunction does have a crosslinguistically consistent meaning (A universal quantifier) but also makes the resulting items sensitive to polarity (again in a crosslinguistically consistent manner). In a nutshell, our argument in this paper, will be that the key to the solution to the second question is provided by an understanding of the first. More specifically, we will argue that the account of disjunction based quantifiers that we have proposed in earlier work, can be easily and beneficially extended to cover conjunction based quantifiers too with some surprising results. The paper is organised as follows. In section2, we present the basic data. In section 3, we outline the general shape of the account and its underlying intuitions. Section 4 offers an overview of the account of disjunctive quantifiers mainly focusing on the problems posed by the analysis of certain Korean data. Sections 5 and 6 extend the account to cover conjunctive quantifiers and discuss a potential problem with the proposed extension. Section 7 concludes the discussion.

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[1] A term introduced by Kuroda (1965).

2. The Data[2]

The combination of indeterminate pronouns and disjunction/conjunction denoting morphemes yields items like the following:

(1) Japanese
  a. Dare - mo
     Who - CONJ
     'everyone' .
  b. Dare - ka
     Who - DISJ
     'someone'

(2) Korean
  a. Nwukwu - to
     Who/One - CONJ
     'everyone'
  b. Nwukwu - na
     Who/One - DISJ
     'anyone/everyone'

(3) Malayalam
  a. arr-e-um
     who-ACC- CONJ
     'anyone/everyone'
  b. arr-e-oo
     who-ACC- DISJ
     'someone'

As can be seen from the above examples a regularity, though not a complete one, can be observed in the above cases. The regularity in question is, of course, reminiscent of the logical equivalences (4) and (5):

(4) $\exists x(\phi x) \leftrightarrow \phi(x_1) \vee \phi(x_2) \vee \phi(x_3) \vee \phi(x_4) \vee \cdots \vee \phi(x_\infty)$

(5) $\forall x(\phi x) \leftrightarrow \phi(x_1) \wedge \phi(x_2) \wedge \phi(x_3) \wedge \phi(x_4) \wedge \cdots \wedge \phi(x_\infty)$

The question, of course, remains whether the equivalences above are the right tool for the understanding of the examples (1) – (3). We will leave this question aside now and take it up again in later sections. Two particularly interesting observations here are that first, the pattern observed in Japanese and Malayalam seems not to be fully reproducible in Korean, cf. (2-b).[3] At first glance Korean seems to lack the existential quantifier formed by the combination of an indeterminate and disjunction. The second observation is that the quantifiers in (1-a), (2-a) and (3-a) require, in order

[2] The following abbreviations are used in this paper: NOM(Nominative), ACC (Accusative), DAT (Dative), GEN (Genitive), PERF (Perfective), DE (Declarative Ending), CONJ (Conjunctive), DISJ (Disjunctive), TOP (Topic), NEG (Negative), SUBJ (Subject), DEM (Demonstrative), COP (Copula)

[3] Whether or not we are fully justified in our expectation that the pattern should also be reproducible in Korean, is a question which would take us to far afield. Our conjecture is that we are.

to be licensed, to be within the scope of a higher operator. For instance, the examples in (6) show clearly that in affirmative episodic sentences, conjunction based quantifiers are disallowed.

(6) (a) Japanese
*Dare mo sushi o takusan tabeta
who CONJ sushi ACC a.lot ate
'**Dare-mo* ate Sushi a lot'
(b) Korean
*nwukwu-to ku kos-ey ka-ss-ta
who- CONJ the place-to go-PAST-DE
'**nwukwu-to* went to that place'
(c) Malayalam
*Sanjay aar-kk-um e.l.uthu ayachu
Sanjay who-DAT- CONJ letter sent
'*Sanjay sent a letter to *aar-kk-um*'
(d) Chinese[4]
*xiaowang zuowan shenme-ye chi-le
Xiaowang last.night what- CONJ ate-PERF
'*Xiaowang ate *shenme-ye* last night'

On the other hand, the range of the operators required is a matter of debate. However, negation is clearly included, and in some cases modality too. It should be noted here that although the operators are, broadly speaking, similar to the ones licensing polarity items, the fact that certain of these elements can appear without licensing makes us hesitate to call them "polarity items" and we will keep to the term quantifiers.

(7) Japanese
(a) Taka-wa nani-mo yoku tabe-na-katta
Taka-TOP what- CONJ well eat-NEG-PAST
'Take ate nothing well'
(b) Reiko-wa hitoride doko-mo ik-eru
Reiko-TOP alone where- CONJ go-can
'Reiko can go everywhere alone'
(c) Noriko-wa dono hon mo suki-da
Noriko-TOP which book CONJ likes
'Noriko likes any of these books'
(8) Korean
(a) Chelswu-nun caki sayil-pati-ey nwukwu-to choday halcwuiss-ta
Chelswu-TOP self birthday-party-to who- CONJ invite can-DE
'Chelswu can invite anyone to his birthday party"
(b) Nwukwu-to ku-uy email-ey dap-haci anh-ass-ta
anyone- CONJ he-GEN email-to reply-do NEG-PAST-DE
'Nobody replied to his email'

[4]We do not deal directly with Chinese in this paper but Chinese has certain similar constructions, partly illustrated by the following example

(9) Malayalam
(a) aar-kk-um innathe meeting-il var-aam
who-DAT- CONJ today's meeting-to come-can
'Anybody can come to the today's meeting'
(b) Anili aar-e-um kant-illa
Anili who-ACC- CONJ saw-NEG
'Anili met nobody'

Another intriguing observation in this respect is that the operator-sensitivity of these items is canceled in Japanese when the conjunctive quantifier appears with a case marker:

(10) Dare-mo ga nani-ka o tabe-te-iru
who- CONJ NOM what DISJ ACC eating-be
'Everyone is eating something'

In the remainder of this paper we will try to address these questions to the extent space allows us. Now let us turn to the analysis of the disjunction-based quantifiers and the puzzle from Korean.

3. The general account: an outline

The basic idea at the heart of our approach is the connection that we noted in the introduction between existential and universal quantification and the disjunction/conjunction connectives respectively. We would like to maintain that the conjunction/disjunction morphemes are not quantificational operators which would in some manner confer to the indeterminate pronouns they combine with their quantificational force directly. In other words, Japanese *mo, ka*, Korean *to, na* and Malayalam *um, oo* are not the equivalents of, say, English *every* and *some* and they just happen to be phonologically the same as the morphemes for conjunction and disjunction. Instead, we propose that the morphemes in question are indeed conjunctors and disjunctors and that the quantificational force of the composites is the result of a two stage process. The conjunction/disjunction morphemes are involved in the first stage of this process and their effect is to *unpack* the indeterminate into an infinite set of variables. In other words the indeterminate pronoun will be some kind of meta-variable, ranging over individual variables. We will remain rather vague regarding the precise formal characterisation of this operation for lack of space. Suffice it to note that it is crucial for the rest of the account that after unpacking the result should be a disjunction/conjunction of variables rather than individuals.[5] Thus applying the operator CONJ to the meta-variable IND: CONJ(IND) we will obtain (11):

(11) CONJ(IND) $\leftrightarrow$ $x_1 \wedge x_2 \wedge x_3 \wedge x_4 \wedge \cdots \wedge x_\infty$

Disjunction will proceed in a similar manner. It follows then, given that the variables are free, that the quantificational force of the composite item will also depend on the presence of other operators higher up in the structure. If we assume, in a simple case that the variables resulting form the unpacking operation are closed by existential closure, the result will be as expected, i.e. the conjunction will give a universal reading while the disjunction will produce an existential one. As we will see below this simple picture is problematic in certain cases. With this background let us now turn to the analysis of disjunction based quantifiers.

[5]For more details on this operations, see Tsoulas (In progress).

4. Disjunction based quantifiers[6]

The paradigmatic case here is the Japanese quantifier *Dare-ka* (who-DISJ). It is possible to maintain, given what we have said so far that this quantifier works exactly as described in the previous section. The disjunctor unpacks the metavariable provided by the indeterminate into an infinite disjunction, the resulting variables are taken care of (bound) by existential closure and the result is an existential quantifier[7]. The problematic case though regarding disjunctive quantifiers is the case of Korean *Nwukwu-na*, which, at first sight at least, presents us with the same ingredients as its apparent Japanese counterpart. However, its interpretation is not existential but, rather unexpectedly, universal as the following example clearly shows.[8]

(12) Nwukwu-na ke kes-ul hal-swuiss-ta
who-DISJ the thing-ACC do-can-DE
'Everyone/anyone can do it'

Now, this seems to go completely against the central idea in the theory outlined above. However, as we have shown in other work too, a closer look reveals that the structure of these quantifiers is more complex. Specifically, in those cases where the phonological context allows it, we see that a particular form of the copula is found (*-i-*):

(13) Chelswu-nun mwues-i-na cal mek-ess-ta
Chelswu-TOP what-COP-DISJ well eat-PAST-DE
'Chelswu ate everything well'

That the morpheme *-i-* is indeed a form of the copula is confirmed by both traditional and modern studies (see a.o. Jang (1999), Lee (1996), Martin (1992)) If this is correct then one is naturally led to ask what exactly is this copula heading and what is its function. The natural assumption is that the presence of the copula is indicative of the existence of covert sentential structure. This fact has been recognised and one proposal along these lines can be found in Chung (2000) who proposes that indeterminate + *(i)-na* elements have more elaborate, sentential-type structure and analyses them as covert indirect questions. The idea that these are covert questions does indeed accord well both with the fact that the morpheme *na* seems to also serve as a question marker[9] and the well known affinity between disjunctions and interrogatives.[10] Although this line of analysis seems rather perspicuous, and does indeed capture a relationship that certainly exists (between disjunction and questions that is), it is nevertheless difficult to see the connection between an indirect question and the quantificational force displayed by these elements. In other words, given that these elements are not interpreted as interrogative pronouns and the sentences in which they occur are not necessarily questions, then one naturally wonders about the feasibility of an analysis which postulates interrogative structure there. To the best of our knowledge, at least so far as Korean is concerned, no analysis has been offered to explain this connection. If we reject the idea that the covert sentential structure is interrogative, we maintain that the only other viable

[6]The account for Korean that we present here in this section is also presented in much greater detail in Gill *et al*., (2003)

[7] An anonymous reviewer correctly remarks that in this particular case a single variable and existential closure would give the same result. However, if we assumed so we would be failing to provide an account for the import of the disjunction and, furthermore, we would be giving up on a unified account fo a set of phenomena which seem to form a natural class.

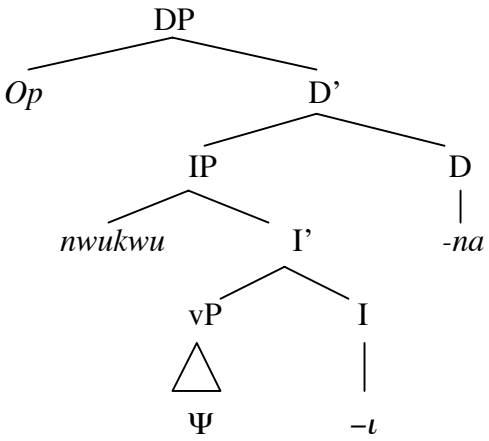
[8]We will ignore here the difference between universal and free choice readings for reasons of clarity.

[9]However, it seems that this is only a superficial similarity as a close examination of the morphophonology of the question morpheme shows.

[10]Jayaseelan (2001) also, in his analysis of Malayalam, makes similar claims.

option open to us is to assume that it is a relative clause. Thus we propose that the sentential component of these items is a relative clause modifying the indeterminate part of the composite item. The disjunction morpheme is then attached to that structure. Now, given the general syntax of relative clauses in Korean and especially the fact that externally headed relatives are prenominal we are forced to the conclusion that the relative clause is an *internally headed* one with the indeterminate pronoun sitting in [Spec IP] and the disjunction morpheme in D as in (14):

(14)



In (14), Ψ stands for the contextually supplied predicate which further restricts the (meta)variable contributed by the indeterminate. This is reasonnable and accurately reflects the intuition that there seems to be a stronger contextual restriction. The operator *Op* is the relative operator merged in [Spec DP]. This structure is the same as the one proposed by Basilico (1996)[11] . This structure also follows a suggestion by Watanabe (1992, 2002) and posits the particle *na* under D.[12] As we will show in the following sections, this consequence of the proposal that the sentential structure is a relative clause is the key to the resolution of the mystery of the universal interpretation.

4.1 The universal interpretation

We claim that if the syntactic structure proposed in the previous section is correct, then the interpretation follows in a simple, elegant and natural manner. To see how the interpretation proceeds let us first consider briefly the nature of internally headed relative clauses.

4.2 Internally headed relative clauses are quantificational

We will follow here an important body of work which has suggested that internally headed relative clauses are quantificational rather than cases of relativisation involving λ-abstraction. Work by Basilico (1996), Jelinek (1987;1995), Culy (1990), Srivastav (1990;1991) and Williamson (1987) convincingly argues that this is so. In this view the sentential part of the relative clause functions as the restriction to the operator associated with the relative clause. The operator in question, it is argued, is the well known *iota* operator. It is this operator that binds the variables inside the relative clause. The following is an example from Diegueño, taken from Basilico (1996):

[11]Watanabe (2002) takes a slightly different view of the structure of Head Internal Relative Clauses. He proposes that D should take a CP rather than an IP complement.

[12]We will return shortly to this point.

(15) i: pac ‘wu: w-pu-c
man I.saw-DEM-SUBJ
‘The man that I saw’

Basilico assigns the following representation to the above sentence in accordance with analysis of internally headed relatives sketched above:

(16) $\iota(x)$ [*man*(x) ∧ *saw*(*I*,x)]

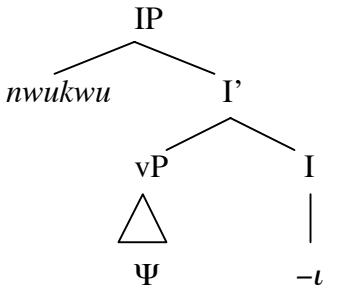
For reasons that need not concern us immediately Basilico takes the demonstrative *pu* to represent the *iota* operator. Nothing intrinsic to the theory though requires that the operator be overt.

Now with these assumptions on the interpretation of internally headed relative clauses in place, we return to the interpretation of *wh +(i)-na*.

4.3 Deriving the interpretation I

Assume now that the following partial structure has been built (omitting irrelevant details and steps in the syntactic derivation):

(17)

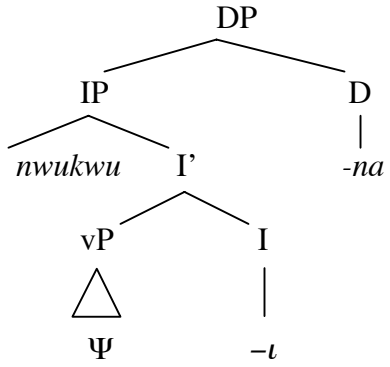


As we have proposed the indeterminate introduces a metavariable with a restriction.[13] In this case the restriction is simply *Human*. The representation then of (17) will be (18):

(18) *H*(Ξ) ∧ Ψ(Ξ)

Where Ξ represents the specific type of variable. Now we introduce the disjunctor *-na*:

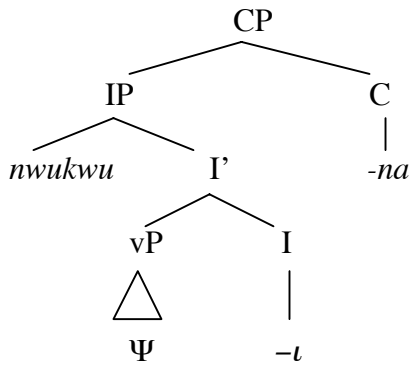
(19)



[13]This proposal is formally dissimilar to the ones found in Jayaseelan (2001) and Nishigauchi (1986; 1990) but it is close in spirit

Two questions arise here, first whether the label DP is appropriate, and second what is exactly the interpretation of (19). Concerning the first question, putting *-na* under D is arguably problematic. Its problematic nature derives from this: if we are to derive the meaning of the composite item purely compositionally based on the meanings of its component parts, and if we take it that the particles attached to the indeterminate elements are indeed the same particles as the ones conveying the meaning of disjunction or conjunction, then the problem is obviously that these elements are not quite the right type to serve as determiners under natural assumptions about the status of determiners. If, on the other hand, we consider these particles as genuine quantificational determiners meaning approximately 'every' and 'some' then the immediate problem is that in order to take on these meanings they *must* combine with an *indeterminate* pronoun. The challenge of offering a solution to this problem is taken up by Watanabe (2002). His explanation is that the restriction in the combination possibilities of the quantificational determiners in Japanese comes from a requirement that they must undergo checking with an indeterminate. This however doesn't quite explain why this should be so. Moreover it simultaneously bars the possibility of a compositional account which would be applicable to both the 'quantificational particle' and 'disjunction marker' uses. In other words, it just seems too exceptional a behavior, which is more or less what Haspelmath (1997) argued concerning the crosslinguistic consistency of these patterns.[14] To avoid these problems we propose that *-na* is in fact under C and the real structure is (20) rather than (19):

(20)



The problem of course here is that these elements have the distribution of DPs rather than CPs. We will address this in a moment. Let's first try to answer the question of the interpretation. We proposed that *-na* is an unpacking disjunctive operator with no peculiar quantificational properties of its own. The effect of adding it to the already formed constituent is in fact to *unpack* it into something of the form:

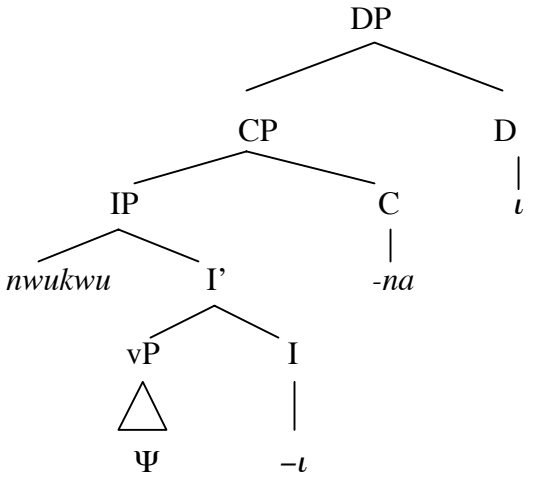
(21) $((H(x_1)\wedge\Psi(x_1))\vee((H(x_2)\wedge\Psi(x_2))\vee((H(x_3)\wedge\Psi(x_3))\vee...(H(x_\infty)\wedge\Psi(x_\infty))$

This is rather similar to Jayaseelan's (2001) operation.

So far then, we can say that we have something akin to an ∃. Crucially though, the next step involves the addition of the *iota* operator. We propose that the operator is a D dominating the CP as in (22)

[14]Though Haspelmath conceded that the Japanese case is one fo the most systematic ones.

(22)



Putting the operator in D is very natural for two reasons, first, it explains why these elements have a DP-like distribution, second, if we recall Basilico's suggestion concerning the Diegueño example in (15) that the demonstrative element plays the role of the *iota* operator, it seems all too natural to adopt a similar strategy for Korean. The representation then for (22) will be something like (23).

(23) $\iota((H(x_1)\wedge\Psi(x_1))\vee(H(x_2)\wedge\Psi(x_2))\vee(H(x_3)\wedge\Psi(x_3))\vee...(H(x_\infty)\wedge\Psi(x_\infty))$

What is remarkable about this structure is that it contains a number of unbound individual variables and an operator that binds no variable. We propose that the *iota* operator unselectively binds all the variables in the formula. We consider the unselective binding operation here as formally similar to existential closure, in the sense that binding by the same operator does not result in identity. We are now just one step away from the universal interpretation. To see what this step is consider the properties of the *iota* operator.

4.4 Deriving the interpretation II

It is fair to say that the best candidates to be represented by the operator in a language like English are demonstratives and the definite article. The definite article can be characterised as an anti-additive function Anti-additive operators are defined as follows (van der Wouden (1994) and Zwarts (1998)).

(24) Let $\mathcal{B}$ and $\mathcal{B}^*$ be two Boolean algebras.
A function f from $\mathcal{B}$ to $\mathcal{B}^*$ is anti-additive iff
for arbitrary elements $X,Y\in\mathcal{B}$ $f(X\cup Y)=f(X)\cap f(Y)$

In slightly different terms we can say that an antiadditive operator is reminiscent of the second De morgan's law:

(25) $\neg(p \vee q) \leftrightarrow \neg\, p \wedge \neg q$

This can be seen in the following English examples[15]:

(26) Every man or woman who bought anything was happy

Here we see that the universal quantifier fulfills the requirements of the definition of an anti-additive function. Thus (26) means : *Every man AND every woman* .... The same is true of the definite article. In English a plural definite is required as the following contrast, first noted by May (1985) shows:

(27) * The student who read anything about Plato left

(28) The students who read anything about Plato left

The anti-additivity of *the* is responsible for the licensing of *anything* in the first argument of *the*. Now, the same observation that we made with respect to (26) can be made with respect to plural definites:

(29) The men or women who left early missed the best part of the party.

(29), just like (26), means *the men AND the women who* .... Interestingly, in English at least these types of construction are only acceptable when a relative clause is modifying the [NP or NP] part. This is of course reminiscent of the phenomenon of subtrigging (LeGrand, 1975) but we will leave this to one side for this paper. Now, if we assume that the *iota* operator in the internally headed relative clause has the same property as the plural definites in English[16] the universal semantics of the Korean disjunction-based quantifier follows without any extra stipulation. Thus by the anti-additivity of ι we have (30)

(30) $\iota((H(x_1)\wedge\Psi(x_1))\vee(H(x_2)\wedge\Psi(x_2)\vee...\vee(H(x_\infty)\wedge\Psi(x_\infty))=$
$\iota x_1(H(x_1)\wedge\Psi(x_1))\wedge\iota x_2(H(x_2)\wedge\Psi(x_2)\wedge...\wedge\iota x_\infty(H(x_\infty)\wedge\Psi(x_\infty))$

which is precisely the interpretation that we sought to derive and the interpretation *wh-(i)-na* elements receive. Put slightly differently, the interaction of the ι-operator with disjunction turns an infinite disjunction to an infinite conjunction, aka a universal quantifier.

5. Extending the account

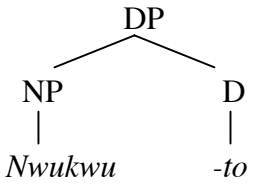
Assuming the account for the disjunction based quantifiers in Korean given in 3. It is still unclear how that can help us in understanding the polarity sensitivity of the quantifiers using conjunctive suffixes. The avenue we would like to pursue with respect to this question is that the line of thought proposed for disjunction quantifiers in the previous section is generally valid for all quantifiers following the same pattern of formation, whether or not disjunction is used. On the other hand, we will take here polarity sensitivity to indicate that the items in question are somehow

[15] A reviewer asks whether this is a property of the determiner *every* or of the disjunction itself and offers the example: *No man or woman left → No man AND no woman left*. However this example is uninformative since *Every* and *No* have the same properties concerning anti-additivity. A more telling example would be *Some*. Consider: *Some man or woman left* which clearly does not entail *Some man and some woman left*, which shows that it is not the disjunction alone that is responsible for the particular effect here.

[16] Plurality is satisfied trivially in the Korean cases given that we have n (n>1) variables.

incomplete. We interpret their incompleteness as reflecting absence of a suitable operator to bind the variables produced by the unpacking operation. Now if we take the above ideas together with the analysis of the Korean quantifiers the following account emerges. We will assume, quite naturally, that the process seen in the cases of disjunction acting upon the variable provided by the indeterminate, whereby an infinite disjunction is produced, equally applies to the cases with conjunction. The crucial difference between the two cases is that in the case of conjunction there is no hidden relative clause and, as a result, there is no operator, such as the ι operator postulated to provide an appropriate binder for the variables, which then remain unbound. This, we claim, is an illegitimate structure and there is no way to salvage it internally so to speak. The only contexts in which this structure can appear and be licensed are contexts where an independent operator is provided and where that operator acts unselectively. This is the case with negation and modality operators. This intuitive extension of the previous account raises, however, an important question. Namely, in order to implement this idea we need to face up to the fact that what made the disjunction based quantifiers special was that the disjunction morpheme was, syntactically, a complementizer. This cannot be so, if this extension is on the right track for the conjunction based ones. There simply isn't any CP for the conjunctive morpheme to head. Given that these elements have the distribution of DPs, the most plausible assumption (in accordance with much of the literature), is that the conjunctive morphemes are determiners, heading the DP projection. The structure will, therefore, be the rather simpler one in (31)

(31)



Though they are determiners we still assume that they do not fulfill the natural role of determiners. Their function still remains that of unpacking the metavariable introduced by the indeterminate to a series of variables connected by the appropriate operator. Now the variables resulting from this operation require further binding. In normal circumstances one would expect that existential closure, as invoked for the derivation of the existential meaning of Japanese *dare-ka* should also be operational here and produce the universal meaning. This however seems not to be the case. As we saw earlier the items in question are all polarity sensitive. Therefore, there seem to be two options, first, to assume that existential closure is not applicable in these languages or in these particular cases, and second, that either the indeterminate itself or the conjunctive operator have a lexical feature which somehow requires them to be in the scope of certain types of operators. It is highly unlikely that the indeterminate may contain such a feature since, in Korean at least, the indeterminate can occur in affirmative sentences and receive the interpretation of an indefinite. On the other hand it would also not be particularly natural to suppose that the operator itself contains that feature. This is especially so in view of the fact that we maintained that these are essentially conjunctions/disjunctions. Concerning the first option, it is in fact more attractive. If we assume that at least existential closure does not apply to these indeterminates because simply they are not Kamp-Heim type indefinites (*contra* Nishigauchi (1986, 1990)) then it is legitimate to assume that being *incomplete* in the way indicated earlier, they require an extra operator such as modality and/or negation for their licensing and the facts follow.

6. A potential problem and a remaining question

We have so far made some progress towards understanding the quantifiers formed out of indeterminate pronouns. If our approach is on the right track there is still a problem that we need to address. Specifically, we need to reassess the case of Japanese existentials for which we have assumed that existential closure was used. If it is the case that the fact that indeterminates are not similar to Kamp-Heim indefinites then the variables in the case of *dare-ka* cannot be bound by it. It would indeed be bad news if we had to maintain both operations. The good news, however, is that as it turns out *dare-ka* is a positive polarity item[17] as the following examples suggest:

(32) Taka-wa dare-ka-ni awa-na-katta
Taka-TOP who-DISJ-with meet-NEG-PAST
'There is someone that Taka didn't meet'
'*Taka didn't meet anyone'

If it is correct to interpret the inability of *dare-ka* to scope under negation as some kind of *positive* polarity sensitivity and assume that in each clause there is a polarity operator (perhaps akin to Laka's Σ (Laka, 1990)) which would, in at least this respect, display the same type of behaviour as its negative counterpart (sentential negation) then it is natural to suggest that the role of negation in the licensing of the conjunction based quantifiers is fulfilled by this polarity operator, dispensing with existential closure altogether in what concerns indeterminates. A welcome result.

The remaining question now is why is the polarity sensitivity of the Japanese conjunction based quantifiers voided by the addition of a case marker[18] (cf. (10) repeated here as (33))

(33) Dare-mo ga nani-ka o tabe-te-iru
who- CONJ NOM who-DISJ ACC eating-be
'Everyone is eating something'

A number of ways to approach this question come to mind, sentence aspect for instance. Tentatively though, we would like to suggest, following Watanabe (2002) who suggests that case in Japanese is closely connected to specificity, that in the presence of a case marker a specificity operator is responsible for the licensing of the conjunctive quantifier. This suggestion is offered as a tentative solution only in order to complete the picture.

7. Concluding Remarks

In this paper we have attempted to formulate a general framework of ideas and tools in order to capture the interpretation of quantifiers formed by affixation of a morpheme denoting conjunction or disjunction to an indeterminate pronoun. One of our main conjectures is that the morphemes which are affixed to the indeterminates are indeed in essence conjunctors and disjunctors albeit of a special kind. We offered a conceptualisation of the semantic function of these morphemes in terms of their effect on an indeterminate pronoun, i.e. unpacking it into a sequence of variables related by the appropriate connective. The underlying intuition is that the quantificational force of the resulting quantifiers is to be accounted for on the basis of the logical equivalences in (4) and (5).

[17]We are indebted to Akira Watanabe for this observation.

[18]Note that this pattern is not reproducible in Korean since the corresponding Korean quantifier does not allow case marking: **Nwukwu-to-ga*.

There are also a number of problems that we have not addressed here at all such as the free-choice meaning often attached to disjunction based quantifiers[19] . Also, the polarity sensitivity of several of these quantifiers remains intriguing. The difficulty lies in the apparent selectivity of the operators to which some of the items seem to be sensitive. Although we tried to derive their distribution in a more general fashion it remains possible that one will be forced to incorporate, in terms of a featural dependency perhaps, the operator selectivity into the lexical definitions of the operators, hopefully this will not be necessary. We have also offered a peculiar view of indeterminate pronouns as variables ranging over other variables, rather than individuals, in terms of, say, alternatives, an avenue which we have not yet explored. However, we have shown that there clearly was some mileage to be gotten from the conception that we put forward.

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Presuppositions and Pedigrees for Discourse Markers*

Jacques Jayez

1. Introduction

In this paper I defend the claim that certain discourse markers (DMs) are presupposition triggers. In itself, this claim is not new but its exact content and consequences are rarely analyzed in detail. However, such an analysis is required for at least three reasons, which correspond to the three main contributions of the paper.

(1) The claim that DMs are presuppositional contrasts with two other approaches in the literature. According to Bach (1999) and Potts (2003), DMs like *but* contribute information on the same level as what is asserted and do not trigger any implicature or presupposition. According to Grice (1989), DMs trigger conventional implicatures. In section 2, I show that certain DMs trigger presuppositions (2.1), that Bach's and Potts' view must be rejected (2.2) and that presuppositions are a special kind of conventional implicature, characterized by their epistemic dynamic behavior (2.3., 2.4, 2.5).

(2) In section 3, I offer a DRT representation of the presuppositional pattern described in section 2.

(3) DMs express relations between discourse segments (discourse relations) and the interplay between their presuppositional behavior and their connective import raises substantial problems for a presuppositional analysis. It turns out that certain consequence DMs are sensitive to the semantic information or *pedigree* carried by the presupposed proposition. In section 4, I explore the modal/attitudinal status of pedigrees and show how they can integrated in a DRT framework.

2. The presuppositional status of DMs

2.1 DMs as presupposition triggers

There are two reasons to claim that certain DMs trigger presuppositions. First, the information they convey is not asserted, as evidenced by the well-known tests of conservation and suspension (see Geurts, 1999 for a general presentation). For instance, the presupposition introduced by the consequence DMs studied here is defined in (1).

1. Certain DMs presuppose the existence of a proposition ϕ and presuppose that it is connected to the current proposition ψ through a certain consequence discourse relation (CONS(ϕ,ψ)).

* I thank Danièle Godard for her comments and suggestions on a previous version of this paper. I am the only responsible for every remaining weakness.

E.g. *as a result* presupposes the existence of a proposition and presupposes that the current proposition is one of its consequences. *As a result* passes the conservation and suspension tests. (2a.B) presupposes $\exists\phi$ ($\phi \Rightarrow$ `edgy`). This presupposition is retained in (2b.B) but suspended in (2c.B). In contrast, the asserted content ('John is edgy') does not survive the conservation environment and creates problems in the suspension environment (??'If John is edgy, he might be edgy').

2. a. [John is on speed]$_A$, [as a result he is rather edgy]$_B$
   b. [John is on speed]$_A$ [but the coach does not believe that, as a result, he is very edgy]$_B$
   c. [John took snot]$_A$. [If, really, speed makes one very nervous, he might, as a result, be rather edgy]$_B$

Note that, whereas *p*, *as a result q* presupposes that *p* caused *q*, *p because q* might *assert* that *q* explains *p*, in contrast to what is assumed by Asher and Lascarides (1998) and Lagerwerf (1998). However, a discussion of this point would take me too far. Particles such as *well*, *you know*, or *bon* 'well', *alors* 'then', etc. in French seem to be presuppositional in that they make sense only if one assumes an existing discourse/context with special features. However, spelling out these features, that is, determining what relation holds between the current discourse segment and the presupposed segment/context is much more difficult than for standard discourse relations and I will not consider them here (see Mosegaard Hansen, 1998:chapter 10, on *bon*).

The second reason for invoking presuppositions here is the fact that the consequence discourse relation is presented as 'taken for granted' (Stalnaker 1973,1974). The speaker of (2a) acts as if the consequence relation `speed` $\Rightarrow$ `edgy` was accessible to the participants of the exchange. This epistemic preexistence will be analyzed more precisely in section 2.5.

Intuitive as it is, the view that certain consequence DMs trigger presuppositions is endangered by (i) the existence of an alternative view (Bach 1999, Potts 2003), under which DMs like *but* contribute 'at-issue' propositions in Potts' (2003) parlance, and (ii) the imprecision of the notion of presupposition. I consider these two problems in turn. In the next subsection (2.2), I show why Bach's and Potts' option must be rejected. In section 2.3, I summarize the distinctions between implicatures and presuppositions and recall Potts' (2004) four criteria. In section 2.4, I proceed to show that all these criteria but one –epistemic preexistence– are shaky. Finally, in section 2.5, I propose an account of epistemic preexistence under which presuppositions are characterized as a special kind of conventional implicature. In this respect, the two claims that DMs trigger presuppositions and conventional implicatures are correct but not strictly equivalent.

2.2 Are DMs part of 'what is said'?

Bach (1999) and Potts (2003) oppose the claim that words like *also*, *but*, *continue* or *although* are conventional implicature triggers. I will discuss the thesis of Bach (1999), which Potts relies on to a large extent.[1] According to Grice, the semantic content worlds like *therefore* is not part of 'what is said' (Grice's terminology). However, Bach observes that they 'can also contribute to what is being reported' (3a,b). Clearly, (3a) admits of an interpretation under which Mary mentioned herself the opposition between being huge and being agile. Similarly, (3b) is open to an interpretation under which Mary made clear that Shaq had already been working (at some time). So, in a sense, the conventional implicatures involved in such sentences and many similar ones are part of what is said.

[1] For space reasons, I cannot discuss Bach's analysis in detail. I will focus on the main issue of this paper, that is, the presuppositional status of certain elements.

3. a. Mary said that Shaq is huge but that he is agile [Bach's example 1, section 2]
   b. Mary said that Shaq continued to work
   c. No, you are wrong, people can be both big and agile

This argument misconstrues the interpretation of 'what is said' as roughly equivalent to 'what is explicitly communicated'. I can report on what Mary explicitly communicated, by (3a), but (3a) certainly does not entail that Mary asserted that there is a –particular or general– contrast between being huge and being agile. Jayez and Rossari (2004) show that conventional implicatures are essentially 'non-asserted' in that they cannot be directly refuted. E.g. (3c) is not a felicitous reply to (3a). More generally, expressions such as *you are wrong*, *it's false*, etc. target the asserted content. If Grice's idea that implicatures do not affect the truth of a sentence is to be taken seriously, the refutation test shows that implicatures are additions to the asserted content and suggests that, at least for assertions, 'what is said' denotes the 'asserted content', *not* the explicitly communicated content, which involves conventional implicatures. Therefore, I do not see any reason to espouse Bach's and Potts' view that DMs convey 'at-issue' propositions (in Potts' terms). In fact, the refutation test shows precisely the contrary and points to an intuitive construal of Grice's thesis.

2.3 DMs as (presupposition vs. implicature) triggers

In the literature, DMs have been said to trigger presuppositions or to convey conventional implicatures.

The presuppositional analysis of DMs comes in two different forms. First, in virtue of their connective (i.e. relational) status, DMs have been said to be anaphoric, that is, they refer to some target segment or proposition connected to the current one by the discourse relation associated with the DM (see Berrendonner, 1983 for French and Webber et al., 2003 for English). In theories like van der Sandt's (van der Sandt 1992, Geurts 1999), there is a strong link between anaphora and presupposition. Geurts (1999:83-84) discusses the relation between presuppositions and anaphors and proposes that the term of anaphora be reserved for a relation between the semantic content of an expression and a 'discourse entity which is at the focus of attention'. So, for instance, accommodation of previously unmentioned, non-topical, material does not give rise to an anaphora. I follow Geurts in assuming that anaphora is a kind of presupposition. Under this perspective, DMs are presuppositional *because* they are anaphoric.

Second, it has been held that DMs presuppose the discourse relation they are associated with. A celebrated example is the analysis by Lakoff (1971) of *but* in its 'denial of expectation' use, illustrated in (4).

4. John is tall, but he's no good at basketball (Lakoff's example (59))

According to Lakoff, (4) presupposes that there is a mental or/and worldly connection between being tall and being good at basketball. While Lakoff does not use the word *presupposition* in the more technical sense it came to acquire subsequently, her notion of presupposition is partly similar to Stalnaker's. She indicates (1971:118-119) that presupposing is supplying non-explicit information on the basis of knowledge or prior discourse. She thereby makes clear that presupposing is using a resource which is, in some sense, 'already there'.

König (1986) notes that although *p q* and *even though p q* presuppose that *p* normally entails ¬*q*. More recently, Lagerwerf (1998) has proposed that *although*, *because* and other DMs presuppose the existence of default implicative relations between propositions.

It is also well-known that Grice (1989) analyzes *therefore* –a typical DM– as a conventional

implicature trigger[2]. The idea of having at least two layers of information, truth-conditional and conventional, has been argued for independently by Dummett (1973:85-88) and is in part inspired by Frege.

Are these two trends of analysis just variants of each other or are they significantly different? The can be distinguished only in so far as presuppositions and implicatures can be. The existence of a frontier between conventional or conversational implicatures and presuppositions has frequently been questioned in the literature.[3] A well-known example is the claim by Karttunen and Peters (1979) that presuppositions are conventional implicatures. Horn endorses a similar view when he speaks of conventional implicatures 'as corresponding essentially to the Stalnaker-Kartunnen notion of pragmatic presupposition' (1996:310).[4] However, two (sets of) reasons for keeping implicatures and presuppositions distinct have also been put forward.

First, Geurts (1999) makes clear that conversational implicatures, in contrast to presuppositions, do not show any projection behavior. For instance (5a) conversationally implies that John will not be able to run the marathon, whereas (5b) conveys no such implicature. In contrast, the presupposition that John has a wife projects in (5c,d).

5. a. John is very tired
   b. The coach does not believe that John is very tired
   c. John's wife is very tired
   d. The coach does not believe that John's wife is very tired

Second, Jayez and Rossari (2004) and Potts (2003) argue independently that presuppositions and conventional implicatures represent different semantic contributions. This is of particular importance since traditional Gricean examples of conventional implicatures involve DMs like *but* and *therefore*. Potts (2003) mentions several differences between presuppositions and conventional implicatures, which I summarize in (6). Note that point 4 echoes Geurts' observation for conversational implicatures.

6. **Potts' differences**
   1. The falsity of a conventional implicature does not affect the truth-value of the propositions that are asserted. The falsity of a presupposition makes these propositions neither true nor false. This is the *detachability* criterion of Grice (1989): conventional implicatures are detachable.
   2. Conventional implicatures should not be part of the initial context whereas presuppositions are usually 'taken for granted' (Stalnaker 1973, 1974).
   3. It is much more difficult (if possible at all) to deny/cancel a conventional implicature than a presupposition.
   4. *Plugs*[5] do not filter out conventional implicatures.

[2]The implicature consists in the existence of a consequence relation between two propositions.

[3] To my best knowledge, Grice was the first to discuss in detail the differences between *conversational* implicature and presuppositions (see Grice, 1989).

[4] So-called *pragmatic* presuppositions (Stalnaker 1974) are not relative to sentences, but to the attitudes and intentions of the speaker and her audience. It seems that Karttunen (1973) does not consider this distinction as really crucial.

[5] That is, environments which prevent presuppositions from projecting (see Karttunen 1973).

2.4 How different are presuppositions and implicatures?

I now show that three of the tests (1, 3, 4) listed in (6) do not discriminate clearly implicatures from presuppositions. I conclude that, if a frontier is to be drawn at all, it requires that criterion 2 be made precise, a task I carry out in section 2.5.

1. The detachability test is conceptually and technically unclear. If the connection `tallness` ⇒ `good-at-bb` is a conventional implicature, its falsity should leave the other propositions untouched. If we have `tallness` ⇒ `good-at-bb`, the facts that John is tall and that he is not good at basketball remain. But, the truth-conditional import of presuppositions has been defined mainly for NPs and verbs. The clearest examples concern the complements of verbs or their lexical semantics, e.g. the fact that *John strokes his cat* presupposes that John has a cat or that *John started walking* (at *t*) presupposes that John was not walking immediately before (*t*). The situation is different for sentential adjuncts which do not influence in general the truth-conditional status of the phrases they adjoin to.[6] On this basis, one might decide that sentential adjuncts cannot be presupposition triggers.

However, refusing the status of presuppositions to DMs on the basis of their detachability goes with the symmetric claim that conventional implicatures are 'detachable'. Unfortunately, the notion of detachability is elusive. In (7a,b), the reportive adjunct seems to trigger a conventional implicature because the information it conveys is detachable in some sense: the fact that Mary has no opinion about John's abilities does not impinge on the truth of 'John is no good at basketball'.[7] Still, the truth of 'John is no good at basketball' cannot be assessed independently of the implicature triggered by the adjunct. If it were the case, (7b) would be contradictory. Therefore, the detachability criterion proves very difficult to apply unless one offers a detailed compositional analysis.

7. a. According to Mary, John is no good at basketball
   b. According to Mary, John is no good at basketball, but, actually, he is a very good player

2. The second criterion seems to suggest that (4) is not a case of conventional implicature. Normally, issuing (4) at *t* makes sense only if one believes before *t* that the connection `tallness` ⇒ `good-at-bb` holds. However, we will see below (2.5) that this conclusion is challenged by Potts, so I defer any judgment based on this test to the discussion offered there.

3. Can we cancel the connection `tallness` ⇒ `good-at-bb`? König's (1986) example (15d) can be adapted to this aim (8a). A similar configuration with a genuine conventional implicature does not give a markedly different result (8b).

8. a. John is tall but he's no good at basketball. This shows that one can be tall and a poor player
   b. Surprisingly, John is no good at basketball. But, after all, maybe that is not much of a surprise

[6] I ignore the well-known problematic cases of 'intensional' adjectives like *pseudo*, *alleged*, etc.

[7] Note that the status of reportives with respect to the distinction between implicatures and presuppositions is far from clear. On one side, suspending the information seems possible: *If Mary has any opinion at all, according to her, John is no good at basketball* allows for the evidential reading 'If Mary has any opinion at all, she must believe that John is no good at basketball'. On the other side, it is difficult to claim that Mary's opinion is taken for granted.

One might object that cases like those ones illustrate *revision* rather than cancellation/suspension.[8] However, when one turns to standard hypothetical suspension environments, the difference remains thin. What complicates the matter somewhat is the role played by the consequence relation. In classical examples, like (9), there is a consequence relation between a possible state of affairs (John has a son) and the belief that the son of John will be bald, (9a) being roughly paraphrased by (9b).[9] It does not seem possible to construct a similar relation of the form *If* A, B *but* C, since B and C would have to be consequences of A and B is conducive to non-C. However, we can take an indirect route by embedding B *but* C into a presuppositional environment, as in (9d). In (9c), the connection `tallness` ⇒ `good-at-bb` is presupposed. In (9d) it is suspended. So, it behaves like a presupposition once the auxiliary coherence conditions for the suspension test have been satisfied.

9. a. If John has a son, his son will be bald
   b. If John has a son, I conclude that his son will be bald
   c. It is surprising that John is tall but that he is no good at basketball
   d. If tall people are in general tolerable basketball players, it is surprising that John is tall but that he is no good at basketball

With conventional implicatures, we observe the same kind of suspension. In (10), it seems difficult to ignore the effect of the *if*-clause on the implicatures conveyed by the underlined phrases. For instance, the epithetic NP *the stupid fool* in (10c) can be interpreted as 'dependent' on the possibility that John could not be silent.

10. a. If Mary said that John had stolen the funds, then, <u>according to her</u>, he is dishonest
    b. If to be fired by Microsoft is really a bad thing, then, <u>unfortunately</u>, they fired John
    c. If John could not shut it, then <u>the stupid fool</u> deserved what happened next

4. Finally, consider a plug like *to say* in (11). The first sentence does not necessarily convey the idea that there is a connection `tallness` ⇒ `good-at-bb`, as the second sentence makes clear.

11. a. Mary said that John is tall but that he is no good at basketball. She seems to believe that it's enough to be tall to be a good player

However, the status of plugs is far from clear in presupposition theories. For a sentence like (12a), many speakers consider that the existence of John's sister is presupposed. This is in agreement with theories (van der Sandt 1992, Geurts 1999) which prefer the highest possible projection for presuppositions (global accommodation in this case). The fact that the difference with *holes* –i.e. expressions that let the presuppositions project (Karttunen 1973)– is rather thin is shown by (12b), where the alleged hole *to hope* is compatible with explicit cancellation. If the presupposition that John has a sister was attributed to speaker of (12b), explicit cancellation would be blocked, as it is in (12c).

12. a. John said that he had to pick up his sister

[8] I owe this remark to Olivier Bonami's (p.c.), who noted that Geurts (1999) uses revision without making it clear whether he puts it on a par with suspension.
[9] So, what we have here is an *epistemic* relation in the sense of Sweetser (1990), that is, one that involves beliefs.

b. Mary hopes that John picked up his sister, but she is confused for some reason: John has no sister
c. John picked up his sister, ??but he has no sister

I conclude that the distinction between holes and plugs is not empirically robust and should not be appealed to when telling apart implicatures from presuppositions. In addition to these theory-dependent problem, Bonami and Godard (2004) observe that conventional implicatures are not necessarily assigned to the speaker, contrary to what is assumed by Potts. For instance, in (13), the idea that John's obligation is unfortunate might be entertained by John only.

13. John said that, unfortunately, he had to pick up his sister

Taking stock, we see that only one of the features mentioned by Potts (2003) could lead us to conclude that the connection associated with *but* is a presupposition. Specifically:

1. Criterion 1 is unclear and might be irrelevant.
2. Criterion 2 shows that *but* behaves like a presupposition trigger.
3. Criterion 3 does not show any salient difference with conventional implicatures.
4. Criterion 4, like criterion 1, is too fragile to ground anything substantial on it.

These results suggest that, except perhaps for criterion 2, there is no compelling evidence that presuppositions and conventional implicatures are distinct. So, the whole issue revolves around the second criterion. This is not exactly a surprise since most theories of presupposition agree on the pretheoretical intuition that to be presupposed is to be 'already there', in some relevant belief state (see for instance Stalnaker, 1973, 1974 Geurts, 1995, 1999, Beaver, 2001). Accordingly, I propose that presuppositions are conventional implicatures that have a special ('presupposed') epistemic status.

2.5 Presuppositions revisited. A dynamic treatment

If (so-called) presuppositions can be part of what is explicitly communicated, like conventional implicatures, what can distinguish them from conventional implicatures? As we saw above, the criterion of epistemic preexistence ('taken for granted') is the most promising. However, Potts (2003) argues that (i) the property of being taken for granted is essential to all meanings and does not characterize presuppositions and (ii) the opposition relation conveyed by *but* is not taken for granted in all cases.

Concerning (i), one can say that meanings are *shared* but that being shared is not being presupposed. The case of *but* probably blurs this distinction because the particle *presupposes* the existence of an opposition relation between the conjuncts.[10] The abstract relation of opposition corresponds to a certain meaning, that one can simulate roughly by the logical form $\lambda\phi,\psi.\phi > \neg\psi$, where $>$ is any suitable conditional operator. This meaning is 'presupposed' in a different sense, namely through the shared belief that every discourse agent is able to decide whether two propositions are opposed (along certain dimensions). However, this common assumption is different from the (genuine) presupposition that there *exists* a proposition which 'entails' (in any suitable sense) the negation of the proposition on the right of *but*. More generally, a presupposition is not a general precondition for communication but a proposition that the discourse points to. Knowing the mean-

[10] I consider only the 'denial of expectation' interpretation of *but* here. Similar remarks would apply to its other uses (for example, contrast and concession).

ing of *cat* is a precondition for understanding *The cat is sleeping*, but what is presupposed by the sentence is the existence of an individual which satisfies the property of being a cat, not the meaning of this property. The difference manifests in two ways: (1) being ignorant of the meaning of *cat* makes one unable to assess the truth of *The cat is sleeping* by other means than indexical (non-descriptive) reference; (2) a sense that is unknown cannot be 'accommodated', unlike a presupposed proposition. So, whereas it is possible that presuppositions and word meanings are both preconditions in a very general sense, their contribution to meaning is different.

Turning to (ii), we must ask in what sense a presupposition is 'taken for granted'. Potts notes that nonsensical *but* sentences raise a problem since, the meaning of the words being unknown, no opposition relation can be assumed to be present before the discourse (14).

14. John was reperting, but he stawled through all the same

Stalnaker too mentions problematic cases for his analysis in (Stalnaker 1973). Generally speaking, one can use presupposition triggers *without* assuming that the presupposition is part of the common ground. First, one can use presupposition triggers to introduce new information, as observed by Stalnaker. Second, one can use presupposition triggers and not know whether the presupposition is part of the common ground, as observed by Sadock in a personal communication to Stalnaker (Stalnaker 1973, note 2). E.g., adapting Sadock's example, (15) can be used in contexts where the speaker knows (resp. does not know) that (resp. whether) the addressee does not know (resp. knows) that the speaker has a sister.

15. I can't come with you because I have to pick up my sister, who is waiting for me

Stalnaker does not provide any precise answer to the difficulty pointed out by Sadock. However, the observations by Potts, Stalnaker and Sadock converge towards the same conclusion: presupposing is not equivalent to assuming some previous (shared) knowledge. This conclusion conflicts with the rendering of presupposition in terms of previous acceptance. Some recent approaches to the satisfaction problem for presuppositions rely on the notion of *update*, familiar from various versions of dynamic semantics. Traditionally, updates (Stalnaker 1978, Heim 1982, 1983, Veltman 1986), are eliminative procedures The update of a set of worlds s with a proposition p, $s \oplus p$, is the set of worlds in s where p is true. s is said to *accept* p iff p is true at every world in s. s is said to *admit* p iff p is true at some world in s. So, in an update, the worlds where p is false are eliminated and $s \oplus p \neq \varnothing$ iff s admits p. I call an update *genuine* if it really eliminates worlds; so, $s \oplus p$ is genuine iff $s \oplus p \neq s$. Beaver (2001), elaborating on (Karttunen 1973) and (Heim 1983), proposes that the presupposition relation be defined as in (16).[11]

16. A. p presupposes q iff, for every s, if s admits p then s accepts q.
    B. Let ∂p be the presupposition that p, $s \oplus \partial p = s$ if s accepts p, and is undefined otherwise.

(16.A) entails that no presupposition can be used for a genuine update. Let s be an information state, if p presupposes q and p is compatible with s (s admits p), then s accepts q, that is, $s \oplus q = s$ and $s \oplus q$ is not a genuine update. The idea that presuppositions are taken for granted seems to entail that they cannot give rise to genuine updates. When confronted with examples like (15), we are left with only two choices: reject the existence of a sister as a valid presupposition or modify or

[11] See (van Eijck 1994) for a similar proposal.

reject (16). The first option is intuitively strange. (15) sounds like a typical scholarly example of presupposition and the presupposed proposition seems to enjoy a different status from both the conventional implicature triggered by the non-restrictive relative clause and the asserted proposition *I can't come with you.*[12]

I propose to modify (16) by incorporating the multi-agent perspective developed in (Jayez and Rossari 2004). There, assertions and conventional implicatures are distinguished by the *intentions* of the agent who is responsible for them. Ignoring the detailed technical structure of the proposal, I summarize the main point in (17).

17. a. If an agent *a* asserts that *p*, she intends that the other agents update their belief states with *p*.
    b. If an agent *a* conventionally implicates that *p*, she intends that the other agents update their belief states with the proposition that *a* believes *p*.

The upshot of this proposal is that conventional implicatures constitute information supported by *a* but, in contrast with assertions, there is no direct attempt to force them into the belief states of the addressees. This difference accounts for the differences in dialogue exchanges noted by Jayez and Rossari (2004) and recalled in section 2.2. Note that nothing prevents agents different from *a* to *adopt* a conventional implicature, that is, to update their belief states with it. What (17) says is that it is not the default intended effect of conventional implicature triggers. Turning to presuppositions, I propose that they correspond to the intention defined in (18).

18. If an agent *a* presupposes that *p*, she intends that the other agents update their belief states with the belief that *a* 'presupposes' *p*.

Under this view, presuppositions differ from conventional implicatures only by the fact that *a*'s belief state supports the presupposition that *p*. What does it mean for a belief state to support a presupposition? One might recycle (16) and define '*s* (a belief state) supports the presupposition that *p*' as the fact that $s \oplus \partial p = s$, or equivalently that *s* accepts *p*. This solution would raise a problem similar to the one observed by Potts. Imagine that John said 'I picked up my sister' and I was not sure he had a sister. The representation of John's belief state I had up to this point was mixed: since I ignored whether he had a sister, my beliefs were compatible with the two possibilities and so were my beliefs about John's beliefs; let *s* denote the beliefs I believed that John entertained and *p* the proposition 'John has a sister'. Then, *s* contained *p*-worlds and $\neg p$-worlds. What happens to *s* when John mentions that he picked up his sister? I could update *s* in the usual way, replacing it by $s \oplus p$. But what I learn is not that John believes (now) that he has a sister but that he already believed it, before telling me that he picked up his sister. So I have to change my view on John's *previous* beliefs and I can do so by *downdating* the information through some revision. Specifically, if ρ is a revision function, I can replace each world *w* of *s* where $\neg p$ held by a set of worlds $\rho(w,p)$ where *p* holds. The general problem of defining reasonable revision procedures is far beyond the scope of this paper and I will simply assume that there is at least one such procedure (see Hansson, 1999, Herzig and Rifi, 1998 for surveys).

[12] Following Potts, I assume that non-restrictive relatives trigger conventional implicatures.

19. Let $s_{x_1 \ldots x_n}$ denote the belief state at the end of the belief path 'x_1 believes that x_2 believes that … that x_n believes […]'. Let $\rho(s,p)$ denote $\{w \in s : w \models p\} \cup \bigcup\{\rho(w',p) : w' \in s \ \& \ w' \models \neg p\}$. If an agent a presupposes that p, she intends that any other agent b downdates her belief state by replacing s_{ba} by $\rho(s_{ba},p)$.

Presupposing is not asserting: if *a* presupposes that *p*, she does not intend that *b* should learn *p*. It is not just conventionally implicating : if *a* presupposes that *p*, she does not intend that *b* should learn that *a* believes *p* but that *b* learns that *a* already believed *p*. As with conventional implicatures, if *a* if considered as trustworthy, it is possible that in effect *b* adopts this belief or even comes to believe that *p*. It might even be the actual intended effect of the presupposing action, but it is not the default intended effect. Of course, as with assertions and non-presuppositional implicatures, the other agents can adopt the presupposition, reject it, postpone downdating, etc.

Summarizing, although I share Potts' concern about the misleading character of the expression 'taken for granted', I do not derive the conclusion that expressions like *but* are not presuppositional. Presuppositions are not 'old' information but information which is presented as such. Moreover, downdates based on revision provide a powerful alternative to the standard model of eliminative updates and do not commit one to the view that information is elimination, a view which proves problematic with presuppositions, since they put together two perspectives: information modification (downdate) and information stability (propositions 'taken for granted'). In a more fine-grained approach one would have to consider temporal belief states and their evolution, but this is not a step I can take within the limits of this paper.

In the following sections, I will rely almost exclusively on Geurts' (1999) version of van der Sandt's (1992) *anaphoric* theory of presuppositions. There are two reasons for doing so. First, the anaphoric theory directly captures the intuition that presuppositions are presented as 'already there' by requiring that they be bound to preexisting material or introduced as supplementary assumptions. Second, Geurts' own version of anaphoric theory adds power and flexibility to van der Sandt's initial proposal.

3. DRT representation

3.1 Basics

I use the traditional resources of DRT: individual discourse referents *x*, *y*, etc. and simple or complex conditions. I ignore the presuppositional behavior of names and introduce them globally for simplicity. To formulate the conditions on DMs, I add handles on DRSs (in a way similar to Asher and Fernando (1999)), but quite conservatively, i.e. preserving the standard architecture used by Geurts and van der Sandt. Presuppositions are considered to be DRSs; however they do not enter the logical relations that make up complex conditions. Graphically, they are boxed and coloured (e.g. K_i). DRSs are declared as any other referent. Finally, DRS conjunction is simulated by a non-commutative conjunction •, which connects 'normal' (= non-presuppositional) DRSs. It does not connect normal DRSs and presupposed DRSs. The standard commutative conjunction is noted &. Presupposed DRS are 'dangling', that is, they are not connected to the other DRSs. So, the general form of a DRS is like in (20a). Handles point to DRS contents, as in (20c). Global referents and conditions are taken out of particular DRSs. Thus, in (20c), *x* and *John*(*x*) do not belong to K_1 or K_2.

20. a. $[x_1 \ldots x_n, K_1 \ldots K_m, K'_1 \ldots K'_k : C_1 \& \ldots \& C_p \& (K_1 = [\,] \bullet \ldots \bullet K_m = [\,])\ K'_1 = [\,] \ldots K'_k = [\,]]$
b. John is on speed. He is edgy
c. $K = [K_1, K_2, x : \mathit{John}(x) \& (K_1 = [: \mathit{on\text{-}speed}(x)] \bullet K_2 = [: \mathit{edgy}(x)])\,]$

Since the ontology is slightly richer than with the original van der Sandt's approach, one has to provide accessibility conditions for DRS referents. This is by no means a novelty, though, since Geurts (1999) extends the representation in the same direction for attitude verbs. For lack of space, I will not use or discuss the full 'SDRT with labels' version proposed by Asher and Fernando (1999) and Asher and Lascarides (1998, 2003). Two cases must be distinguished: 'ordinary' accessibility, which concerns individual discourse referents (*i-accessibility*) and propositional accessibility, which concerns propositions (*p-accessibility*). Since I am not proposing a theory of discourse relations, I need only a very weak form of p-accessibility on presupposed DRSs (see Asher and Lascarides, 2003:149,def. 15 for a more elaborate approach).

21. **Accessibility**
1. If $K = [\ \ldots K_i \ldots : \ldots K_i = [\,] \ldots]$, every $K' \neq K$ i-accessible to K is p-accessible to K_i and K is i-accessible to K_i.
2. If $K = [K_1, \ldots, K_n, \ldots : \ldots (K_1 = [\,] \bullet \ldots \bullet K_n = [\,])]$, K is i-accessible to $K_1 \ldots K_n$ and $K_1 \ldots K_n$ are sequentially i-accessible (every K_i is i-accessible to every K_j such that $i \leq j$)[13].
3. If $K = [\ldots : K_1 = [\,] \Rightarrow K_2 = [\,] \ldots]$ K_1 is i-accessible to K_2, etc. (the usual accessibility conditions)

The fact that K is (i/p)-accessible to K' is noted by $K \leq_{\text{(i/p)-acc}} K'$.

Note that sequential accessibility is not sufficient in general; suppose we have a sequence of the form $K_1 = [\,] \bullet K_2 = [\,]$, K_2 can access K_1 but it might have to access DRSs inside K_1 and not be able to do so, as in the following structure, where K_2 cannot access $[x : \alpha]$ to resolve *y*.

$$K_1 = [\ : \neg[x : \alpha\ ]] \bullet K_2 = [y : C(y)]$$

Since presupposed DRSs are 'dangling' (not logically connected to the rest) they are not accessible out of subordination (a presupposed DRS containing another presupposed DRS, etc.). E.g., in $K = [\ \ldots : K_1 = [\,]\ K_2 = [\,] \bullet K_3 = [\,]]$, $K \leq_{\text{i-acc}} K_2$, and K_3, $K_2 \leq_{\text{i-acc}} K_3$ but $K_1 \not\leq_{\text{i-acc}} K_2$ and $K_1 \not\leq_{\text{i-acc}} K_3$. For individual or DRS referents, anaphora resolution is standard: presupposed conditions are trasnferred to the DRS where the antecedent is declared. A simple example is provided in (22).

22. a. A man entered, he wore a hat
b. $K = [K_1, K_2 : K_1 = [x : \mathit{man}(x) \& \mathit{entered}(x)] \bullet K_2 = [K_3 : K_3 = [y :]\ \mathit{wore\text{-}hat}(y)]]$
By 21.2 and 21.1, $K_1 \leq_{\text{i-acc}} K_2$ and $K_2 \leq_{\text{i-acc}} K_3$, so $K_1 \leq_{\text{i-acc}} K_3$ and *y* can be bound to *x*. Therefore, $K = [K_1, K_2 : K_1 = [x : \mathit{man}(x) \& \mathit{entered}(x)] \bullet K_2 = [: \mathit{wore\text{-}hat}(x)]]$

Since we have handles, DRS merging must be adapted.

23. If K is a DRS, *gr*(K) is the set of global individual referents of K (here, referents that are introduced through proper names). *gc*(K) denotes the set of conditions through which global individual referents are introduced (the predications of proper names). The DRS obtained by withdrawing the global referents and conditions from K is noted *loc*(K).

[13] Remember that • is non-commutative; so, $K_1 = [\,] \bullet K_2 = [\,]$ is not the same as $K_2 = [\,] \bullet K_1 = [\,]$.

24. **DRS merging**
Let K_1 and K_2 be two DRSs. Their merge $K_1 \oplus K_2$ is defined by:
$K_1 \oplus K_2 = [gr(K_1) \cup gr(K_2) \cup \{K_1,K_2\} : gc(K_1)\ \&\ gc(K_2)\ \&\ (K_1 = loc(K_1) \bullet K_2 = loc(K_2))]$[14]

The result of left-adjoining a consequence DM to a sentence represented by a DRS K is defined in (25).

25. **Presupposition of consequence DMs**
$DM_{cons}(K) = [gr(K),\ K_i,\ K_{i+1} : gc(K)\ \&\ (K_i = loc(K)\ K_{i+1} = [K_{i+2} : \text{CONS}(K_{i+2},K_i)]]$,
where *i* is the smallest fresh DRS handle index.

According to (25), A consequence DM bearing on a DRS K introduces a presupposed DRS (K_{i+1}) which indicates that some proposition (K_{i+2}) entails the non-global content K_i of the initial DRS K. For a simple example, consider (26).

26. a. John is on speed, so he must be edgy
b. $K_1 = [x : John(x)\ \&\ on\text{-}speed(x)]$
$K_2 = [K_3 : \text{Must}\ K_3 = [K_4 : K_4 = [y :]\ edgy(y)]]$
$so(K_2) = [K_5, K_6 : K_5 = [K_3 : \text{Must}\ K_3 = [K_4 : K_4 = [y :]\ edgy(y)]]\ K_6 = [K_7 : \text{CONS}(K_7,K_5)]]$
$K_1 \oplus so(K_2) = [x, K_1, K_2 : John(x)\ \&$
$(= K)$ $(K_1 = [: on\text{-}speed(x)]] \bullet$
$K_2 = [K_5, K_6 : K_5 = [K_3 : \text{Must}\ K_3 = [K_4 : K_4 = [y :]\ edgy(y)]]$
$K_6 = [K_7 : \text{CONS}(K_7,K_5)]])$
c. $K = [x, K_1, K_2 : John(x)\ \&\ (K_1 = [: on\text{-}speed(x)]] \bullet$
$K_2 = [K_5 : K_5 = [K_3 : \text{Must}\ K_3 = [: edgy(x)]]\ \&\ \text{CONS}(K_1,K_5)]\ )]$

Resolving *y* is easy by means of the accessibility chain: $K \leq_{i\text{-}acc} K_2 \leq_{i\text{-}acc} K_5 \leq_{i\text{-}acc} K_3 \leq_{i\text{-}acc} K_4$, which allows one to posit $x = y$. For K_6, one has: $K \leq_{i\text{-}acc} K_2$ so $K \leq_{p\text{-}acc} K_6$, and one can resolve K_7 with K_1. The two resolutions produce (26c).

3.2 Disjunctive structures

Disjunctive structures of the form *Either* A or B (*Ou* (*bien*) A *ou* (*bien*) B in French) are paired with structures (1) or (2). I follow Geurts and Frank, who argue against Robert's analysis and adopt (2). More precisely, I consider that a structure *Either* ϕ *or* ψ is felicitous only if ψ can be interpreted as incompatible with ϕ. So $\neg\phi$ is accommodated in the right term of the disjunction, unless $\psi = \neg\phi$, in which case accommodation would create a redundancy. This gives the representation in (28)

1. *Either* ϕ *or* $\psi = \phi \vee \Box(\neg\phi \Rightarrow \psi)$ (Roberts 1989)
2. *Either* ϕ *or* $\psi = \phi \vee (\neg\phi \wedge \psi)$ (Geurts 1995, Frank 1996)

To define the 'negation' of a DRS, we need to take care of the status of discourse referents.

[14] In this and similar definitions, $gc(K_1)\ \&\ gc(K_2)$ abbreviates $C_1\ \&\ \ldots\ \&\ C_k\ \&\ C_m\ \&\ \ldots\ \&\ C_p$, where $C_1,\ldots,C_k$ and $C_m,\ldots,C_p$ are the global conditions of K_1 and K_2 respectively.

27. **Contradictory DRSs**
Let *lr*(K) be the set of local referents of K, that is, those referents which are declared inside K. K' $\approx_{loc}$ K iff K' is an alphabetic variant of K on *lr*(K). K and K' are *contradictory* iff, for some K'', K'' $\approx_{loc}$ K' and K = [¬K''].

28. **Exclusive disjunction**
Let ~K be any DRS contradictory to K.
A sequence K_1 **<either-or>** K_2 is construed as:
[{K_1, K_2} ∪ *gr*(K_1) ∪ *gr*(K_2) : *gc*(K_1) & *gc*(K_2) & K_1 = *loc*(K_1) ∨ K_2 = [K_i, K_{i+1} : K_i = ~K_1 • K_{i+1} = *loc*(K_2)]], where *i* is the smallest fresh DRS handle index.[15]

So, (29a) is actually (29b). Since $K_3 \leq_{i\text{-acc}} K_4 \leq_{i\text{-acc}} K_5$, *z* can be bound to *u*, resulting in (29c).

29. a. Either Fred has no rabbit or it is in hiding
b. K = [K_1, K_2, *x* : *Fred*(*x*) &
(K_1 = [: ¬[*y* : *rabbit*(*y*) *owns*(*x*,*y*)]]
∨
K_2 = [K_3, K_4 : K_3 = [*u* : *rabbit*(*u*) & *owns*(*x*,*u*)] •
K_4 = [K_5 : K_5 = [*z* : *non-human*(*z*)] *in-hiding*(*z*)]])]
c. K = [K_1, K_2, *x* : *Fred*(*x*) &
(K_1 = [: ¬[*y* : *rabbit*(*y*) *owns*(*x*,*y*)]]
∨
K_2 = [K_3, K_4: K_3 = [*u* : *rabbit*(*u*) & *owns*(*x*,*u*) & *non-human*(*u*)] • K_4 = [: *in-hiding*(*u*)]]]

In French, it turns out that disjunctive structures have unexpected effects on consequence DMs. A sentence like (30a) (the French counterpart of (29a) + *alors*) has the structure in (30b). Resolving *z* in K_3 gives *z* = *u*. K'$_2$ $\leq_{p\text{-acc}}$ K_8, so K_6 can be bound to K_7. The result is (30c)

30. a. Ou bien Fred n'a pas de lapin ou bien alors il se cache
'Either Fred has no rabbit or then it is in hiding'
b. K_1 = [*x* : *Fred*(*x*) & ¬[*y* : *rabbit*(*y*) & *owns*(*x*,*y*)]], K_2 = [K_3 : K_3 = [*z*: *non-human*(*z*)] *in-hiding*(*z*)]
K'$_2$ = *then*(K_2) = [K_4,K_5 : K_4 = [K_3 : K_3 = [*z*: *non-human*(*z*)] *in-hiding*(*z*)] K_5 = [K_6: CONS(K_6,K_4)]]
K_1 <either-or> K'$_2$ = [*x* : *Fred*(*x*) & K_1 = [¬[*y* : *rabbit*(*y*) & *owns*(*x*,*y*)]] ∨
K'$_2$ = [K_7,K_8 : K_7 = [¬[¬[*u* : *rabbit*(*u*) & *owns*(*x*,*u*)]]] • K_8 = [K_4,K_5 : K_4 = [K_3 : K_3 = [*z*: *non-human*(*z*)] *in-hiding*(*z*)]] K_5 = [K_6 : CONS(K_6,K_4)]]]]
c. K_1 <either-or> K'$_2$ = [*x* : *Fred*(*x*) & K_1 = [¬[*y* : *rabbit*(*y*) & *owns*(*x*,*y*)]] ∨
K'$_2$ = [K_7,K_8 : K_7 = [¬[¬[*u* : *rabbit*(*u*) & *owns*(*x*,*u*) & *non-human*(*u*)]]] • K_8
= [K_4 : K_4 = [: *in-hiding*(*z*)] & CONS(K_7,K_4)]]]]

However, this predicts that (31a,b) should be fine.

31. a. Ou bien Fred n'a pas de lapin ou bien ??donc il se cache
b. Ou bien Fred n'a pas de lapin ou bien ??dans ce cas il se cache

[15] the **<either-or>** constructor behaves like a merging operator.

4. Pedigrees

4.1 What are they?

One can account for (31a) by mixing two observations.
a. The propositions $\phi/\neg\phi$ occurring in exclusive disjunctions of the form ϕ **<either-or>** ψ are not standard assertions. Rather, they have an hypothetical status (Roberts 1989).
b. *Donc* is not always felicitous in the apodosis of conditionals (Jayez and Rossari 2000).

32. a. Fred a un lapin, donc il se cache
[intended : since Fred has a rabbit and we don't see it, it must be in hiding]
'Fred has a rabbit, therefore it is in hiding'
b. Si Fred a un lapin, ??donc il se cache
'If Fred has a rabbit, therefore it is in hiding'

More generally, *donc* cannot always be naturally bound to propositions with a hypothetical status.

33. a. Peut-être que Fred a un lapin, mais ??donc / alors il se cache
'Maybe Fred has a rabbit, but therefore / then it is in hiding'
b. Est-ce que Fred a un lapin? Parce qu'alors / ??donc je vais prendre de la salade
'Does Fred have a rabbit, because then / therefore I'll take some salad'

One can explain (31a) by assigning to the proposition that Fred has a rabbit a hypothetical status and assuming that certain consequence DMs are sensitive to the modal status of the proposition they presuppose. Roughly speaking, a *pedigree* is a trace of the modal/illocutionary status of an antecedent proposition

34. **Pedigrees**
Any DRS handle K receives a *pedigree*, which is a Boolean expression of types in some Boolean lattice of types.

The detailed structure of the type language is immaterial. I simply assume that we have Boolean expressions (that is, in particular, $\sigma \wedge \neg\sigma = \bot$). K with pedigree π is noted ${}^{\pi}K$. Pedigrees can be modal. Let *m* be a sequence of modal operators that defines the set of worlds at which some proposition must be evaluated; *m* can constitute a term in a Boolean pedigree. The sources of modal pedigrees are, for instance, morpho-syntactic and prosodic information, certain constructions or the context itself (e.g. descriptive vs. 'evidential' assertions). The important point is that certain consequence DMs are *sensitive* to pedigrees (35); e.g. *donc* demands elements already present in the common ground or 'taken for granted', hence the pedigree **gr**(**anted**). The existence of pedigrees restricts the binding options (36).

35. **Pedigree sensitivity for consequence DMs**
A consequence DM is sensitive to pedigrees whenever it triggers a presupposition of the form $K_i = [{}^{\pi}K_{i+1} : \text{CONS}({}^{\pi}K_{i+1}, K')]$. In particular, *donc* triggers a presupposition of the form $K_i = [{}^{\mathbf{gr}}K_{i+1} : \text{CONS}({}^{\mathbf{gr}}K_{i+1}, K')]$.
36. **Binding with pedigrees**
${}^{\pi}K_i$ can be bound to ${}^{\pi'}K_j$ iff $\pi \wedge \pi' \neq \bot$. The result is ${}^{\pi \wedge \pi'}K_j$.

When we try to bind a handle to another handle with an incompatible pedigree ($\pi \wedge \pi' = \bot$), we get an anomaly. For (31a), we have the structure (31c). For simplicity I assume that the relevant pedigrees are incompatible atoms, **hyp** and **gr**. We have **hyp** $\wedge$ **gr** $= \bot$, so the binding fails.

31. c. K_1 <either-or> $K'_2 = [x : Fred(x)$ & $K_1 = [\ \neg[y : rabbit(y)$ & $owns(x,y)]]$ $\vee$ $K'_2 = [{}^{hyp}K_7, {}^{hyp}K_8 :$
${}^{hyp}K_7 = [\neg[\neg[u : rabbit(u)$ & $owns(x,u)]]]$ • ${}^{hyp}K_8 = [K_4, K_5 : K_4 = [K_3 :$
$K_3 = [z: non\text{-}human(z)]\ in\text{-}hiding(z)]]\ \ K_5 = [K_6 : \text{CONS}({}^{gr}K_6, K_4)]]]]$

4.2 Disjunctive syllogism and pedigrees

Jayez and Rossari (2000) note that *donc* improves in contexts like (37a). The observation extends to (37b). Such structures correspond to an implicit reasoning of the form A $\vee$ B, $\neg$A |– B (disjunctive syllogism).

37. a. Si Fred était à l'étranger, (?)donc il ne peut pas être le meurtrier
'If Fred was abroad, he cannot be the murderer'
b. Ou bien Fred n'était pas à l'étranger, ou bien, (?)donc, il ne peut pas être le meurtrier
'Either Fred was not abroad, or he cannot therefore be the murderer'

Epistemically, a disjunctive syllogism corresponds to the fact that there are only two possibilities that the speaker and the hearer are aware of. So, the validity of (37) is based on a **granted** proposition of the form ^{gr}[abroad ∨∨ ◊murderer], where ∨∨ notes the exclusive disjunction One can relax condition (35) as in (35').

35'. **Pedigree sensitivity for** *donc*
Donc triggers a presupposition of the form $K_i = [\Gamma: \text{CONS}(\Gamma, K')]$, where Γ is a non-empty list of DRSs that contains at least one DRS of pedigree **gr**.

With (30a) and (31a), there are additional possibilities: Fred has a rabbit and it is in hiding, Fred has a rabbit and he is on vacations with his rabbit, Fred has a rabbit but it lives in the garden, etc. The granted premise rabbit ∨∨ in-hiding is not available as an element of the common ground. See fig. 1 and 2.

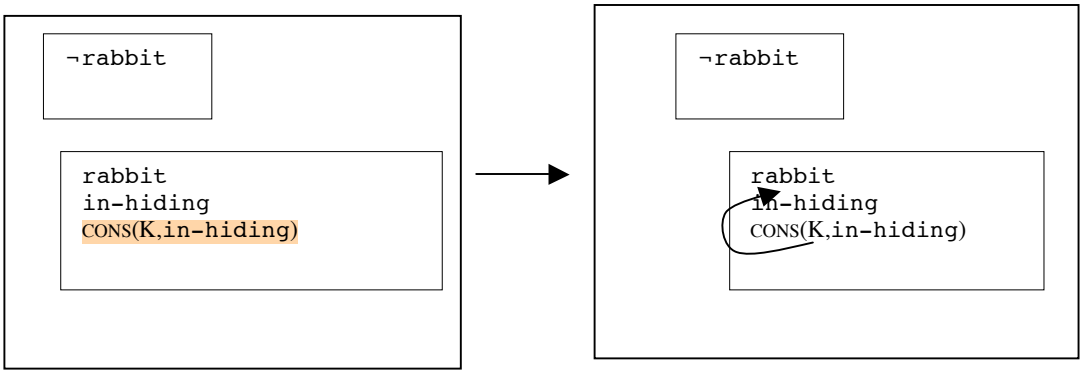

FIGURE 1 : (30a) and (31a)

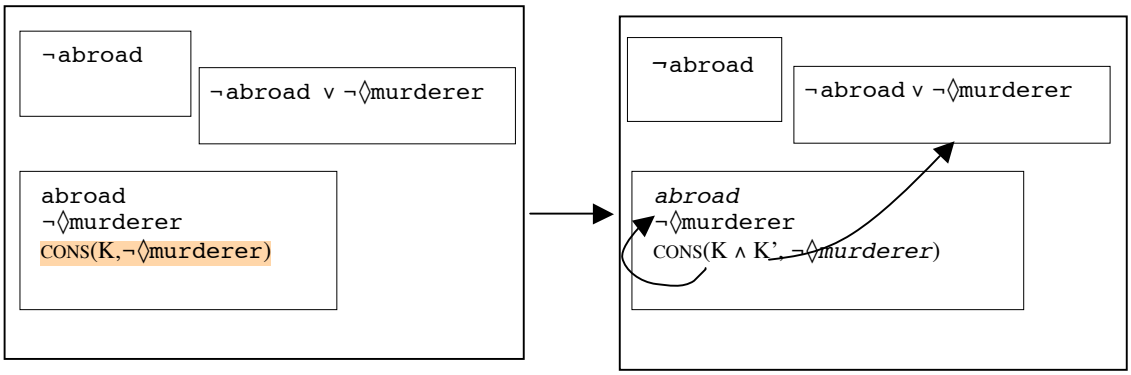

FIGURE 2 : (37b)

The relevance of the difference is confirmed by the improved versions (38a,b) of (32b) and (31a). The initial assertion in (38) introduces the necessary disjunction in the common ground.

38. a. Le lapin ne peut être que dans la maison. Si Fred en a un, donc il se cache
'The rabbit can only be in the house. If Fred has one, therefore it is in hiding'
b. Le lapin ne peut être que dans la maison. Ou bien Fred n'en a pas ou bien donc il se cache
'The rabbit can only be in the house. Either Fred has no rabbit, or therefore it is in hiding'

4.3 'Dans ce cas'

What about (31b)? Since *dans ce cas* is compatible with **hyp**-type DRSs (39a), the explanation offered for *donc* is inappropriate. Similar observations hold whenever the presupposed proposition is not explicit.

39. a. Si Jean prend des amphets, dans ce cas il va être très nerveux
'If John is on speed, in that case he is going to be very edgy'
b. John prend probablement des amphets, sinon alors / ??dans ce cas je ne com prends pas pourquoi il est si nerveux
'John probably takes speed, if not (then / in that case) I can't understand why he is so edgy'
c. Il faut que John prenne des amphets, faute de quoi alors / ??dans ce cas il ne pourra pas réussir l'examen de sémantique formelle
'John must take speed, otherwise (then / in that case) he will not be able to pass the formal semantics exam'

The structure of (39b,c) is $M(\phi)$, if $\neg\phi$ then (*alors* vs *dans ce cas*) ψ, $\neg\phi$ being implicit. By and large, DMs such as *sinon*, *autrement*, *faute de quoi, sans quoi*, *dans le cas contraire* transform propositions into their implicit hypothetical inverse (ϕ becomes (if $\neg\phi$)). The data suggests that *dans ce cas* is sensitive to the explicit character of propositions. To be accepted in the common ground is not enough. In a discussion among mathematicians, the proposition that no contradiction can be admitted is probably part of the common ground.

40. Dans la démonstration classique de l'irrationnalité de √2, ou bien on admet une contradiction ou bien alors / ??dans ce cas √2 n'est pas fractionnaire
'In the classical proof that √2 is irrational, either one admits a contradiction or then / in that case √2 is not fractional'

Dans ce cas is a demonstrative DM, so its behavior is analogous to what is observed for demonstrative determiners in the presence of bridging (see Corblin 1995, Kleiber 1989 for French, Diessel 1999 for a cross-linguistic study). Generally speaking, demonstratives do not like implicit antecedents (41).

41. a. J'ai examiné la voiture. Le/*Ce coffre était abîmé
b. I inspected the car. The/*This trunk was damaged

Implicit DRSs can be tagged with a special tag **impl**. If *dans ce cas* and similar DMs demand a ¬**impl**-type DRS, the binding fails.

4.4 Pedigrees and attitudes

A *prima facie* reasonable assumption is that attitudes create non-accessible contexts, see (42).

42. Mary believes that a bear$_i$ broke in, ??it$_i$ crushed the TV[16]

However, Asher (1993:chap. 6) notes examples like (43a) (his 18).

43. a. John now believes that [Mary will leave him]$_i$. Fred has been expecting it$_i$ to happen all along
b. [x,y,s : *John*(x) & *Mary*(y) & *s-believes*(x, [$\underline{e : \textit{e-leaves}(x,y)}$])]

Asher's explanation is twofold:

a. One can refer anaphorically to event-*types* (vs. events).

b. Event-types are predicative DRSs of the general form $\lambda e \lambda x_1 \ldots x_n[y_1 \ldots y_k : \textit{e-pred}(x_1 \ldots x_n) \ldots]$, e.g. the event of leaving is $\lambda e \lambda x,y$ [: x *e-leave* y]. They behave as terms and are 'freely'[17] available for anaphora. DRSs are 0-place predicative DRSs, so DRSs (*qua* event-types) are 'freely' available.

Disregarding time, the first sentence of (43a) can be coded as (43b). The underlined DRS is accessible (in contrast with the event referent e). I follow Asher in assuming that abstract objects are much more freely accessible than individual discourse referents. In practice, I will make all the propositions in the scope of attitudes accessible. This squares well with examples like (44a-c)

44. a. Marie croit qu'[un ours est entré]$_i$. Effectivement, c'$_i$ est vrai
'Mary believes that [a bear broke in]$_i$. Indeed it$_i$'s true'
b. Je pense qu'[un ours est entré]$_i$. Si ça$_i$ n'était pas le cas, il n'y aurait pas autant de dégâts
'I think that [a bear broke in]$_i$. If it$_i$ were not the case, there would be less damage'

[16] Note that the sentence is not uniformly rated as strange.
[17] Not exactly. The accessibility conditions on individual discourse referents must be respected.

c. Marie s'imagine que [Jean pense qu'[un ours est entré]$_j$]$_i$. C$_{i \text{ or } j}$'est ce que croit Fred
'Mary imagines that [John thinks that [a bear broke in]$_j$]$_i$. It$_{i \text{ or } j}$'s what Fred believes'

The possible sensitivity to attitudes requires an elaboration of pedigrees. Rossari (2002) shows that a DM like *effectivement* 'indeed' is sensitive to attitudes, see (45a-d). See (Zeevat 2003) for similar remarks on *indeed*.

45. a. Il y a des souris chez Julie. ??Effectivement j'en ai vu (≈ Rossari's example (74))
'There are mice in Julia's house. Indeed I saw some mice'
b. Julie croit qu'il y a des souris chez elle. Effectivement j'en ai vu
'Julia believes there are mice in her house. Indeed I saw some mice'
c. Julie a rêvé qu'il y avait des souris chez elle. Effectivement j'en ai vu (≈ her (79))
'Julia dreamt that there were mice in her house. Indeed I saw some mice'
d. Julie a raison de croire qu'il y a des souris chez elle. Effectivement, j'en ai vu (≈ her (75))
'Julia is right when she believes that there are mice in her house. Indeed I saw mice'
e. Julia s'imagine qu'un ours est entré. ??Effectivement, il y a de gros dégâts
'Mary imagines that a bear broke in. Indeed there is a lot of damage'[18]

Effectivement demands that its antecedent be the object of a *veridical* (Zwarts 1995) attitude and that the attitude be assigned to an agent distinct from the speaker. Veridical attitudes entail that the agent under consideration believes the proposition which the attitude is about. Let *a* be an agent and ATT an attitude, then $R_{<a,\text{ATT}>}$ is the accessibility relation between the current world and the accessible worlds w.r.t. *a* and ATT. As usual, $\Box_{<a,\text{ATT}>}\ \phi$ is true at *w* iff ϕ is true at every world *w'* such that $w\ R_{<a,\text{ATT}>}\ w'$.

46. **Presupposition of** *effectivement*
$K_i = [{}^{C}K_{i+1} : K' \Rightarrow \Box_{<speaker,\text{BELIEVE}>}\ {}^{C}K_{i+1})]]$,
where *i* is the smallest fresh DRS handle index and $\mathbf{C} = \exists a,\text{ATT}\ (a \neq speaker\ \&\ (\Box_{<a,\text{ATT}>}\ K_{i+1} \Rightarrow \Box_{<a,\text{BELIEVE}>}\ K_{i+1})\ \&\ (\Box_{<a,\text{ATT}>}\ K_i \not\Rightarrow \Box_{<speaker,\text{BELIEVE}>}\ \neg K_{i+1}))$

(46) says that the proposition in the scope of *effectivement* entails that the speaker believes a certain propositional antecedent such that (i) the attitude entertained by some agent *a* different from the speaker entails that *a* believes that the antecedent is true and (ii) does not entail that the speaker believes that the antecedent is false. For instance, in (45b), Julie believes that she has mice at home. In (45d), Julia's belief is already presupposed by the first sentence. (45e) may sound odd because the first sentence entails that the speaker believes that no bear broke in. (45c) is more problematic. Following Giannakidou (1998), I assume that dreaming that ϕ entails believing that ϕ during the dreaming event. Whether this belief is *about* the current world, as any normal belief is, is more debatable. The world which the dream-beliefs are about might give rise to different beliefs than those the current world gives rise to; e.g. *x* dreams that he is a tennis-player and he knows (in the real

[18] I assume that, in the example, *s'imaginer* means *to suppose wrongly*.

world) that he is not a tennis-player. Since we usually do not entertain (simple) inconsistent beliefs about the same world, the current world of the dream and that of the reality are presumably not the same *unless* one considers that the difference between dream-beliefs and real beliefs is a matter of belief change.

In contrast with the treatment proposed by Zeevat (2003) for *indeed*, there is no accessibility problem: *effectivement* picks up propositions inside attitudes. This is not idiosyncratic; the conditional mood, for instance, can bypass attitudes in the same way (Jayez and Rossari 1999).

47. a. Marie a peur qu'il y ait des cafards dans sa salle de bains; elle serait obligée de s'en débarrasser
'Mary is afraid that there are roaches in her bathroom ; she would have to get rid of them'
b. Marie a peur qu'il y ait des cafards dans sa salle de bains; alors / dans ce cas/ du coup/ ??donc elle serait obligée de s'en débarrasser

4.5. Some residual problems

In this section, I mention a few problems which call for an extension/modification of the present approach.

A. DMs are usually not cataphoric.

48. a. Either it is in hiding, or then Fred has no rabbit
b. Either, ??then, it is in hiding or Fred has no rabbit

However, once the cataphor has been resolved there is no difference of structure with (30b). To deal with such examples, one has to provide for a temporal structure of resolution/accommodation. The DM cannot be used as long as its left argument has not be found or constructed. Obviously, the present framework is not adequate in this respect.

B. Anaphoric 'strength'

It is well-known that pronouns and DMs, in contrast with full NPs, resist in general accommodation.

49. a. ??She came [intended: no salient antecedent]
b. ??Therefore Mary came [intended: no salient plausible premise]
c. Mary picked up her children at school [intended: no salient antecedent]
d. Mary might be in the garden [intended: no salient reason for Mary being in the garden]
e. Mary ??would be in the garden [intended: no salient condition for Mary being in the garden]

If the 'informational' account of these differences (Geurts) is right, (49a) and (49b) are strange because *she* and *therefore* cannot help to identify their 'referent', i.e. the left argument of the discourse relation for *therefore*. *Therefore* has descriptive content (in contrast with *she*), but it concerns the discourse relation, not the referent; *her children* corresponds to the property $\lambda X.\ X = \{x : x$ is one of Mary's children$\}$, which identifies uniquely its referent. Geurts (1999) propose that modals presuppose their domain (see also Geurts and van der Sandt 1999). A potential problem

with this assumption is that it does not explain why (49d) is admissible 'out of the blue' whereas (49e) is strange. (49) suggests rather that being dependent on a modal base (Kratzer 1981) and being presuppositional are distinct properties. *Might* (which requires a modal base) and conditional or DMs (which are based on presuppositions) would then be different in this respect.

C. Corblin's observation
Francis Corblin (p.c.) observed that DMs like *donc* can be found inside *if*-clauses.

50. a. Si Marie dit la vérité, si donc elle a bien vu le meutrier, ça change tout
'If Marys tells the truth, so if she actually saw the murderer, it changes everything'

What is the antecedent of *donc* in (50)? Presumably, it is the hypothetical proposition 'if Mary tells the truth'. But this shows that conditions (35) and (35') are too strong. In fact, in (50), *donc* is licensed by the fact that the conclusion ('if Mary tells the truth') has the same modal status than the antecedent. The general constraint is captured by (51), which requires that one of the DRSs in Γ have the same pedigree as the consequent. (51) allows in particular for cases where π = **hyp**.

51. **Pedigree sensitivity for** *donc* (II)
Donc triggers a presupposition of the form K_i = [Γ: CONS(Γ, $^{\pi}$K')], where Γ is a non-empty list of DRSs that contains at least one DRS of pedigree π.

5. Conclusion

Pedigrees constitute the semantic interface between DMs and their antecedents. Whereas pronouns and verbs have individual or propositional antecedents that exist or hold in the current world, DMs may impose more complex constraints on their antecedents. Although the notion of pedigree can be approximated by simple types in a Boolean algebra, the observations in sections 4.3, 4.4 and 4.5 show that we have to make room for a richer ontology. Pedigrees are not equivalent to discourse relations, in the traditional sense. The most obvious manifestation of this difference is the fact that the same relation of consequence is associated with otherwise very different DMs, such as *donc* and *alors*. In future work, I will examine other types of DMs and the general problem of the relation between pedigrees, modal status and speech acts, along the lines of (Jayez 2003).

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Bare NPs: Kind-referring, Indefinites, Both, or Neither?

Manfred Krifka

1. Generally shared assumption about Genericity

It is generally assumed that there are two types of genericity, called **characterizing statements** and **kind reference** in Krifka et al. (1995). Characterizing statements express generalizations about sets of entities or situations, cf. (1); kind reference involves reference to an entity that is related to specimens, cf. (2).

(1) a. A potato contains vitamin C.
'For all/typical x: if x is a potato, x contains vitamin C.'
b. A gentleman opens doors for ladies.
'For all/typical x: If x is a gentleman, he opens doors for ladies.'

(2) a. The potato was first cultivated in South America.
'The kind *tuber tuberosum* was first cultivated in South America.'
b. Shockley invented the transistor.
'Shockley conceived of, and realized, the kind of the transistor.'

There are **mixed** cases, characterizing statements about the specimens of kinds:

(3) The potato contains vitamin C.
'For all/typical specimens of *Tuber tuberosum* x, x contains vitamin C.

We distinguish these types because indefinite NPs in characterizing statements cannot in general be replaced by definite NPs, and definite kind-referring NPs cannot in general be replaced by indefinite NPs, cf. (4). Sentence (4.b) is possible on the taxonomic interpretation, referring to a subspecies of *tuber tuberosum*.

(4) a. *The gentleman opens doors for ladies.
b. *A potato was first cultivated in South America.

Of course, definite and indefinite singular NPs do not only occur in generic expressions. Definite singular NPs can also refer to some salient or unique object, cf. (5.a), and indefinite NPs can also introduce a new entity, cf. (5.b).

(5) a. The potato rolled out of the bag. b. A potato rolled out of the bag.

Definite singular NPs are assumed to be systematically **ambiguous**, that is, **polysemous**: They can either refer to the kind, or to some unique or salient specimen belonging to the kind. A predicate like *is extinct*, or *was cultivated in the South America*, selects for the kind reading; a predicate like *rolled out of the bag* selects for the object reading. We can represent these two readings as in (6), where ι is an operator that maps a predicate to the unique or most salient entity it applies to.

(6) a. ROLLED_OUT_OF_THE_BAG(ιPOTATO)
b. FIRST_CULTIVATED_IN_SOUTH_AMERICA(TUBER_TUBEROSUM)

Indefinite singular NPs are generally assumed to be **not** ambiguous. Their apparently different interpretation in sentences like (1.a) and (5.b) is a result of the presence of a quantificational

operator in characterizing statements, quite similar as in sentences with overt adverbial quantifiers, as in *A potato always contains vitamin C* (cf. Heim (1982)). What is common to all indefinite NPs is that they introduce a variable that is constrained by the predicate expressed by the indefinite. If the NP is interpreted in the restrictor of a quantificational operator (like *always*, or the generic operator in characterizing sentences called GEN), the variable is associated with this operator, cf. (7.a). If there is no quantificational operator around, the variable is associated by existential closure, here indicated by ∃ (cf. (7.b)).

(7) a. A potato contains vitamin C.
GEN(λx[POTATO(x)])(λx[CONTAINS_VITAMIN_C(x)])
b. A potato rolled out of the bag.
∃[POTATO(x) ∧ ROLLED_OUT_OF_THE_BAG(x)]

It is also possible to give a more ordinary semantics to indefinites where they are always associated with an existential quantifier. This quantifier then has to be treated as dynamic, which will result in the same semantic interpretation (cf. Rooth (1987)).

2. Different opinions about Bare NPs

The interpretation of bare NPs – that is, NPs without articles, mass nouns like *bronze* and plurals like *potatoes* – is controversial. They appear in contexts that select for kind reference, cf. (8.a), and in characterizing statements, cf. (8.b). And they have non-generic uses, as in (8.c).

(8) a. Potatoes were first cultivated in South America.
Bronze was invented around 3000 BC
b Potatoes contain vitamin C. / Gentlemen open doors for ladies.
Bronze was used for jewelry and weaponry.
c. Potatoes rolled out of the bag.
Bronze was detected in the remnants of the furnace.

There are essentially two types of theories for bare NPs: The **kind-reference analysis** of Carlson (1977) holds that they uniformly refer to kinds. The apparent object-related use as in (8.c) is explained by a general property of episodic predicates: If applied to a kind, they introduce, by existential quantification, a specimen of that kind. Writing R(y,x) to indicate that y is a specimen, or realization, of the kind x, we can give the following analyses:

(9) a. Potatoes were first cultivated in South America.
FIRST_CULTIVATED_IN_SOUTH_AMERICA(TUBER_TUBEROSUM)
b. Potatoes contain vitamin C.
CONTAIN_VITAMIN_C(TUBER_TUBEROSUM)
c. Potatoes rolled out of the bag.
λx∃y[R(y, x) ∧ ROLLED_OUT_OF_THE_BAG(y)](TUBER_TUBEROSUM)
= ∃y[R(y, TUBER_TUBEROSUM) ∧ ROLLED_OUT_OF_THE_BAG(y)]

The **ambiguity analysis**, as proposed by Wilkinson (1991) and Gerstner-Link & Krifka (1993), holds that bare NPs are systematically ambiguous (i.e., polysemous). They either refer to a kind, like definite singular NPs, or are the plural counterpart of indefinite singular NPs. (8.a) is interpreted just as in the kind-reference analysis, but (8.b,c) get the interpretation of their singular counterparts, (7.a,b):

(10) a. Potatoes contain vitamin C.
GEN(∃x[POTATOES(x)])(CONTAINS_VITAMIN_C(x))
b. Potatoes rolled out of the bag.
∃x[POTATOES(x)] ∧ ROLLED_OUT_OF_THE_BAG(x)

There are a number of arguments for the kind-reference analysis of bare NPs, and some against it that argue for the ambiguity hypothesis, which I will review here.

2.1 Arguments for the kind-referring analysis.

First, Carlson (1977) observed that the readings of sentences are determined by their predicate. The sentence *Potatoes are rolling out of the bag* only has a non-generic interpretation, and *Potatoes contain vitamin C* only a generic one. His theory accounts for this fact. However, we find a similar lack of ambiguity with singular indefinites, as in *A potato was rolling out of the bag* and *A potato contains vitamin C.* Carlson's theory does not generalize to these cases, as singular indefinites certainly do not denote kinds.

Second, it was shown by Carlson (1977) that anaphoric bindings are possible across kind-referring and apparently object-referring uses, as in (11).

(11) a. John bought potatoes because they contain vitamin C.
b. Watermelons contain iron, so John often buys them / one.

Assumes that all of these NPs are kind-referring explains these cases: Definite pronouns like *they* also refer to the kind, and indefinite pronouns like *one* pick up a kind and introduce a specimen of it. But again, singular indefinites behave similar:

(12) a. John bought a potato / some potatoes because they contain vitamin C.
b. A watermelon contains vitamin C, so John often buys them / one.

A third argument was put forward by Schubert and Pelletier (1987), who argue that predicates of different types can be conjoined:

(13) $^{(??)}$Frogs are reptiles and are croaking right now in front of my window.
$\lambda x[\text{REPTILES}(x) \wedge \lambda x \exists y[R(y, x) \wedge \text{BE\_CROAKING}(y)]](\text{RANO})$

The kind-reference analysis explains such cases easily. But informants judge such examples as problematic, essentially not better than parallel sentences with singular indefinite NPs, as in $^{??}$*A frog is a reptile and is croaking right now in front of my window.* However, cases like (14), which make a similar point, are fine.

(14) Frogs, which are reptiles, are croaking right now in front of my window.

Of Carlson's original arguments for the kind-referring analysis of bare NPs, the most convincing ones are those that relate to their scopal behavior. Bare NPs have a clear preference for narrow scope, whereas singular indefinite NPs may have narrow or wide scope, with respect to other operators such as negation, quantifiers, or attitude verbs. For example, (15.a) has a non-contradictory reading because *a dog* can have wide scope with respect to negation, which is lacking for (15.b). This is predicted if the existential quantifier is introduced by the lexical predicate.

(15) a. A dog is here, and a dog is not here.
i. $\exists x[\text{DOG}(x) \wedge \text{HERE}(x)] \wedge \exists x[\text{DOG}(x) \wedge \neg\text{HERE}(x)]$
ii. $\exists x[\text{DOG}(x) \wedge \text{HERE}(x)] \wedge \neg\exists x[\text{DOG}(x) \wedge \text{HERE}(x)]$ (contradict.)
b. Dogs are here, and dogs are not here.
$\lambda x \exists y[R(y, x) \wedge \text{HERE}(y)](\text{CANIS}) \wedge \neg[\lambda x \exists x[R(y, x) \wedge \text{HERE}(y)](\text{CANIS})]$
$= \exists y[R(y, \text{CANIS}) \wedge \text{HERE}(y)] \wedge \neg\exists y[R(y, \text{CANIS}) \wedge \text{HERE}(y)]$ (contrad.).

Similarly, while the singular indefinite NP in (16.a) has a narrow-scope and a wide-scope reading, the bare NP in (16.b) appears to have only a narrow-scope reading.

(16) a. Minnie wants to talk to a psychiatrist (non-specific or specific)
i. $\text{WANT}(\text{MINNIE}, \lambda x[\ \lambda P \exists y[\text{PSYCHIATRIST}(y) \wedge P(y)](\lambda y[\text{TALK\_TO}(x,y)])])$
ii. $\lambda P \exists y[\text{PSYCHIATRIST}(y) \wedge P(y)]\ (\lambda y[\text{WANT}(\text{MINNIE}, \lambda x[\text{TALK\_TO}(x,y)]])$

b. Minnie wants to talk to psychiatrists. (non-specific only)
WANT(MINNIE, λx[λy∃z[R(z,y) ∧ TALK_TO(x,z)](PSYCHIATRISTS)])

A variant of the anaphora argument was put forward by Rooth (1985). Consider (17.a), as a report about a peace meeting after an interplanetary war. Anaphoric binding is possible, even though *Martians* appears to refer to some Martians, and *themselves* to the kind. Such bindings are not possible for non-bare indefinites, as in (17.b.c). This is as predicted by the kind-referring analysis, for which *Martians* refers to a kind (cf. the analysis given for (17.a). A similar argument involves the binding of the subject position of indefinites, PRO, cf. (18).

(17) a. At the meeting, Martians presented themselves as almost extinct.
∃x[R(x, HOMO_MARTIENSIS) ∧ PRESENTED_AS_EXTINCT(x, HOMO_MART.)]
b. *At the meeting, a Martian presented themselves/itself as almost extinct.
c. *At the meeting, some Martians presented themselves as almost extinct.

(18) a. At the meeting, Martians claimed [PRO to be almost extinct].
b. At the meeting, some Martians claimed [PRO to be almost extinct].

Another argument for a the kind-referring analysis was brought forward in Dayal (2002). In languages that allow for bare singular count noun NPs like Hindi and Russian, bare singulars and bare plurals behave differently with respect to scope effects. Take the following Russian examples:

(19) a. #Sobaka byla vesde.
dog.SG was.SG everywhere
'A dog was everywhere.'

b. Sobaki byli vesde.
dog.PL was.PL everywhere
'Dogs were everywhere.'

(19.a) is strange because it suggests that one and the same dog was everywhere. Dayal argues that this difference can be captured if we assume that bare singulars refer to kinds that allow only for single instantiations in a particular situation, which according to her is similar to definite-generic NPs like *the dog*. But a variant of the ambiguity theory could deal with this phenomenon equally well. We would have to assume that bare singular NPs introduce new discourse referents under the presupposition that they are unique in the situation talked about.

2.2 Arguments for the ambiguity analysis

There are some observations that pose problems for the kind-reference analysis and argue for the possibility that bare NPs can be interpreted like indefinites.

The kind-reference analysis is problematic because it stipulates that bare NPs, like *potato*, and singular definite generic NPs, like *the potato*, both refer to kinds. But they behave differently in episodic sentences; (20.a) cannot be used when some potatoes rolled out of the bag, in contrast to (20.b).

(20) a. The potato rolled out of the bag. b. Potatoes rolled out of the bag.

To be sure, there are theories that assume that the kinds bare NPs refer to and the kinds definite NPs refer to are different; for example, Chierchia (1998) and Dayal (2002) hold that the latter have unique representations. But even then (20.a) should be interpretable, saying that the potatoes of the situation talked about rolled out of the bag.

Another problem was discovered by Carlson (1989), who observes that his original theory cannot be right in the face of examples like (21).

(21) Hurricanes arise in this part of the Pacific.
i. 'For hurricanes in general it holds: They arise in this part of the Pacific.'
ii. 'For this part of the P. it holds: There are hurricanes that arise there.'

The kind-referring analysis gives us only reading (21.i). Reading (ii) can be explained if *hurricanes* is an indefinite NP. Notice that singular indefinite NP behave in the same way; for example, (22.a) and (b) have similar interpretations (i), (ii).

(22) a. Frenchmen wear berets. b. A Frenchmen wears a beret.
i. For Frenchmen in general it holds: They were berets.
ii. For berets in general holds: They are worn by Frenchmen.

Prosody can distinguish between these readings: Accent on the object will result in reading (i), accent on the subject in reading (ii). This can be captured in different ways – by assuming that adverbial quantification is sensitive to focus, cf. Rooth (1985, 1995), or to givenness presuppositions expressed by deaccenting, cf. Krifka (2001). The accentual differences are reflected in different segmental realizations in certain languages. For example, Finnish uses nominative case for NPs that denote the set of entities about which a characterizing statement is made, and uses partitive case for indefinites in episodic sentences. In Japanese, NPs of the first kind carry a topic marker.

One further argument for the ambiguity analysis when extended to other languages is that there are languages in which bare NPs do not occur in argument places reserved for kind reference, but may occur in characterizing sentences or episodic sentences. The following data are from Longobardi (2001), on Italian:

(23) a. Elefanti di colore bianco possono creare grande curiosità.
'White-colored elephants may raise a lot of curiosity.'
b. *Elefanti di colore bianco sono estinti.
'White-colored elephants are extinct.'

To summarize, we are facing the following predicament: On the one hand, there is clear evidence that bare NPs are never interpreted just as the plural versions of indefinite NPs; otherwise, they would allow for wide scope readings, and they could not be antecedents of kind-referring reflexives or PRO. On the other, there is equally clear evidence that not all uses of bare NPs refer to kinds: They significally differ from other kind-referring NPs, and they show many similarities with indefinite NPs. The question, then, is: Are bare NPs kind referring, or are they ambiguos between a kind-referring and an indefinite reading? In the following, I will first discuss Chierchia (1998), a theory that, while selling itself as a kind-reference analysis, allows for systematic flexibility in the interpretation of NPs. I will point out a number of problems, and then propose another theory of flexible interpretation. It will turn out that bare NPs basically are neither kind-referring nor indefinites, but that they can be coerced to kind-referring or indefinite NPs.

3. The Theory of Chierchia (1998)

3.1 Ontological requirements for kind reference

Chierchia assumes, in line of much work on the semantics of plurals and mass nouns such as Link (1983), that individuals form an atomic join semi-lattice, with a sum operation $\oplus$, a part relation $\leq$, and a set of atoms AT. Interpretations are with respect to possible worlds. The meaning of a **singular count noun** like *dog* is a property, a function that maps every world w to the set of (atomic) dogs in w:

(24) $[dog] = \text{DOG}, = \lambda w \lambda x[\text{DOG}(w)(x)]$ (where: If $\text{DOG}(w)(x)$, then $x \in \text{AT}$).

The meaning of a **plural count noun** is the transitive closure of the meaning of the singular count noun under $\oplus$, minus the atomic individuals. This ensures that *dogs* will apply to sum individuals consisting of one or more dogs.

(25) $[dogs] = \text{DOGS}, = \lambda w \lambda x[\neg \text{DOG}(w)(x) \wedge \forall y[y \leq x \wedge \text{AT}(y) \rightarrow \text{DOG}(w)(y)]]$

Notice that DOGS is a **cumulative** property, that is, for any world w, if $\text{DOGS}(w)(x)$ and $\text{DOGS}(w)(y)$, then $\text{DOGS}(w)(x \oplus y)$. Mass nouns denote properties that are cumulative as well, but they also apply to atomic entities. The meaning of *furniture* applies to single pieces of furniture and to entities that consist of pieces of furniture.

The definite article denotes the maximization operator ι, which, when applied to a predicate P, returns the greatest individual in P. If P doesn't have a single greatest individual, then ιP is undefined. If a predicate P is cumulative, finite, and non-empty, then ιP always exists. Hence the meaning of *the dogs* is defined in a world in which there are dogs, as DOGS is cumulative, whereas the meaning of *the dog* is defined only for those worlds in which there is a single dog, cf. (26.a,b).

(26) a. [*the dogs*] = λw[ι[DOGS(w)]] b. [*the dog*] = λw[ι[DOG(w)]]

Kinds have a hybrid nature; they are individual concepts, i.e. functions from worlds to individuals, but also members of the set of atoms. The set of kinds K is a proper subset of the set of atoms, AT. They are also related to properties by the **down operator** $^\cap$. Applied to a property $\underline{P}$, this operator yields the function that maps each world w to the greatest element of the extension of $\underline{P}$ in w, provided that this is an element of the set of kinds K:

(27) $^\cap\underline{P} = \lambda w[\iota\underline{P}(w)]$, if this is an element of K, else undefined.

The down operator is so-called because it "brings down" the type of a property to the type of an individual concept (and, as elements of the set K are also entities, to an individual). This reflects the long-recognized double nature of bare NPs as referring expressions, as in *Gold is a metal*, and predicates, as in *This ring is gold* (cf. ter Meulen (1980)).

Chierchia exploits the fact that properties whose extensions do not have a greatest individual cannot be mapped to a kind. In particular, singular properties like DOG cannot be associated with a kind by the down operator, as in worlds w in which there is more than one dog, ιDOG(w) is not defined, cf. (28.a). In contrast, cumulative properties, like DOGS, can be associated with a kind, cf. (28.b).

(28) a. $^\cap$DOG = λw[ιDOG(w)], undefined if there are worlds with two dogs.
b. $^\cap$DOGS = λw[ιDOGS(w)], if λw[ιDOGS(w)] ∈ K

There is a problem with this approach: Chierchia must allow for kinds that have no specimens in certain possible worlds for several reasons, for example, to treat extinct kinds. Hence he must allow for kinds to be **partial** individual concepts that are not defined for certain possible worlds; e.g. the kind λw[ιDODO(w)] is not defined for our world/time w. But then individual concepts like (28.a) look much more natural: They pick out, for every world that has exactly one dog, this dog. And it is unclear why the property of cumulativity should play a crucial role in determining which kind exists and which kind does not.

The down operator has as its inverse the **up operator** $^\cup$, which maps a kind individual to the property of being a part of that individual:

(29) If k is a kind individual, then $^\cup$k = λwλx[x ≤ k(w)]

This gives us the property of being a specimen of the kind k, similar to Carlson's R relation. It includes atomic individuals and sum individuals. If d is the kind *canis* (that is, the kind of dogs), then $^\cup$d is the property that identifies, for each possible world, the atomic dogs and the sum individuals of dogs in this world. Notice that $^\cup$d, = $^\cup{}^\cap$DOGS, differs from DOGS: While DOGS only applies to sum individuals of dogs, $^\cup$d in addition applies to atomic dogs. For mass nouns, like FURNITURE, we have $^\cup{}^\cap$FURNITURE = FUNRNITURE, if $^\cap$FURNITURE is a kind (an element of K).

3.2 Type shifting of denotations and types of kind predications

In order to explain the various forms of NPs used for kind reference in English and a variety of other languages, Chierchia assumes certain **type shift** operations. For NP denotations, Partee (1987) proposed a number of type shift rules between the recognized NP types of entity, predicate, and quantifier, like the type shift ∃ that maps a predicate to a quantifier, the type shift ι that maps a predicate to an individual, or the type shift BE that maps an indefinite quantifier to a predicate. Intensional versions of these shifts are given in (30.a,b,c).

(30) a. ∃: $\underline{P} \Rightarrow \lambda w \lambda P \exists x[\underline{P}(w)(x) \wedge P(x)]$
b. ι: $\lambda w \lambda y[y \leq x] \Rightarrow \lambda w[x]$ (undefined for other predicates)
c. BE: $\lambda w \lambda P \exists x[\underline{P}\mathbf{(w)}(x) \wedge P(x)] \Rightarrow \underline{P}$,
or more generally, $\underline{Q} \Rightarrow \lambda w \lambda x \forall P[\underline{Q}(w)(P) \rightarrow P(x)]$

Type shifts can be indicated by overt determiners. In English, the indefinite determiner *a* indicates ∃, and the definite determiner *the* indicates ι. But type shift can also happen without overt marking, if the linguistic context requires it, by coercion. Coercion is constrained by a **blocking** principle that says that if a language has overt means to express a type shift, then they have to be used. This explains some of the variation that we find in the structure of the NP (or DP) in different languages: In English, ∃ and ι cannot apply freely because of the presence of *a* and *the*; however, ∃ can apply with plurals and mass nouns, which do not combine with *a*. Italian also has a plural indefinite determiner, the partitive article *dei*, as in *dei cani* 'dogs', hence ∃ cannot apply freely with plurals either. Slavic languages don't have any articles, hence ∃ and ι can apply freely. In a language that has only one type of article, like Hebrew, which only has a definite article, this article has to be used to express the corresponding type shift, whereas the other type shift is free.

Chierchia's operators can also be seen as type shifters: $^{\cup}$ maps kind individuals to properties, cf. (31.a), and $^{\cap}$ maps those properties that correspond to kinds to their kind individual, cf. (31.b). As far as we know, there is no language that has specialized determiners for these type shifters, hence they are not restricted by the blocking principle, and can always apply freely.

(31) a. $^{\cup}$: $k \Rightarrow \lambda w \lambda x[x \leq k(w)]$, if $k \in K$, else undefined.
b. $^{\cap}$: $\underline{P} \Rightarrow \lambda w[\iota \underline{P}(w)]$, if $\lambda w[\iota \underline{P}(w)] \in K$, else undefined.

In addition to the presence or absence of overt determiners, languages also differ in the way how arguments of verbal predicates can be filled, and how nominals can be interpreted. Chierchia captures this with two binary features: NP[±arg] relates to the variation whether nouns can or cannot be **arguments** (that is, refer to entities), and NP[±pred] to the variation whether nouns can or cannot be **predicates**. For example, in Chinese nouns denote kind entities and hence can be arguments, but they cannot directly be predicates; in Romance the situation is reversed; and in English mass nouns denote kind entities whereas bare plurals basically denote predicates. This feature system strikes me as something that should be eliminated if we can capture its intended effects by type shifts, overt articles and the blocking principle.

Let us now discuss various types of predications within Chierchia's theory, for English. We start with **regular kind predications** that involve predicates that select for kinds. Chierchia assumes that mass nouns directly refer to kinds, hence no shift is necessary, cf. (32.a). Count nouns basically denote predicates, but they can refer to kinds by free type shift with the down operator, which requires a plural form, cf. (32.b,c). Recall that kind individuals are individual concepts that are also atomic individuals, hence they can fill the argument slots of predicates.

(32) a. Gold is a metal. $\lambda w[\text{METAL}(w)(\text{AUREUM})]$
b. Dodos are extinct. $\lambda w[\text{EXTINCT}(w)(^{\cap}\text{DODOS})]$
c. *Dodo is extinct. $*\lambda w[\text{EXTINCT}(w)(^{\cap}\text{DODO})]$, as $^{\cap}\text{DODO}$ is undefined.

Characterizing statements need a restrictor for their quantificational operator. It can be provided by kind-denoting NPs if they are shifted to their corresponding property by the up operator $^{\cup}$. Chierchia assumes analyses like (33.a) for mass nouns and (33.b) for count nouns; notice that the bare plural is shifted back to the property use.

(33) a. Gold is shiny. $\lambda w[\text{GEN}(w)(^{\cup}\text{AUREUM})(\text{IS\_SHINY})]$
b. Lions have a mane. $\lambda w[\text{GEN}(w)(^{\cup\cap}\text{LIONS})(\text{HAVE\_A\_MANE})]$

By this analysis, the kind-referring analysis of bare NPs is made compatible with the view that characterizing statements have a quantificational structure. But there are is a problem that I would like to point out: It is not clear what prevents simpler derivations like (34.a) for sentences with bare plurals. And if this is possible, we cannot prevent the derivation of sentences with bare singular count nouns, like (34.b)

(34) a. Lions have a mane. $\lambda w[GEN(w)(\text{LIONS})(\text{HAVE\_A\_MANE})]$
b. *Lion has a mane. $\lambda w[GEN(w)(\text{LION})(\text{HAVE\_A\_MANE})]$

3.3 Derived Kind Predications

Let us now consider NPs in non-generic sentences. Chierchia follows Carlson in assuming that bare NPs in such sentences, at least at some stage in the derivation, denote kinds. In contrast to Carlson's original theory, the introduction of specimens is not accomplished by an existential quantifier inherent in the meaning of the verbal predicate, but by the **derived kind predication** rule (the DKP rule, in short), cf. (35). An episodic sentence with a bare plural NP is interpreted as in (36).

(35) DKP rule: If the verbal predicate **P** applies to objects, and k denotes a kind,
then $\lambda w[\mathbf{P}(w)(k)] \Leftrightarrow \lambda w \exists x[^{\cup}k(w)(x) \wedge \mathbf{P}(w)(x)]$

(36) a. Dogs are barking.
b. *$\lambda w[\text{BARKING}(w)(^{\cap}\text{DOGS})]$, due to sortal mismatch.
c. By DKP rule: $\lambda w \exists x[^{\cup\cap}\text{DOGS}(w)(x) \wedge \text{BARKING}(w)(x)]$
$= \lambda w \exists x[x \leq \iota\text{DOGS}(w) \wedge \text{BARKING}(w)(x)]$

By the DKP rule bare NPs have narrow scope, if we assume that it is triggered as late as possible in the derivation – that is, when an argument position of a predicate that selects for an object is to be filled with a kind. Consider (37), with a logical form in which *dogs* is LF-moved, thus suggesting a wide-scope interpretation, as in (37.a), where I use conventions of Heim & Kratzer (1998). In the interpretation, cf. (37.b), the basic meaning of the subject, DOGS, will be shifted to $^{\cap}$DOGS, in order to satisfy the type requirements of the verbal predicate. After applying $\lambda x[\neg[\text{SEE}(w)(x)(\text{J})]]$ to it, we get the representation in (37.c). This is the point where the sortal conflict between the requirement of the predicate and the nature of the argument matters. The DKP rule for the object position will apply, resulting in the meaning (37.d), which is equivalent to (37.e).

(37) John didn't see dogs.
a. LF: [dogs λ1[John didn't see t_1]]
b. interpretation:$\lambda w[\lambda x[\neg[\text{SEE}(w)(x)(\text{JOHN})]](^{\cap}\text{DOGS})]$
(after type shift DOGS $\Rightarrow$ $^{\cap}$DOGS, to satisfy type requirement)
c: after application: $\lambda w \neg[\text{SEE}(w)(^{\cap}\text{DOGS})(\text{JOHN})]$
d. after DKP: $\lambda w \neg \exists x[^{\cup\cap}\text{DOGS}(w)(x) \wedge \text{SEE}(w)(x)(\text{JOHN})]$
e. $= \lambda w \neg \exists x[[\text{DOG}(w)(x) \vee \text{DOPS}(w)(x)] \wedge \text{SEE}(w)(x)(\text{JOHN})]$

Contrast this with indefinite singulars like *a dog*. The logical form in which *a dog* is moved over negation, cf. (38.a), will result in an interpretation in which the indefinite has wide scope, cf. (38.b,c).

(38) John didn't see a dog.
a. LF:[a dog λ1[John didn't see t_1]]
b. interpretation: $\lambda w[\lambda P \exists x[\text{DOG}(w)(x) \wedge P(x)](\lambda x[\neg[\text{SEE}(w)(x)(\text{J})])]$
c. after application: $= \lambda w \exists x[\text{DOG}(w)(x) \wedge \neg[\text{SEE}(w)(x)(\text{J})]]$

The DKP rule is problematic on two counts: First, it is not couched in the general format of Chierchia's account, which makes heavy use of type shifts. This can be remedied; the semantic changes involved in it are as follows:

(39) DOG $\Rightarrow$ DOGS $\Rightarrow$ $^{\cap}$DOGS $\Rightarrow$ $^{\cup\cap}$DOGS $\Rightarrow$ $\exists^{\cup\cap}$DOGS
pluralization type requirement DKP-rule DKP-rule

But now the second problem appears: The type shifts involved in derived kind predications are overly complex, and it is difficult to see how they can be motivated by general principles of type shifting. The first shift in (39) is explicitly triggered by pluralization. The second shift, to $^{\cap}$DOGS, is not immediately motivated, because the resulting structure, BARKING(w)($^{\cap}$DOGS), could not be interpreted due to a sortal conflict: The predicate BARKING(w) expects an ordinary object, not a

kind. Hence $^{\cap}$DOGS has to be modified by the DKP rule, which combines two type shifts: The first one, to $^{\cup\cap}$DOGS, also does not lead to an interpretable structure, as BARKING(w)($^{\cup\cap}$DOGS) is still not well-formed. Only after shifting the property $^{\cup\cap}$DOGS to a quantifier by $\exists$ do we get a well-formed representation, λw[[$\exists^{\cup\cap}$DOGS](w)(BARKING)]. The problem is that the second and third shift in (39) are not locally triggered: they are neither enforced by an overt operator, nor do they lead to an interpretable structure.

We may perhaps entertain type-shift systems in which type shifts do not have to lead to locally interpretable structures, provided that the overall result is interpretable. Still, we would like to assume that in general, simpler shifts are preferred over more complex ones. Now, there is a considerably simpler sequence of type shifts that in addition leads to locally interpretable structures, and can account for the reading of sentences like *Dogs are barking*. It is given in (40).

(40) DOG $\Rightarrow$ DOGS $\Rightarrow \exists$DOGS
pluralization type requirement

Consider (41) as an example. As before, the straight interpretation (41.a) does not work out, this time due to a type clash: The verbal predicate expects an entity, but DOGS(w) is a set. The remedy is to shift the meaning of DOGS to a quantifier, using $\exists$, which has the consequence that the verbal predicate will become an argument, cf. (41.b). This is an interpretable structure, and can be simplified to (41.d).

(41) Dogs are barking.
a. *λw[BE_BARKING(w)(DOGS(w))] , due to type clash.
b. λw[[$\exists$(DOGS)](w)(BE_BARKING(w))], after type shift DOGS $\Rightarrow \exists$DOGS
c. = λw[λP′$\exists$x[DOGS(w)(x) $\wedge$ P′(x)](BARKING(w))]
d. = λw$\exists$x[DOGS(w)(x) $\wedge$ BARKING(w)]

Chierchia is aware of the possible derivation (41), but he considers the DKP derivation (36) preferable because the shift by the down operator, $^{\cap}$, which is responsible for the detour that this derivation takes, is more meaning preserving that the existential shift by $\exists$. The reason is that $\exists$ adds existential import; it claims the existence of an entity of a particular type. But notice that a derivation like (36) requires existential import at the end of the day anyway, by the DKP rule.

Chierchia assumes that the type shifts sequence (40) applies in cases in which a nominal predicate does not correspond to a kind like *parts of that machine* or *persons in this building*, cases already identified by Carlson (1977). In contrast to nouns that correspond to kinds, we find wide-scope readings of bare NPs in such cases. Section 4.2 will present another explaination of the behavior of such NPs.

3.4 Singular definite kind terms

Chierchia also offers an interesting proposal for singular definite kind terms as in *the dodo is extinct*, partly following Dayal (1992), cf. also Dayal (2002). Definite generic NPs refer to **singular kinds** that pick out, for each world, a **group** individual, a special type of atomic individual. Group individuals were proposed by Link (1983) and Landman (1989) as the referents of collective NPs like *the Jones family* that are distinct from sum individuals, like the individuals picked out by *the members of the Jones family*. Even though group individuals are related to members, they are atomic, as argued for in Barker (1992). In particular, collective NPs do not allow predicates that explicitly refer to the number of its members, in contrast to sum individuals, cf. (42). They share this property with singular kind NPs, in contrast to regular kind NPs, cf. (43), as observed in Kleiber (1989).

(42) a. *The Jones family is numerous.
b. The members of the Jones family are numerous.

(43) a. *The tiger is numerous. b. Tigers are numerous.

Chierchia proposes a "massification" operator MASS that applies to the meaning of singular count nouns, like DOG, so that MASS(DOG(w)) refers to atomic dogs and sum individuals of dogs in w. There is also a group-formation operator g that maps plural individuals to atomic groups that have the atomic parts of the plural individual as their members. The meaning of definite generic *the dodo* is illustrated in (44).

(44) [*the dodo*] = λw[g(ιMASS(DODO(w))]

We now can account for differences with *numerous* predications. (45.a) says that the sum individual of all dodos in the world w has the property of being numerous in w, which is fine. (45.b) says that the group individual representing all dodos in the world w is numerous in w, which is not good, as this individual is an atom.

(45) a. Dodos are numerous. = λw[NUM(w)(∩DODOS(w))
= λw[NUM(w)(ι[DODOS(w)])]
b. *The dodo is numerous. = λw[NUM(w)(λw′[g(ιMASS(DODO(w′))](w)]
= λw[NUM(w)(g(ιMASS(DODO(w′))))]

We have already seen that singular kinds can also be the object of regular kind predications, as in example (46.a), which now is analyzed as in (46.b).

(46) a. The dodo is extinct. b. λw[EXTINCT(w)(λw[g(ιMASS(DODO(w)))])]

For this analysis to work, we must assume that not only regular kinds, like ∩DODOS, are elements of the subset K of atomic individuals, but also singular kinds like λw[g(ιMASS(DODO(w)))]. This proliferation of kind individuals should be avoided if we just consider regular kind predications (but see Dayal 2002 for other uses).

If this analysis is couched in a type-shift framework, it is unclear what could trigger the shift to the required meaning for expressions like *the dodo*. If the basic meaning of *the dodo* is ιDODO, then a shift to the meaning λw[g(ιMASS(DODO(w)))] would be fairly complex due to the presence of the MASS operator. An alternative is that the definite article *the*, in addition to its ordinary meaning ι, also has a meaning ι* = λwλP[g(ιMASS(P))] that, when applied to a singular count noun like *dodo*, yields the required meaning that denotes a singular kind. But then we should expect that some languages lexicalize ι*, yet a generic definite article has not been found.

Consider now singular definite kind-referring NPs in characterizing statements, which are analyzed by assuming that the restrictor of the quantifier is specified by the members of the group denoted by the NP, as in (47). Here, $\leq_m$ is the membership relation. The sentence says that generally, members of the group that corresponds to the sum of dodos have a black beak.

(47) The dodo has a black beak.
λw[GEN(w)(λwλx[x $\leq_m$ g(ιMASS(DOG(w)))])(HAS_A_BLACK_BEAK)]

In a type-shift framework, the introduction of members should be enforced by a general type shifter $\cup_m$ that is like the up operator $\cup$, except that it makes use of the member relation $\leq_m$ instead of the part relation ≤.

(48) $\cup_m$s = λwλx[x $\leq_m$ s(w)], if s is a singular kind, else undefined.

It is unclear, however, how the restrictions for definite generic NPs in characterizing statements should be accounted for, which were illustrated in (1.b) and (4.a). It appears that we have to distinguish between two types of characterizing statements: Those that make **inductive generalizations**, and those that express **rules or regulations**, including definitions, cf. Carlson (1995), Cohen (2002). While indefinite singular NPs and probably also bare singular NPs occur in either type, definite generic NPs do not occur in the rule or regulation type:

(49) a. A gentleman opens doors for ladies.
b. Gentlemen open doors for ladies.
c. *The gentleman opens doors for ladies.

Consider now episodic sentences like (50). There are two interpretations that are theoretically possible: (50.a), saying that the group individual representing all the dogs in w is barking in w. Or (50.b): The original representation (i) is not interpretable, but a rule similar to the DKP rule, using the type shift $\cup^{m}$ and $\exists$, cf. (ii), leads to an (iii) which is true in w if one or more dogs in w are barking in w.

(50) The dog is barking outside.
- a. $\lambda w[\text{BARKING}(w)(\lambda w'[g(\iota\text{MASS}(\text{DOG}(w')))](w))]$
  $= \lambda w[\text{BARKING}(w)(g(\iota\text{MASS}(\text{DOG}(w))))]$
- b. i. $*\lambda w[\text{BARKING}(w)(\lambda w'[g(\iota\text{MASS}(\text{DOG}(w')))])]$
  ii. $\lambda w[\exists[^{\cup m}\lambda w'[g(\iota\text{MASS}(\text{DOG}(w')))]](w)(\text{BARKING}(w))]$
  iii. $= \lambda w \exists x[x \leq_m g(\iota\text{MASS}(\text{DOG}(w)) \wedge \text{BARKING}(w)(x)]$

Interpretation (50.a) is certainly not natural to express that all the dogs are barking, perhaps because there are simpler ways to express this. But this type of interpretation might be suitable to express certain kind predications discussed in Krifka et. al. (1995). It is what is required for collective predications as in *The American customer bought 74.000 BMWs last year*. It is also plausible for avantgarde interpretations as in *The rat reached Australia in 1770*, as we can attribute important properties of group members to the group, cf. *The Rothschild family established a banking house in Paris in 1812*. Interpretation (50.b) is impossible altogether, thus posing a problem for this approach.

4. Elements of a revised theory for bare NPs

Let me now discuss an alternative to Chierchia (1998) that overcomes many of the problems mentioned above, while remaining quite close in spirit to this work. In particular, it will work with the assumption that NP denotations can be type shifted, and that free type shifts are blocked by the existence of overt determiners.

In the following, I will pay closer attention to the compositional derivation of expressions. Binary branching constituents $[\alpha\ \beta]$ are interpreted as follows:

(51) $[[\alpha\ \beta]]$
- a. $= \lambda w[\{[\alpha](w), [\beta](w)\}]$
- b. $= \lambda w[[\alpha](w)([\beta](w))]$ or $\lambda w[[\beta](w)([\alpha](w))]$, whatever well formed.
- c. if b fails: $= \lambda w[\{\text{TS}([\alpha])(w), [\beta](w)\}]$ or $\lambda w[\{[\alpha](w), \text{TS}([\beta])(w)\}]$,
  where TS is a suitable type shift operation.

(51.a) says that the resulting meaning is always an intension, a function from possible worlds w, which is a function of the extensions of the constituents α and β. This is like in Montague (1973), except that quantification over possible worlds is explicit. The set denotation employed here indicates that it is still undetermined how these meanings are to be combined. (51.b) states that either the extension of α is to be applied to the extension of β, or vice versa. If this fails, (51.c) says that things can be rescued by a suitable type shift operation on one of the meanings of the subconstituents. The set of type shifters should include Partee's and Chierchia's operators.

4.1 The nature of count nouns and plural marking

Recall how Chierchia's theory explains the ungrammaticality of **Dog is barking*. The meaning of *dog* is a property, and properties cannot fill the argument slots of verbal predicates due to a type mismatch. This mismatch cannot be resolved by the down operator $\cap$, as this requires a cumulative property. It cannot be resolved by $\exists$ or ι either, as these shifts are blocked by the overt determiners *a* and *the*. In languages that lack articles, as in Slavic languages, type shifts by $\exists$ and ι are possible; also in languages like Chinese, in which nouns basically denote kinds.

The problems with this account have been discussed in section 3.3 on the DKP rule above. There is a quite different line of explanation that has been proposed in Krifka (1989), and in

Krifka (1995), a comparison between English and Chinese. The basic idea is that count nouns have a **number argument** that can be specified by a number word; mass nouns lack such an argument. This idea is exemplified in (52.a,b). A formula like DOG(w)(n)(x) says that in the world w, the individual x consists of n dogs.

(52) a. [*dog*] = λwλnλx[DOG(w)(n)(x)], = DOG, type ⟨s,⟨n,⟨e,t⟩⟩⟩
b. [*gold*] = λwλx[GOLD(w)(x)], = GOLD, type ⟨s,⟨e,t⟩⟩

More specifically, count nouns denote **extensive measure functions**, like *gallon* or *mile*: They relate a given entity to maximally one number, cf. (53.a), and they are additive, cf. (53.b), illustrated for *dog*. Additivity requires that if x is a sum individual consisting of n dogs, and y is a sum individual consisting of m dogs, and x and y do not overlap, then the sum x⊕y is a sum individual consisting of n+m dogs.

(53) a. If DOG(w)(n)(x) and DOG(w)(m)(x), then n=m.
b. If DOG(w)(n)(x), DOG(w)(m)(y) and x, y do not overlap,¬∃z[z≤x ∧ z≤y]),
then DOG(w)(n+m)(x⊕y).

The number arguments can be filled by number words, as in (54.a,b):

(54) a. [*one dog*]
= λw[[*dog*](w)([*one*](w))]
= λw[λnλx[DOG(w)(n)(x)](1)]
= λwλx[DOG(w)(1)(x)]

b. [*two dogs*]
= λw[[*dog*](w)([*two*](w))]
= λw[λnλx[DOG(w)(n)(x)](2)]
= λwλx[DOG(w)(2)(x)]

The difference in the grammatical number of the noun is a matter of syntactic **agreement** with the number word. Evidence for this comes from two facts. First, decimal fractions always trigger plural agreement, even for the number word *one point zero*, which presumably has the same meaning as *one*, as 1.0 = 1 is a mathematical fact. (There are differences in admitted vagueness, cf. Krifka (2002)).

(55) American households have, on average,
zero point seven {cats / *cat} and one point zero {dogs / *dog}.

Secondly, there are many languages that have distinct plural forms for count nouns but lack agreement with number words. See (56) for Hungarian examples.

(56) a. egy kutya
one dog
‘one dog’

b. két kutya
two dog
‘two dogs’

c. kutyák
dog.PL
‘dogs’

d. a kutya
the dog
‘the dog’

e. a kutyák
the dog.PL
‘the dogs’

NPs consisting of count nouns with a specified number argument denote predicates that are quantized. That is, if the NP *seven cats* refers to an entity x, then it cannot apply to proper parts of x, or to individuals that have x as a proper part. This follows from the fact that count nouns express measure functions. With mass nouns, quantized predicates can be built with explicit measure functions, such as *gallon*:

(57) [*three gallons of milk*]
= λwλx[[*three gallons*](w)(x) ∧ [*milk*](w)(x)]
= λwλx[GALLON(w)(3)(x) ∧ MILK(w)(x)]

Classifier languages, like Chinese, don’t have count nouns and rely on measure constructions for expressing quantization in general. The classifier is a measure function that may be interpreted either as a measure of the number of atoms of an entity, cf. (58.a), or as a measure function that is characteristic for the meaning of the head noun, called a “Natural Unit” (NU) in Krifka (1995), cf. (58.b).

(58) san ben shu 'three CL book'
a. λwλx[ATOM(w)(3)(x) ∧ BOOK(w)(x)]
b. λwλx[[NU(BOOK)](w)(3)(x) ∧ BOOK(w)(x)]

The difference between count noun constructions like *three books*, and classifier constructions like *san ben shu*, then is the following: In count noun constructions, the unit of measurement is part of the lexical meaning of the noun; in classifier constructions, the unit of measurement is expressed by a separate lexical element.

In addition to the agreement plural which shows up in forms like *two dogs*, English also has a **semantic plural** that is responsible for bare plural NPs. This is the plural we also find in Hungarian. As the number argument is not filled overtly, plural morphology does the job, creating a property. This number argument can either be specified as greater than 1, cf. (59.a), or be left unspecified, as in (59.b).

(59) [*dog-s*] = λw[[*-s*](w)([*dog*](w))]
a. = λw[λRλx∃n>1[R(n)(x)](DOG(w))], = λwλx∃n>1[DOG(w)(n)(x)]
b. = λw[λRλx∃n[R(n)(x)](DOG(w))], = λwλx∃n[DOG(w)(n)(x)]

There is ample evidence that the latter version is right. For example, a question like *Do you have dogs?* can be answered by *Yes, one*, but not by *No, only one*. This contrasts with questions like *Do you have more than one dog?*, which can be answered by *No, only one*. Also, notice that *John doesn't have dogs* is false if John has one dog; again, *John doesn't have more than one dog* is true in this situation. Also, *If Mary has cats, then John cannot stay with her, as he is allergic* entails that even if Mary just has one cat, John cannot stay with her, in contrast to *If Mary has more than one cat, John cannot stay with her*. True, a person that points to one dog and says *See, there are dogs!* would have expressed something that is true. However, the oddness of this statement can be traced back to the fact that there is a more specific expression, and one that is about equally complex, namely *a dog*.

Other languages may have, in addition to the semantic plural in (59), a **semantic singular** that specifies the number argument of the NP with the number 1. For example, in Slavic languages like Czech we find bare singulars and bare plurals, cf. (60.a,b). I assume that these languages have a singular operator SG, cf. (61), where SG operates on the noun stem *ps*, resulting in the singular form *pes*.

(60) a. štekal pes.
barked dog
'A dog was barking.'

b. štekal-i psi.
barked-PL dogs
'Dogs were barking.'

(61) [*pes*] = [*ps*-SG] = λw[[SG](w)([*ps*](w))]
= λw[λRλx[R(1)(x)](DOG(w))], = λwλx[DOG(w)(1)(x)]

Following the observation of Dayal (2002) cited in (19), there might be additional meaning components that come with bare singulars, in particular uniqueness presuppositions with respect to a given situation. This would not be too surprising, as bare singulars are semantically more specific than bare plurals. Condoravdi (1992) has pointed out a similar effect with certain uses of bare **plurals** as in (62), where *students* refers to the students of the campus.

(62) A serial killer haunted the campus. Students were aware of the danger.

Such additional meaning components arise when the bare NP is in topic position, cf. section 4.4 for the relevance of information structure.

Let me summarize this section. Under the theory developed here, singular count nouns like *dog* differ in semantic type from plural count nouns like *dogs*, mass nouns like *milk*, or nouns with explicit number words like *one dog* or *two dogs*: Singular count nouns are functions from numbers to predicates, the other expressions are predicates. This explains the puzzle we set out with, why singular count nouns cannot occur as arguments. Singular count nouns are not of the proper type,

the type of predicates. No recourse to a restriction of kind formation to cumulative properties is necessary.

4.2 The articles, and an explanation of narrow-scope phenomena

Let us turn to the treatment of the articles. The definite article *the* can be combined with singular count nouns, as in *the dog*, with mass nouns, as in *the milk*, with plural nouns, as in *the dogs*, and with nouns whose number argument is filled by a number word, as in *the three dogs*. As the type of singular count nouns differs from the rest, we assume two versions of the definite article: One that combines with predicates, cf. (63), and another one that combines with number relations, cf. (64).

(63) a. [*the*] = λwλP[ιP]
b. [*the dogs*] = λw[[*the*](w)([*dogs*](w))]
= λw[λP[ιP](λx∃n[DOG(w)(n)(x)])]
= λw[ιλx∃n[DOG(w)(n)(x)]]
c. [*the* [*three dogs*]] = λw[ι[DOG(w)(3)]]

(64) a. [*the*] = λwλR[ιR(1)]
b. [*the dog*] = λw[[*the*](w)([*dog*](w))]
= λw[λR[ιR(1)](DOG(w))]
= λw[ιλx[DOG(w)(1)]]

(63.b) is defined for worlds in which there are dogs, (63.c) is defined for worlds in which there are exactly three dogs, and (64.b) is defined for wolds in which there is exactly one dog. A unified analysis of the definite article may be possible if we assume that in cases the number word is not specified, the argument slot is filled by 1. There is independent evidence for such a default rule: Cheng & Sybesma (1999) report that in Cantonese, the lack of specification of a number word in a classifier construction is interpreted by 1. I leave it for future research to investigate this option. – As an example for the derivation of a sentence meaning, consider (65); it maps worlds w to truth if the single dog in w is barking in w, to falsity if the single dog in w is not barking in w, and is undefined if there is no dog or more than one dog.

(65) [[[*the dog*] [*is barking*]]]
= λw[[*is barking*](w)([*the dog*](w))]
= λw[BE_BARKING(w)(ιλx[DOG(w)(1)])]

As for the indefinite article *a*, the simplest analysis might be that it is a variant of the number word *one*, meaning '1'. After all, indefinite articles generally develop from the number word 'one', and often still are homophonous with it. The only difference is that *one*, as a number word, is pragmatically related to alternative number words, which can lead to scalar implicatures, whereas *a*, as an article, is pragmatically related to the definite article. This leads to different kinds of implicatures: *John saw one dog* implicates that John didn't see more than one, and *John saw a dog* implicates that the dog is not unique or salient.

However, *a* differs in another respect from number words: Whereas constructions like *the one dog* are fine, **the a dog* isn't. While we can attribute this to an incompatibility of the implicatures of *the* and *a*, we also can rule it out syntactically, by saying that *the* and *a* occupy the same syntactic slot, which is different from the one that number words occupy in constructions like *the one dog*. Following the DP analysis of nominal expressions, as initiated by Abney (1987), we assume syntactic structures like (66):

(66) a. [$_{DP}$ *the* [$_{NP}$ *one* [$_{N}$ *dog*]]]
b. [$_{DP}$ *the* [$_{NP}$ *two* [$_{N}$ *dogs*]]]
c. [$_{DP}$ *the* [$_{NP}$ [$_{N}$ *milk*]]]
d. [$_{DP}$ *the* [$_{NP}$ _ [$_{N}$ *dog*]]]
e. [$_{DP}$ *a* [$_{NP}$ _ [$_{N}$ *dog*]]]

Articles, and other true quantifiers like *every*, *all*, *most* and *no*, form the head of the DP, whereas number words are specifiers of count nouns. They are licensed there because they fill the number slot. Singular determiners like singular *the*, the indefinite article *a*, but also quantifiers like *every* or

singular *no*, do double duty: they contribute their quantifier or determiner meaning and satisfy the number argument of the count noun by 1. In particular, the meaning of the indefinite article can be given as in (67); see (68) for an example derivation of a sentence.

(67) a. [*a*] = $\lambda w \lambda R \lambda P \exists x[R(1)(x) \wedge P(x)]$
b. [*a dog*] = $\lambda w[[a](w)([dog](w))]$
= $\lambda w[\lambda R \lambda P \exists x[R(1)(x) \wedge P(x)](\text{DOG}(w))]$
= $\lambda w \lambda P \exists x[\text{DOG}(w)(1)(x) \wedge P(x)]$

(68) [[[$_{\text{DP}}$ *a dog*] [*is barking*]]]
= $\lambda w[[a\ dog](w)([is\ barking](w))]$
= $\lambda w[\lambda P \exists x[\text{DOG}(w)(1)(x) \wedge P(x)](\text{BE\_BARKING}(w))]$
= $\lambda w \exists x[\text{DOG}(w)(1)(x) \wedge \text{BE\_BARKING}(w)]$

This theory implies a meaningful relation between syntactic categories and semantic types: DPs have meanings that can directly be combined by functional application with verbal predicates; they are either referring expressions or quantifiers. And NPs are predicates that cannot directly be combined with verbal predicates.

Let us now turn to bare NPs, as in *Dogs are barking*. We have a type mismatch that has to be resolved. Type shift by ∃ allows for the following derivation:

(69) [[[$_{\text{NP}}$ *dogs*] [*are barking*]]]
a. = $\lambda w[\{[dogs](w),\ [be\ barking](w)\}]$, functional application impossible
b. Type shift: [*dogs*] ⇒ ∃[*dogs*], = $\lambda w \lambda P \lambda x[[dogs](w)(x) \wedge P(x)]$
c. = $\lambda w[\exists[dogs](w)([be\ barking](w))]$
d. = $\lambda w \exists x[\exists n[\text{DOG}(w)(n)(x)] \wedge \text{BE\_BARKING}(w)]$

We would have arrived at a similar result with a non-overt determiner with the meaning of the type shifter ∃. However, if we follow Chierchia and assume that type shifting occurs as late, or as locally, as possible, only when the mismatch between the NP and the verbal predicate becomes apparent, type shifting predicts that bare NPs have narrow scope. To see this, consider the example *dogs aren't barking*, in which *dogs* is moved over negation. I assume that χ_1 is a type-neutral variable.

(70) [[*dogs* λ1[*aren't* [t_1 *barking*]]]]
a. = $\lambda w[[\lambda 1[aren't\ t_1\ barking]](w)([dogs](w))]$
b. = $\lambda w[\lambda \chi_1[[aren't\ t_1\ barking]^{t1 \to \chi 1}(w)([dogs](w))]$
c. = $\lambda w[\lambda \chi_1[[aren't]^{t1 \to \chi 1}(w)([t_1\ barking]^{t1 \to \chi 1}(w))]([dogs](w))]$
d. = $\lambda w[\lambda \chi_1[\lambda p[\neg p](\{[t_1]^{t1 \to \chi 1}, [barking]^{t1 \to \chi 1}(w)\})([dogs](w))]$
e. = $\lambda w[\lambda \chi_1[\lambda p[\neg p](\{\chi_1, \text{BE\_BARKING}(w)\})([dogs](w))]$
f. = $\lambda w[\lambda p[\neg p](\{[dogs](w), \text{BE\_BARKING}(w)\})]$, application impossible
g. type shift by ∃: $\lambda w[\lambda p[\neg p](\{[\exists[dogs](w), \text{BE\_BARKING}(w)\})]$
h. = $\lambda w[\lambda p[\neg p](\lambda P \exists x[[dogs](w)(x) \wedge P(x)](\text{BE\_BARKING}(w)))]$
i. = $\lambda w[\lambda p[\neg p](\lambda P \exists x[\exists n[\text{DOG}(w)(n)(x)] \wedge P(x)](\text{BE\_BARKING}(w)))]$
j. = $\lambda w[\lambda p[\neg p](\exists x[\exists n[\text{DOG}(w)(n)(x)] \wedge \text{BE\_BARKING}(w)]])]$
k. = $\lambda w[\neg \exists x[\exists n[\text{DOG}(w)(n)(x)] \wedge \text{BE\_BARKING}(w)]]$

In (70.a-f), the expressions are interpreted in the usual compositional fashion. For (d), notice that the meaning of traces are generally not world-dependent, and the meaning of lexical constants are not dependent on variable assignments. After applying the meaning of λ1[*aren't* t_1 *barking*] to [*dogs*](w), we have to compute the meaning of {[*dogs*](w), BE_BARKING(w)}. The type mismatch can be resolved by type shift of [*dogs*] using ∃, cf. (70.g), which finally leads us to the representation (70.k), in which negation has wide scope over the existential quantifier.

It is important for this derivation that type shifts occur locally. For this the variable representing the subject trace must not be typed. This predicts that with quantificational subjects, as in *A dog isn't barking*, we have two possible readings, as illustrated in (71). If the variable is of the type of entities, we arrive at the representation (71.c.i), in which the quantifier scopes over

negation. If the variable is of the type of quantifier, we get the representation (71.c.ii), in which the quantifier is reconstructed in the position of the subject, and negation scopes over the quantifier.

(71) a. [[[*a dog*] λ1[*isn't* [t_1 *barking*]]]]
b. = λw[{[*a dog*](w), [λ1[*isn't* [t_1 *barking*]]]}]
c. = λw[{λPΞx[DOG(w)(1)(x) ∧ P(x)], λχ_1[¬[{[t_1]$^{t1\rightarrow\chi1}$, BARKING(w)}]]}]
i. take χ_1 as a variable for entities, x_1:
λw[λPΞx[DOG(w)(1)(x) ∧ P(x)](λx_1[¬[BARKING(w)(x_1)])]
= λwΞx[DOG(w)(1)(x) ∧ ¬[BARKING(w)(x)]]
ii. take χ_1 as a variable for quantifiers, Q_1:
λw[λQ_1[¬[Q_1(BARKING(w))]](λPΞx[DOG(w)(1)(x) ∧ P(x)])]
= λw[¬[λPΞx[DOG(w)(1)(x) ∧ P(x)](BARKING(w))]]
= λw[¬Ξx[DOG(w)(1)(x) ∧ BARKING(w)]]

We may assume that in general, lower-type variables are preferred, which would predict the preference for the wide-scope interpretation of the quantifier.

Instead of the type shift by Ξ, we could also assume a type shift of the verbal predicate to make it applicable to a nominal predicate, like BE_BARKING ⇒ λwλPΞx[BE_BARKING(w) ∧ P(x)], as proposed by van Geenhoven (1998). The predictions would be exactly the same as with local type shift of nominals by Ξ.

Our strategy of interpreting bare NPs could also be applied to indefinite NPs with number words, such as *two dogs*, as they have the same semantic type as bare NPs like *dogs*. This would predict a narrow-scope interpretation of such NPs. However, we do find a wide-scope interpretation for sentences like *Two dogs aren't barking*, which is even the preferred reading. This means that NPs like *two dogs* cannot get their interpretation by type shifting. Rather, we should assume that number words can also be interpreted like determiners, with existential force, as in (72). The derivation of sentences like (73) is exactly parallel to (68).

(72) a. [[$_D$ *two*]] = λwλRλPΞx[R(2)(x) ∧ P(x)]
b. [[$_{DP}$ [$_D$ *two*] [$_{NP}$ _ [$_N$ *dogs*]]]] = λw[[*two*](w)([*dogs*](w))]
= λw[λRλPΞx[R(2)(x) ∧ P(x)](DOG(w))]
= λwλPΞx[DOG(w)(2)(x) ∧ P(x)]

(73) [[[$_{DP}$ [$_D$ *two*] [$_{NP}$ _ [$_N$ *dogs*]]] [*are barking*]]]
= λwΞx[DOG(w)(1)(x) ∧ BE_BARKING(w)]

Analyzed in this way, we predict that wide-scope interpretations of expressions like *two dogs* are possible. The fact that they are preferably interpreted with wide scope can be taken to indicate that they have to be interpreted as DPs, and not as NPs, if possible. The general reason for this is that the DP interpretation avoids the otherwise necessary type shift.

The type-shift account for bare plurals, in either the version developed here or in Chierchia's original version, appears problematic because there is an indefinite plural and mass noun determiner, *some*, as in *some dogs* or *some milk*. Why doesn't *some* block the application of the type shifter Ξ? Following the logic of the blocking principle, *some* must express more than just existential quantification. Possible differences are that *some* (and perhaps indefinite determiners in general) introduce discourse referents (Arik Cohen, pers. comm.), or that *some* introduces a choice function, thus allowing for wide scope interpretations (cf. Chierchia (1999), also von Heusinger (1997), Reinhart (1997), Winter (1997)). Example (74) shows that, even under a narrow-scope interpretation of the subject DP, we get a wide-scope interpretation if the choice function *f*, which maps a predicate P to an entity that P applies to, is existentially bound with wide scope.

(74) [[$_{DP}$ Some [$_{NP}$ [$_N$ dogs]]] aren't barking].
λwΞ*f*[¬[BE_BARKING(w)(*f*(λxΞn[DOG(w)(n)(x)]))]]

We can apply similar reasoning to the case of Brazilian Portuguese (cf. Schmitt and Munn (1999), which has bare singular indefinites in addition to an indefinite article. Bare singulars have narrow

scope, which argues that they undergo existential type shifting, whereas indefinite article induces wide scope readings, which is evidence that they are interpreted by choice functions.

Evidence for the forced choice-function interpretation comes from the fact, observed in Kratzer (1998), that indefinite NPs with the determiner *some* do not allow for characterizing statements, cf. (75). The reason is that the choice function reduces the domain of the generic operator to a singleton, which violates a restriction against quantification, cf. de Swart (1991).

(75) a. Some dog barks. b. Some dogs bark.

Wide-scope readings that cannot be captured by LF movement due to island violations also occur with other indefinite NPs, such as *a dog* or *two dogs*, cf. Abusch (1993). They hardly occur with bare NPs. We can take this as evidence that the choice function are bound to the presence of a determiner, that is, to a DP.

Recall that Chierchia, following Carlson, observed wide-scope interpretations with some bare NPs such as *parts of that machine* and *persons in this building*:

(76) a. Parts of that machine aren't working.
b. The police is looking for persons in this building.

Chierchia argued that such NPs do not correspond to kinds, hence cannot use $\cap$ as a type shifter, and instead use $\exists$. In our current theory, $\exists$ is the regular type shifter for bare NPs, and hence this explanation does not work. But there is an alternative: Observe that these NPs refer to a finite, typically fixed, set of entities. In such cases, the determiner *some*, which otherwise induces specific interpretations in the context of opacity predicates, would receive a **partitive** interpretation, in which it contrasts with other proportional quantifiers such as *most* and *all*. The sentence *Some parts of that machine aren't working* then implicates that not all parts of that machine aren't working, and the sentence *the police is looking for some persons in this building* implicates that the police isn't looking for all persons in this building. As *some* does not have the reading that normally distinguishes it from bare NPs (say, the choice function interpretation), it doesn't block possible type shifts that would lead to such readings. We can assume that choice function readings can be generated by type shifts, but are blocked by choice function *some* in cases like *The police is looking for drug dealers*. We can furthermore assume that *some* has a preferred partitive reading in case the head noun refers to a finite set, as in *persons in this building*. In this case, then, the type shift leading to a choice function interpretation is not blocked by any overt determiner.

4.3 Kind-referring NPs and reflexive and control anaphora

Bare NPs can refer to kinds, cf. (8.a). We follow Chierchia for such cases and assume a type shift by the down operator, $\cap$, now defined as in (77) as a partial individual concept that is defined for those worlds w for which $\underline{P}$ has a greatest element.

(77) $^{\cap}\underline{P} = \lambda w[\iota \underline{P}(w)]$

Predicates like *extinct* have argument slots that require individual concepts, hence their arguments do not have to be applied to a possible world. This is similar to the analysis of verbs like *rise* and *change* in Montague (1973).

(78) [*Dodos are extinct*] $= \lambda w[\{[\textit{be extinct}](w), [\textit{dodos}]\}]$
by type shift: $= \lambda w[[\textit{be extinct}](w)(^{\cap}[\textit{dodos}])]$
$= \lambda w[\text{BE\_EXTINCT}(w)(\lambda w'[\iota \lambda x \exists n[\text{DODO}(w')(n)(x)]])]$

The down operator as defined in (77) is not restricted to cumulative predicates; for example, $^{\cap}$[*one dog*] is defined, and stands for an individual concept that maps every world that has exactly one dog to that dog. There is no need for a converse operator $^{\cup}$ that maps kinds to instances. This is possible because the down operator does less work in the current system: It is only used for true kind predications.

In addition to predicates that strictly apply to kinds, there are predicates that can apply to kinds or to regular objects. Krifka et al. (1995) have identified several such uses, such as the following:

(79) a. Rats reached Australia in 1770.
b. American customers bought 75,000 BMWs last year.

Assuming that predicates like *reach* or *buy* are not intensional like *be extinct* or *invent*, we have the following interpretation:

(80) [*Rats reached Australia in 1770*]
= λw[REACH_AUSTRALIA_IN_1770(w)(∩[*rats*](w))]
= λw[REACH_AUSTRALIA_IN_1770(w)(ιλx∃n[RAT(w)(n)(x)])]

This means, literally, that the sum individual consisting of all rats reached Australia in 1770. While false in an inclusive sense, it is true in the sense that an important property of avantgarde specimens is attributed to the sum of all rats. Notice that we can say *The rats reached Australia in 1770* with a similar interpretation.

Let us turn now to the argument of Rooth (1985) for the kind-referring analysis, the observation that apparently non-generic bare NPs can bind kind-referring reflexives and control PRO, cf. (17), (18). We can deal with such examples by assuming that bare NPs basically denote properties, that reflexives or PRO can instantiate the same property as the antecedent, and that any type shifts are triggered locally. Consider the following example:

(81) Martians$_1$ claimed [PRO$_1$ to be almost extinct].
a. = λw[{[*Martians*](w),
[*claimed*](w)([{[PRO$_1$]$^{\text{PRO1}\rightarrow [\textit{Martians}]}$(w), [*almost extinct*](w)}])}]
b. = λw[{[*Martians*](w),
[*claimed*](w)([{[*Martians*](w), [*almost extinct*](w)}])}]
c. type mismatch (twice) with [*Martians*], requiring type shifts by ∃ and ∩:
= λw[{∃[*Martians*](w),
[*claimed*](w)([{∩[*Martians*](w), [*almost extinct*](w)}])}]
d. = λw[∃[*Martians*](w)(CLAIMED(w)(ALMOST_EXTINCT(w)(∩[*Martians*]))]
e. = λw[λP∃x[∃n[MARTIAN(w)(n)(x) ∧ P(x)]
(CLAIMED(w)(ALMOST_EXTINCT(w)(∩λw′λy∃n[MARTIAN(w′)(n)(y)])))]
f. = λw∃x[∃n[MARTIAN(w)(n)(x) ∧
CLAIMED(w)(ALM_EXTINCT(w)(∩λw′λy∃n[MARTIAN(w′)(n)(y)]))(x)]

In (81.a) *Martians* is interpreted as a property in subject position, and co-indexed with PRO. This is spelled out in (b). Two type shifts are required, the first one shifting the subject to an existential quantifier, the second one shifting PRO to a kind, cf. (c). This leads us to the correct interpretation: There were some Martians x that claimed that the kind Martians are almost extinct. Examples like (14), which imply a mixed object and kind reading, can be treated in a similar way.

4.4 The role of information structure

In cases like (79.a), a type shift by ∃ would be possible as well. Not so for (79.b), which would result in a completely different interpretation. Why does the type shift by ∃ not happen here? I would like to suggest, following Krifka et al. (1995) and Cohen & Erteschik-Shir (2002), that **information structure** plays an important role. In order for type shift by the down operator to occur, the nominal predicate must be a **topic**. The kind-referring readings of (79.a,b) require a prosodic structure typical for topic-comment structures: There are two prosodic phrases, one on the subject, one on the object. Kind-referring readings of bare NPs in object position are disfavored because this is not a regular topic position; cf. **Shockley invented transistors*. Also, in languages with pragmatically determined word order, bare NP subjects are often interpreted as kind-referring when pre-verbal, and as existential when post-verbal, again an effect that can be ascribed to topichood (cf. Doron 2003 for Hebrew, Hindi and Brazilian Portuguese).

Appealing to information structure also helps to explain the observation by Carlson that the nature of the verbal predicate can decide whether a bare NP is interpreted generically or as involving specimens (cf. the first argument in section 2.1). He appealed to a distinction between individual-level and stage-level predicates, which, in other frameworks, corresponds to a distinction between **episodic** predicates with a situation argument, and **stative** predicates without it (cf. Kratzer (1995)). As a general rule of discourse coherence, every sentence must have a topic. The situation argument can satisfy the topic requirement, which is the case in utterances like *Dogs are barking* that are about contextually given situations. The bare NP *dogs* is not a topic, hence can be interpreted by existential type shift. In stative sentences, which do not have a situation argument, another constituent must be the topic. For a sentence like *Dogs are widespread*, the most plausible candidate is the bare NP *dogs*, which then cannot be interpreted by existential type shift $\exists$, and must be interpreted by the generic type shift $\cap$ instead.

Information structure also plays a role in characterizing statements like *Dogs bark* or *A dog barks*. In Krifka (2001) I argued that indefinite NPs in the restrictor have topicality features, and that the restrictor is a topic. The topicality requirement for restrictors can explain the widespread use of definite articles in Romance languages, which is probably due to the fact that deaccenting cannot be used as freely as in English to mark topicality. Also, it can explain certain puzzling complexity requirements for bare NPs in Italian and Spanish, cf. Longobardi (2001), Gutierrez-Rexach & Silva-Villar (2002).

(82) a. Elefanti di colore bianco possono creare grande curiosità.
b. *Elefanti possono creare grande curiosità.
'(White-colored) elephants can create great curiosity.'

(83) a. Minirobots hacen el trabajo con igual cualidad.
b. *Robots hacen el trabajo con igual cualidad.
'(Mini)robots do the job with the same quality.'

Complex bare NPs may form a prosodic phrase on their own; this is necessary for interpreting the phrase in the restrictor of a quantifier (cf. the notions of integration and separation in Jacobs (1999)).

4.5 Definite generic NPs and taxonomic NPs

This article is abolut bare NPs, but let me add some thoughts about definite generic NPs, like *the dog*. While the arguments of Dayal and Chierchia are quite compelling that they involve reference to groups, the meaning of such NPs cannot be derived in a systematic way (cf. section 3.4).

Dayal (2002) makes the interesting proposal that it can be obtained via the **taxonomic** interpretation of count nouns. This use of count nouns refers to kinds instead of regular objects; an example is *There are two bears in Alaska, the black bear and the grizzly*. Krifka et al. (1995) and Krifka (1995) proposed that count nouns also have a reading in which they apply to subspecies. The relation BEAR(w) can be applied to numbers and bear subspecies, e.g. BEAR(w)(1)(URSUS_HORRIBILIS). Dayal proposes in addition that it can be applied to the bear species URSUS itself. The kind-referring use of *the bear* then can be derived by the usual meaning of *the*, as ιx[BEAR(w)(1)(x)], if the domain of quantification, left implicit here, does not contain any bear subspecies or specimens.

In order to adopt this proposal, we assume that the kinds that can be denoted by singular definites are related to **kind individuals**, which are atomic individuals that form a special sort, similar to the set K in Chierchia (1998). I will use the down arrow $\downarrow$ to denote this relation: $\downarrow\lambda w \iota\lambda x \exists n$[BEAR(w)(n)(x)] = URSUS. Comparatively few individual concepts have this double life; this captures the insight that only established kinds can be referred to by definite singulars (cf. *the coke bottle* vs. *the green bottle*; Carlson (1977), attributed to Partee). Consequently, we only have a sortal distinction, and not a type distinction, between the different arguments of a count noun predicate like BEAR(w)(1). We can refer to singular kinds by names, like *Ursus* or *Man* or, following Dayal, by regular definite descriptions like *the bear* if the quantificational domain is suitably restricted. It appears that mass nouns generally can be used as names for atomic kinds,

which explains the lack of articles in sentences like *Gold is shiny*. Presumably, this is because mass nouns are categorized as NPs in syntax, in contrast to count nouns, which are categorized as N due to the more frequent non-generic uses they need to have their number argument filled. German can use definite articles with kind-referring mass nouns, as in *Das Gold glänzt*, which can be explained by the fact that German can use definite articles with names in general, cf. Krifka et al. (1995). In Hebrew, bare singular count nouns can also refer to atomic kinds, cf. Doron (2003), which might indicate a double function of count nouns as measure relations and as names.

What properties do atomic kinds have? I suggest that properties of regular kinds can generally be applied to corresponding atomic kinds; hence we have *the dodo is extinct*. Also, properties that the predicates related to regular kinds have are ascribed to the corresponding atomic kinds; thus we have *the dodo had a purple beak*. General number restrictions have to be followed; so while we have *dodos had a purple beak*, by distributive interpretation, and *dodos had black beaks*, by cumulative interpretation, *the dodo had purple beaks* suggests that a dodo had more than one beak. This is a plausible reason why sentences like **the dodo was numerous* are bad; *numerous* has to be applied to a sum individual, which the atomic kind does not provide. Contrast this with *the dodo was rare*, which can be used with singular generics. This is just as in *A dodo is rare* vs. **A dodo is numerous*. Presumably, *be rare* has to be interpreted as 'it is a rare event to find instances of _', where the blank position can contain anything that has members, elements, or specimens. We have also observed that characterizing sentences of the rule-and-regulations variety cannot be expressed with definite generic NPs, cf. (4.a). Such statements essentially state conditions under which an entity belongs to a class, e.g. whether it is a gentleman or not. For this, we crucially need to refer to the class, which can naturally be done by bare NPs or by indefinites (perhaps via type shift with BE), but not with atomic kinds.

5. Conclusion

This paper set out with the controversy around the semantic nature of bare NPs in English: Are they kind referring, or ambiguous between a kind-referring and an indefinite interpretation. The answer, which required a type shift framework as developed in Chierchia (1998), is: Bare NPs are basically **properties**, hence they are **neither** kind-referring nor indefinites. They can be shifted to one or the other interpretation in appropriate linguistic contexts. They cannot be called ambiguous either, as their basic meaning is always a property. In a sense, all disjuncts in the title of this talk are true: Bare NPs have kind-referring interpretations, they have indefinite interpretations, hence they have **both** kind-referring and indefinite. But basically they are **neither** one nor the other. The type shifting framework is flexible enough to make all these statements true.

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Number from a syntactic perspective: Why plural marking looks 'truer' in French than in Korean*

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1. Introduction

This paper is a contribution to a general theory of grammatical number, based on comparative evidence from French and Korean, two languages whose noun phrases exhibit plural marking but otherwise differ in many respects: for instance, French has both definite and indefinite determiners which find no counterparts in Korean; and Korean, unlike French, is a generalised-classifier language. As witnessed by our bibliographical references, a number of linguistic works have already been devoted to the interesting properties of the Korean plural. Recent linguistic literature dealing, more generally, with plural marking is mostly written from a semantic perspective (cf. Schwarzschild 1996) in connection with the vast corpus of research on bare nouns, genericity, and the mass/count distinction. In this study we shall approach the issue from a morphosyntactic perspective – attempting to derive from morphosyntax the distributional and semantic similarities and discrepancies between the French and Korean plural markers. We shall first (section 2) briefly show how plural marking may seem less 'genuine' in Korean than it does in French, due to its apparent optionality, and shall argue (section 3) that Chierchia's (1998) semantic theory does not satisfactorily account for the observed data. Using French-Korean comparison, we shall show (section 4) that French plural marking actually exhibits the same apparent optionality as its Korean homologue, with similar semantic effects, and we shall propose a syntactic analysis in keeping with the distributional and semantic data. We shall then (section 5) focus on the French-Korean contrasts, which we shall propose to derive from the fact that the Korean plural marker *deul* (unlike the French plural) triggers a *rigidity* effect, a discrepancy we shall in turn correlate with the inflectional vs. noninflectional nature of the French and Korean plural markers.

2. The issue

2.1. Where the Korean and French plurals look different

Korean has a plural marker transcribed below as *deul*[1], which occurs for instance in the external argument of (1a). What makes this morpheme peculiar for an English or French speaker is that it may also fail to appear in such examples as (1b) :

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(1)a.	*manheun*	*hagsaeng*	*-deul*	*-i*	o	-ass	-da.
	many	student	PL	NOM	come	PST	DEC
	'Many students came.'						
b.	*manheun*	*hagsaeng*		*-i*	o	-ass	-da.
	many	student		NOM	come	PST	DEC
	'Many students came.'						
	[adapted from Kang (1994 :10); transcription our own, cf. fn.1]						

This pair of examples suggests that plural marking is 'optional' in a Korean noun phrase denoting a plural referent (cf. Roger-Yun 2002), or that Korean has two types of plural, one with and one without plural morphology (cf. Kwak 1996, 2003, who calls this latter type *bare-formed plurals*). In the French translations of (1), plural marking is obligatory, as shown by the ungrammaticality of (2b) :

(2)a.	Il	est venu	*beaucoup*	*d'*	{*étudiants/amiraux*}.
	it	came	a lot	of	student.PL/admiral.PL
	'Many students came.'				
b.	*Il	est venu	*beaucoup*	*d'*	{*étudiant*/*amiral*}.
	it	came	a lot	of	student /admiral

The semantic contrasts between Korean (3) and French (4) below further confirm that the plural markers have different distributions in these two languages :

(3)a.	i	kape-ui	*uija-deul*-eun		peulaseutig	i	-ne !
	DM	café GEN	chair PL TOP		plastic	COP	EXCL
	'The chairs (which are) in this café are made of plastic !'						
b.	i	kape-ui	*uija*	-neun	peulaseutig	i	-da.
	DM	café GEN	chair	TOP	plastic	COP	DEC
	lit. 'The chair of this café is made of plastic.'						
	= 'The chairs of this café are made of plastic.'						
(4)a.	Les	chaises	de ce	café	sont	en	plastique.
	DF.PL	chair.PL	of DM.M	café	be.PRS.3PL	in	plastic
	'The chairs of/in this café are made of plastic.'						
b.	La	chaise	de ce	café	est	en	plastique.
	DF.F	chair	of DM.M	café	be.PRS.3SG	in	plastic
	'The chair of/in this café is made of plastic.'						

In (3a), the pluralised noun phrase *uija-deul* is construed as denoting a closed set anchored at T0 ('the chairs which happen to be in this café'), while only nonpluralised *uija* in (3b) allows a Kind reading denoting an open set ('whatever chairs may be found in this café'). The semantic effects

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[1] Our transcription of Korean follows the recent *Revised Romanization of Korean* (see references).

Abbreviations used in the glosses of the French and Korean examples: ACC=accusative ; CL= classifier ; COM= comitative ; COP=copula ; DAT=dative ; DEC=declarative ; DM=demonstrative ; EX=existential verb ; EXCL=exclamative ; F=feminine gender ; GEN=genitive; H= human ; +HON=+honorific ; INJ=injunctive ; INT=interrogative ; LOC=locative ; M=masculine gender ; NEG=negation ; NOM=nominative ; PL=plural ; PROG=progressive ; PRS=present ;PST=past ; REL=relative marker ; SG=singular ; TOP=topic ; 1, 2, 3 = 1st, 2nd, 3rd person. Hyphens in the Korean examples indicate suffixation.

%: syntactically well-formed but unfelicitous in the discourse context.

associated with (4a) and (4b) in French seem somewhat reversed: the Kind reading is only available under plural marking in (4a), while nonpluralised *la chaise* in (4b) may only denote an extensional referent construed as a singleton.

2.2. A semantic account: the Nominal Mapping Parameter

An interesting semantic theory developed by Chierchia (1998) and other scholars (cf. Kurafuji 2001 on Japanese) inspired by Carlson (1977) and Krifka (1995), predicts that the Korean-type plural should contrast with the French-type plural because Korean is a generalised-classifier language, while French is not.

The leading assumption is that in languages such as French, nouns are subdivided into so-called Count nouns, such as *étudiant* 'student', *cheval* 'horse', *livre* 'book', which combine with a cardinal without a classifier; and so-called Mass nouns, e.g., *eau* 'water', *bétail* 'cattle' or *sable* 'sand', which require a classifier or a measure noun when combined with a cardinal:

(5)a. Marie cherche trois {étudiants /chevaux/livres}.
Mary look for.PRS.3SG three {student.PL/horse.PL/book.PL}
'Mary is looking for three {students/horses/books}.'

b. *Marie cherche trois {eaux /bétails /sables }.
Mary look for.PRS.3SG three {water.PL/cattle.PL/sand.PL}
'Mary is looking for three {waters/cattles/sands}.'

(6)a. *Marie cherche trois {individus d' étudiant /
Mary look for.PRS.3SG three {individual.PL of student
têtes de cheval/volumes de livre}.
head.PL of horse/volume.PL of book}

b. Marie cherche trois {bouteilles/litres} d'eau /têtes de bétail/
Mary look for.PRS.3SG three {bottle.PL/litre.PL} of water/head.PL of cattle/
{unités /sacs } de sable}.
{unit.PL/sack.PL} of sand}.
'Mary is looking for three {bottles/litres} of water/heads of cattle/{units/sacks} of sand.'

In Korean, on the other hand, all nouns require or at least accept a classifier when they combine with a cardinal, including those which mean 'student', 'horse' or 'book' (see Roger-Yun 2002 for a detailed description). Consequently, Korean is identified as a *generalised-classifier* language:

(7)a. Minna-neun *se (myong-ui) hagsaeng* -eul chodaeha -yeoss-da.
Minna TOP three CL GEN student ACC invite PST DEC
Lit. 'Minna invited three individuals of student.'
= 'Minna invited three students'.

b. Minna -neun *se *(mali-ui) eollu-mal* -eul chag -go iss -da.
Minna TOP three CL GEN stripe horse ACC look for PROG EX DEC
Lit. 'Minna is looking for three {heads/units} of zebra.'
= 'Minna is looking for three zebras.'

c. Minna -neun *se* **(gwon-ui) tongwachaeg* *-eul* sa -ss -da.
Minna TOP three CL GEN fairy-tale-book ACC buy PST DEC
Lit. 'Minna bought three volumes of fairy-tale book.'
= 'Minna bought three books of fairy tales.'

The contrast between (6a) and (7) has led some scholars (among whom Chierchia 1998, followed by Mizuguchi 2001) to the assumption that in a generalised-classifier language such as Korean all nouns have a mass-type denotation in the lexicon: in Chierchia's terms they denote *Kinds*, rather than *Objects,* and this he takes as a semantic primitive. The Kind-denoting nature of Korean nouns is empirically supported by such examples as (3b) , where the external argument (*i kape-ui uija* '(the) chair of this café') may indeed be construed as denoting a kind ('the open CHAIR class as it manifests itself at all times in this café').

It follows that the Mass/Count distinction, which is crucially relevant in French as exemplified by (5) and (6), is not relevant in Korean, as witnessed by (7). The assumed optionality of the Korean plural marker suggested by (1) and (3), contrasting with the non-optionality of its French homologue suggested by (2) and (4), is hence correlated with the different lexical denotations of nouns in Korean and French: generalised-classifier languages cannot have a 'true' plural since they have no Object-denoting nouns, i.e. no Count nouns.

Kurafuji (2001), who looks at Japanese, argues that Chierchia's theory correctly applies to non-human nouns, but should be slightly amended to incorporate the following two observations:
(i) classifiers are not thoroughly generalised in Japanese-type languages, as illustrated in Korean by (7a), where the classifier is optional with a [+human] noun;
(ii) Japanese-type languages do have plural morphology: however, the Japanese plural marker *tachi* only selects [+human] nouns.
Kurafuji's conclusion is that Japanese nouns basically have Kind denotations, as argued by Chierchia, but that [+human] nouns may be idiosyncratically construed as [+count]. Despite this small amendment, Kurafuji essentially accepts Chierchia's semantic approach to number, which parameterises the lexical denotation of nouns.

2.3. Problems

However, even if we should focus on [-human] nouns in keeping with Kurafuji's amendment, it is possible to show that Chierchia's theory does not correctly predict the distribution of plural marking in Korean. Example (3a), for instance, contains a pluralised [-human] noun phrase. And in the following Korean examples, we see that plural morphology on the BOOK noun phrase is required in (8), where the BOOK referent is preconstrued as plural, and disallowed in (9) where it is preconstrued as a singleton, exactly as in the English translations :

(8) [Minna-neun oneul-achim -e chaeg se gwon- gwa
Minna TOP today morning LOC book three CL and
sinmun han bu-leul sa -ss -da.]
newspaper one CL ACC buy PST DEC
'Minna bought three books and one newspaper this morning.'

a. *Chaeg -deul* -eun naengjanggo -wi -e noh-yeo -iss -da.
book PL TOP fridge top LOC lying EX DEC
'The books are on top of the fridge.'

b. %*Chaeg* -eun naengjanggo -wi -e noh-yeo -iss -da.
book TOP fridge top LOC lying ex DEC
'The book is on top of the fridge.'

(9) [Minna-neun oneul-achim - e chaeg han gwon -gwa
Minna TOP today morning LOC book one CL and
sinmun se bu -leul sa -ss -da.]
newspaper three CL ACC buy PST DEC
'Minna bought one book and three newspapers this morning.'

a. %*Chaeg* *-deul* -eun naengjanggo -wi -e noh -yeo -iss -da.
book PL TOP fridge top LOC lying EX DEC
'The books are on top of the fridge.'

b. *Chaeg* *-eun* naengjanggo -wi -e noh-yeo -iss -da.
book TOP fridge top LOC lying EX DEC
'The book is on top of the fridge.'

These data are counter-evidence to the claim that Korean nouns such as *chaeg* 'book' have a Mass denotation in the lexicon. In (8) and (9), Korean *chaeg* seems to behave with respect to plural marking exactly as English *book* or French *livre* : if the preidentified BOOK referent is construed as a set of atomic entities, a pluralised noun phrase is called for. But if we cast aside Chierchia's Nominal Mapping Parameter, we must find an alternative explanation for the French-Korean contrasts exemplified in (1)-(2) and (3)-(4). To get a grasp on the apparent optionality of Korean plural marking, we shall first look at some French data which suggest a similar situation. We shall propose a syntactic account of this phenomenon in French and shall argue that it may be extended to the Korean 'bare-formed plurals' exemplified in (1b) and (3b). We shall then attempt to understand what draws apart the French and Korean plural markers.

3. Towards a syntactic approach to number

3.1. Plural optionality and Kind denotation in French

If plural marking should be viewed as 'optional' in such Korean examples as (1a,b), the same could be said about plural marking in French in at least two classes of examples respectively illustrated in (10) and (11) :

(10)a. *Le* *panda* aime le bambou.
DF.M panda likes DF.M bamboo
'The panda likes bamboo.'

b. *Les* *pandas* aiment le bambou.
DF.PL panda.PL like DF.M bamboo
'(The) pandas like bamboo.'

(11)a. Achetez *ma* *(délicieuse)* *tomate* *italienne* !
buy my.F (delicious.F) tomato.F Italian.F
Lit. 'Buy my delicious Italian tomato.'

b. Achetez *mes* *(délicieuses)* *tomates* *italiennes* !
buy my.PL delicious.PL tomato.PL Italian.PL[2]
'Buy my (delicious) Italian tomatoes!'

[2] Gender and number marking occur in complementary distribution on the French D head: when gender is morphologically specified, number is unmarked (*le*=M, *la*=F), and conversely (*les*=PL).

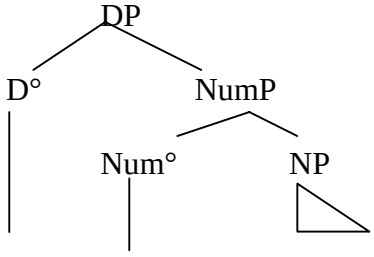
In both (10a) and (10b), the italicised subject may be read either as Entity-denoting ('definite') or as Kind-denoting ('generic'), and the same is true of the italicised object of (11a) and (11b). Under the Entity reading, the object noun phrase of (11b) *ma délicieuse tomate italienne* 'my delicious Italian tomato' is construed as denoting a single TOMATO item. Under the Kind reading, the sentence is felicitous regardless of the number of tomato-items which are actually available for sale (there may be one tomato for sale OR several, the sentence doesn't say).[3]

Under the definite/entity readings, plural marking appears as nonoptional in both (10) and (11), in the sense that the plural sharply contrasts semantically with the nonplural: *le panda* and *ma délicieuse tomate italienne* in (10a)-(11a) denote a single preidentified PANDA creature or TOMATO item, while *les pandas* and *mes délicieuses tomates italiennes* in (10b) and (11b) denote preidentified sets comprising at least two PANDA creatures or TOMATO items.

Under the Kind reading, on the other hand, plural marking may at first glance appear as optional in (10) and (11), since both the plural and the nonplural denote a class of atomic entities construed as <u>open</u>, i.e. unspecified for the number of atomic entities it comprises.

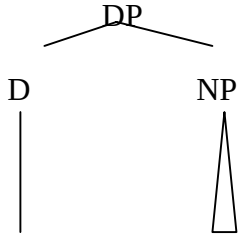
We shall however argue that plural marking is never semantically vacuous in French,[4] and that plural optionality is an illusion triggered by two factors : (i) the French-type plural is open to an intensional reading (involving an open set) – a property which fails to be matched by the Korean plural, as we shall see below ; (ii) the French-type nonplural is syntactically ambiguous between number unmarkedness and number deficiency,[5] as represented in (12), with number deficiency triggering a 'Kind' semantic effect :

(12) a.



(number unmarkedness : Singular > Entity reading)

b.



(number deficiency > Kind reading)

Since the French-type plural is semantically intensional, and the nonplural may spell out number deficiency, it follows that both the plural and the nonplural may denote Kinds, thus creating the illusion of plural optionality. We shall however argue that the Kind denotations triggered by the plural and the nonplural are not semantically synonymous. We shall also provide empirical evidence in support of the idea that the Kind reading of (10a) and (11a) correlates with Number deficiency in syntax.

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[3] Interestingly, the ambiguity observed in French in (11a) does not obtain in the English example (i) , where the italicised noun phrase may only denote a single TOMATO item , even if it is uttered by a vegetable grocer:
(i) Buy my delicious Italian tomato.
This contrast between French and English would certainly deserve further probing.

[4] This assumption is independently made by Farkas & De Swart (2003), basing themselves on Hungarian.

[5] Independent evidence supporting this general idea is given in Zribi-Hertz & Mbolatianavalona (1999) and Zribi-Hertz & Glaude (to appear).

3.2. Optional plural in French

Under its Kind reading, the object noun phrase of (10b) involves an unspecified, open quantity of separate TOMATO items. A very similar semantic interpretation is productively available for the italicised object of such examples as (13), which may either denote an unspecified, open quantity of atomic instances of the Kind (let us call this the *Collective* effect), or a referent reduced to a mass of continuous matter — let us call this the *Pulp* effect, involving what Link (1983) calls *grinding* of the referent:

(13)a. On trouve toujours *de la* *Granny Smith* dans ce marché.[6]
one finds always *de* DF.F Granny Smith in DM.M market
Lit.'One always finds Granny Smith apple on this market.'
(i) 'One always finds Granny Smith apple mush on this market.'
(ii) 'One always finds Granny Smith apple produce on this market.'

b. Il y avait *du* *chien* partout.
it LOC had *de*.DF.M dog everywhere
Lit.'There was dog everywhere.'
(i) 'There was dog pulp everywhere.'
(ii) 'There were dog creatures everywhere.'

c. Il y avait *du* *clébard* dans tous les coins.
it LOC had *de*.DF.M mutt in all DF.PL corners
Lit. 'There was mutt all over the place.'
(cf. (12b))

d. Il y avait *du* *maire* dans tout le quartier.
it LOC had *de*.DF.M mayor in all DF.M neighbourhood (i) 'There was mayor pulp all over the neighbourhood.'
(ii) 'There were mayor creatures all over the neighbourhood.'

e. Il y avait *du* *flic* partout.
it LOC had *de*.DF.M cop everywhere
(i) 'There was cop pulp all over the place.'
(ii) 'There were cop creatures all over the place.'

In each of these sentences, the Pulp and Collective readings are both productively available for the italicised noun phrase . Under the Pulp reading, the APPLE, DOG, MAYOR or COP referent is construed as a mush/a stew/a liquid. The Collective reading, thus labelled under analogy with so-called *collective nouns* (e.g. *cattle*, *furniture*, etc.),[7] does not involve liquefaction, but only a blurring of the atoms which constitute the Kind : under the Collective reading, the COP referent in (13e) is construed as a group of indistinct COP entities. The Collective reading is stylistically marked in French: it either pertains to the language of trade (as explicit in (11a) and (13a), which involve vegetable produce available for sale) or it has a derogatory flavour, enhanced in (13c) and (13d) by the slang lexicon: *clébard* ('mutt'), *flic* ('cop'), rather than standard *chien* 'dog' and *policier* 'policeman'). Take (13b): the Pulp reading (*du chien* = 'dog mush') is available in any type of communicative context; the Collective reading (*du chien* = 'an unspecified quantity of DOG

[6] We leave unglossed the morpheme *de* which partakes in the French determiner system. *De* is an uninflected item which, combined with the definite determiner, gives rise to the so-called 'partitive' and 'indefinite plural' determiners : *de la*, *de le>du*, *de les>des*.

[7] Cf. Flaux (1999) on French *noms collectifs*.

entities') involves the construal of the referent as a set of separate but non-individualised dogs, which immediately suggests either a heap of dog produce available for sale (e.g. at a pet fair, considered from a pet-dealer's perspective), or a set of indistinct creatures forming a cattle-type throng (hence the strong pejorative effect with an animate or, worse, human referent). In spite of these special stylistic effects, the Collective reading is productively available in (13a) through (13e). Any noun denoting a concrete physical entity (thing, animal, human) productively allows both the Pulp and the Collective readings in the syntactic context exemplified in (13).[8]

Note, however, that what triggers the Pulp and Collective effects in (13) is not the partitive marker *de*. This is shown by (11a), where the Collective effect obtains though *de* does not occur, by (14), where the Pulp effect obtains though *de* does not occur, and by (15), where the Pulp and Collective effects do not obtain although *de* does occur:

(14) *Le* *panda* est recommandé aux estomacs sensibles.
DF panda is recommended DAT.DF.PL stomachs sensitive
'Panda (meat) is recommended for sensitive stomachs.'

(15)a. On trouve toujours *des* *Granny Smith* dans ce marché.
one finds always *de*.DF.PL Granny Smith in DM.M market
'One always finds Granny Smith apples on this market.'

b. Il y avait *de nombreux* *{chiens/clébards}* dans la ville.
it LOC had *de* numerous dog.PL /mutt.PL in DF.F town
'There were a large number {dogs/mutts} in town.'

c. Il y avait *des* *maires* dans tout le quartier.
it loc had *de*.DF.PL mayor.PL in all DF.M neighbourhood
'There were mayors all over our neighbourhood.'

d. Il y avait *des* *{policiers/flics}* dans tout le quartier.
it loc had *de*.DF.PL policeman.PL/cop.PL in all DF.M neighbourhood
'There were {policemen/cops} all over our neighbourhood.'

The italicised subject *le panda* respectively triggers in (10a) and (14) the two semantic effects labelled above Collective and Pulp. On the other hand, the italicised noun phrases in (15) fail to exhibit both the Pulp and the Collective readings. The unavailability of the Pulp reading is immediately clear – none of these noun phrases allow us to construe their referent as a mush or a stew. In order to perceive the unavailability of the Collective reading in (15), consider the subtle semantic contrast between (13a) and (15a): if the addressee needs to make a huge apple pie and the speaker knows there is likely to remain only one Granny Smith apple at the market, (15a) is less truthful than (13a), for the plural specification on *des Granny Smith* in (15a) suggests that more than one Granny Smith apple should be available, while (13a) doesn't hint anything as to the available quantity of apple-tokens - it only means that the Granny Smith species should have *at least one* representative at the market, which the speaker assumes to be true. Furthermore, none of the

[8] Our description departs from the idea that such nouns as *chien* 'dog', being +Count, cannot denote 'continuous referents', cf. : « Count nouns such as *chimpanzé* 'chimpanzee', *tabouret* 'stool', etc., are compatible with such determiners as *un* 'a(n)', *des* (indefinite plural), *les* 'the.PL', as well as with cardinals and indefinite adjectives (e.g. *quelques* 'some, a few', *plusieurs* 'several', etc.), but they cannot combine with partitive determiners (e.g. *du, de la*, etc.). » [translated from Kleiber 1994, p.12]. The assumption that any count noun may be *coerced* into a mass denotation is similarly based on the idea that such nouns as *dog* should be primarily, basically, canonically, lexically, preferably... associated with atomic ('count') entities. We believe this view to be incorrect from a *linguistic* point of view. That the noun *dog* should be more frequently associated with a +count, or a –count, referent, is an effect of our cultural habits regarding dog(s), whatever they may be.

italicised noun phrases in (15) trigger the special stylistic effects (trade language, derogatory massification) which typically correlate with the Collective reading.

Basing ourselves on the above data, we propose that the Pulp and Collective readings of French noun phrases are crucially correlated with number deficiency, as represented in (12b). The *de* noun phrases italicised in (13) and (15) in effect include Kind-denoting DPs headed by the definite article,[9] which are either pluralised (*les N*) and construed as intensional atomised sets, or number-neutral (*le/la N*) and construed as intensional nonatomised sets read as either Collective or Pulp. As suggested by Carmen Dobrovie-Sorin (p.c.), the so-called partitive marker *de* of French could be analysed as the spell-out of Chierchia's (1998) 'Up' operator, which converts Kinds into Properties — these two complementary semantic types being independent from number marking in a language such as French.

3.3. Korean 'bare-formed plurals' have a Collective reading

We next wish to argue that the so-called 'bare-formed plural' noun phrases of Korean exemplified in (1b) trigger the Collective-type Kind reading just described in association with some French nonpluralised DPs including the definite article (cf. (10a), (11a), (13)). This descriptive assumption is in keeping with the semantic literature discussing such examples as (1b). Song (1975), for example, considers a sentence similar to (1b), where the nonpluralised noun *hagsaeng* 'student' is construed as denoting a set of students : ' *Hagsaeng* 'student' in sentence [...] does not refer to a particular student but rather a category of status. It contrasts with faculty or staff, for instance'. Kang (1994), Kwak (1996, 2003) and Song (1997) also phrase the intuition that Korean 'bare-formed plurals' actually have a Collective-type Kind reading (which Kwak, following Link 1983 and Landman 1989 labels *group reading*). Kwak (1996) emphasises the fact that bare-formed plurals do not license a distributive reading, as witnessed by (15):

(15) *Hagsaeng -i gagja seonsaengnim -gge jilmun -eul
student NOM each teacher DAT question ACC
hae -ss -da.
ask PST DEC
Lit. 'The student each questioned a teacher.'
[adapted from Kwak 2003 :8]

The ill-formedness of (15) in Korean may be compared to that of French (16a) or (16b):

(16)a. *Le personnel a chacun interrogé un professeur.
DF.M staff have.PRS.3SG each questioned one.M teacher
Lit. 'The staff each questioned a teacher.'[10]

b. *Le panda se mord les uns les autres.
DF.M panda REF bites one another
Lit. 'The panda bites one another.'

We propose the generalisation phrased in (17) :

[9] For a discussion of French partitive *de*, see Kupferman (2003) and Zribi-Hertz (2003).

[10] The French example in (16a) is completely ungrammatical, more sharply so than its English translation which is judged as acceptable by some speakers. Unlike English, French does not allow the combination of a plural predicate with a collective subject, e.g. *My family were not happy about this*, *The staff have decided that...*, etc.

(17) Assumption I
a. In French as in Korean, an argument noun phrase may be left unspecified for number (i.e. may be *number-deficient* in syntax).
b. Number-deficient noun phrases (represented in (12b)) typically allow a Pulp or Collective construal of their referent.

This claim (a variant of which was developed by Jun 1999) is in conflict with several assumptions which have been put forward in the linguistic literature. One of them is Chierchia's Nominal Mapping Parameter: under our own assumption, the lexical content of Korean *gae* 'dog' is roughly the same as that of French *chien*, neither noun is specified with respect to the count/mass distinction until it is merged in syntax, and the 'Collective' effect correlates with the number-deficient syntax sketched in (12b). In contrast with Kwak (1996, 2003), we propose that Korean's 'bare-formed plurals' are not plural, since they are not specified as plural at any level of grammatical representation: they are unspecified for number. Our assumption further leads us to discard Bouchard's (2003) idea that Number is a necessary ingredient in an argument noun phrase: we are on the contrary claiming that number deficiency is productively licensed in French as in Korean and triggers similar semantic effects in both languages. Focusing here on the Collective reading, we shall try to understand where the French-Korean contrasts lie.

4. Number specification and number deficiency

4.1. The Collective-read nonplural in Korean and French: a reminder

Leaving aside the Pulp reading of number-deficient noun phrases, let us concentrate on the Collective reading, which, as argued above, is available in both French and Korean, a point further exemplified by Korean (18) and (20) and their French analogues (19) and (21):

(18) [i gage -neun sweta -wa yangmal -eul pa -n -da.]
DM store TOP jumper and sock ACC sell PRS DEC
'This store sells jumpers and socks.'
sweta-neun wis -ceung -e *yangmal* -eun
jumper TOP top floor LOC sock TOP
alaes - ceung-e iss -da.
bottom floor LOC EX -DEC
Lit. '(The) jumper is upstairs and (the) sock downstairs.'
= 'Jumpers are upstairs and socks downstairs.'

(19) [Ce magasin vend du pull et de la chaussette.]
DM.M store sell.PRS.3sg *de*.DF.M sweater and *de* DF.F sock
'This store sells jumpers and socks.'
Le pull est en haut et *la chaussette* en bas.
DF.F jumper is upstairs and DF.F sock downstairs.
Lit. 'The jumper is upstairs and the sock downstairs.'
= 'Jumpers are upstairs and socks downstairs.'

(20) i gage -e -neun *saengjwi* -ga iss -da.
DM store LOC TOP mouse NOM EX DEC
Lit. 'In this store there is (some) mouse.'
= 'In this store there are mice.'

(21) Il y a de *la* *souris* dans ce magasin !
there is *de* DF.F mouse in this store
Lit. 'There is mouse in this store !'
= 'There is some atomised instantiation of the MOUSE species in this store!'

In these examples, the nonpluralised italicised noun phrase is open to the Collective reading in both languages. In other contexts, however, the Collective interpretation seems licensed in Korean, but not in French. One such contrast appears above between (3) and (4) , another one is exemplified by (22)/(23):

(22) [i haggyo-neun namnyogonghag i -da.]
DM school TOP co-ed COP DEC
'This is a co-ed school.'
yeohagsaeng -eun wis -ceung -eseo,
schoolgirl TOP top floor LOC
namhagsaeng -eun alaes - ceung-eseo gongbuha -n -da.
schoolboy TOP bottom floor LOC study PRS DEC
Lit. '(The) female student studies upstairs and the male student downstairs.'
= 'Female students study upstairs and male students downstairs.'

(23) [Cette école est un établissement mixte.]
DM.F school be.PRS.3SG an institution co-ed
'This is a co-ed school.'
Toutefois, *le* *professeur femme* prépare ses cours en haut
however DF teacher female prepares their classes upstairs
et *le* *professeur homme* en bas
and DF teacher male downstairs
(i) '(...) However, the female teacher prepares her classes upstairs and the male teacher prepares his downstairs.'
(ii) * '(...) However, female teachers prepare their classes upstairs and male teachers downstairs.'

In this case the nonpluralised DPs *le professeur femme* ('the female teacher') and *le professeur homme* ('the male teacher') are naturally construed in French as Entity-denoting, i.e. as syntactically singular (diagram (12a)), rather than Kind-denoting, while their italicised analogues in Korean (22) may quite naturally be construed as Kind-denoting.[11] Under our own assumption phrased in (17), we have to understand why number deficiency associated with the Collective reading seems more restricted in French than it is in Korean. We believe that a part of the answer lies in the properties of the plural marker, which are not the same in these two languages.

[11] According to our own intuitions, the Kind-reading however becomes possible in (i) below, where an epistemic modality has been inserted :
(i) Le professeur-femme doit préparer ses cours en haut, et le professeur-homme en bas.
This judgement, if correct, suggests that whatever factor makes the Kind-reading unnatural in (23) is not inherent to the noun phrase itself.

4.2. The plural in French and Korean: where does the difference lie ?

4.2.1. Our proposal

Borrowing the notion of *rigidity* from Tovena & Jayez (1999), who draw their own inspiration from Fine (1995), we first propose the double assumption phrased in (24), and then provide empirical evidence to support it:

(24) Assumption II
The French-type plural in a noun phrase does not trigger a *rigid* construal of the referent.
The Korean plural marker *deul* in a noun phrase triggers a *rigid* construal of the referent.

This assumption runs against any theory claiming (cf. Kang 1994) that Korean *sagwa-deul* 'apple.PL' has the same semantic denotation as English *apples.* We on the contrary believe that the English plural is semantically similar to the French plural, and that *sagwa-deul* and *apples* therefore have different semantic contents. Following Tovena & Jayez (1999), we understand *rigidity* as involving an extensional denotation: a *deul*-noun phrase (hereunder: *deul-NP*), in Korean, is construed as denoting a closed set of entities, therefore it cannot be associated with an intensional class; the French plural, on the other hand, does not trigger a rigidity effect, i.e. it is compatible with an open, intensional reading. We believe that this important difference accounts for a series of distributional and interpretive contrasts between French and Korean pluralised noun phrases, and we shall argue below that it also sheds some light on the more restricted distribution of Collective-read nonplurals in French.

The double generalisation proposed in (24) may be assessed with respect to three available theories contrived to account for the semantic contrasts between the Korean-type and the English-type plural markers. Kurafuji (2001), working on Japanese, argues that the plural marker *tachi* spells out both plural and definiteness, but is similar to the English plural as regards its plural semantics. Mizuguchi (2001:532) claims that 'Japanese plurals are functions that individuate a set into atoms, while English plurals are functions that form a set from atoms'. Kim (2003) claims that *deul*-NPs in Korean are semantically similar to plural noun phrases in English. The empirical evidence presented below seems to us to be globally in keeping with Mizuguchi's idea, but to run against the other two theories.

4.2.2. Empirical evidence

4.2.2.1. Korean *deul* disallows an open Kind reading

A first piece of empirical evidence in support of (24) is that Korean *deul*-NPs may not denote intensional Kinds, while French plurals can, as first exemplified by analytical generic sentences such as (25)-(26) :

(25)a. *pendeo-gom* -eun poyudongmul i -da.
panda bear TOP mammal COP DEC
'The panda is a mammal.'

b. **pendeo-gom* *-deul* -eun poyudongmul i -da.
panda bear PL TOP mammal COP DEC
Lit. 'The (various) members of the panda species are mammals.'

(26)a. *Le* *panda* est un mammifère.
DF.M panda is a mammal
'The panda is a mammal.'

b. *Les* *pandas* sont des mammifères.
DF.PL panda.PL be.PRS.3pl *de*.DF.PL mammal.PL
'Pandas are mammals.'

The main point here is the contrast between (25b), which is completely ungrammatical in Korean, and (26b), which is perfectly natural in French. The contrast between Korean (25b) and French (26b) also seems predicted under Mizuguchi's (2001) assumption that Japanese-type plural markers individuate sets into atoms while French-type plural markers form sets from atoms, if we should understand that 'individuating sets into atoms' involves a rigidity effect (the atoms being construed from an extensional set), while 'forming sets from atoms' involves an intensional effect (the set formed from atoms standing as an open class).

Our description of (25) is at odds with Kim (2003: ex. (23a)), who claims that a *deul*-subject is compatible in Korean with a kind-level predicate, and illustrates this point with (27):

(27) gonglyong *-deul* -eun myeoljong -doe -eoss -da. dinosaur
PL TOP extinction become PST DEC [Kim's gloss]
'Dinosaurs became extinct.' [Kim's translation]
'The (various) members of the dinosaur species were eradicated.'[12] [our own transl.]

As hinted by the double translation, we believe that Kim's semantic account is incorrect, and that although the external argument may be described as 'kind-denoting' in (27), it is crucially read as extensional, i.e. as denoting a closed set (e.g. 'those dinosaurs which used to walk about our planet'), rather than an open class construed intensionally. We hope to make this point clearer below.

In generic sentences such as (28), the *deul*-subject is acceptable in Korean (28a), as the plural subject in French (28b) :

(28)a. *pendeo-gom* *-deul* -eun julo daenamu -leul meog-neun-da.
panda bear PL TOP mainly bamboo ACC eat PRS DEC
(i) 'The pandas mainly eat bamboo.'
(ii) 'The members of the panda species mainly eat bamboo.'

b. *Les* *pandas* mangent principalement du bambou.
DF.PL pandas eat mainly *de*.DF.M bamboo
(i) 'The pandas mainly eat bamboo.'
(ii) 'Pandas mainly eat bamboo.'

However, Korean (28a) and French (28b) do not have the same semantic contents, as hinted by the tentative English translations. Korean (28a) generalises over a set of pandas which must be construed as extensional, both under the specific reading glossed in (28a-i) (preidentified set of pandas) and under the Kind reading glossed in (28a-ii) (the various members of this world's panda species). French (28b) may contrastively be read as a generalisation about the panda class construed as intensional, as glossed in (28b-ii). Suppose the speaker has just returned from a scholarly trip to China during which (s)he spent a month with two pandas, living in their tree and taking notes about their behaviour. In this pragmatic context, sentence (28a/ii) is not optimally felicitous in the zoologist's report to the Korean Zoological Society, because it implies that (s)he must have based

[12] The morpheme *doe*, which Kim glosses as 'become', is a verbalising suffix which suggests that the extinction process was caused by some external, rather than internal, factor.

his/her generalisation on more than just two pandas. French (28b/ii), on the other hand, is optimal in the same pragmatic context, unproblematically suggesting that the zoologist has inductively generalised to the intensional panda species the eating behaviour of his/her two subjects of study. This contrast follows from (24) and is also in keeping with Mizuguchi's (2001) analysis of plural semantics.

We again disagree with Kim (2003), who gives (29) as a Korean generic sentence interpreted on a par with the author's English translation:

(29) Italia-salam -deul -eun myeonglangha -da.
Italy person PL TOP cheerful DEC
(i) 'Italians are cheerful.' [Kim's translation]
(ii) 'The people of Italy are cheerful.' [our own translation]

Here as above, we believe that the semantic content of Korean (29) is not accurately captured by Kim's translation, which incorrectly suggests an intensional construal of the ITALIAN referent. According to our own intuition, the occurrence of the plural marker *deul* in (29) forces us to construe the referent extensionally ('the (various) people of Italy'), rather than intensionally ('whoever is Italian').

4.2.2.2. Korean *deul*-NPs disallow inalienable binding

Another interesting class of French-Korean contrasts illustrated in (30) involves noun phrases denoting inalienable plural body-parts :

(30)a. Minsu -neun *pal* -eul deuleoolyeo -ss -da.
Minsu TOP arm ACC raise PST DEC
Lit. 'Minsu raised arm.'
= 'Minsu raised his arm(s).'
b. Minsu -neun *pal* -*deul* -eul deuleoolyeo -ss -da.
Minsu TOP arm PL ACC raise PST DEC
Lit. 'Minsu raised arms.'
* 'Minsu raised his arms.'
= 'Minsu raised the arms.'

(31)a. Marie a levé le bras.
Mary raised DF.M arm
Lit. 'Mary raised the arm.'
= (i) 'Mary raised the arm.' (ii) 'Mary raised her arm(s).'[13]
b. Marie a levé les bras.
Mary raised DF.PL arms
Lit. 'Mary raised the arms.'
= (i) 'Mary raised the arms.' (ii) 'Mary raised her arms.'

[13] Note that in French (31a) read as inalienable, the nonplural bodypart nominal does not force the construal of the ARM referent as a singleton (cf. Guillaume 1919, Kayne 1975, Guéron *passim*, Vergnaud & Zubizarreta 1992, among others). The predicate *lever le bras*, literally 'to raise the arm', refers to a conventional gesture made by a member of a group to indicate that they wish to be allowed to speak. Under this reading, sentence (31a) may describe a body gesture actually involving both arms. French (31a) thus contrasts with our English translation *Marie raised her arm*, in which *her arm* must be construed as a singleton. French nonplural inalienable nominals interestingly share their number deficiency with their Korean homologues.

In both languages, the nonpluralised body-part object may be read as inalienable. The plural-marked body-part object, on the other hand, only allows an alienable reading in Korean (30b), while it may be construed as inalienable in French (30b). We take these data as an effect of the contrast phrased in (24), assuming that the inalienable reading of the body-part nominal crucially involves a binding relation and hence precludes any rigidity factor within the noun phrase.[14]

4.2.2.3. Korean *deul*-NPs disallow narrow-scope readings

Contrary to Kurafuji's prediction regarding Japanese *tachi*, the Korean plural marker *deul* may occur in a noun phrase associated with a discourse-new referent. Like some French or English indefinite objects and unlike bare plural objects, Korean pluralised objects only take wide scope over sentence negation:

(32)	Minna	-neun	*chaeg*	*-deul*	-eul	ilgji	-an	-ass	-da.	
	Minna	TOP	book	PL	ACC	read	NEG	PST	DEC	
	'Minna didn't read some books.'									[wide scope only]
(33)a.	Marie	n'	a		pas	lu	*certains*	*livres*.		[wide scope only]
	Mary	NEG	have.PRS.3SG		NEG	read	some.PL	book.PL		
	'Mary didn't read some books.'									
b.	Marie	n'	a		pas	lu	de	*livres*.		[narrow scope only]
	Mary	NEG	have.PRS.3SG		NEG	read	*de*	book.PL		
	'Marie didn't read books.'									

Whereas in Korean (32), the pluralised object only allows a wide-scope reading, French (33b) shows that plural morphology on the object does not preclude the narrow-scope interpretation. The semantic contrast between (33a) and (33b) in French is grounded in determiner selection, not in number specification.

Our semantic description of (32) again departs from Kim (2003), who describes the example reproduced in (34) as ambiguous between (34i) and (34ii):

(34)	Cheolsu-neun	*jeonjiin-deul*-eul		manna-go		sipeoha-n		-da.
	Cholsu	TOP	politician PL	ACC	meet	COMP	want	PRS	DEC
	(i) 'Cholsu wants to meet politicians.'								
	(ii) 'Cholsu wants to meet the politicians.'								
	[adapted from Kim (2003: ex. (25), translations his]								

The interpretation glossed in (34i) incorrectly suggests that the italicised plural object, when construed as discourse-new, has narrow scope with respect to the modal operator. In our view, the narrow scope reading glossed in (34i) is only possible if *deul* fails to occur within the object. The *deul*-object has wide scope in (34) regardless of information structure, and the interpretation which (34i) attempts to capture would be more accurately glossed by *There are some politicians that Cholsu wants to meet*, where the indefinite-read object *jeonjiin-deul-eul* takes wide scope over the modal.

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[14] For the same general reason, a deictic determiner (unlike a pronoun-like determiner) blocks the inalienable reading (cf. Zribi-Hertz & Glaude to appear), as exemplified in French by (i) below, contrasting with (30b) above :

(i)	Marie	a	levé	ces	bras.
	Mary	have.PRS.3SG	raised	DM.PL	arm.PL
	'Mary raised those arms.'				

4.2.2.4. Korean *deul*-NPs cannot be quantifier-bound

Unlike French indefinite plurals, Korean *deul*-NPs cannot be read as plural-polarity items, in the sense of Spector (2002) – they cannot be licensed by event quantification or generic aspect:

(35)a. i daehaggyo -ui gyosu -deul -eun jeonbu *negtai deul*-eul
DM university GEN professor PL TOP all necktie PL ACC
mae -go dani -n -da.
tie COM walk around PRS DEC
lit. 'In this university, all professors walk around with several neckties tied (around their neck(s)).'
= 'In this university, all professors wear several neckties.'

b. Dans cette université, tous les professeurs portent *des cravates*.
in DM.F university all DF.PL professors wear *de*.DF.PL neckties
'In this university, all professors wear neckties.'

In Korean (35a), the italicised *deul*-NP can only denote a rigid set, which triggers an interpretation under which each professor wears several neckties at once. Contrastively, French (35b) favours the pragmatically unmarked reading involving only one necktie at a time around each professoral neck.

4.2.2.5. Korean *deul*-NPs never instantiate number agreement

This restriction is exemplified by (35), contrasting with French (36):

(36)a. i *salam -deul* -eun *uisa* i -da.
DM person PL TOP doctor COP DEC
Lit. 'These people are doctor.'
= 'These men are doctors.'

b. *i *salam -deul* -eun *uisa* *-deul* i -da.
DM person PL TOP doctor PL COP DEC
Lit. 'These men are (several) doctors.'

(37)a. **Ces hommes* sont *amiral*.
DM.PL men be.PRS.3PL admiral

b. *Ces hommes* sont *amiraux*.
DM.PL men be.PRS.3PL admiral.PL
'These men are admirals.'

In Korean (36), the NP *uisa* 'doctor' in predicate position cannot exhibit plural marking on a par with the *deul*-subject. In French (37), predicate agreement is unmarkedly acceptable in such contexts.[15]

[15] Predicate agreement is in our opinion obligatory in (37a), at least without further discourse context. Lack of plural agreement on French predicative nominals is however possible in some contexts, as pointed out by A. Kihm. According to our own intuitions, on such case is (i) below:

(i) Tous ces hommes souhaitent devenir {amiral/amiraux}.
all these men wish (to) become admiral/admirals
'All these men wish to become admirals.'

As regards our present issue, the crucial observation in (36)-(37) above is that plural marking on the predicate is strictly impossible in Korean (36), while it is unmarkedly grammatical in French (37).

Contrary to the descriptive assumption put forward in this subsection, Korean *deul* has been claimed (cf. Lee 1991, Park & Sohn 1993) to spell out subject-agreement in such examples as (38a), contrasting with (38b):

(38)a. geu hagsaeng *-deul* -eun Storrs-eseo-*deul* gongbuha -n -da.
DM student PL TOP Storrs LOC PL study PRS DEC
'The students are studying in Storrs.'

b. *geu hagsaeng -eun Storrs-eseo-*deul* gongbuha -n -da. DM
student TOP Storrs LOC PL study PRS DEC
[adapted from Park & Sohn (1993), ex. (23b)]

In sentence (38a), the *deul* marker attached to the right of the locative phrase instantiates what some linguists have called the *Extrinsic Plural Marker* (EPM), [16] which appears within the predicate and, if on a noun phrase, on its right periphery (to the right of the Case marker) rather than inside it. Basing themselves on such pairs as (38), Park & Sohn (1993) have analysed EPM *deul* as a subject-agreement marker. Evidence in support of this idea is that EPM *deul* seems crucially licensed by a plural subject, as witnessed by the ungrammaticality of (38b), contrasting with (38a),[17] as well as by the contrast in (39) below:

(39)a. ø sugje *-deul* ha -yeoss -ni *-deul* ?
(you) homework PL do PST INT PL
(i) *'Have you (SG) done your homework ?'
(ii) 'Have you people done your homework ?'

b. ø sugje ha -yeoss -ni ?
(you) homework do PST INT
(i) 'Have you (SG) done your homework ?'
(ii) *'Have you people done your homework ?'

These examples illustrate a frequent use of Korean EPM, where it cooccurs with a null subject understood as denoting a plural referent. The contrast in (39) further suggests that the occurrence of EPM *deul* is <u>required</u> if the subject is read as plural.

The generalisation just hinted is however too strong, since a plural subject in no way automatically triggers the occurrence of EPM *deul*, whether this subject be overt, as in (1a), (8a), (27), (28a), or phonologically null, as in (40):

[16] This type of plural marking has received various names in linguistic literature, e.g.: *pluractional marker* (Kwak 1996), *copy plural marker* (Kuh 1987, Lee 1991), *thematic particle* (Prost 1992), *agreement plural marker* (Park & Sohn 1993), *spurious plural* (Kim 1994), *non-nominal DEUL* (Yim 2002), and *extrinsinc plural marker* (Song 1997) – the term we are borrowing here. Some authors (e.g. Kuh 1986, Lee 1991, Prost 1992, Moon 1995) treat the noun-phrase-internal plural marker (*IPM*) and the extrinsic plural marker (*EPM*) as homonymous morphemes, but, following Baek (2002), we believe in the basic unity of *deul*, and that we should try and understand why the same morpheme may occur, as it does, either noun-phrase-internally, or noun-phrase-externally, triggering the observed semantic effects.

[17] Kim (1994) and Yim (2002) claim that EPM may occur with a nonplural subject, but we find all their illustrative examples sharply ungrammatical.

(40) [sajang :] - Kim gwajang -gwa Lee gwajang -eun
[general manager :] Kim head of department and Lee head of department TOP
yojeum wae an boi - neun -ga?
nowadays why NEG see PRS INT
[General Manager] 'How come Mr Kim and Mr Lee are not seen around the office these days ?'

[biseo] - ø Nyuyog jijeom -e (*-*deul)* chuljang
secretary New York branch LOC PL trip
jung i -sibni -da.
in COP +HON DEC
[Secretary] '(They) are visiting our New York branch.'

Furthermore, the fact that some morpheme within the predicate should be licensed by a plural subject does not prove this element to be a subject-agreement marker, since various predicate-internal expressions similarly select a plural subject without being agreement markers, e.g. English *one another, respectively, together,* and floating quantifiers:

(41)a. The {*child/*children*} sent owls to *each other*.
b. The {*child/*children*} broke the spell *together*.
c. Our {*only child/*two children*} *respectively* picked a blue and a red flying broomstick.
d. Our {*son/*sons*} {*both/all*} bought new flying broomsticks.

The semantic effects associated with EPM *deul* are actually rather similar to those triggered by plural-subject-selecting adverbs and quantifiers. In (42b), for instance, EPM *deul* forces us to understand that the two characters sang and enjoyed themselves together, whereas this effect is absent from (42a), where EPM *deul* fails to occur:

(42)a. Chanu -wa Minsu-ga nolae -leul sinnage -bull -eoss -da.
Chanu and Minsu NOM song ACC have-fun sing PST DEC
'Chanu and Minsu had fun singing.'
b. Chanu -wa Minsu-ga nolae -leul sinnage -*deul* bull -eoss -da.
Chanu and Minsu NOM song ACC having-fun PL sing PST DEC
'Chanu and Minsu had fun singing together.'
[adapted from Yim 2002 :190 ; translations our own]

In (43b), contrasting with (43a), EPM *deul* emphasises the plurality of the subject, thus triggering a distributive-like semantic effect, tentatively captured by our English translation:

(43)a. Hangug eomma-deul -eun mad -jasig -ege gidae -leul
Korea mother PL TOP first child DAT expect ACC
manhi ha -n -da.
much do PRS DEC
'The mothers of Korea expect much from the eldest child.'

b. Hangug eomma-deul -eun mad -jasig -ege -*deul* gidae -leul
Korea mother PL TOP first child DAT PL expect ACC
manhi ha -n -da.
much do PRS DEC
'The mothers of Korea all expect much from their eldest child.'[18]
[adapted from Kim 1994 :317 ; translations our own]

4.2.2.6. Synthesis

The assumption phrased under (24) correctly predicts the distribution of the plural marker *deul* in all the Korean examples discussed above. In such cases as (8a), where plural specification on the noun phrase is motivated by a preidentified specific (hence rigid) referent involving several atomic entities, the plural marker *deul* naturally occurs, in keeping with (24a). This accounts for the often-noted affinity between *deul*-type plural markers and definite readings (cf. Kurafuji 2001 on Japanese *tachi*). The examples in (32), (34i) and (35a) however show that *deul*-NPs in Korean may also be read as indefinite – always triggering an extensional construal of their referent.

4.2.3. Inflectional and non-inflectional plural markers

4.2.3.1. The inherent nature of plural morphology

We would now like to relate the above results to a remark made by Ramstedt (1939: 35), who identifies *deul* as a noun which forms a compound with the noun it attaches to, but 'can as well be considered (an) independent word'.

We propose to rephrase this idea as in (44) :

(44) Assumption III
The French plural spells out the positive value of an *inflectional* feature.
Korean *deul* is a *lexeme*, and as such does not have a *negative value*.

Formally, we propose to characterise *inflectional* features as a subclass of functional features which have a binary value (±). The *negative value* of an inflectional feature may correlate with unmarked morphology. Inflectional features instantiate an advanced stage of grammaticalisation. Examples of inflectional features are the [±Past] specification in French (with [-Past], known as 'Present', generally correlating with zero morphology), and the [±Plural] specification discussed in this article. Due to the inflectional nature of the plural, nonplural morphology — known as *singular* — in French is syntactically ambiguous between number unmarkedness and number deficiency, as represented in (12). With noninflectional features, on the other hand, morphological absence is either interpreted as phonological deficiency (ellipsis) or equated with syntactic absence: thus, the English sentence *John came* is construed as containing no adverb at all rather than as involving a negative value of, e.g., *now* or *tomorrow*. As regards number, (44) predicts that if the plural marker spells out a noninflectional feature, as we assume is the case in Korean, a nonpluralised noun phrase is unambiguously construed as number-deficient – i.e. is always associated with a representation similar to (12b). In other words, while plural morphology occurs in both Korean and French, 'singular morphology' is a relevant concept for French but not for Korean.

[18] The contextual semantic effects of EPM are a tricky issue which calls for a separate study (see fn. 10). Our examples (41b) and (42b) are only meant to suggest that the semantic import of EPM goes beyond the topicality effects that may correlate with rich subject-predicate agreement.

4.2.3.2. Empirical evidence

In support of (44), we shall now provide some empirical evidence that the Korean plural marker *deul* is more weakly grammaticalised and has more lexical semantic content than does French-type plural morphology.

4.2.3.2.1. Korean 'particles' are lexemes

Most Korean 'particles' have been shown to derive from identifiable lexemes: Kim (1996) thus argues that *ga* (the nominative particle) derives from a noun meaning something like 'set'; *mada* (the distributive translated as 'each') derives historically from a noun meaning 'unit, singular entity'; *buteo* (the morpheme translated as 'from') from a verb (*butda*) meaning 'to stick'), and so on. It is thus likely that *deul* similarly originates as a lexeme, whose exact identity remains an open issue for us at this point.

4.2.3.2.2. Pluralising mass nouns

Korean *deul* may interestingly combine with a noun which denotes a mass of continuous matter such as SAND, OIL, or MONEY, to produce a derived meaning construed as a set of atoms:

(45) geu -neun eongdeongi -e but -eun *molae-deul*-eul teol -eoss -da.
3H TOP backside LOC stick REL sand PL ACC brush PST DEC
Lit. 'He brushed off some *sands* which had stuck to his backside.'
= 'He brushed off a number of sand particles which had stuck to his backside.'
[adapted from an example drawn from the KAIST database]

(46) gunbam -jangsa-ha-yeoseo moa du-eoss-deon *don* *-deul-do*
roast chestnut trade do by means amass PST REL money PL also
geoui badag -i na -ss -da.
almost bottom NOM appear PST DEC
Lit. 'Even the *moneys* which he had put aside by selling roasted chestnuts almost let the bottom show.'
= 'Even the heap of bills and coins which he had put aside by selling roasted chestnuts almost let the bottom show.'
[adapted from an example drawn from the KAIST database]

(47) nakksi-ha-l saenggaghaji-ma !
fishing do REL think NEG.INJ
'Don't think of fishing !'
Yeogi-n *gileum-deul* ppun i -da.
here TOP oil PL only COP DEC
Lit. 'There's nothing here but *oils*.'
= 'This place is nothing but a cluster of oily spots.'
[adapted from an example drawn from the KAIST database]

These data are especially unexpected under the assumption that all Korean nouns should be parameterised as having mass denotations in the lexicon. In a sense, the Korean nouns *molae*, *don* and *gileum* would seem less strictly mass-denoting than their English or French homologues *sand/sable*, *money/argent* and *oil/mazout*, which cannot be made to denote atoms of continuous matter when combined with the plural.[19]

[19] In English and French, pluralising such nouns as *sand*, *money* or *oil* at best allows a reading involving the covert insertion of a TYPE classifier, e.g. :
(i) ?Three oils have leaked from this ship.
= 'Three different types of oil have leaked from this ship.'

4.2.3.2.3. *deul* as an enumeration closure

Korean *deul* also occurs to close enumerations, where it is traditionally identified as a 'dependent noun':

(48)	sagwa,	bae,	podo	*deul*	-i	sigtag	wi	-e	nohyeo	iss	-da.
	apple,	pear,	grape	PL	NOM	table	top	LOC	lie	EX	DEC

Lit. 'Apple, pear, grape, *deul* are lying on the table'.
= 'Apples, pears, grapes, those things are lying on the table.'

As an enumeration closure, Korean *deul* contrasts semantically with such expressions as English *and so on* or Latin *et coetera*, which crucially point to an open set. Korean *deul* indicates the plurality of an extensional set: thus, in (48), it emphasises the fact that the closed set of objects lying on the table is composed of several different subsets. This semantic property is in keeping with the extensional effect of *deul* described above, and with the assumption that Korean *deul* might be intrinsically referential, hence nominal.

4.2.3.2.4. *deul* as an Extrinsic Plural Marker

The assumption that Korean *deul* is noninflectional in nature is in keeping with its EPM behaviour, briefly discussed above in section 4.2.2.5: EPM *deul* is not obligatory from a *morphosyntactic* point of view, and its semantic effects are those of a lexeme whose nonoccurrence is construed as an absence at all levels of representation, rather than as the unmarked value of a binary feature.

4.2.3.2.5. *deul* and other 'plural' lexemes

In Korean grammars and dictionaries, *deul* is mentioned alongside two other 'plural marking' devices . The morpheme *ne* is listed as a plural marker in, e.g., Ramstedt (1939) and the recent *Standard Korean Dictionary*, and noun reduplication in Ramstedt (1939) and Baek (2002). *Ne* and noun reduplication are far less productive than *deul*, whose distribution is itself, as argued above, more restricted than that of the French/English-type plural. The examples presented below in (49) and (50) bring out the semantic contrasts between the three Korean 'plural' markers: *deul*-NPs are construed as extensional sets, as illustrated by (49b) and (50b); *ne*-NPs trigger an associative-plural effect, cf. (49c); and noun reduplication triggers what we might call a *string* effect, which our translation attemps to capture in (50c):

(49)a.	geu	-geos	-i	balo	*eonni*	-ga	wonha	-neun	geos	-i	-da.
	DM	thing	NOM	exactly	sister	NOM	want	REL	thing	COP	DEC

'That is exactly what my (elder) sister wants.'

b.	geu	-geos	-i	balo	*eonni*	*-deul*	-i	wonha	-neun	geos	-i	-da.
	DM	thing	NOM	exactly	sister		NOM	want	REL	thing	COP	DEC

'That is exactly what my (elder) sisters want.'

c.	geu	-geos	-i	balo	*eonni*	*-ne*	-ga	wonha	-neun	geos	-i	-da.
	DM	thing	NOM	exactly	sister		NOM	want	REL	thing	COP	DEC

'That is exactly what my (elder) sister and her lot want.'

d.	*geu	-geos	-i	balo	*eonni*	*-eonni*	-ga	wonha	-neun	geos	-i	-da.
	DM	thing	NOM	exactly	sister		NOM	want	REL	thing	COP	DEC

Interestingly, this option is not available in Korean without an overt classifier, while pluralisation *is* possible with an atomising effect, as witnessed by (44)-(46).

(50)a. geu -neun maeul -e dochagha -jamaja,
3MSG TOP village LOC arrive as soon as
(ø) *jib* -eul bangmunha -yeoss -da.
(he) house ACC visit PST DEC
'As soon as he arrived in the village, he visited {the/his} house.'

b. geu -neun maeul -e dochagha -jamaja,
3MSG TOP village LOC arrive as soon as
(ø) *jib* *-deul* -eul bangmunha -yeoss -da.
(he) house ACC visit PST DEC
'As soon as he arrived in the village, he visited {the/his/some} houses.'

c. geu -neun maeul -e dochagha -jamaja,
3MSG TOP village LOC arrive as soon as
(ø) *jib* *-jib* -eul bangmunha -yeoss -da.
(he) house ACC visit PST DEC
'As soon as he arrived in the village, he visited {several houses in a row/ a row of houses}.'

d. *geu -neun maeul -e dochagha -jamaja,
3MSG TOP village LOC arrive as soon as
(ø) *jib* *-ne* -leul bangmunha -yeoss -da.
(he) house ACC visit PST DEC

This competition between *deul*, *ne* and noun reduplication, as plural markers, gives further empirical support to our assumption (44).

5. Conclusion : explaining the French-Korean contrasts

We argued in section 4 that what distinguishes Korean *deul* from the French-type plural morphology is not its 'optionality', but rather its *noninflectional* character. We would now like to suggest that it is the inflectional nature of the French-type plural which accounts for its correlating with intensional readings, which we have shown to be unavailable with Korean *deul*. The central contrast between the Korean-type and French-type plural markers is their rigid vs. nonrigid semantics, not the Collective reading associated with number deficiency – which is common to the two languages. Our prediction is that only inflectional plural markers (as opposed to noninflectional ones) may allow intensional readings, and hence undergo binding, be involved in number agreement or exhibit narrow-scope effects. We assume that the inflectional or noninflectional nature of number marking is a relevant parameter for grammatical typology (to be added to Corbett's 2000 survey of properties), and that it is quite independent from the determiner issue: thus, Russian and Hindi, discussed by Dayal (1992, 1999, 2002), have no articles but have inflectional number; whereas Korean (like Chinese [Iljic 1994, Cheng 1999], Japanese [Ishii 2000, Kurafuji 2001, Mizuguchi 2001], Indonesian [Chung 2000]) combines lack of articles with noninflectional plural marking. French and English, as well as Hungarian (Farkas & De Swart 2003) have inflectional number and articles. Can a language combine (definite and/or indefinite) articles with noninflectional plural marking? We leave this as an open question.

We must now go back to the issue raised in sections 1 through 3: why are Collective-read number-deficient noun phrases more restricted in their distribution in French than in Korean? Suppose that we are correct in assuming that only an inflectionally-pluralised (French-type) noun phrase, as opposed to a lexically-pluralised (Korean-type) noun phrase, is open to intensional readings. It follows that in an inflectional-number language such as French, number deficiency associated with the Collective reading competes with the plural for denoting intensional sets

(whether kinds, or properties). From an interpretive perspective, however, the Collective reading involves a 'massification' effect - the blurring of the individuals which constitute the set - whereas the plural preserves the atomised construal of these individuals. In other words, number deficiency correlates with a mass-type interpretation (the Collective effect), which the plural fails to trigger. When inflectional plural morphology and Collective-read number deficiency are both available in the same language (as is the case in French), Collective-read number-deficiency is hence likely to get restricted to those styles, referents, and contexts which pragmatically motivate the de-atomising (mass) effect: the more the referent calls for an atomised reading, the less felicitous number-deficient syntax appears. On the other hand, in a lexical-plural language such as Korean, the plural triggers a rigidity effect; it follows that number deficiency takes over all intensional readings, including those which call for the plural in French because of its preferred atomising effect: cf. (3b), (22). In Korean, the plural, because of its semantic rigidity, is more restricted in its distribution than it is in French, and correlatively, there is no available grammatical strategy in this language to force an atomised AND intensional construal of a kind.

Summarising, the leading assumptions developed in this article are the following:

• The mass/count distinction is not a semantic primitive rooted in the lexicon but always an effect of morphosyntax.

• Number deficiency in syntax correlates with Mass and Collective readings in both Korean and French.

• Lexical plural markers (such as Korean *deul*) should be expected to be distributed and interpreted differently from inflectional plural markers (such as the French plural).

• In order for a plural marker to grammaticalise into an inflectional feature, it must acquire a *negative value*.

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The syntax of extraction: derivation or constraint satisfaction?

Robert Levine

1 Filler/gap constructions: two approaches

Historically, filler/gap constructions such as those in (1) have been approached two ways:[1]

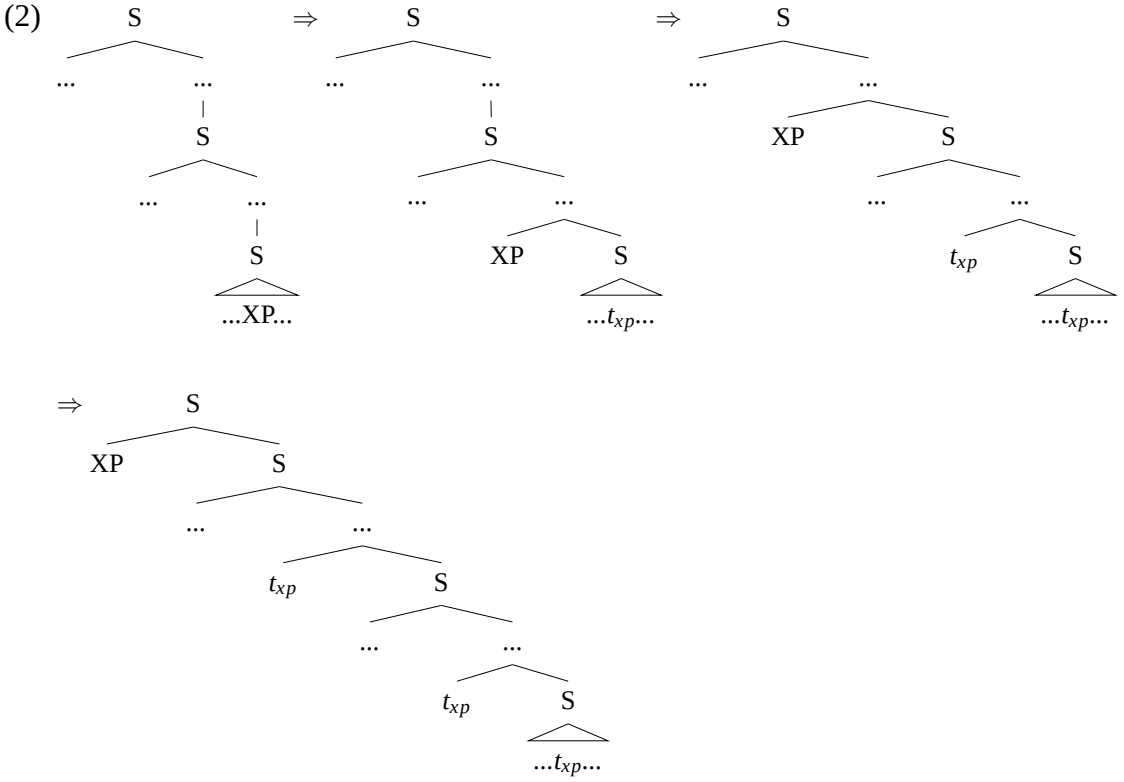
(1) a. THAT book, you should purchase __.

b. Which book does Leslie think you should purchase __?

c. This is the book which Leslie told me she thinks I should purchase __.

Transformational approaches posit a sequence of representations in which the filler is initially in the position notated by the underline in (1), which is then relocated, possibly via a series of movement steps, to its final position on the left of the highest clause. Schematically, the derivational approach can be illustrated in (2):

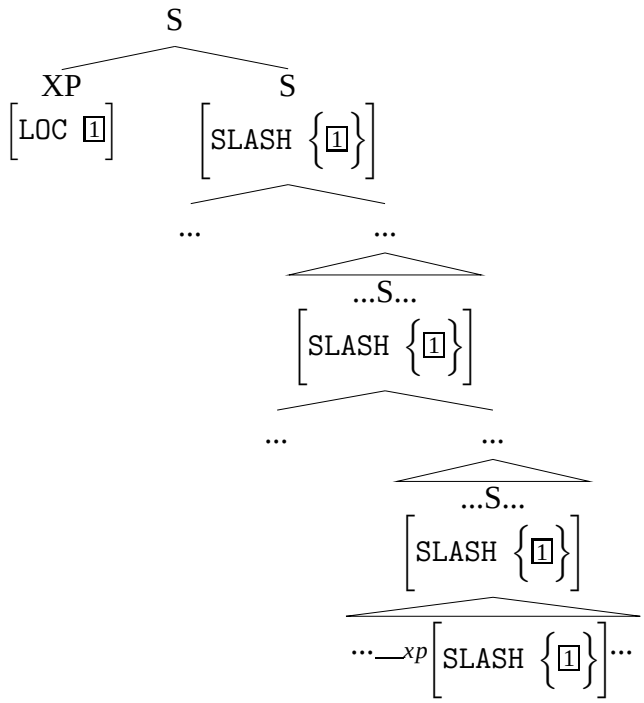
(2)



[1]The material presented in this paper partially overlaps with the content of Levine and Sag (2003).

There are two crucial aspects to the analysis depicted in (2): (i) the filler is the same object at the end of the derivation as the in-situ category at the beginning of the derivation, merely relocated by movement, and (ii) a series of intermediate traces is left at each of the positions occupied by the trace in transit, in addition to the trace demarcating its original position prior to movement. Just what these traces consist of is a recurring issue for derivational theories: they range from proper subsets of the grammatical specifications of the extracted category to full-blown ghost copies of the moved constituent, complete with descending constituent structure. Compare this picture to the HPSG connectivity mechanism linking fillers and gaps given in (3):

(3)



Connectivity in ensured by constraints on feature descriptions in HPSG, which have the effect of guaranteeing that SLASH specifications on daughters are reflected in the SLASH specification of the mother; that the value of SLASH reflects a particular subset of the grammatical specifications of the filler, and that SLASH is cashed out at a structural position corresponding to a constituent which matches the grammatical specifications borne by SLASH, and therefore those of the filler as well.

Casual comparison of (2) and (3) might suggest that these representations are essentially equivalent. Indeed Chomsky has insisted, over much of his career, on the empirical indistinguishability of monostratal representations with 'base generated gaps', on the one hand, from derivationally derived gaps as per (2). In *LGB* (Chomsky (1981)), for example, he asserts their 'virtual indistinguishability', arguing that the problem of choosing between them is 'a fairly marginal one', later on strengthening this claim to the bizarre assertion that all nonderivational theories of filler/gap linkages are 'transformational theories, whether one chooses to call them that or not)' (Chomsky (1995), p. 403). Over the past two decades, the notion seems to have circulated in certain circles that monostratal feature-linkage analyses of filler/gap constructions are nothing more than old wine in new, not very interesting bottles. It is true that during the past several years Chomsky seems to have rethought this position and has attempted to motivate the superiority of the derivational approach. Though there is certainly much to say about the logical coherence and empirical status of Chomsky's recent claims along these lines, the discussion below focuses instead on establishing that the view of derivational and nonderivational theories of extraction as notational variants is altogether misguided, and that not

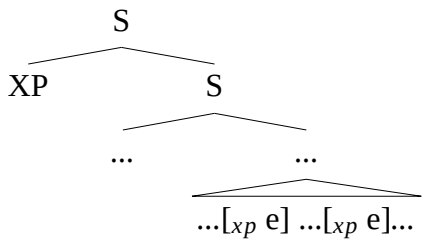
only are there clear framework-architectural differences between the approaches, but that the radical inadequacy of derivational approach to extraction on purely factual ground makes the monostratal position—which as I'll argue is the logically strongest position one can take on—distinctly preferable on uncontrovesial methodological grounds.

The problem with framework comparison taking extraction phenomena as the basis is that *single* filler/gap linkages do not sharply distinguish between the predictions of derivational theories in which a constituent changes its structural position in the course of a derivation vs. those of monostratal theories in which nothing moves, but where instead a small set of very general constraints have to be satisfied at all structural positions. To drive a wedge between these two fundamentally different worldviews in an *empirically* pointed way, it is necessary to examine their relative utility in accounting for constructions in which a single filler is linked to two or more gap sites.

2 What multiple gap constructions tell us

The first point is straightforward: in a single filler/multiple gap construction, such as the parasitic gap phenomenon, the finale of the derivational picture looks not like that in (2), but rather like (4):

(4)



What is the relationship between the filler and the two gaps? There is no well-defined formal operation corresponding to movement of two distinct daughter constituents to a single phrase structure position, as emphasized by Gazdar et al. (1982). That is, a single linkage mechanism to the two gap sites is in principle unavailable given movement *simpliciter.* Only two possible choices are available:

- there is one kind of linkage mechanism between the filler and one of the gaps and a different kind of linkage mechanism between the filler and the other gap; or
- there is only a single kind of linkage mechanism available between fillers and gaps, and in multiple gap construction there are two separate instances of the same mechanism.

In the first case, there is an obvious asymmetry: one of the gaps must represent a trace of the filler, so that the other position must be occupied by a phonologically null something which is not a trace. In the second case, movement is the sole linkage mechanism in both cases, which entails that there is, in addition to the movement bringing the overt filler to its surface position, a second movement leaving the second trace—with the second moved element then necessarily, invisible. Here the asymmetry is between the movement chain linking the overt filler to the gap site, on the one hand, and that linking the null filler to the gap site, on the other.

Both variants, and various hybrids, exist in the literature; sticking to very familiar examples, Chomsky (1982) manifests the first alternative and Contreras (1984), later adopted in Chomsky (1986) the second, which has become known, in spite of the fact that Contreras first proposed it, as the *Barriers* approach. But the plausibility of such approaches is only as strong as the arguments for the asymmetry assumed. The following are the principle ones I am aware of:

- the so-called Kearney paradigm;
- the distribution of finite clause subject gaps;
- the supposed asymmetry of weak crossover;
- supposed (anti)pronominality effects and alleged categorial restrictions on parasitic extraction.

Each of these supposed phenomena has been used to motivate a radical dichotomy among filler/gap chains in at least certain multiple-gap constructions. Frampton (1990) cites this data in arguing for a distinction between true gaps and p-gaps, and Kiss (2001) repeats this evidence apparently under the impression that it constitutes support for an asymmetrical analysis of p-gap constructions.

But the data supporting this dischotomy turns out in every case to be illusory, in many cases straightforwardly clearly derivable from processing constraints that are, in the relevant respects, configurationally blind. When these are sorted out, none of the supposed evidence for chain asymmetry in multiple gap constructions turns out to be relevant.

There is, in fact, positive evidence *against* this asymmetrical characterization of multiple gap chains. I will argue later that in addition to parasitic gap constructions there is

- a *symbiotic* multiple gap construction which is intractable on derivational accounts predicated on an asymmetry between filler/gap linkages, and
- a pattern of apparent case-inconsistency between the gaps in multiple gap constructions which, though at first glance compatible with a Contreras/*Barriers*-style analysis of asymmetrical chaining, turns out to be badly mispredicted by such approaches.

2.1 The Kearney paradigm

The primary argument in the literature for chain asymmetry in p-gap constructions is, as far as I am aware, given in Chomsky (1986). Chomsky cites the following two examples, due to Kearney (1983):

(5) a. Which books about himself did John file *t* [before Mary read *e*]?

b. *Which books about herself did John file *t* [before Mary read *e*]?

Chomsky observes that

> Example [(5)a] is a normal parasitic gap construction, but [(5)b] is ungrammatical. It follows, then, that the *wh*-phrase in [(5)a], [(5)b] is extracted from the position of *t*, not from the position of the parasitic gap *e*. As Taraldsen had originally assumed, the latter is truly 'parasitic'.

While hardly transparent, the reasoning seems to be this: if p-gap constructions were instances of multiple, i.e., symmetrical, gap phenomena, reconstruction of the filler should proceed symmetrically to yield identical effects in both (5)a and b. In both cases, the result would be a structure with a reconstructed filler compatible with one antecedent *but not the other*, and so both should be bad. What we instead find is that the reconstruction is good when the anaphor is compatible with the subject of the clause containing the 'true' gap, but not otherwise. The simplest conclusion, the reasoning seems to be, is that the overt filler reconstructs only to the main clause gap site, which must then be its transformational point of origin.

But this frequently accepted conclusion, echoed for example in Frampton (1990) and Kiss (2001), is demonstrably incorrect. Consider first the contrast:

(6) a. Which pictures of himself did John go to England without telling Mary to send t to the INS?

b. ??*Which pictures of herself did John go to England without telling Mary to send t to the INS?

The pattern and the quality of the contrast here is exactly parallel to that in (5), but there is only one gap site, hence necessarily the 'true' gap site in both cases, and hence nothing remotely like the explanatory line Chomsky, Frampton, Kiss and others assume respectively for (5) here can apply in the case of (6). There is no structural difference whatever between the two examples in (6). The sole difference is that in (6), an incompatible potential antecedent is linearly closest to the reflexive within the filler.

This observation suggests that we might well be able to ameliorate the ill-formedness in (5) were we able to rearrange the structures involved somewhat so that the antecedent in the ill-formed case in (5)b were closer to the filler than the unmatchable potential antecedent *John*. And this is possible: as we have learned from Haegeman (1984), parasitic gap construction of the form VP/1 XP/1 have well attested analogues XP/1 VP/1. Consider the result of replacing in (9) the right-adjunct version of the p-gap with the left-adjunct version:

(7) a. There were pictures of $\left\{ \begin{array}{c} \text{himself} \\ \text{*herself} \end{array} \right\}$ which John put into circulation once Mary approved of.

b. There were pictures of herself which once Mary finally decided she liked/approved of, John put into circulation.

And for completeness,

(8) a. There are pictures of himself which John wants to put into immediate circulation, though they'll take Mary a while to get used to.

b. There are pictures of herself which, though they'll take Mary a while to get used to, John wants to put into immediate circulation.

The goodness of (7)b and (8)b immediately refutes Chomsky's (rather implicit) account of the Kearney paradigm in (5). For when the parasitic-gap adjunct host precedes the main VP, the Kearney effect disappears completely. On Chomsky's account, this would have to mean that for structurally unmotivated reasons, reconstruction into the parasitic gap was suddenly possible, in spite of the supposed fact that the overt filler has no direct syntactic relationship with this gap site. And if such reconstruction were possible, then what could possibly block it in the case of (5)?

The conclusion we come to then is that the Kearney paradigm has been badly misunderstood ever since its first introduction into the literature as a justification for the possited asymmetry of p-gap constructions, and in fact is at best irrelevant to the question.

2.2 Nominative subject p-gaps

A second argument for chain asymmetry is given in Chomsky (1982), Cinque (1990), Frampton (1990) and Postal (1998), based on the supposed ill-formedness of parasitic gaps in finite subject positions. Examples such as those in (9) are often offered as illustrations of this claim:

(9) a. *Jack, who$_i$ I heard about __$_i$ before you said __$_i$ would hire us... (Frampton (1990), p.68.)

b. *Someone who$_i$ John expected __$_i$ would be successful though believing __$_i$ is incompetent...(Chomsky (1982), p.55)

c. *The militant who they arrested __$_i$ after learning __$_i$ was __$_i$ carrying a gun...

Since true gaps have no problem extracting from finite subject position, such examples, taken to be representative, have been important supporting evidence for the position that parasitic gaps really involve a different relation to overt fillers than true gaps do. But again, examination of a slightly wider range of data shows that whatever difficulty such examples pose for acceptability, they are very far from from being representative of the general case. Consider examples (10):

(10) a. [Which people]$_i$ did you invite __$_i$ without thinking __$_i$ would actually come?

b. Jack, who$_i$ even before you said __$_i$ would hire us I was favorably disposed towards __$_i$, is a prince among men.

c. There go [the Endaby twins]$_i$, who as soon as I realized __$_i$ were on their way over to visit me I made immediate arrangements to avoid __$_i$.

There are so many good examples of such p-gaps that the claim that they are in general bad seems without any solid foundations.

2.3 Weak crossover

The next set of claims I want to address posits a distinction between true and p-gaps (and, in parallel fashion, between the first gap in an ATB extraction and a following gap as per Munn (2001)) based on the claim that there is a class of extractions which are not susceptible to weak crossover (WCO) effects, and that these include parasitic and non-leftmost coordinate structure gaps. The basic argument here is presented in Lasnik and Stowell (1991). They note the contrast between examples such as (11)a and b:

(11) a. *Who$_i$ did his$_i$ lawyers make a convincing case for t$_i$?

b. Who$_i$ did the jury acquit after his$_i$ lawyers made a convincing case for t$_i$?

Lasnik and Stowell argue that p-gaps line up with missing object constructions, clefts, non-restrictive relatives and other instances of what Postal has referred to as 'B-extractions', which he and Cinque, offering somewhat different variants of the analysis, have argued should be analyzed as instances of null resumptive pronouns. I don't want to say too much about their argumentation, which consists of taking a reasonable generalization about extracted operators, generalizing it against all factual evidence to all $\bar{A}$ fillers, then exempting the counterfactual cases by arguing that the gaps are not traces and hence their proposed WCO condition will not apply to them—an argument roughly like claiming that the observation that all primes greater than 2 are odd is too weak, that *all* prime numbers must be odd, and then arguing that the claim is justified if we decide that 2 is not a number. But the crucial point is that Lasnik and Stowell's position—which is a centrepiece of Munn's (Munn (2001)) analysis of multiple-gap constructions—turns out to be empirically completely unfounded. Parasitic gaps indeed manifest WCO effects, if the p-gap appears in a place where—to summarize altogether insufficiently—there is insufficient material introduced into the discourse to establish a credible antecedent for the pronoun. There are two such classes of p-gaps:

- subject p-gaps;
- left-fronted adjunct p-gaps

Consider the first kind of case, exemplified in (12):

(12) His$_i$ fan's ideas about Robin$_i$'s work materially **improved** Robin$_i$'s work.

As we would expect, such cases of cataphora are quite legal under all versions of binding theory. The pragmatics of ordinary discourse seem to require that a repetition of the NP *Robin's work* involve some kind of appropriate contrastive or emphatic stress, but this effect seems irrelevant to the syntax itself. Suppose now we attempt to form a subject p-gap on the basis of (12):

(13) ??*[Whose$_i$ work]$_j$ did his$_i$ fan's ideas about e$_j$ materially improve t$_j$?

This sounds pretty dreadful—a classic, typical WCO effect, in fact. And as proof of this, note that we can ameliorate the effect by using the standard technique of increasing the denotational specificity of the extracted element, a point noted in Wasow's groundbreaking work on the WCO effect in the early 1970s:

(14) [[Which reknowned master of fiction]$_i$'s work]$_j$ did his$_i$ fan's ideas about e$_j$ materially improve t$_j$?

Similarly, the other well-established technique of focalizing the pronoun works in these cases exactly as in standard WCO examples:

(15) a. Who$_i$ did *(even) his$_i$ mother complain about?

b. Who$_i$ did his$_i$ *(own) mother complain about?

c. [Whose$_i$ work]$_j$ did even his$_i$ own fan's ideas about e$_j$ fail to materially improve t$_j$?

Next, consider the Haegeman variant of adjunct p-gaps in connection with the supposed WCO-immunity of p-gaps:

(16) a. I've found that what$_i$ I can't understand t$_i$ until its$_i$ author explains e$_i$ to me is basically anything in post-WWII literature.

b. *I've found that what$_i$ until its$_i$ author explains e$_i$ to me I can't understand t$_i$ is basically anything in post-WWII literature.

c. I've found that what$_i$ until my agent explains e$_i$ to me I can't understand t$_i$ is basically anything in post-WWII literature.

These examples are *exactly* what we predict on the assumption that p-gaps are subject to precisely the same WCO effects as any other kind of 'true' gap. They show conclusively that there is no chain asymmetry between parasitic gaps and the gaps that these are putatively parasitic on. [2]

[2] In any case, as exhaustively documented in Postal's unaccountably overlooked (1993b) discussion of weak(est) crossover, Lasnik & Stowell's claims about topicalization and other 'weakest' cases are factually untenable: 'in certain circumstances, extractions under at least topicalization, clefting and nonrestrictive relative clause formation do yield WCO effects, even when... the extracted phrases are not in any sense characterizable as "true quantifier phrases"'. (p. 546). Munn (2001) appears to wish to retain Lasnik & Stowell's argument at least insofar as it putatively applies to multiple gap constructions; he cites Postal's WCO paper approvingly, suggesting that he accepts Postal's demonstration of Lasnik and Stowell's empirical failings so far as single-gap constructions are concerned, but thinks that it still holds for multiple-gap constructions. The data cited above of course show that Lasnik & Stowell's claims about multiple gap constructions are as unsupported as those pertaining to the single-gap cases implicated in Postal's extensive counterevidence.

2.4 Alleged antipronominality

Finally, it has been claimed in Cinque (1990), Postal (1998) and Munn (2001) that p-gaps (along with other supposed B-extractions) do not tolerate extractions from sites that are resistant to the appearance of pronominal forms. This claim is extremely easy to falsify; so consider, e.g.,

(17) a. I'm a(n) { friend / brother / ally } of Thorkill Skullsplitter, but Terry isn't a(n) { friend / brother / ally } of his/*him

a. There are [certain people]$_i$ you can't do business with $\_\__i$ unless you're a { friend / relative / ally } of $\_\__i$.

(18) *There are certain people whose you can't do business with unless you're a relative of.

Many other examples are given in Levine et al. (2000) and Levine (2001). It seems very difficult to maintain the claim in question unless one appeals, as in Postal (1998), to the possibility that such environments rule out overt weak definite pronouns but allow covert instances of such pronouns—a position that Postal himself acknowledges has no independent support and amounts essentially to a diacritic invoked to neutralize real counterexamples.

3 Evidence against chain asymmetry

3.1 Symbiotic gaps

The foregoing discussion establishes the essentially negative point that the chief published arguments for chain asymmetry in derivational theories of p-gap licensing are entirely spurious. We now move to positive evidence that that chain-asymmetric approaches to multiple gap constructions are profoundly misconceived. Consider the data in (19), where *both* gaps seem to be within islands:

(19) a. What kinds of books do authors of __argue about royalties after writing __?

b. ??What kinds of books do authors of malicious pamphlets argue about royalties after writing __?

c. *What kinds of books do authors of __argue about royalties after writing malicious pamphlets?

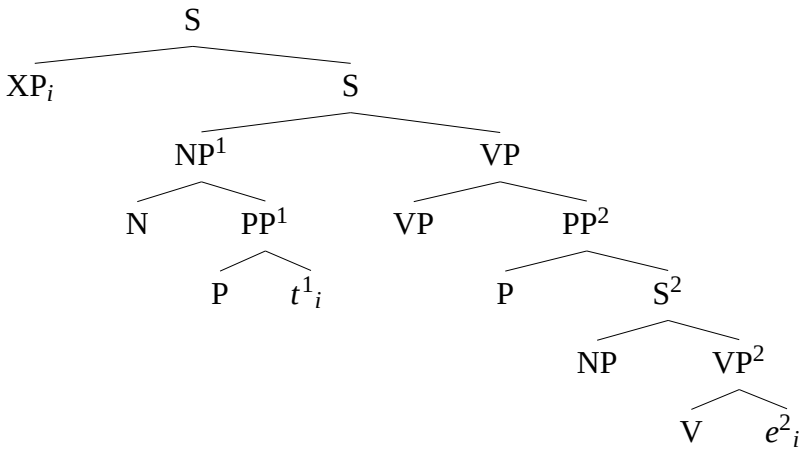
If either gap is a 'true' gap, then the argument for chain asymmetry essentially disappears in the case of subject-gap/main VP gap or main VP gap/adjunct gap p-gap constructions—in which case multiple-chain analyses such as the *Barriers* analysis make no sense. The only defensible position seems to be to assume that subject and adjunct gap are *mutually* parasitic, or as I shall call them, symbiotic, i.e., depend on *each other* for licensing.

Can such constructions actually be licensed by movement approaches? The short answer is no. In particular:

- Under Chomsky's 1982 approach in *Concepts and Consequences* (and also Cinque (1990)), a parasitic gap starts out in DS as *pro*, and is subsequently coindexed with the filler linked to the 'true' gap site'; otherwise identification of *pro* is impossible (or the functionally determined equivalent reasoning). Island conditions apply to all variables, regardless of how they arise. But both gap sites are islands. Hence there is no legal extraction to establish a filler that can license the other gap.

- On Kayne's 1983 'connectedness' approach, a free gap can only establish a connection to a parasitic gap if the path from the parasitic gap to the true gap can be continuously xmediated in terms of what Kayne calls the g-projection path. Longobardi noted that in order to yield the correct results for p-gap constructions, it was necessary to ensure that each node in the projection path be properly governed. But on this assumption, it turns out however that the g-projections of the subject gap and the adjunct gap both terminate before a connected path can be established, leaving the legal examples in (19) presumably unlicensed, as charted in (20), where superscripts indicate g-projections.

(20)



- Chomsky's 1986 *Barriers* approach does not actually contain a particularly satisfactory account of gap parasitism, since in the end it posits a technical device—Chain Composition constrained by 0-subjacency—which is never reconciled with the existence of subject islandhood and subject parasitic gaps. It seems fairly clear from Chomsky's discussion in §7 that he regards IP as directly dominating the adjunct, in spite of the fact that examples such as *And go to England without signing these papers I will* make it clear that the adjunct is part of the VP. To ensure the parasitism of parasitic gaps, it is necessary on the *Barriers* analysis that the adjunct and the subject not only function as barriers themselves but, as blocking categories, ensure that the dominating maximal projections closest to them—which in the case of the subject is clearly IP but for the adjunct must be VP—are barriers for any movement originating within the subject and the PP respectively.

  For symbiotic gaps there are only two possibilities: the *wh* phrase originates in the subject or in the adjunct island. If the subject is the source, then the stipulated prohibition on adjunction to DP entails a direct movement through IP (which itself also prohibits adjunction). But a movement from a barrier immediately under IP entails that IP counts as a barrier by inheritance for that movement. The result is of course a decisive subjacency violation ruling out (unsupported) subject extraction. But, while PPs are not L-marked and therefore count as barriers, adjunction to PPs is actually admitted in Chomsky's analysis (see *Barriers*, pp. 65–66). What then

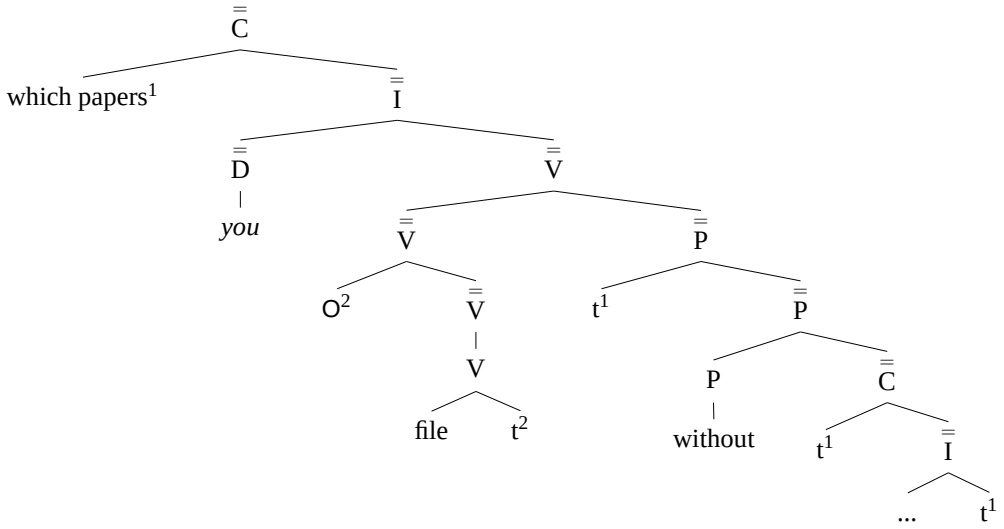
blocks *wh* movement from the adjunct itself, and empty operator adjunction within the main VP? Clearly, Chomsky's discussion of the Kearney paradigm makes it clear that he does not envisage this possibility.

In fact, this possibility is clearly ruled out for parasitic gaps under Chomsky's notion of Chain Composition. Chain composition requires that the head of the parasitic chain be 0-subjacent to the lowest element in the true-gap chain. Consider (21):

(21) Which papers did you file __without reading __?

If *wh* percolated from the *adjunct* clause to the highest [Spec,CP], and the empty operator main verb object adjoined to VP (from which it could go no higher) then we would have the situation depicted in (22), in which Chain Composition could not occur:

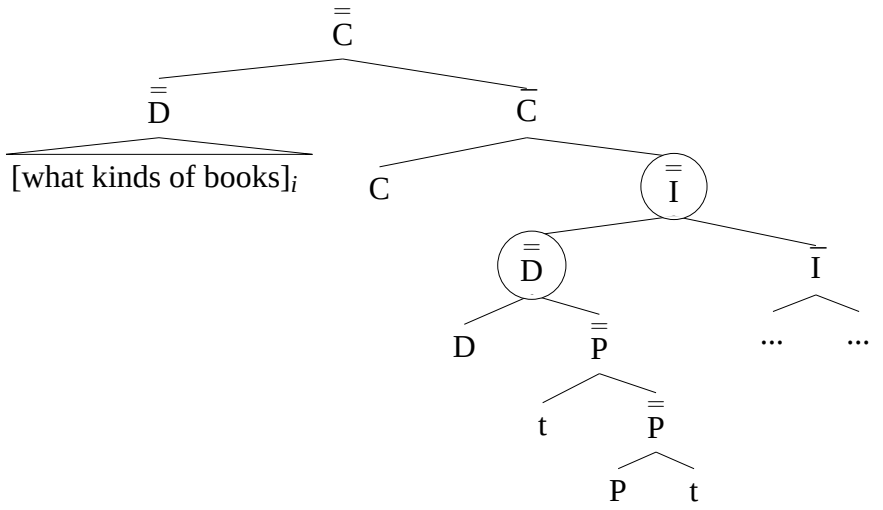
(22)



The head of the parasitic chain, the empty operator, is separated from the bottom trace of the true chain by the barrier PP. Hence the conditions on Chain Composition cannot be met.

In exactly the same way, if in the case of (19)a we attempted to use the adjunction escape hatch to allow *wh* to move from the adjunct phrase to the highest Spec position, we would have the null operator phrase within the subject NP, unable to escape any futher. This operator would be separated from anything outside the subject by the NP barrier, and still further by the main VP, adjunct PP and adjunct CP barriers from the tail of the true chain. Hence Chain Composition would be ruled out on this scenario. Nor could *wh* originate in the subject DP, since it would have to pass through two barriers on the way to matrix Spec, as shown in (23):

(23)

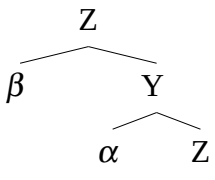


Therefore the approach in Chomsky (1986a) mispredicts that examples such as (19) are ill-formed.

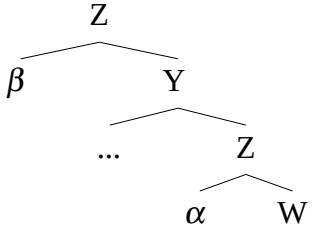
Nonetheless, Chomsky's *Barriers* proposals for gap parsitism are seriously compromised by the fact that 0-subjacenty is impossible for subject parasitic gap Chain Composition unless, as Chomsky himself observes, 'the empty operator [moves] out of subject position (which is a barrier) at S-structure, where Chain composition is licensed' (p.66). But where will it go? By stipulation it cannot adjoin to NP, which it must to render IP a non-barrier for Chain Composition. Chomsky never actually provides a solution, merely noting vaguely that 'several possibilities might be pursued, but the question remains obscure' (p.66). One of the motivations of Frampton's treatment of p-gap phenomena was clearly to propose a *Barriers*-framework alternative to Chomsky's technically highly problematic treatment of gap parasitism.

- Frampton's (1990) treatment of parasitic gaps, a kind of hybrid of Kayne's connectedness with Chomsky's null operator treatment in *Barriers* incorporating his *wh*-deletion analysis in 'On *wh* movement' (Chomsky (1977)), is in effect a derivational reconstruction of the multiple licensing of extractions pathways linked to a single filler. Frampton's strategy is to dissociate the formation of chains from the history of movement, and to allow *wh* NPs to spontaneously delete, leaving, in a manner never made particularly explicit, a trace behind which can then be gathered into a chain, as he puts it, by an SS-level operation which requires subjacency between all links. Adjunction is excluded to the 'potential argument categories' DP, PP and CP. In Frampton's system, α is subjacent to β in (24)a but not (24)b:

(24) a.

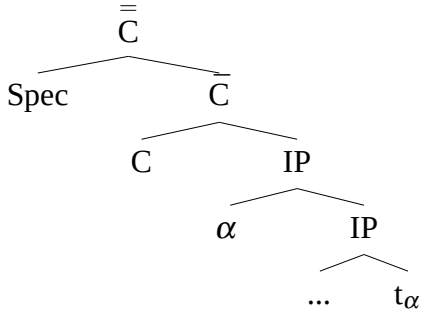


b.



where both Y and Z are barriers. Barrierhood is reserved either for non-L-marked categories or those which inherit barrierhood from blocking categories below them, along familiar lines. Frampton however allows adjunction to IP, yielding the configuration

(25)



Even though CP inherits barrierhood from IP, it will not be a barrier for a trace which is not properly dominated by the IP it inherits barrierhood from. Hence, if the CP in (25) is L-marked, it cannot be a barrier. However, adjunction is restricted by the crucial condition that it is possible only to a category whose head canonically governs the moved constituent. Thus, in (25), α cannot be the DS subject of IP.

With these components in place, Frampton attempts to explain the pattern of judgments in (26)-(27):

(26) a. *Who do friends of hate Tolstoy?

b. *Who did you praise Bill because you like?

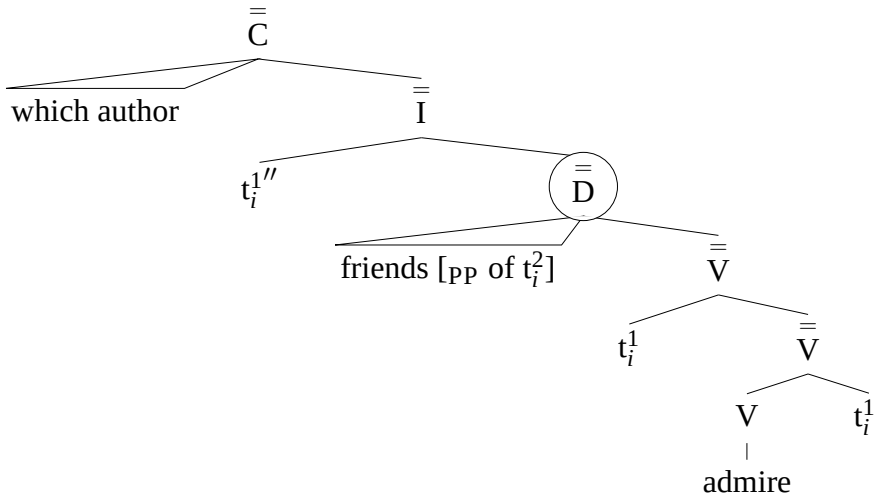
(27) a. Which author do friends of admire?

b. Who did you praise because you like?

In (26)a, *who* may not adjoin to NP, which is forbidden in principle, or to IP, since the subject is not canonically governed by Infl. Hence it must move directly to [Spec,CP]. But since both the non-L-marked subject NP and the barrier-by-inheritance CP intervene, subjacency is violated in this movement and the example is ill-formed. In (26)b, *who* can legally move as far as the [Spec,CP] of the clause. Since PP is not L-marked, it constitutes a barrier, to which adjunction is moreover ruled out by fiat. Hence the head of the VP containing the PP does not canonically govern *who* in its highest legal position within PP, and therefore *who* cannot adjoin to VP, which then constitutes a second barrier that may not be crossed without violating subjacency.

In order to motivate (27), Frampton no longer has to rely on the construction-specific stipulation of Chain Composition which Chomsky introduced in *Barriers*, and which, as noted, still faces the technical impasse of subject gap parasitism. In (27)a, the *wh* phrase object of *admire* legally adjoins to VP, then to IP and moves into [Spec,CP]. The subject of *admire* remains a barrier as in (26)a. But the prepositional object within this subject need not, in this case, move itself. It can spontaneously delete, i.e, become a trace, leaving us with the configuration in (28):

(28)



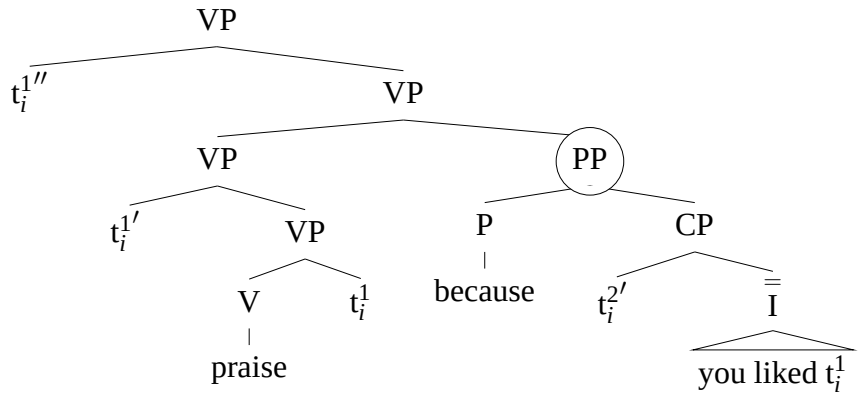
The two *wh* expressions are freely coindexed in DS. Superscripts identify the original 'history of derivations' for the two separate *wh* expressions. We have, according to Frampton's constraints on chain formation, two legal chains

(29) a. (*which author*, $t_i^{1\prime\prime}$, $t_i^{1\prime}$, t_i^1)

b. (*which author*, $t_i^{1\prime\prime}$, t_i^2)

Crucially, there is a legal chain which includes the highest token of t^1 and the sole element of the second 'history of movement' t^2. Since the nominal head of the subject L-marks the *of* PP, the latter is not a barrier, and hence there is only a single DP barrier intervening between between t^1 and t^2. Thus the chain (29)b is legal. A similar derivation will license (27)b. Here there will be a legal chain reflecting a history of movement from the object of *to* to the *wh* phrase in [Spec,CP], and a second history of movement whose upper termination is in the Spec of the adjunct CP *you like*. If the *wh* phrase in the latter position morphs into a trace, we have for the critical part of the structure the tree in (30), with, again, the sole barrier circled:

(30)



Adjunction to PP is ruled out. Here again, however, there is a chain which can be formed linking $t_i^{1\prime\prime}$ to t_i^2 legally, with only a single intervening PP barrier. This chain is parasitic on the 'history of movement' linking the *wh* filler to its DS site as the object of *like*.

And, as we might expect, the same problem with connectedness in these cases carries over to Frampton's trace-based analogue. It is obvious that when one gap is within a subject DP and

the other within an adjunct, there is no 'history of movement' which can provide the materials for a chain that will include *either* gap. For the very reasons that Frampton has been at pains to explain, neither of the coindexed *wh* phrases that would have to be assumed in DS in (19)a can reach Spec of the matrix CP. As already explained in connection with (26)a and b., they will be prevented by subjacency from extracting from DP and adjunct PP respectively: adjunction to the PP subject by an internal *wh* phrase is ruled out in principle, and so is adjunction to PP, leaving neither barrier-internal operator able to establish a history of movement which can be utilized to license a gap corresponding to 'spontaneous deletion' of the other. Thus Frampton's account falsely predicts that gap symbiosis does not occur in English syntax.

The upshot of all this is that no reasonably explicit P&P theory of p-gaps has anything that looks like even the beginning of an account of symbiotic gaps.

3.2 Case conflict and its resolution

Finally, consider examples such as (31).

(31) Robin is someone who$_i$ even good friends of $\_\_{}_i$ believe $\_\_{}_i$ likes power entirely too much.

The filler here is linked to two gap sites, an accusative prepositional object and a nominative finite clause subject. Such mismatches seem to support the position that there is an aysmmetry between the two chains that p-gap constructions comprise: if both gaps were linked to a single filler in precisely the same way, the latter would have to share case specifications with both gap sites.In contrast, a double chain analysis, for example, along *Barriers* lines, seems to fit the bill: there will be literal connectivity only along the true filler/gap pathway, while the null operator is linked to the true filler/gap pathway only anaphorically, sharing indices but no ϕ features, so that we would have the situation in (32)

(32) *wh*$_i$ [Nom]... O$_i$ [Acc]...t$_i$ [Acc]....t$_i$ [Nom]

So the possibility of case mismatches seems to be predicted. Surely this is a plus for the asymmetrical chain analysis?

In this case appearances are particularly deceiving, for it turns out that none of the movement approaches considered has a straightforward way of accounting for the fact that *such mismatches will occur only when the overt filler is morphologically neutral with respect to case marking.* On the *Barriers* approach, the true and parasitic gap are supposed to be case-independent of each other. So then why then do we have the following data?

(33) a. *Him$_i$, even friends of $\_\_{}_i$ think $\_\_{}_i$ likes power entirely too much.

b. He I very much DOUBT $__$wants to have anything to do with us.

c. Robin is someone who(*m)$_i$ once I realized $\_\_{}_i$ WOULD be coming to the party I made a special point of being nice to $\_\_{}_i$.

The *Barriers* analysis gets these dead wrong: if the two chains are linked purely by Chain Composition in such as way that (31) is good, then certainly (33)a should be good, since the structure is literally identical to that of (32):

(34) *Him$_i$* [Nom]... O$_i$ [Acc]...t$_i$ [Acc]....t$_i$ [Nom]

All that is different is that the case on the filler is phonologically visible. On the other hand, (33)c is nothing more than the mirror image of (32):

(35) *whom*$_i$ [Acc]... O$_i$ [Nom]...t$_i$ [Nom]....t$_i$ [Acc]

Again, contrary to various urban legends about finite clause subject p-gaps being blocked, there is nothing in the least wrong with the case-neutral version of (33)c, which presumably is structurally absolutely indistinguishable from (35). What makes all the bad cases bad seems to be nothing more than the overt morphological form of the same case specification which supposedly corresponds to good examples when it is covert. The same case, that is, corresponds to a well-formed result when unmarked, but an ill-formed string when spelled out, bad, with no theoretically coherent account even vaguely suggested by the form of derivational approaches to movement phenomena. In response to this serious embarrassment, one might want to assume instead that Case identity between the two chains really *was* a condition on chain composition—in which case, of course, one would incorrectly predict the badness of (31).

4 Conclusion: the superiority of HPSG

We conclude with the following observations:

- The HPSG theory of p-gaps, which is in a sense the HPSG theory of filler/gap UDCs itself, takes the putative 'true' and the alleged 'parasitic' gaps to be on a complete par with each other. Hence the Kearney paradigm facts are just what we would expect, given the Pollard and Sag (1994) binding theory along with certain processing constraints that seem, in view of (6), to be necessary independently of multiple gap construction.

- The well-formedness of nominative subject p-gaps corresponds to the HPSG null hypothesis, and hence nothing further needs to be said about it.

- The HPSG theory of p-gaps, since it treats all gaps on a par, can treat symbiotic gaps exactly the same as parasitic gaps, assuming the general position on strong islands taken in Pollard and Sag (1994) (and strongly supported by the complementary work reported in Kluender (1998), Kroch (1989) and others sources). Note that the Pollard-Sag Subject Condition predicts the well-formedness of the symbiotic gap examples, since it imposes a language-particular restriction on English grammar that a gap within in an English subject must be matched by a gap in the VP of which the subject is a valent. This formulation correctly predicts the fact that the gaps need not correspond to the same filler, as documented in Hukari and Levine (1989):

  (36) a. There are [certain heroes]$_i$ that that I find [long stories about t$_i$]$_j$ too boring to listen to t$_j$.

  b. There are [certain heroes]$_i$ that [long stories about t$_i$]$_j$ invariably prove to be too boring to listen to t$_j$.

  c. [Which heroes]$_i$ are [long stories about t$_i$]$_j$ bound to be too boring to listen to t$_j$?

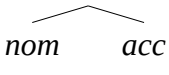
  Cf.

  (37) ??*Which heroes are long stories about bound to be too dull to entertain Robin.

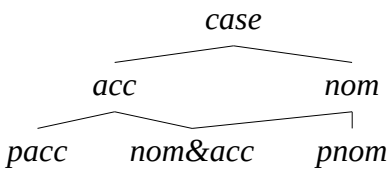
It is not in the least obvious how any of the P&P parasitic gap hypotheses are going to be able to license gaps in subjects that do not correspond to the supposedly 'true' gaps which in one way or another are going to have to license them, at least given the apparently universal assumption that English subject positions are syntactic islands.

- The case mismatch facts fall simply and directly out of the case type hierarchy presented in Levine et al. (2000). Briefly, we replace the case subhierarchy of English in (38)a with (38)b:

(38) a.



b.



To implement this solution, Levine et al. (2000) propose the following case values for various English NPs.

(39)

he	[CASE *pnom*]
him	[CASE *pacc*]
whom	[CASE *pacc*]
who	[CASE *nom&acc*]
Robin	[CASE *nom&acc*]
t	[CASE *case*]

This solution gives us exactly what we want both in more typical examples (where there are constraints on case assignment, but no case mismatches) and in the previously problematic examples like (31 and (33). Consider the following examples:

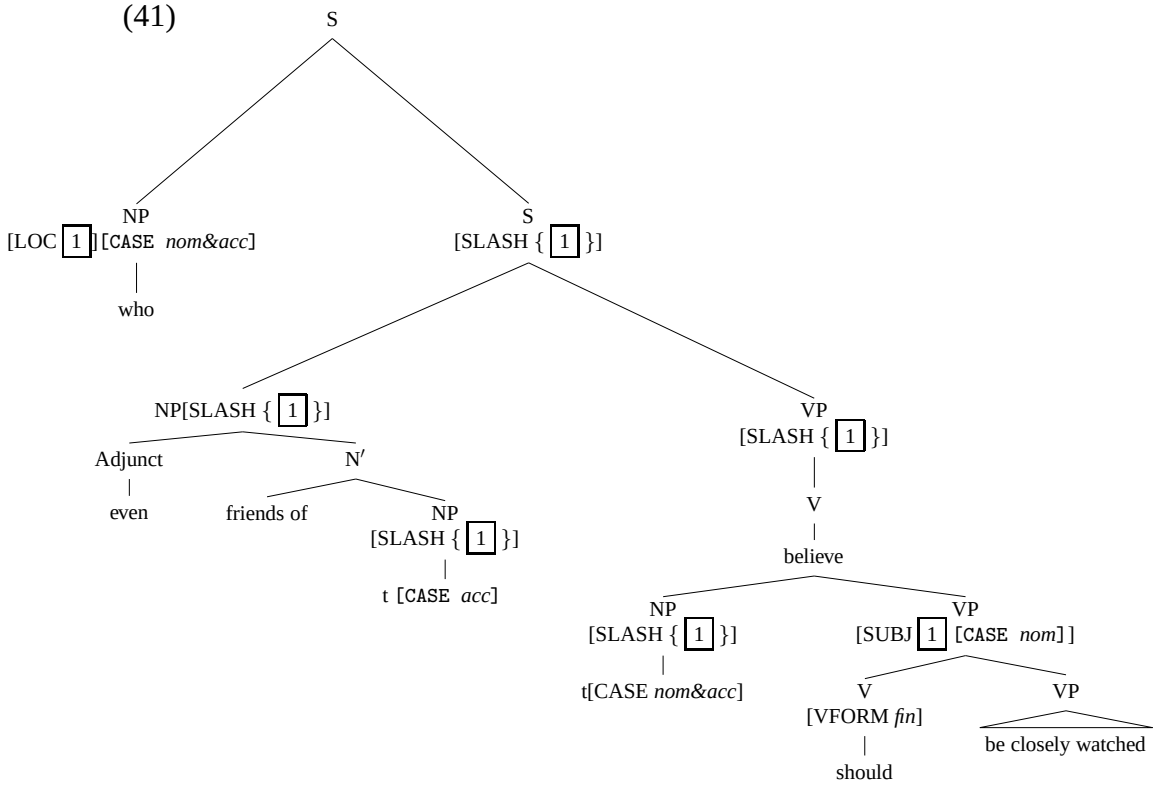
(40) a. Who(*m) likes him?

b. Who(m) does he like?

Here, assuming the case theory we have outlined, the selectional properties of *likes* assign *nom* to the subject of this verb in the first example, and *acc* to its object in the second. However, on our proposal *nom* is really just an abbreviation for either *pnom* or *nom&acc*. The word *who* is, as specified in (39), *nom&acc*, and is compatible with the case assignment *pnom*, ensuring that the first example will be licensed when *who* is the filler. The word *whom*, however, is specified as a (pure) *acc* element, so it is not compatible with an *nom* case assignment, and therefore the first example is correctly ruled out when *whom* is the filler. Similarly, in (40)b, *acc* is just an abbreviation for *acc* or *nom&acc*, and *who* is *nom&acc*, compatible with the *acc* specification of the object trace, while *whom* is *pacc*, which is also compatible with *acc*. Both variants of this example are therefore correctly predicted to be good.

We are now able to address the case connectivity problem in parasitic gap examples like (31). On the account we have provided, this problem essentially disappears. The following tree illustrates the licensing of such sentences:

(41)



The short story here is that the morphsyntactic specifications included under the LOC description are token-identical to those of SLASH, which, looking at it from the 'top' of the representation, appears on any subset of the daughters of the clausal sister to the filler, and is shared between mother and daughter down to a point where it appears in the syntactic description of a category which also structure-shares that LOC specification. All components of the LOC description must be matched, including the case value. The case value assigned to the subject is *nom*, which subsumes the description *nom&acc*; the case value assigned to the object is *acc*, which also subsumes that description as per (38)b. Hence both subject and object can be token identical to the LOC value of the filler, each can be realized as an empty category, and the example is licensed.

As a last resort, one can imagine an effort to incorporate the HPSG analysis I've just sketched into something like the *Barriers* analysis. But it's hard to imagine a natural, or even remotely plausible way this could be done while still allowing empty-operator-headed chains to involve genuine out-and-out case inconsistency as necessary, for example, in missing object constructions:

(42) He$_i$ is [O$_i$ tough to please t$_i$]

The problem of course is that *he* is *pnom*, while the trace, and the empty operator that shares its ϕ features, is either *pacc* or *nom&acc*. It thus appears that the relationship between chains in p-gap constructions would have to impose a condition of chain consistency which somehow gave rise to the effects alluded to above, while the relationship between the antecedent chain and the MO chain in MOCs would have to overlook such conflict. I am not aware of any means to ensure this outcome in a plausible, nonstipulative fashion.

One possibility would be to incorporate something like the case hierarchy already sketched into the Frampton account of multiple-gap constructions, notwithstanding the emprical failure of that account in the face of symbiotic gap constructions. One could imagine a parallel analysis to the HPSG account just sketched, with the filler of conjunctive case type, linked by two separate chains to gap

sites compatible with the type *nom&acc*. Nowhwere in P&P Case theory, to my knowledge, has anything along these lines been proposed, but let's assume it to be possible. The fact is that the possibility of instantiating such a solution in Frampton's analysis should not be surprising, given the nature of that analysis—which is, fundamentally, an effort to implement a single filler/multiple gap analysis by an archaic theoretical technology forced to achieve the desired effect via separate establishment of multiple histories and then replacement of all but one of the fillers with traces—in a manner which is essentially arbitrary if it turns out, as I have argued, that there is no structural basis for positing an asymmetry between some 'true' history of derivation on the one hand and the remaining parasitic histories. To put it bluntly (but, I think, fairly), Frampton's analysis is an inevitably clumsy effort to replicate the feature-percolation model of UDCs in classical GPSG using a singularly unsuitable bit of machinery based on movement. Grafting a type-hierarchical solution from HPSG onto an awkward transformational simulation of a natural phrase-theoretic extraction treatment merely underscores the deficient nature of the movement analysis that requires many so many imported fixes.

In short, none of the phenomena I have surveyed in this paper—the Kearney paradigm, WCO effects, the distribution of finite clause gaps, pronominality, symbiotic gaps and case inconsistency—support any deviation from the strongest possible hypothesis about extraction, which is that there is a single mechanism linking a single filler to all gap sites, and that there is no asymmetry in any respect in the establishment of these multiple linkages. And this is an outcome which follows directly from the constraint-regulated feature percolation architecture of HPSG. It does not require an at best multistage, formally inexplicit *simulation* of a direct, symmetrical linkage; it expresses this linkage directly, as the null hypothesis—an hypothesis which I think the evidence shows is not just the strongest but also the most likely to be correct.

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Relational adjectives as properties of kinds*

Louise McNally
Gemma Boleda

1 Introduction

This paper fits in the context of a current movement in formal semantics to reanalyze as INTERSECTIVE most or all adjectives that have been treated as predicate modifiers in the tradition of formal semantics. The specific goal of the paper is to provide an intersective analysis of so-called RELATIONAL adjectives such as Catalan *tècnic* ('technical') in (1). (1a) entails that Martí is an architect ((1b)) but not that he is technical ((1c)) – indeed, *tècnic* sounds rather anomalous when applied to *Martí*:[1]

(1) a. El Martí és arquitecte tècnic.
'Martí is a technical architect.'
b. |= El Martí és arquitecte.
c. #El Martí és tècnic.

In this respect, *tècnic* does not behave like a prototypical intersective adjective such as *male*, which, in the context *NP is Adj N* licenses not only the entailment that *NP is N* but also that *NP is Adj*, as shown in (2). The term 'intersective' refers to the fact that the semantic composition of the adjective and noun can be characterized in terms of the intersection of their extensions, as represented in the translation in (2d):

(2) a. Martí is a male architect.
b. |= Martí is an architect.
c. |= Martí is male.
d. T(*male architect*) = λx [**male**(x) $\wedge$ **architect**(x)]

Rather, *tècnic* and other relational adjectives appear to be SUBSECTIVE: in the context *NP is Adj N* they license only the entailment that *NP is N*.

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[1] Throughout this paper we use the symbol '#' to mark expressions which are, on our analysis, semantically anomalous, and '??' to mark expressions which sound unacceptable to us without our making any a priori commitment to the reason for their unacceptability.

Since the failure to entail *NP is Adj* could not readily be explained on an intersective analysis, Siegel (1976) and others after her have analyzed subsectively interpreted adjectives as predicate modifiers, that is, as properties of properties, rather than properties of individuals, as represented in (3).

(3) T(*arquitecte tècnic*) = λx[(**technical**(**architect**))(x)]

The predicate modifier analysis, also used for adjectives such as *former*, does not entail that the set of individuals described by the noun phrase has the adjectival property, since that property is not directly ascribed to those individuals.

Despite its ability to account for the entailment facts, there are at least two problems with the predicate modifier analysis when applied to certain classes of adjectives. First, as Larson (1998) observes, the analysis postulates an ambiguity for many adjectives which is difficult to justify. While a sentence like (4) might be ambiguous between a reading that entails that Olga as an individual is beautiful and one that does not, that ambiguity intuitively involves more what *beautiful* is modifying – Olga herself or her dancing – than anything in the lexical semantics of the adjective itself.

(4) Olga is a beautiful dancer.

In this respect, it seems a mistake to account for what we might call the event-related reading of (4) by treating the adjective as ambiguous between a property of individuals and a predicate modifier.

Second, and perhaps more importantly, the predicate modifier analysis makes it difficult to explain why the putatively nonintersective reading is sometimes available even when the adjective appears to be predicated of something of type *e*. For example, *beautiful* in (5) is most naturally understood as describing Olga's dancing, even though it does not modify any noun, and following the standard semantics of copular constructions, should be predicated directly of *Olga*.

(5) Look at Olga dance – she's beautiful!

Unless some kind of ellipsis is postulated, the predicate modifier analysis cannot explain why sentences such as (5) are grammatical and mean what they do. Yet ellipsis is difficult to justify: there is no direct antecedent for a hypothetically elided noun *dancer*, and we would also have to explain why the indefinite article *a*, which would be necessary to form a grammatical postcopular NP, is also elided.

Partee (2001) makes similar observations for what she calls PRIVATIVE adjectives, such as *fake*. If *Adj* is privative, then *NP is Adj N* entails *NP is not N*, as in (6a). Nonetheless, privative adjectives, though ostensibly nonintersective, also appear as simple complements to copular predicates, as shown in (6b):

(6) a. That is fake fur |= That is not fur.
b. That fur is fake.

These syntactic distribution facts and other observations have led Larson and Partee to find a way to treat event-related readings and privative adjectives intersectively.[2] Our proposal fits into this line of research: We will argue that relational adjectives denote properties of KINDS, where kinds are modeled as entities, following Carlson (1977). This proposal allows for an intersective semantics for these

[2] As Olivier Bonami observes (p.c.), Partee (2001) says that privative adjectives are subsective; however, her semantic analysis is intersective insofar as she treats them as simple properties, once the domain of objects is extended to include fake objects.

adjectives and at the same time explains some of the data which are problematic for the predicate modifier analysis.

The structure of the paper is as follows: in Section 2, we provide some background on relational adjectives; Section 3 offers some empirical arguments for their intersectivity, based on Catalan data; Section 4 contains the analysis, a further argument for it, and a discussion of some additional predictions it makes; and Section 5 presents our conclusions.

2 Relational adjectives

We take the term 'relational adjective' from the French descriptive grammar tradition, specifically from work by Bally (1944:96-97), the first linguist we know of to have studied this kind of adjective. Bally was interested in noun-adjective pairs such as *chaleur solaire*, 'solar heat' (his example), and characterized relational adjectives (*adjectifs de relation*) such as *solaire* by the four properties that follow.

First, these adjectives never appear prenominally in Romance languages such as French or Catalan (*#solaire chaleur*), whereas other adjectives can occur both pre- and postnominally (*forte croissance* vs. *croissance forte*, 'important growth'). Second, according to Bally, they are not able to appear as predicates in copular sentences: *#Cette chaleur est solaire*. Third, they are not gradable (*#chaleur très solaire*); this is usually related to their 'classificatory' or 'taxonomic' meaning. Finally, they are often identified as denominal and semantically similar to nouns; as Bally (1944: 97) observed, a relational adjective "transpose des substantifs sans rien changer à leur valeur de substantifs" ('substitutes nouns without changing any aspect of their value as nouns'). This is related in his and much subsequent work to an intuition that relational adjectives are 'covert nouns' which, among other characteristics, saturate argument positions of the nouns they modify.

A closer look at these characteristics raises some puzzling questions about relational adjectives, and in particular, about the predicate modifier analysis of them, at least for Catalan. First, the restriction to postnominal position is very surprising if these adjectives are predicate modifiers. As can be seen in (7), those adjectives which are arguably the best candidates for a predicate modifier analysis, such as *presumpte*, 'alleged', never follow the head noun:

(7) a. un presumpte assassí
'an alleged murderer'

b. #un assassí presumpte

On the other hand, this postnominal position is the usual one for intersective adjectives, as can be seen in (8a). (8b) shows that the position of relational adjectives with respect to the head noun corresponds to that of an intersective adjective.

(8) a. un escriptor jove
a writer young
'a young writer'

b. una malaltia pulmonar
a disease pulmonary
'a pulmonary disease'

Second, if relational adjectives were intersective, we would also expect them to be able to appear as a predicate in copular sentences, and yet according to Bally and others (Levi 1978, Fradin and Kerleroux 2003) they cannot. Failure to appear in postcopular position is one of the clearest distributional characteristics of predicate modifier-type adjectives such as *presumpte*:

(9) #L'assassí era presumpte.

If Bally's observation were correct, the distribution of relational adjectives would be contradictory indeed.

It turns out, however, that this second claim by Bally is *not* correct: Postcopular predicative uses *are* in fact possible for relational adjectives, as has been previously noted by various researchers (Demonte 1999, Picallo 2002),[3] and as illustrated in (10):

(10) a. El domini del Tortosa va ser només territorial.
'The dominance of the Tortosa [soccer team] was only territorial.'

b. Aquest congrés és internacional.
'This conference is international.'

c. El conflicte és polític.
'The conflict is political.'

The fact that relational adjectives share the syntactic distribution of other intersective adjectives, and are distributionally unlike adjectives requiring a predicate modifier analysis, is a fundamental piece of data to be accounted for.

The other two characteristics that Bally mentioned seem less crucially correlated with the semantic type of the adjective, or at any rate do not constitute convincing reasons for holding on to the

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[3] Examples also appear in Levi (1978: 254; her examples (7.5a-c)):

(i) The process by which compounds are formed is transformational.

(ii) Her infection turned out to be bacterial, not viral.

(iii) His razor is electric.

However, Levi maintained that these cases necessarily involved ellipsis of a noun following the adjective, and thus were not true cases of predicative uses. Although she does not develop a full analysis, she lists the steps that a derivational analysis like the one she suggests would imply. For e.g. (iii), these steps are the following (reproducing (7.6b), p. 255):

(iv) His razor is a razor using electricity.

(v) His razor is an electricity-using razor.

(vi) His razor is an electric razor.

(vii) His razor is electric.

Such an analysis is necessary to maintain the fundamental distinction that Levi makes between ordinary predicative adjectives (true predicates) and relational ones (nominals acting as adjectives), which seems to be a development of the intuition mentioned above that relational adjectives are "nouns in disguise." Our analysis considers them to be true predicates in Levi's sense, as will be further developed in Section 4.

predicate modifier analysis in the face of the two pieces of data just mentioned. On the one hand, while it may be the case that all predicate modifier-type adjectives are nongradable, nongradability is not a sufficient condition for denoting a property of properties: there are nongradable adjectives which are unquestionably intersective, like *solter*, 'single'.

On the other hand, denominal adjectives are not a homogeneous class. Some denominal adjectives are clearly intersective, such as *vergonyós*, 'shy', derived from *vergonya*, 'shyness'; others, like *ocasional*, 'occasional', fall into the category that has been reanalyzed as intersective by Larson (1998). At the same time, there are relational adjectives that are not synchronically denominal, such as *bèlic*, 'bellic', or *botànic*, 'botanical'. Thus being denominal is neither a necessary nor sufficient condition for being relational.

Readers familiar with the French descriptive grammatical tradition and its characterization of relational adjectives may object at this last remark, since this denominal character was a fundamental element in the original characterization of relational adjectives – indeed, it was the source of the term 'relational', since the adjective's meaning involves relating the denotation of the head noun to another individual identifiable via the adjective. For example, in the NP *chaleur solaire*, the adjective relates the heat denoted by *chaleur* to the sun, recoverable from the semantics of the adjective. We do not dispute at all the interest of this aspect of the semantics of relational adjectives, and it is something we intend to account for within our analysis. However, we maintain (at the moment, without further argument, though see the Conclusion for some comments) that a predicate modifier analysis is not essential to capturing this characteristic, and thus that it should not prevent us from pursuing an intersective semantics, as long as we foresee a means of accounting for the facts via that semantics.

Summarizing, we are, to some extent, calling into question the assumption that what have traditionally been called relational adjectives constitute a single, well-defined class. In the remainder of this article, we will take the syntactic distribution criteria as a starting point and will argue for the viability of an intersective analysis for an important subset of those adjectives which have been previously claimed not to permit such an analysis.

3 Further evidence for an intersective analysis

We will now offer three more empirical arguments against considering relational adjectives to be predicate modifiers. The aim of these data is to show that relational adjectives behave like intersective adjectives and unlike the core cases of predicate modifiers with respect to syntax and some aspects of semantics. We conclude that an intersective reanalysis such as the one we will propose should be taken seriously.

First, consider the distribution of the partitive pronoun *en* in Catalan. Roughly, *en* plays the role of a nominal within an indefinite NP:

(11) a. Buscàvem llibres, però no en vam trobar.
We-looked-for books, but not EN did find
'We looked for books, but we didn't find any.'

b. Buscàvem llibres; només en vam trobar un.
We-looked-for books; only EN did find one
'We looked for books; we only found one.'

When *en* is used, some of the material in the related NP can be stranded or dislocated, provided it is preceded by the preposition *de* 'of':

(12) a. No en vam trobar, de fotografies maques.
Not EN did-find, of pictures beautiful
'Beautiful pictures, we didn't find any.'

b. No en vam trobar, de maques.
Not EN did-find, of beautiful (talking e.g. about pictures)
'Beautiful, we didn't find any.'

As can be seen, among other possibilities, the stranded material can be the head noun plus one or more modifying adjectives (12a), or simply the adjective, where the reference of *en* has to be recovered from discourse or context (12b).

However, not just any adjective can be dislocated; crucially, those adjectives which constitute the prototypical examples of predicate modifiers cannot:

(13) a. No en vam veure, de presumptes assassins.
'We did not see any, alleged murderers.'

b. *No en vam veure, de presumptes.

The key to understanding why only intersective adjectives and not predicate modifiers can appear in this construction probably lies in the presence of the preposition *de*. As mentioned above, this preposition is obligatory with dislocated nominals anaphorically related to the pronoun *en*, so that (14) is not acceptable:

(14) *No en vam trobar, fotografies maques.

Interestingly, the preposition cannot be used when the stranded or dislocated NP-related material is a determiner (15), while it is compulsory when the material left behind is an adjective (16):[4]

(15) a. En vam trobar una.
'We found one.'

b. *En vam trobar d'una.

(16) a. *En vam trobar maques.

b. En vam trobar de maques.
'We found beautiful ones.'

While a complete analysis of this construction is beyond the scope of this paper, we posit that the preposition *de* when linked to the pronoun *en* must be followed by a property-type constituent (for the sake of convenience, represented extensionally here as of type $\langle e,t \rangle$). This explains why nominals and intersective adjectives cooccur with the preposition, while determiners cannot. Similarly, if adjectives

[4] In fact, Quixal, et al. 2003 used this property as a diagnostic for determining whether a lexical item is an adjective or a determiner in Catalan.

such as *presumpte* do not denote in type <*e*,*t*> but rather only in type <<*e*,*t*>,<*e*,*t*>> (or its intensional counterpart), the unacceptability of (13b) follows directly.

Now if relational adjectives were of the same type as predicate modifiers like *presumpte*, we would expect them not to be able to appear in the *en* construction. However, they can and do appear in this construction, as shown in (17).

(17) En aquella època, de malalties, n'hi havia de pulmonars.
'At that time, diseases, there were pulmonary ones.'

Given what we have said here about the conditions on the appearance of adjectives in this construction, the acceptability of (17) is strong evidence that relational adjectives are of type <*e*,*t*>.

Another consequence of the difference in semantic type between adjectives like *presumpte* and those like *jove*, and the source of our second argument for the intersectivity of relational adjectives, appears in (18). Catalan, like other Romance languages (though unlike English, as a rule), allows surface NPs which lack an overt noun, as in (18a). However, this *Det AP* (Adjective Phrase) configuration is not possible when the AP is a predicate modifier, as (18b) shows.

(18) a. Els joves van venir.
'The young ones came.'

b. *Els presumptes van venir.
'The alleged ones came.'

Although, once again, a full analysis of this construction is not possible here, a simple explanation of these facts would be that Catalan, unlike English, regularly allows for determiners to combine with adjectives, as long as the adjective is of the appropriate semantic type. Given that the determiner, under most assumptions, combines only with constituents of type <*e*,*t*>, we can readily explain the contrast in (18).

As was the case with the *en* construction, if relational adjectives were of the same semantic type as predicate modifiers, we would predict them not to occur in 'headless' NPs. Crucially, however, this prediction is incorrect, as seen in (19):

(19) Les pulmonars són les pitjors.
'The pulmonary ones are the worst.'

A third piece of evidence that relational adjectives denote properties of individuals comes from their failure to exhibit interesting scope effects in combination with other adjectives. If a noun combines with more than one adjective, all of which are intersective, the order in which the adjectives combine with the noun will not affect the denotation of the resulting noun phrase.[5] Thus, the nominals in (20) denote exactly the same set of objects: shoes that are new and white.

(20) a. sabates noves blanques
shoes new white
'new white shoes'

[5] Saying this does not exclude the possibility that there might be preferences for certain adjective orderings over others. See example (23) below for one such case.

b. sabates blanques noves
shoes white new
'new white shoes'

The failure of adjective order to affect the denotation of the nominal is due to the semantic rule for composing the adjective and noun denotations. When *Adj* is intersective, we assume, following many linguists before us, a rule such as the following:

(21) For all *N* (or *N'*) α and *A* (or *AP*) β, $[[\alpha\ \beta]] = [[\alpha]] \cap [[\beta]]$

Given that intersection is commutative and associative, the result of intersecting the denotation of *sabates* with that of *noves*, and then intersecting the denotation of the result with the denotation of *blanques*, will be the same as the result of intersecting the denotation of *sabates* first with that of *blanques* and then intersecting the result with that of *noves*.

In contrast, when a noun is modified by both a predicate modifier such as *presumpte* and another adjective of whatever kind, as in (22), the order in which the adjectives combine with the noun does crucially affect the denotation of the resulting NP. For example, (22a) entails that the referent of the NP is young, while (22b) does not.

(22) a. jove presumpte assassí
'young alleged murderer'

b. presumpte jove assassí
'alleged young murderer'

As a first approximation, we can attribute this difference to the nonintersectivity of the semantic contribution of *presumpte*. If *presumpte* is not intersective, there will be no guarantee that combining it with a given noun and then combining the result with some other adjective will return the same result as combining it with that noun previously modified by the same adjective.

Once again, the data demonstrate that relational adjectives behave like intersective ones and contrast with predicate modifiers: the order in which relational adjectives appear with respect to other (intersective) adjectives does not affect the interpretation of the noun phrase. The nominals in (23) have exactly the same denotation:[6]

(23) a. producció mundial pesquera
production worldwide fishing
'worldwide fishing production'

b. producció pesquera mundial
production fishing worldwide
'worldwide fishing production'

[6] Some speakers do not accept the ordering in (23a) for reasons which are unclear to us. However, what is crucial is that all of those speakers who accept both orders assign the same interpretation to both nominals. In fact, these examples are taken from a Catalan corpus (Rafel 1994), where both nominals appear in the same text and the author is clearly referring to the same thing in both cases.

Summarizing, we now have five pieces of data which argue for an intersective analysis of relational adjectives: position with respect to the head noun, predicative uses, distribution within the *en* construction, uses in 'headless' NPs and lack of scope effects when combined with other adjectives. We now turn to developing such an analysis.

4 Analysis

4.1 Previous formal treatments

Relational adjectives as a separate class within the subsectives have received very little attention from formal semanticists.[7] The most concrete proposal for a semantic analysis we have found is that in Fradin and Kerleroux 2003 (hereafter F&K). F&K take seriously the intuition that relational adjectives are deeply related to nouns, and their analysis builds on the observation that such adjectives often modify nouns with more than one argument. On their semantics, the relational adjective predicates the nominal property embedded in the adjective meaning of one of the arguments in the noun being modified. For example, the function of *cérébral*, 'cerebral', in the nominal *lobe cérébral*, 'cerebral lobe', is to predicate the property "brainhood" of the second argument of *lobe*, as in (24):

(24) $T(\textit{lobe cérébral}) = \lambda x \lambda y\ [\mathbf{lobe}(x,y) \wedge \mathbf{brain}(y)]$

Abstracting and generalizing, the schema for the type they propose for relational adjectives is that represented in (25), where the adjective is of type $<<e,t>,<e,t>>$ – in this sense, a predicate modifier – but effectively intersective in the sense that it introduces a first-order property which is predicated of one of the modified noun's arguments.[8]

(25) $\lambda P \lambda x/y\ [P(x, ..., y) \wedge \mathbf{N}(x/y)]$, where **N** is the noun from which the adjective is derived.

F&K's analysis, though technically a predicate modifier analysis, is intersective in spirit, and is similar to ours in that the first order property introduced by the relational adjective does not (generally) modify the referent of the modified nominal. However, the similarities end there: F&K's central concern is to account for the apparent argument-saturating effect of the relational adjective, while, as will become clear below, this is not our first priority. We will leave additional comments on the differences between our analysis and F&K's until the final section of the paper.

4.2 A Larsonian intersective semantics

As noted above, our proposal is inspired in Larson's analysis of event-related adjectives (Larson 1998). Larson proposed that certain adjectives (in fact, many) denote properties of events rather than, or in

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[7] The most extensive analysis of relational adjectives (though not under that name) in the generative linguistics tradition is probably Levi's (Levi 1978). Levi's transformational syntactic account treated relational adjectives as nouns at Deep Structure, which were converted to adjectives in the course of deriving Surface Structure. Although she does not offer any explicit semantic type assignment for these adjectives, her analysis of predicative uses of them, sketched briefly in footnote 3, strongly suggests that her conception of relational adjectives was very close to a predicate modifier analysis. See also Bolinger 1967 for extensive informal discussion of these adjectives, which suggests an analysis similar to that proposed by Levi.

[8] F&K allow for the possibility that the adjective might modify any of the noun's arguments, hence the "*x*/*y*" notation; however, this aspect of their analysis is not crucial for our purposes and we will not comment on it further here.

addition to, denoting properties of ordinary individuals; thus, an adjective like *bona*, 'good', could be translated as in (26a).[9] In addition, he posited that nouns quite generally have an event argument in addition to their other, more familiar arguments, as illustrated with *violinista* in (26b). On the event related reading of the adjective, the adjective modifies the event argument of the noun, as in (26c):

(26) a. $T(bona) = \lambda e.\mathbf{good}(e)$
b. $T(violinista) = \lambda x \lambda e.\mathbf{violinist}(x,e)$
c. $T(bona\ violinista) = \lambda x \lambda e.\mathbf{good}(e) \wedge \mathbf{violinist}(x,e)$

In this representation, *bona* denotes a first order property and restricts the denotation of *violinista*, but does so without being ascribed to the individual argument of *violinista*. The fact that *bona* denotes in type $<e,t>$ accounts for its acceptability in predicative positions; the fact that it modifies the noun's event argument and not its individual argument accounts for its apparent nonintersectivity.

The analysis we propose is analogous to Larson's analysis for event-related adjectives, with the difference that we make use of kinds rather than events. First, we posit that all common nouns have an implicit kind argument,[10] which is related to the individual-sort argument typically associated with nouns via the Carlsonian realization relation *R* (Carlson 1977). We represent the general translation for nouns, closely following Krifka, et al. 1995, as in (27), where the subscript *k* indicates a kind-level entity and the subscript *o*, an object-level entity. Put informally, this analysis states that objects realize the kinds of things that nouns describe:

(27) For all common nouns *N*, $T(N) = \lambda x_k\, \lambda y_o[R(y_o,x_k) \wedge \mathbf{N}(x_k)]$

Thus, a noun such as *arquitecte*, 'architect', would receive the translation in (28):

(28) $T(arquitecte) = \lambda x_k\, \lambda y_o[R(y_o,x_k) \wedge \mathbf{architect}(x_k)]$

Second, we posit that those adjectives traditionally described as relational denote properties of kinds. That is, they fall into the same sortal class as adjectives such as *widespread* or *extinct* in English.[11] Thus, an adjective such as *tècnic* will have the translation in (29); it can be truthfully applied to any number of kinds – the kind *architect*, *solution*, *translation*, etc.:

(29) $T(tècnic) = \lambda x_k[\mathbf{technical}(x_k)]$

As under this analysis *tècnic* denotes a property of a kind, and not of an individual, we need a special noun-adjective (or more precisely, noun-adjective phrase) composition rule to combine the adjective with the noun, as in (30):

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[9] Of course, treated this way, this adjective would have to have other translations as well, corresponding to properties of the other sorts of individuals it can describe. No doubt a better analysis would assign a single translation to the adjective, on which it denoted a property of the most general sort of entity, a sort encompassing both entities and events. However, for the sake of illustrating Larson's analysis, we will use more specific translations like that found in the text.

[10] This assumption neither excludes nor presupposes the presence of an event argument; however, we will leave any possible event arguments out of the representations that follow to keep things simple.

[11] The intuition is also expressed in Bosque and Picallo 1996, and more indirectly in Bolinger 1967, though neither of these works develop it into a specific semantic proposal.

(30) If noun *N* translates as $\lambda x_k\, \lambda y_o[R(y_o, x_k) \wedge \mathbf{N}(x_k)]$ and adjective phrase *AP* translates as $\lambda x_k[\mathbf{A}(x_k)]$, then [*N AP*] translates as $\lambda x_k\, \lambda y_o[R(y_o,x_k) \wedge \mathbf{N}(x_k) \wedge \mathbf{A}(x_k)]$

The effect of this rule is to restrict the kind described by the modified noun to one of its subkinds.

After the adjective phrase and the noun have composed, the resulting phrase still needs to be saturated with two arguments – one corresponding to a kind, and the other corresponding to the object-level individual described by the noun. We propose that the kind argument gets saturated by a contextually-determined kind. This seems plausible because in most or perhaps all cases, this kind will be uniquely identifiable in the context (indeed, this is the assumption behind Carlson's claim that kind terms are like proper names). Thus, the noun phrase *arquitecte tècnic* translates as in (31), where we use an indexed free variable (analogous to a free pronoun) to saturate the kind argument:

(31) $\lambda x_k\, \lambda y_o[R(y_o,x_k) \wedge \mathbf{architect}(x_k) \wedge \mathbf{technical}(x_k)](k_j) = \lambda y_o[R(y_o,k_j) \wedge \mathbf{architect}(k_j) \wedge \mathbf{technical}(k_j)]$

This property of individuals can then be applied to an argument such as *Martí*:

(32) a. El Martí és arquitecte tècnic.
'Martí is a technical architect.'

b. $\lambda y_o[R(y_o,k_j) \wedge \mathbf{architect}(k_j) \wedge \mathbf{technical}(k_j)](\mathbf{m}) = [R(\mathbf{m}, k_j) \wedge \mathbf{architect}(k_j) \wedge \mathbf{technical}(k_j)]$

This analysis has the advantage that it does not directly ascribe "technicalness" to Martí, while still entailing that a technical architect is an architect. It also predicts the unacceptability of *#El Martí és tècnic* mentioned above; that is, it predicts the apparent nonintersective behavior of the adjective. The key here is that if the argument of the adjective does not denote a kind, the adjective cannot be predicatively used: the sort of the adjective and its argument will conflict, and this sortal mismatch will make the predication infelicitous.

In contrast, if the subject of a copular sentence containing a relational adjective *does* plausibly denote a kind, the predication will be acceptable, as in (33):

(33) La tuberculosi pot ser pulmonar.
'Tuberculosis can be pulmonary.'

Thus, the analysis both predicts that relational adjectives can be used predicatively and accounts for the conditions under which this use is possible.

4.3 A further argument for the analysis

Our analysis makes yet another correct prediction, which amounts to an additional argument in its favor. This prediction involves adjective order. It has been noted (e.g. by Demonte 1999, Picallo 2002) that relational adjectives always appear closer to the head noun than do other intersective adjectives, illustrated in the following contrast:

(34) a. inflamació pulmonar greu
b. #inflamació greu pulmonar
'serious pulmonary inflammation'

Our analysis predicts precisely this pattern of word order possibilities.[12] We first show how it predicts the unacceptability of (34b). We assume the following translations for *inflamació*, *pulmonar*, and *greu*:

(35) a. $T(\textit{inflamació}) = \lambda x_k \lambda y_o[R(y_o,x_k) \wedge \textbf{inflammation}(x_k)]$
b. $T(\textit{pulmonar}) = \lambda x_k[\textbf{pulmonary}(x_k)]$
c. $T(\textit{greu}) = \lambda x_o[\textbf{serious}(x_o)]$

Let us assume that adjective ordering reflects order of composition, and that if *greu* appears closest to the head noun, it must combine with it first. In order for this combination to take place, we must first saturate the noun's kind argument; only then will it denote a property of individuals that can be intersected with the denotation of *greu*. That is, the translation of *inflamació greu* will be as follows:

(36) $T(\textit{inflamació greu}) = \lambda y_o[R(y_o,k_j) \wedge \textbf{inflammation}(k_j) \wedge \textbf{serious}(y_o)]$

But this resulting translation is not of the right sort to combine with *pulmonar*: the latter can only be combined with something whose translation contains a lambda-bound kind argument. Thus, the phrase *inflamació greu pulmonar* is ruled out.

This problem does not arise if we combine *inflamació* with *pulmonar* first and then with *greu*:

(37) a. $T(\textit{inflamació pulmonar}) = \lambda y_o[R(y_o,k_j) \wedge \textbf{inflammation}(k_j) \wedge \textbf{pulmonar}(k_j)]$
b. $T(\textit{inflamació pulmonar greu}) = \lambda y_o[R(y_o,k_j) \wedge \textbf{inflammation}(k_j) \wedge \textbf{pulmonary}(k_j) \wedge \textbf{serious}(y_o)]$

After the relational adjective combines with the noun, we can saturate the kind argument and the result will denote a property of the same sort as that denoted by *greu*. Note that this prediction is not contradictory with examples such as those in (23) above (*producció mundial pesquera* vs. *producció pesquera mundial*), as in these latter cases both adjectives are relational. As discussed in Section 3, our analysis correctly predicts that both orders should be possible and lead to no difference in denotation.

4.4 Some complications in the data

4.4.1 Relational adjectives predicated of nonkinds

As noted in Section 4.2, our analysis predicts that relational adjectives should only take as arguments in a predicative construction NPs that denote kinds (as opposed to ordinary individuals), and this prediction appears to be largely borne out by facts such as (33) and (1c), repeated below for convenience:

(38) a. La tuberculosi pot ser pulmonar. (=33)
b. #El Martí és tècnic. (=1c)

However, we have also found ostensible counterexamples to this prediction, in which a relational adjective is predicated of a NP that arguably does not denote a kind in the context. (39) presents an example.

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[12] Our analysis does not make any specific predictions concerning the ordering of relational adjectives with respect to each other. In principle it permits variation in the ordering of relational adjectives (see the discussion of (23) above), but of course other factors independent of semantic type *per se* may limit the ordering possibilities. However, we must leave further exploration of this issue for future research.

(39) Infection with tuberculosis spreads in two ways, by the respiratory route directly from another infected person or by the gastrointestinal route by drinking milk infected with the tubercle bacillus….In infections with *M. tuberculosis*, the tubercle bacilli commonly affect the lungs, in which case the disease is known as pulmonary tuberculosis. By contrast, infections with *M. bovis* often affect the bones and joints. **About 90 percent of all clinically recognized tuberculosis in humans is <u>pulmonary</u>**. (the Britannica Guide to the Nobel Prizes, http://www.britannica.com/nobel/micro/606_50.html)

The sentences in (10) above, repeated here in (40), constitute additional examples:

(40) a. El domini del Tortosa va ser només territorial.
b. Aquest congrés és internacional.
c. El conflicte és polític.

In all of these examples, the property denoted by the adjective is used to classify individual instances of a kind that could typically be described using the adjective. For example, (40b) asserts that a particular conference belongs to the (sub)kind of international conferences.

A thorough study of such examples (including their frequency and distribution in different types of corpora) will have to await future research, but we would like to make a few preliminary observations. Perhaps the most salient fact about such examples is that we have only found them attested with common noun subjects, and the contrast between (38b) and the examples in (39)-(40) is sharp.

One way to explain this contrast is to hypothesize that relational adjectives are susceptible over time to extending the domain over which they denote. Perhaps they originate as properties of kinds and then, as those properties become useful for subclassifying instances of these kinds directly, their extension is expanded to include such instances themselves. Such an explanation would predict that, statistically speaking, it will sound more felicitous to predicate a relational adjective of an individual that is described using a noun denoting a kind for which that adjective is a well-established modifier than it will be to predicate such an adjective of an individual that is described by an expression that does not denote such a kind.[13] While we must evaluate this prediction carefully in future research, the following case study bears it out.

As (40b) sounded very natural to us, we did a simple Google search for the expressions "international conference" and "conference is international". The first search returned about 3,720,000 hits, and the second, 251 hits. While these lists of hits contain irrelevant examples, certainly they returned many, many relevant ones. We then did a search for "international bakery" and "bakery is international". This time, the former returned 1,910 hits (again, not all of which are relevant), and the latter, none. This dramatic difference in hits correlates with our intuition that, even though (41a) is perfectly acceptable (and was in fact attested), (41b) sounds very odd.

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[13] Moreover, this account might well also lead to explanation for the widely noted fact that many relational adjectives also have a nonrelational meaning, as in (49):

(49) a. Aquests pantalons són molt econòmics.
'These trousers are very economical (i.e., cheap)'

If our analysis is correct, cases in which a relational adjective is predicated of an individual for the purposes of subclassification could be a first step in the development of such derived meanings.

(41) a. Droubi's Bakery is an international bakery that is currently located only in Houston. http://www.droubisbakery.com
b. ??That bakery is international.

We suggest that while *international* might be plausibly used to describe and subclassify any number of kinds of things (including bakeries), its use as a classifier of bakeries has not become sufficiently established for the adjective to serve as a direct property of individual bakeries.

It could be thought that this contrast is merely due to frequency: more frequent adjective-noun pairs (be they relational adjectives or not) would lead to predicative examples, whereas less frequent ones would not. However, this appears not to be the case: Google searches for "nice mouse" and "pink table" returned a number of hits comparable to the "international bakery" case (2,680 and 1,660, respectively), and their predicative counterparts ("mouse is nice" and "table is pink") returned 183 and 65. This suggests that both the analysis and the explanation for cases like (40) and (41) are on the right track, for it reveals two related facts.

First, for some adjective-noun pairs involving relational adjectives it is not possible to use the adjective predicatively at all ((41b)), or it is only possible under very constrained conditions. Second, even for adjective-noun pairs where we find the adjective predicatively applied to an NP headed by the noun in question, we find that predicative uses involving a given relational adjective and a given noun are proportionally much less frequent than predicative uses of a given nonrelational adjective in combination with a given noun. For example, while the attributive uses of *nice* in NPs headed by *mouse* are approximately 15 times more frequent than the predicative uses of *nice* with NPs headed by *mouse* (based on the figures mentioned above), the attributive uses of *international* in NPs headed by *conference* are 15,000 times more frequent than the predicative uses of the same adjective with NPs headed by *conference*. This may explain why many people have the strong intuition that relational adjectives cannot be used predicatively, even though this is clearly not the case. However, a thorough statistical analysis should be performed in order to test whether these differences in distribution are robust through the different classes of adjectives.

Given this explanation, we would predict relational adjectives to sound anomalous when predicated of proper names because proper names are not classificatory expressions, and the set of individuals described by a proper name, generally being a singleton, will not permit further subclassification by a property such as one described by a relational adjective. We would also not be surprised to find that the use of relational adjectives predicatively to subclassify ordinary individuals is most frequent in specialized discourses, where the adjectives used for subclassification of a given kind of entity are well known and the interest in such subclassification is obvious.

Obviously, this explanation for the facts in (40) runs the risk of weakening our analysis: If we stand by it, we must admit that at least some relational adjectives can denote properties not only of kinds but also of individuals. Nonetheless, we think this weakening is more apparent than real. First, our analysis clearly accounts for the classic subsective behavior of relational adjectives. Second, it forms the basis for a promising explanation of the complex distribution of relational adjectives described in this section.

4.4.2 The use of more familiar kind-level predicates within NP

Because we propose that relational adjectives denote properties of kinds and because nothing in our analysis prevents any kind-level predicate from modifying a noun within an NP, we also expect that we should find examples of the more familiar kind-level predicates such as *extinct* in NPs which are predicated of ordinary individuals. However, as pointed out to us (Satoshi Tomioka and Olivier Bonami, p.c.), sentences such as the following sound extremely odd:

(42) a. ??Dino is an extinct dinosaur.
b. ??Tweety is a widespread bird.

We suspect that the oddness/nonexistence of examples such as (42a), involving *extinct*, is that such sentences can never be true. If Dino is or was a dinosaur, it is entailed that that species of dinosaur exists or existed (whether in reality or fiction) at the relevant time of evaluation, and if the species is or was entailed to exist, it cannot simultaneously be or have been extinct, which is what the semantic rule for combining adjectives and nouns requires. Thus, (42a) may well be odd, and similar examples inexistent, because of their contradictory nature. A similar explanation can be provided for (42b): it is pragmatically odd to assign the property of being a widespread bird to a single individual.

However, if this is true, we should find other, pragmatically plausible instances of kind-level predicates modifying a noun within an NP predicated of ordinary individuals. In order to test this prediction, we performed a series of Google searches for occurences of the adjectives *extinct*, *widespread*, *scarce*, *abundant*, *common* and *rare* in this construction.[14] The searches were of course only approximations, as no linguistic constraints can be set on current web search engines: we searched for exact matches for "is a(n) A", where A was one of the six adjectives just listed. For four of the adjectives (*rare*, *scarce*, *common*, and, perhaps surprisingly, *widespread*), we found relevant examples in the first 20 to 40 matches.[15] These results clearly confirm our prediction. Some of the examples, together with the original URLs, are the following:

(43) a. There are a number of reasons such a clamorous stir has developed with collectors over this find: (1) It Is a truly a vintage piece from the early 1980's. (…) (5) It was not printed in the United States, but is a ***scarce*** overseas piece.
http://www.findarticles.com/cf_0/m0FCM/4_32/112904360/p1/article.jhtml
b. This is a ***scarce*** figure of a railway engineer in fair to good all original condition.(…)This is a ***scarce*** figure in good condition. (…) . This is a ***scarce*** item in good all original condition. (…)This is a ***scarce*** Britains nurse in fair to good all original condition.[16]
http://www.collectorsworld.net/lead.htm

[14] These are the kind-level adjectives listed in Krifka, et al. 1995, one of the standard references on genericity and kinds. We chose to search English examples because this class of adjectives is even smaller in Catalan than it is in English, and the number of web pages in Catalan, much smaller as well.

[15] *Google* returns an approximate total number of matches for the searches, which we report here: *extinct* (7,370), *widespread* (109,000), *abundant* (22,700), *rare* (709,000), *scarce* (22,700), *common* (1,670,000).

[16] It seems that this use of *scarce* is mostly found in collectors' vocabulary.

(44) a. The Ageing Labour Force is a ***Common*** Challenge for Europe
[Title, hence capital letters]
http://presidency.finland.fi/netcomm/news/showarticle279.html
b. "Sweet potato" is a ***common*** nickname for what small musical instrument?
http://www.themusicstand.com/info/trivia/questions/0,1936,t,00.html

(45) Charlie Kaufman is a ***Rare*** Scribe
[Title, hence capital letters]
http://www.scre.com/cgi-bin/news.cgi?v=news&c=Screenwriting_Coverage&id=031820048187

(46) SHIN SPLINTS is a ***widespread*** term for a variety of generalized symptoms for pain in the lower legs.
http://www.doctorsexercise.com/journal/sum01.htm

Note that the example in (46) is parallel to that in (42b), which we suggested was unacceptable for pragmatic reasons. What makes (46) different is that, while its subject does not denote a kind, it does denote an entity which can have distinct realizations at distinct points in time, making it easier to satisfy the truth conditions of the predicate: An individual term such as *shin splints* can qualify as widespread because it is used on many occasions.

To sum up, it seems that kind-level predicates modifying nouns within NPs predicated of individuals are in fact attested; however, it is also clear that they are relatively rare. Our hypothesis is that this is for pragmatic, rather than semantic, reasons: Not many individual-denoting subjects fulfill the restrictions that a kind-level adjective imposes on the predicate. We are currently undertaking a statistical analysis that should shed more light on the facts discussed both in this subsection and in the previous one.

5 Conclusion

In this paper we have shown how an intersective analysis of relational adjectives can be maintained if we assume that they denote properties of kinds. Our analysis accounts for the predicative uses of relational adjectives (and the conditions under which they can occur), their failure to induce scope effects in combination with other adjectives, and the ordering restrictions on them that have been observed. It also captures their "classificatory" flavor, noted by many researchers: If they are properties of kinds, their main function will be to establish subkinds, that is, to further classify entities.

Treating relational adjectives as properties of kinds also has the consequence of substantially expanding the class of kind-level adjectives. The literature on kinds has always given the impression that the number of adjectives that select specifically for kind-type arguments is extremely small (see Krifka, et al. 1995 and Section 4.4.2.). While there is no reason in principle why this class couldn't be so small, it is nonetheless puzzling that there would be only a handful of adjectives specialized for talking about such a cognitively important category as we might consider kinds to be. Though it was not one of our original goals, we consider it a welcome result that our analysis of relational adjectives normalizes the category of kind-level adjectives in this respect.

At this point, our analysis leaves one important issue unaddressed: It says nothing so far about the apparent argument saturation effect of relational adjectives – the sort of facts that Fradin and Kerleroux's analysis, discussed in Section 4.1, was designed to account for. While we must leave the

resolution of this issue for future research, we think the key question to ask is whether this argument saturation effect is real or simply apparent.

Our analysis commits us, in principle, to treating it as a byproduct, insofar as the relational adjective directly restricts only the kind of entity that the modified noun describes, and doesn't have any argument saturating effect. Interestingly, recent work by Mezhevich (2002) argues precisely against allowing relational adjectives to saturate noun argument positions directly, defending instead the view that this "saturation" is in large part a contextual effect (see her paper for details). The analysis she suggests for e.g. *presidential advisor* is the following (her (55a)), where ***R*** stands for a contextually-determined relation:

(47) $\lambda x[\textbf{advisor}(x) \wedge \boldsymbol{R}(x, \textbf{president})]$

If Mezhevich's arguments for the analysis in (47) are sound, then the criticism of our analysis that it fails to account for the argument-saturating effect of relational adjectives will be greatly weakened.

As noted in the introduction, our proposal represents a further step in the project of simplifying and unifying the semantics of adjectives. On top of Larson's (1998) arguments for unification in the direction of a simple property type, Catalan shows perhaps more clearly than English that the strategy adopted by Siegel and others of "generalizing to the worst case" and analyzing subsective adjectives as predicate modifiers is not satisfactory: It sheds no light on the fact that, in a language where a number of distributional phenomena clearly distinguish intersective adjectives from nonintersective ones, relational adjectives (and other subsective adjectives) clearly pattern with the former.

Moreover, there is a methodological advantage to trying to reanalyze subsective adjectives as intersective. It is possible to provide a predicate modifier semantics for these adjectives without having to pay close attention to the differences in the kinds of subsectivity different adjectives exhibit – for example, the fact that *occasional* restricts the denotation of a noun by restricting some aspect of its temporal dimension, while *pulmonary* restricts a class of individuals to those that have something to do with the lungs. In contrast, the intersective analysis proposed by Larson for *occasional* is not remotely plausible for *pulmonary*, thus forcing us to be much more explicit about the differences between the two types of adjectives, while at the same time allowing us to capture something that they have in common.

The move to an intersective semantics for at least some of the subsective adjectives entails providing a much finer-grained semantics for nouns. However, how best to do this is not a trivial question. Larson proposed adding an event argument to the argument structure of nouns. Our extension of his analysis has led us to add a kind argument as well. When one contemplates the possibility of having to add even more arguments in order to account for other kinds of modification, representing the lexical entailments of nouns in a more richly structured fashion like that developed in Pustejovsky (1995) begins to look appealing. We hope that additional work on the varieties of adjectival and adverbial modification will help to answer this question.

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Local Semantics in Head-Driven Phrase Structure Grammar

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1 Introduction

Semantic research is generally divided into *lexical semantics* (LS) and *compositional semantics* (CS). LS is concerned with the relation between a semantic functor and its arguments, either in terms of *semantic selectional restrictions* or in terms of *linking*, i.e., the relation between syntactic complements and semantic argument slots. CS focuses on the way in which the semantic contributions of constituents in a sentence are combined to arrive at the interpretation of the sentence. The central notion here is the scope of quantifiers and other operators. This devision of labor in semantics has its parallel in syntax, which, for example, is evident in the A- vs. A-bar syntax of Government and Binding Theory. In the case of syntax, the modularization and the interaction of the two "kinds" of syntax have been studied fairly thoroughly. On the semantic side, however, the relation between the two kinds of semantics is still not so well understood.

In this paper we will contribute to the study of the LS-CS interface by reviewing two empirical phenomena, linking and selectional restrictions. We will propose a distinction between local and nonlocal semantics which will be embedded in a general linguistic theory, *Head-Driven Phrase Structure Grammar* (HPSG, Pollard and Sag (1994)). We have chosen HPSG because it is a rigidly formalized linguistic framework (Richter, 2004), and for both LS and CS it offers a number of substantial proposals to build on. In recent years techniques of *underspecified semantics* have become popular within HPSG (Egg, 1998; Egg and Erk, 2002; Copestake et al., 2003; Richter and Sailer, 1999, 2004a). We will demonstrate that these techniques allow us to define a modular devision of the two kinds of semantics within a linguistic sign.

In the rest of the introduction we will characterize what we understand by a *local* phenomenon and present the structure of a linguistic sign as given in the standard form of HPSG. In Section 2 we will discuss two local semantic phenomena. In Section 3 we will present a concise introduction to the framework of *Lexical Resource Semantics* which can incorporate the LS-CS distinction. A conclusion will round off this paper in Section 4.

1.1 Local Phenomena

We will try to illustrate what we understand by a *local* phenomenon in contrast to *nonlocal* phenomena. *Local* phenomena are typically determined by lexical properties and concern the relation between a head and its dependents. In contrast to this, *nonlocal* phenomena are largely independent

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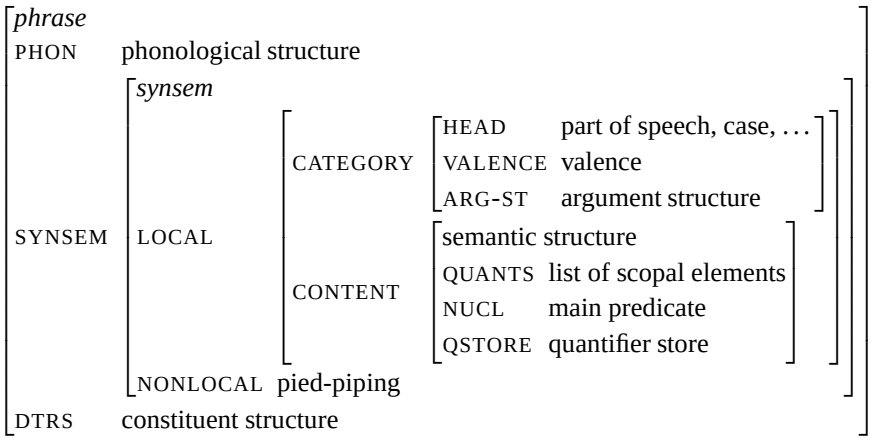
Figure 1: Architecture of a linguistic sign according to PS94 and Pollard and Yoo (1998)



of concrete lexical items, referring instead to structural properties. They may also go beyond direct head-dependent relations.

In syntax, categorial selection and case assignment are local phenomena. On the semantic level the corresponding phenomena are selection, in particular semantic selectional restrictions, and the assignment of thematic roles. On the syntax-semantics interface we find argument structure alternations such as dative shift, passive and such like and linking, i.e. the mapping between semantic arguments and syntactic complements. These phenomena are all local in the sense that one only needs to consider the projection of a head in order to formulate the regularities. On the other hand they typically involve a high degree of lexical idiosyncrasy.

Let us next turn to a number of nonlocal phenomena. In syntax extraction is by far the most extensively discussed nonlocal topic. Similarly pied-piping and, depending on the theory, scrambling fall in this category. Analogous nonlocal semantic phenomena are the scope of semantic operators (such as negation, quantifiers, or tense). Those phenomena are typically accounted for by general principles of the grammar. Often they apply to larger syntactic domains, in particular they may be "unbounded".

1.2 The architecture of HPSG

One of the major empirically motivated changes from the first presentation of HPSG in Pollard and Sag (1987) to recent versions of the theory, starting with Pollard and Sag (1994) (PS94), is the incorporation of the local-nonlocal distinction within the architecture of a linguistic sign. This has been quite successful for syntax, but less so for semantics. In Figure 1 we will outline the architecture of a linguistic sign of PS94, with slight modifications in the semantics.

HPSG signs comprise the phonological structure (as value of the PHON attribute), the constituent structure as the DAUGHTERS (DTRS) value and a so called *synsem* structure as its SYNSEM value. In the latter the NONLOCAL value may, among others, specify whether or not a sign contains a gap. In the LOCAL value we find the part-of-speech (within the HEAD value), and the syntactic valence.

There is also a CONTENT attribute, whose value contains the entire semantic structure of a sign. An HPSG-specific representation is very often chosen for the semantic structure. The CONTENT value of a verb contains a specification of the verb's semantic relation and of its arguments within the NUCL(EUS) value. The QUANT(IFIER)S list contains quantifiers which have scope over the nucleus.

Nouns do not have the attributes NUCL and QUANTS; instead their CONTENT value contains an INDEX feature which expresses the referential index of the noun and a RESTRICTIONS set. The proposal also incorporates a Cooper store mechanism (Cooper, 1975, 1983), encoded with the QSTORE value.

In PS94 the attribute QSTORE was defined on the sort *sign*. Therefore the surface position of a quantifier determined its smallest possible scope. Consequently the *de dicto* reading could not be derived in sentences such as *A unicorn appears to be approaching.* (see PS94, p. 328). This empirical deficiency was solved in Pollard and Yoo (1998) by incorporating QSTORE inside the *local* structure. Building on this, Przepiórkowski (1998) argues for including QSTORE inside the CONTENT value. In Figure 1 we adopted this suggestion.

The argument structure (ARG-ST) of a sign contains the SYNSEM values of the signs it selects. This reveals two insights: Firstly, properties of the phonology or of the constituent structure of a selected element cannot be selected for. Secondly, since *synsem* contains both the syntactic category and the semantics, PS94 acknowledges that a selector can impose categorial as well as semantic restrictions on the selected elements.

The HPSG architecture of a linguistic sign assumes a sharp distinction between syntactic category (realized within *synsem* as the CAT(EGORY) value) and syntactic structure (within the DTRS value). In fact the syntactic phenomena characterized above as local are all treated in PS94 at the word level and concern relations within the SYNSEM value of a word. Unbounded dependencies, on the other hand, are treated by a global principle of the grammar. While this distinction is made clear in the syntax, all of the semantics are gathered within the LOCAL value.

In the following section we will look at local semantic phenomena and we will demonstrate that there is no empirical motivation for having quantifiers or other semantic operators as part of the LOCAL value, where they are visible for selectors. Consequently we will draw a line between local semantics and logical form which will be analogous to the division between syntactic category and constituent structure.

2 Local Semantics

In this section we will discuss two local semantic phenomena, linking and semantic selectional restrictions. We will demonstrate that the architecture in Figure 1 is not restricted enough since neither of these phenomena manifest a need to refer to semantic operators or scope.

2.1 Linking

Linking is the mapping between semantic roles and syntactic complements. Our discussion will focus on linking constraints as formulated in Koenig and Davis (2003).[1] To illustrate the way in which linking is expressed within HPSG consider the example in (1a). In (b) we will describe the word *moved* as it occurs in (a).

(1) a. Pat moved the car.

[1] See e.g. Davis and Koenig (2000) for an earlier version of their theory and Kordoni (2003) for an overview of the HPSG literature on linking.

b.
$$\left[\begin{array}{l}\textit{word}\\ \textsc{phon}\ \langle \textit{moved}\rangle\\ \textsc{syns}\left[\begin{array}{l}\textit{synsem}\\ \textsc{loc}\left[\begin{array}{ll}\textsc{cat} & \left[\begin{array}{ll}\textsc{head} & \textit{verb}\\ \textsc{arg-st} & \left\langle \boxed{1}\left[\begin{array}{l}\textit{synsem}\\ \textsc{loc cont index}\ \boxed{2}\end{array}\right], \boxed{3}\left[\begin{array}{l}\textit{synsem}\\ \textsc{loc cont index}\ \boxed{4}\end{array}\right]\right\rangle\\ \textsc{val} & \left[\begin{array}{ll}\textsc{subj} & \langle\boxed{1}\rangle\\ \textsc{comps} & \langle\boxed{3}\rangle\end{array}\right]\end{array}\right]\\ \textsc{cont} & \left[\begin{array}{ll}\textsc{nucl} & \left[\begin{array}{ll}\textit{move-rel}\\ \textsc{causer} & \boxed{2}\\ \textsc{causally-affected} & \boxed{4}\end{array}\right]\end{array}\right]\end{array}\right]\end{array}\right]\end{array}\right]$$

The description in (1b) combines the architecture of a linguistic sign outlined in Figure 1 with the proposal of Koenig and Davis (2003). The description shows that the argument structure of the verb contains two *synsem* objects. The entire semantic contribution of the two arguments can be found in these *synsem* objects. However, only the INDEX information is relevant for linking. In Koenig and Davis (2003) linking constraints are expressed as implicational constraints of the form in (2).

(2) Linking constraint (adapted from Koenig and Davis (2003)):

$$\left[\begin{array}{l}\textit{word}\\ \textsc{s l}\left[\begin{array}{l}\textsc{cat}\left[\textsc{arg-st}\left\langle \textsc{np}, \ldots\right\rangle\right]\\ \textsc{cont}\left[\textsc{nucleus}\ \textit{cause-rel}\right]\end{array}\right]\end{array}\right] \Rightarrow \left[\begin{array}{l}\textsc{s l}\left[\begin{array}{l}\textsc{cat}\left[\textsc{arg-st}\left\langle\left[\textsc{l cont index}\ \boxed{1}\right], \ldots\right\rangle\right]\\ \textsc{cont}\left[\textsc{nucleus}\ \left[\textsc{causer}\ \boxed{1}\right]\right.\end{array}\right]\end{array}\right]$$

(where *move-rel* is a subsort of *cause-rel*)

Stated informally, this constraint expresses that if a word has an NP as its first element on the ARG-ST list and introduces a semantic constant of sort *cause-rel*, then the index of the first syntactic argument and the value of the CAUSER thematic role are identical.

With this linking constraint, the identity between the INDEX value of the first element in the ARG-ST list of *move* in (1b) and the CAUSER value need no longer be stipulated, as it follows directly from the linking theory. Analogous linking constraints will ensure the identity between the second complement and the CAUSALLY-AFFECTED value.

Linking constraints such as in (2) indicate that linking is perceived as a local phenomenon in the sense characterized above: Firstly, linking constraints are formulated for words. Secondly, linking involves only a head and its direct dependents. Thirdly, the kind of information used in linking constraints are the semantic constant contributed by the head, the thematic roles which are defined for this constant, the syntactic category of the selected elements and their indices.

It is reasonable to assume that this locality applies to linking in general. Nonetheless, the architecture of linguistic signs as outlined in Figure 1 would also allow for linking constraints which refer to the particular quantificational nature of the complement. In (3) we will state the antecedent of a hypothetical linking constraint. This constraint would determine the linking of a *cause-rel* predicate in the case in which its first syntactic argument contains an unretrieved universal quantifier (i.e., has a *forall* object in its QSTORE).

(3) Hypothetical linking constraint:

$$\left[\begin{array}{ll}\textsc{syns loc} & \left[\begin{array}{ll}\textsc{cat} & \left[\textsc{arg-st}\left\langle\left[\textsc{loc cont qstore}\ \left\langle \ldots, \left[\textit{forall}\right], \ldots\right\rangle\right], \ldots\right\rangle\right]\\ \textsc{cont} & \left[\textsc{nucleus}\ \textit{cause-rel}\right]\end{array}\right]\end{array}\right] \Rightarrow \quad \ldots$$

(if the first argument contains an unretrieved universal quantifier, then . . .)

We require that an adequate structure of signs should exclude the formulation of this kind of linking constraint. The cause of the problem with the current HPSG architecture lies in the absence of a strict separation between LS and CS.

2.2 Semantic Restrictions

While linking is a widely discussed topic within HPSG, semantic restrictions are largely ignored (with the exception of Androutsopoulos and Dale (2000)). Semantic restrictions have been discussed in comparison to categorial selection in Chomsky (1965), yet their status in grammar remains unclear. We cannot develop a theory of semantic restrictions here, but we will demonstrate that they are a local phenomenon, and do not refer to clausal semantic properties. We will address two kinds of semantic restrictions based on a distinction exemplified in Lang (1994): *sortal* and *selectional restrictions.*

2.2.1 Sortal Restrictions

It has been established that sortal differences are important for grammar (see Dölling (1994), Chierchia (1998), Krifka (2003) among others). In this subsection we will consider primarily the analysis in Krifka (2003). Krifka assumes a semantic ontology which contains kinds, groups, individuals and numbers. These are encoded as semantic types. In a typed semantic representation language determiners and predicates can impose type requirements on their semantic arguments. This can account for the fact that a bare singular noun cannot occur as an argument of a verb which requires a kind (see (4)).[2]

(4) * Dodo is extinct.

At first glance the data in (5a) seem to suggest that the predicate *be extinct* can restrict the quantificational status of its complement. However, adopting the richer semantic ontology, the contrast follows from the fact that *every dodo* expresses a quantification over individuals. In the web example (5b) the quantification is over kinds, and consequently the universally quantified NP is compatible with the type requirements of the verb.

(5) a. The dodo/ *Every dodo is extinct.

b. Wenn noch vor zehn Jahren jede Art des Positivismus als ausgestorben . . . galt,
'While 10 years ago every kind of positivism was still considered . . . extinct, . . . '

A predicate does not restrict the quantificational aspects of its arguments, but the type of its argument can be restricted. Quantifiers may have the effect of type shifting which accounts for the apparent sensitivity to particular determiners in (5a).[3]

[2]The dodo was a flightless bird of Mauritius, extinct in the 17th century.

[3]Analogously we expect that the inherently distributive or collective nature of predicates such as *die* and *besiege* can be captured respectively by the subtle sortal distinctions.

2.2.2 Selectional Restrictions

Besides the sortal restrictions discussed in the previous subsection there are other more fine-grained semantic restrictions which a verb can impose on its complements. They are usually called *selectional restrictions.* In (6) an example is presented.

(6) a. Hans pflückte eine Pusteblume.
Hans picked a dandelion

b. ?? Hans pflückte ein Buch aus dem Regal.
Hans picked a book from the shelf

The German verb *pflücken* and its English translation *pick* impose the same sortal restrictions on their argument. Nonetheless, *pflücken* is restricted to flowers and fruits. As illustrated in (b), this is not the case for English *pick.* Note also that selectional restrictions are independent of the occurrence of particular quantifiers or other semantic operators:

(7) Hans hat zwei/ alle Pusteblumen gepflückt/ pflücken wollen.
Hans has two/ all dandelions picked/ pick want
'Hans picked/ wanted to pick two/ all dandelions.'

Within generative grammar the oddness of sentences such as (6b) is considered to follow from world knowledge rather than from the grammar (see for example Bennis and Hoekstra (1989, p. 23). The reason for this is that the context may improve the data:[4]

(8) a. ?? Tom ate a keyboard.

b. Tom cannot eat a keyboard. (Androutsopoulos and Dale, 2000, p. 15)

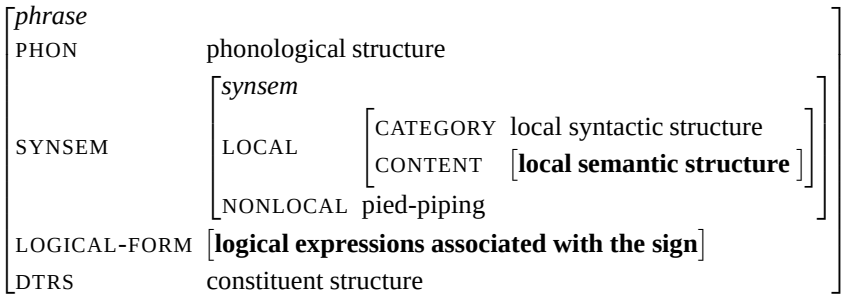
It should be noted that the repair effect of the context in (8b) is systematic, while the selectional restrictions are idiosyncratic. I.e. it is an idiosyncratic property of *eat* to be compatible only with food, but it is a general property of the negation to allow for the violation of selectional restrictions. This shows that selectional restrictions qualify as a local semantic phenomenon: They are idiosyncratic properties of a lexical item and involve the semantic properties of a head and its dependents, but they are indifferent with respect to semantic operators.

There is a difference between sortal restrictions and selectional restrictions. Chomsky (1965) already distinguishes between two kinds of semantic features, one group being of relevance to the grammar, the other being more pragmatic in nature. We follow Lang (1994) in defining this distinction in terms of sortal versus selectional restrictions. Selectional restrictions are more subtle — for example, they allow us to distinguish between flowers and books, and they can be violated more readily.

To our knowledge Androutsopoulos and Dale (2000) is the only study which proposes an account of selectional restrictions within HPSG. The authors outline two different possible analyses, depending on whether the phenomenon is treated as primarily pragmatic or primarily semantic. For both analyses the verb needs only to have access to the INDEX value of its complements. In the first case it adds a restriction of this index to the context. In the alternative analysis they assume a complex

[4]Classical examples for this argument can be found in Chomsky (1965, p. 158).

Figure 2: The architecture of semantics



hierarchy below the sort *index*. The verb *eat* then requires a complement whose INDEX value is a subsort of *edible*.

The HPSG architecture in Figure 1 makes the index of the complements available to the verb. However, the rest of the semantic contribution of the complements is also accessible. Thus there could in principle be a verb that can only take a universally quantified subject. Clearly such a selectional restriction is as implausible as the hypothetical linking constraint in (3) and should therefore be excluded by the structure of linguistic entities.

In this section we have looked at local semantic phenomena. We have demonstrated that the semantic information referred to in the description of these phenomena includes the basic semantic constant of a word, and its index. Yet, in the current architecture of semantics in HPSG, all of the semantics of a word are available for imposing lexical restrictions on the relation between a head and its dependents.

3 Lexical Resource Semantics

Lexical Resource Semantics (LRS) is an alternative system for combinatorial semantics in HPSG. Richter and Sailer (2004a) give a detailed presentation of the framework. LRS combines techniques of underspecified semantics (Reyle, 1993; Bos, 1996; Pinkal, 1996) with the properties of an HPSG grammar. LRS departs from the HPSG tradition in that it assumes a standard semantic representation language such as Ty2 (Gallin, 1975) as the logical form of a sentence. Expressions of this representation language are encoded as objects of a sort *meaningful-expression* (*me*, see Sailer, 2003). In LRS the semantic contribution of a sign is not considered a single *content* object, it is rather conceived of as a list of subexpressions of the final logical form. This kind of semantic representation is called *discontinuous* in Richter and Sailer (2004a).[5]

In LRS we can establish a distinction between local and non-local semantics which is analogous to the distinction between syntactic category and constituent structure. The resulting architecture is presented in Figure 2.

We assume two attributes for semantics: the local semantic representation appears as the CONTENT value within LOCAL. The clausal semantics, i.e., the logical form of a clause, constitutes the LOGICAL-FORM (LF) value. We will briefly present how nonlocal semantics is dealt with in LRS, and then explain our assumptions about local semantics.

[5]This discontinuous approach proved successful in the analysis of a number of nonlocal semantic phenomena: German multiple interrogatives (Richter and Sailer, 2001), Polish negative concord (Richter and Sailer, 2004a,b), scope ambiguity in Dutch (Bouma, 2003), and Afrikaans tense phenomena (Sailer, 2004).

3.1 Nonlocal Semantics

This subsection will be exclusively devoted to the LF value. We will go through a simple example which illustrates the combinatorial mechanism of LRS. The LF attribute in Figure 2 takes values of sort *lrs*. In (9) we will give the appropriateness conditions for this sort.

(9) Appropriateness conditions of the sort *lrs*:

lrs	
EXTERNAL-CONTENT	*me*
INTERNAL-CONTENT	*me*
PARTS	*list(me)*

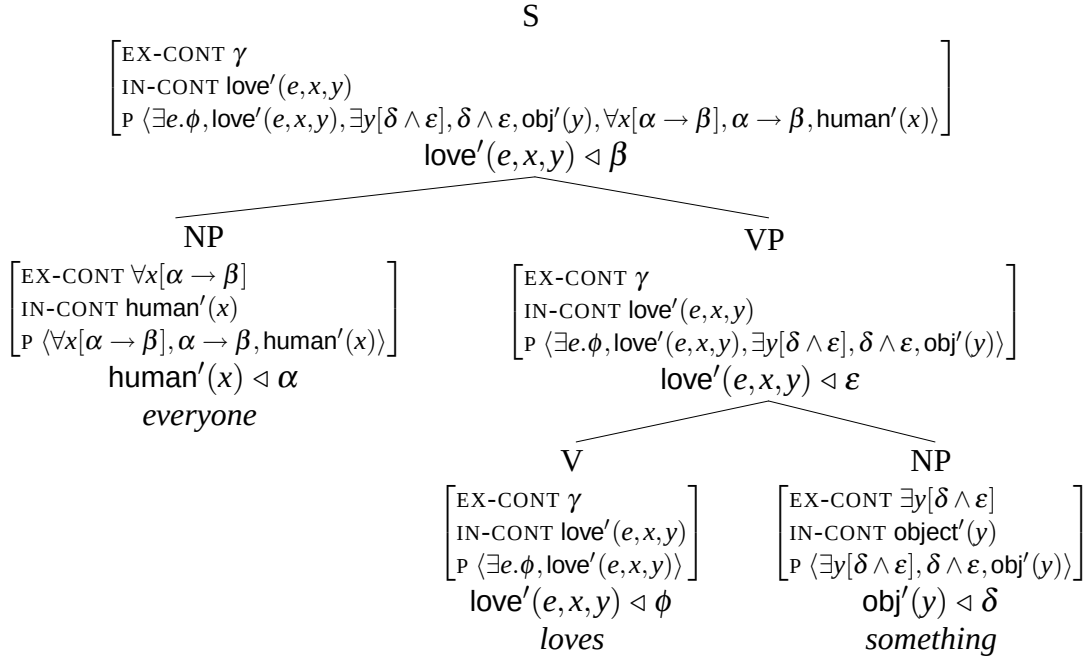
The PARTS list contains all the subexpressions which are contributed by a sign. In an utterance, these subexpressions together constitute the EXTERNAL-CONTENT (EX-CONT) value, i.e. the overall logical form associated with that sign. The attribute INTERNAL- CONTENT (IN-CONT) is needed for the definition of the combinatorial principles of LRS. It specifies the scopally lowest expression in a head projection.

In the following we will illustrate how to derive the two readings of the sentence in (10).

(10) a. Everyone loves something.

b. $\forall\exists$-reading: $\forall x[\mathsf{human}'(x) \rightarrow \exists y[\mathsf{object}'(y) \wedge \exists e[\mathsf{love}'(e,x,y)]]]$
$\exists\forall$-reading: $\exists y[\mathsf{object}'(y) \wedge \forall x[\mathsf{human}'(x) \rightarrow \exists e[\mathsf{love}'(e,x,y)]]]$

Figure 3: The structure of sentence (10)



In Figure 3 we summarized our analysis of sentence (10). The semantic contributions of the words are indicated on the leaves of the tree. The PARTS list (P) of the NP *everyone* contains the universal quantifier, the variable bound by this quantifier, the restriction to humans and the implication, i.e.,

the indication of how the restrictor and the nuclear scope should be connected in the interpretation. However the restrictor and the nuclear scope are not fully specified, which we mark by lower case Greek letters (α, β, ...). The lexical entry of *everyone* also specifies that the expression $\mathsf{human}'(x)$ must be part of the quantifier's restrictor.[6] We indicate this by the constraint $\mathsf{human}'(x) \lhd \alpha$ in the figure. The relation "$\lhd$" encodes subexpressionhood. The semantic contribution of *something* is analogous to that of *everything*. The verb contributes the semantic constant love' together with the argument variables. Note that we assume an eventuality argument *e* for verbs. The verb also contributes the existential quantification over this variable.[7]

The LF value of a phrase is fully determined by the LF values of its daughters and the way in which the daughters are syntactically combined.[8] This is regulated in the SEMANTICS PRINCIPLE (SP). The SP states that the EX-CONT and the IN-CONT values of a phrase and its head daughter are identical. The PARTS list of the phrase consists of all the elements of the PARTS lists of the daughters. In addition the SP specifies further requirements depending on the syntactic structure. For our example, one such requirement is relevant: if the nonhead is a quantified NP. then the IN-CONT value of the head is a subexpression of the nuclear scope of the quantifier in the EX-CONT value of the nonhead.

The effect of the SP has already been integrated in the tree in Figure 3. Note that the expression $\mathsf{love}'(e,x,y)$ is required to be whithin the scope of both quantifiers. The relative scope of the two quantifiers is not constrained by the grammar. The EX-CONT value of the sentence must consist of all the elements of its PARTS list, and must respect the indicated subexpression constraints. This leaves two options for the EX-CONT value, γ: the two readings given in (10b).

The mechanism presented so far is very similar to other systems which build on techniques of underspecified semantics. Within HPSG, *Minimal Recursion Semantics* (MRS, Copestake et al., 2003) is particularly popular. It should be emphasized that the main argument of this paper applies to MRS just as well as to LRS. In fact the locality of semantic selection is sometimes mentioned in MRS publications. Nonetheless, no detailed argumentation has been presented so far, nor has this locality been reflected in the linguistic architecture. We have chosen LRS because it uses a standard semantic representation language, which allows us to integrate logical forms from the literature directly.

3.2 Local Semantics

After this brief presentation of the combinatorial mechanisms of LRS we will indicate how local semantics can be integrated into the system. We will assume that the values of the attribute CONTENT in Figure 2 are objects of the sort *content*. In (11) we will specify the sort hierarchy and the appropriateness conditions below the sort *content*.

(11) The sort *content*:

content	
INDEX	*extended-index*
MAIN	*me*

Our CONTENT values are a considerably simplified compared to the structures in PS94. This is, of course, partly due to the fact that some of the semantic burden is transferred into the nonlocal

[6] The PARTS lists are abbreviated in this paper for better readability. In fact, the PARTS list of *everyone* also contains the expressions x, human', $\mathsf{human}'(x)$.

[7] For simplicity we assume the narrowest possible scope of $\exists e$ and ignore its potential scopal interaction with other quantifiers.

[8] The LF value is a semantic representation, not the semantic denotation of a sign. Thus, LRS obeys "systematicity" (Halvorsen, 1995), but is not strictly compositional.

Figure 4: Description of the word *everyone*

$$\begin{bmatrix}\text{PHON } \langle \textit{everyone} \rangle \\ \text{SYNS LOC} \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{noun}\end{bmatrix} \\ & \begin{bmatrix}\text{ARG-ST} & \langle\rangle\end{bmatrix}\end{bmatrix} \\ \text{CONT} \begin{bmatrix}\textit{nom-obj} \\ \text{INDEX} \begin{bmatrix}\text{PHI} & \begin{bmatrix}\text{NUM} & \textit{sg} \\ \text{PERS} & \textit{3rd}\end{bmatrix} \\ \text{VAR} & x\end{bmatrix} \\ \text{MAIN} \quad \mathsf{human}'\end{bmatrix}\end{bmatrix} \\ \text{LF} \begin{bmatrix}\text{EX-CONT} & \forall x[\alpha \rightarrow \beta] \\ \text{IN-CONT} & \mathsf{human}'(x) \\ \text{PARTS} & \langle \forall x[\alpha \rightarrow \beta], \alpha \rightarrow \beta, \mathsf{human}'(x) \rangle\end{bmatrix}\end{bmatrix} \quad \textbf{and } \mathsf{human}'(x) \lhd \alpha$$

semantics. All *content* objects have an INDEX and a MAIN attribute. The value of the MAIN attribute of a word is the major semantic constant contributed by this word. The attribute INDEX has values of the sort *extended-index*, which we will define in (12)

(12) The sort *extended-index*:

extended-index	
PHI	*index*
VAR	*me*

This new index has two attributes, PHI and VAR. The values of PHI are structured as prescribed by the sort *index* in PS94, i.e., they include the attributes PERSON, NUMBER and GENDER which encode the traditional "ϕ-features". The value of the attribute VAR contains an expression of the semantic representation language. In simple cases it is an individual variable. The VAR value corresponds intuitively to the referential semantic argument of the MAIN value. Thus, in the case of a quantified NP, the VAR value is the variable which is bound by the quantifier. For verbs the VAR value is an eventuality variable.

The PS94 theory draws heavily on the INDEX, in particular for Binding Theory, which we would like to preserve. However, in PS94 verbs do not have an index. In our approach, following Soehn (2003), we have an attribute INDEX defined for all parts of speech, including verbs. While an eventuality variable is needed in the semantics, it is not clear whether ϕ-features are necessary. In order to establish this we could assume that the PHI value of verbs is of a new subsort of *index*, called *no-phi*. Alternatively we would have to make sure that the PHI values of verbs do not play any role in the grammar. In both cases the verb's PHI value would not be mentioned in the lexicon.

We will illustrate the interplay between the CONTENT value and the LF value with the description of two words in Figures 4 and 5. The quantified NP *everyone* in Figure 4 has a third person singular PHI value. Its VAR value (x) is the variable bound by the quantifier. The MAIN value expresses the main semantic constant contributed by the NP: the restriction to humans.

The INDEX PHI value of the verb in Figure 5 is not specified. Its VAR value is an event variable e and its MAIN value is the constant love'. Since the VAR value of the verb's complements are part of the *synsem* structures on the verb's ARG-ST list, they are accessible for the identification of the argument positions of love' on the PARTS list ($\mathsf{love}'(e,x,y)$). The semantic typing of love' guarantees the correct semantic type for the VAR values, which are, in the present case, individuals.[9]

[9] See section 3.2.1 for a refinement.

Figure 5: Description of the word *loves*

$$\left[\begin{array}{l}\textsc{phon}\ \langle \textit{loves}\rangle \\ \textsc{s l}\ \left[\begin{array}{ll}\textsc{cat} & \left[\begin{array}{ll}\textsc{head} & \textit{verb} \\ \textsc{arg-st} & \left\langle \left[\textsc{l}\ \left[\begin{array}{l}\textsc{cat}\left[\textsc{head}\ \textit{noun}\right] \\ \textsc{cont}\left[\textsc{index var}\ x\right]\end{array}\right]\right], \left[\textsc{l}\ \left[\begin{array}{l}\textsc{cat}\left[\textsc{head}\ \textit{noun}\right] \\ \textsc{cont}\left[\textsc{index var}\ y\right]\end{array}\right]\right]\right\rangle\end{array}\right] \\ \textsc{cont} & \left[\begin{array}{l}\textsc{index var}\ e \\ \textsc{main}\ \mathsf{love}'\end{array}\right]\end{array}\right] \\ \textsc{lf}\ \left[\begin{array}{ll}\textsc{ex-cont} & \gamma \\ \textsc{in-cont} & \mathsf{love}'(e,x,y) \\ \textsc{parts} & \langle \exists e.\phi, \mathsf{love}'(e,x,y)\rangle\end{array}\right]\end{array}\right]$$

and $\mathsf{love}'(e,x,y) \lhd \phi$

This brief illustration demonstrates that the information necessary for linking and sortal restrictions are present in the new architecture for semantics. Our major concern in Section 2 was that the traditional HPSG architecture does not adequately restrict the kinds of linking constraints or selectional restrictions which can be imposed by a head. In particular it was possible to write linking constraints which referred to the presence of quantifiers in the complements (see (3)). In the new architecture a constraint of this kind can no longer be formulated, since the quantificational impact of a complement is located entirely in its LF value, and thus is not accessible to the selecting head.

It is in line with the literature on linking and also with the theory of selectional restrictions in Androutsopoulos and Dale (2000) to assume that semantic constants are ordered hierarchically. In the HPSG encoding of Ty2 (Sailer, 2003), the sort *me* has a subsort *constant* which has a maximally specific subsort for each constant of Ty2. It is very natural to incorporate a more elaborated sort hierarchy below *constant.* To illustrate this, we will introduce a new subsort of *constant*, called *cause-rel*. All semantic constants whose first semantic argument can be interpreted as a causer will be subsorts of this new sort. Linking constraints can then refer to these more general supersorts in the usual way.

This sort hierarchy below *constant* is not only the basis for generalization on linking, it can also be seen as a conceptual organization of the constants. The first purpose is mainly fulfilled by the ordering of verbal predicates, the second by the ordering of nominal predicates. Thus there will be a sort *food* which will have *apple, chocolate,* etc as its subsorts. Such conceptual hierarchies are widely used in computational linguistic applications such as GermaNet (Kunze and Wagner, 2001). Since the semantic constant of a complement is now visible to a selecting head, selectional restrictions can be expressed. We leave it to further research to determine how these restrictions will be spelled out, i.e. whether in terms of the semantic or the pragmatic properties of the head.

After this general outline of local semantics in LRS, we will elaborate on some details in the following subsections. In Section 3.2.1 we will identify cases in which the INDEX VAR value of a syntactic dependent does not appear directly as a semantic argument of the head. Section 3.2.2 will be concerned with the distinction between MAIN and IN-CONT. Finally, in Section 3.2.3 we will investigate the potential objection that, contrary to our original goal, the proposed architecture allows heads to impose conditions on which quantifiers may appear in their argument positions.

Figure 6: Local semantics of *the/every car*

$$\begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{PHI} & \begin{bmatrix} \text{NUM} & sg \\ \text{GEN} & neutr \\ \text{PERS} & 3rd \end{bmatrix} \\ \text{VAR} & x_e \end{bmatrix} \\ \text{MAIN} & \mathsf{car}'_{et} \end{bmatrix}$$

3.2.1 Complement INDEX versus Argument Type

In the simple example in (10) the verb *loves* occurs as outlined in Figure 5. Here, the INDEX VAR values of the syntactic arguments appear as semantic arguments of the MAIN constant love'. This is, however, not the case in general. Consider for example the logical forms of the following sentences one of which contains a definite NP, the other a universally quantified NP.[10]

(13) a. Mary likes the green car.
$\exists e[\mathsf{like}'(e, m, \iota x[\mathsf{car}'(x) \wedge \mathsf{green}'(x)])]$
(where $\iota x_\tau[\phi]$ denotes an individual a of type τ such that $[\![\lambda x.\phi]\!](a) = 1$ if there is exactly one such individual, otherwise the denotation is undefined.)

b. Mary likes every green car.
$\forall x[[\mathsf{car}'(x) \wedge \mathsf{green}'(x)] \rightarrow \exists e[\mathsf{like}'(e, m, x)]]$

For both direct object NPs we assume the same local semantic structure, as given in Figure 6. In the logical form the VAR value x is bound by an operator which is introduced by the determiner: the iota-operator in the case of *the*, and the universal quantifier in the case of *every*. Since the iota-operator conserves the semantic type, both x and $\iota x[\mathsf{car}'(x) \wedge \mathsf{green}'(x)]$ are of type e, and, thus, compatible with the type requirements of the constant like'.

As a consequence, the lexical entry of a verb will require that the VAR values of its syntactic arguments occur *inside* the semantic argument slots of its MAIN constant. However, they do not need to be *identical* to these arguments slots. To illustrate this, consider the outline of the lexical entry of *like* in Figure 7.

In this lexical entry the argument slots of the MAIN value are not filled explicitly, instead of this, it is merely specified that some expressions of type e will appear here. The linking information is, however, preserved, since we state that the VAR value of the first syntactic argument must be a subexpression of α and the VAR value of the second syntactic argument must be a subexpression of β.

The case of definite NPs is the simplest instance of a mismatch between the VAR value of a syntactic argument and the corresponding semantic argument slot. The following two sentences, quoted from Krifka (2003), can be treated similarly.

(14) a. At the meeting, Martians presented themselves as almost extinct.

b. At the meeting, Martians claimed [to be almost extinct].

[10] The semantics of the definite NP is a simplified version of the proposal in Krifka (2003).

Figure 7: Outline of the lexical entry of the verb *like*

$$\left[\begin{array}{l}\text{PHON } \langle \textit{like} \rangle \\ \text{S L}\left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \textit{verb} \\ \text{ARG-ST} & \left\langle \left[\text{L}\left[\begin{array}{l}\text{CAT}\left[\text{HEAD } \textit{noun}\right] \\ \text{CONT}\left[\text{INDEX VAR } x\right]\end{array}\right]\right], \left[\text{L}\left[\begin{array}{l}\text{CAT}\left[\text{HEAD } \textit{noun}\right] \\ \text{CONT}\left[\text{INDEX VAR } y\right]\end{array}\right]\right] \right\rangle\end{array}\right] \\ \text{CONT} & \left[\begin{array}{l}\text{INDEX VAR } e \\ \text{MAIN } \mathsf{like}'_{e(e(et))}\end{array}\right]\end{array}\right] \\ \text{LF}\left[\begin{array}{ll}\text{EX-CONT} & \gamma \\ \text{IN-CONT} & \mathsf{like}'(e,\alpha,\beta) \\ \text{PARTS} & \langle \exists e.\phi, \mathsf{like}'(e,\alpha,\beta)\rangle\end{array}\right]\end{array}\right] \quad \begin{array}{l}\textbf{and } \mathsf{like}'(e,\alpha,\beta) \lhd \phi \\ \textbf{and } x \lhd \alpha \\ \textbf{and } y \lhd \beta\end{array}$$

The subject *Martians* binds respectively a reflexive pronoun or an unexpressed embedded subject. The standard HPSG analysis assumes INDEX identity between the subject *Martians* and the reflexive pronoun *themselves* in (14a), and between *Martians* and the unrealized subject of the infinite VP in (b). On the other hand, as Krifka (2003) argues, the sortal restrictions of the predicates are not compatible with each other, i.e., *present* and *claim* require an individual (or a group individual) as its first semantic argument. The predicate *be extinct*, however, requires a kind.

Since binding is expressed as the identity of INDEX values, we will have to demonstrate that, in our approach, the binder and the bindee can indeed have the same VAR values in our approach. The noun *Martian* has an individual variable as its VAR value. Following Krifka (2003) we assume that the plural operator can have the effect of creating a group individual or a kind. In both cases, the operator will bind the variable of the noun's VAR value. Thus, while *Martians* and *themselves* have different EX-CONT values, they can still have identical VAR values.

These examples served to illustrate the distinction between the VAR value of a syntactic argument and the corresponding semantic argument slots of predicates. The present discussion relies heavily on the possibility of integrating standard semantic representations into HPSG. For example, with the semantic representations used in PS94, it would not be obvious how the data should be represented.

3.2.2 MAIN **versus** INTERNAL-CONTENT

The simple example in (10) has also glossed over another important distinction which we want to capture in LRS. In the case of *everyone* and *loves* mentioned above, the MAIN value was very similar to the IN-CONT value. The scope possibilities of opaque predicates such as German *fehlen* (*be missing*) indicate that this need not be the case. In (15) we will give an example with two possible readings. In (16) we will outline the lexical entry of the verb *fehlen*.

(15) Eine Schraube fehlt.
a screw is missing

de re-reading: $\exists x[\mathsf{screw}'(x) \wedge \exists e[\mathsf{be\text{-}missing}'(e, \hat{}\lambda P.\check{}P(x))]]$
de dicto-reading: $\exists e[\mathsf{be\text{-}missing}'(e, \hat{}\lambda P.\exists x[\mathsf{screw}'(x) \wedge \check{}P(x)])]$

(16) Outline of the lexical entry of *fehlen* (*be missing*):

$$\left[\begin{array}{l}\textsc{phon}\ \langle \textit{fehlen}\rangle \\ \textsc{synsem}\left[\textsc{loc}\left[\begin{array}{l}\textsc{cat}\left[\begin{array}{l}\textsc{head}\ \textit{verb} \\ \textsc{arg-st}\left\langle\left[\textsc{loc}\left[\begin{array}{l}\textsc{cat}\left[\textsc{head}\ \textit{noun}\right] \\ \textsc{cont}\left[\textsc{index}\ \textsc{var}\ x\right]\end{array}\right]\right]\right\rangle\end{array}\right] \\ \textsc{cont}\left[\begin{array}{ll}\textsc{index}\ \textsc{var} & e \\ \textsc{main} & \textsc{be-miss.}'\end{array}\right]\end{array}\right]\right] \\ \textsc{lf}\left[\begin{array}{ll}\textsc{ex-cont} & \gamma \\ \textsc{in-cont} & \check{}P(x) \\ \textsc{parts} & \langle \exists e.\phi, \textsc{be-miss.}'(e, \hat{}\lambda P.\delta), \hat{}\lambda P.\delta, \check{}P(x)\rangle\end{array}\right]\end{array}\right] \begin{array}{l}\textbf{and}\ \textsc{be-miss.}'(\ldots) \lhd \phi \\ \textbf{and}\ \check{}P(x) \lhd \delta\end{array}$$

Note that the MAIN value of the verb *fehlen* is the constant be-missing′ but this constant does not appear in the IN-CONT value. Instead, the scopally lowest subexpression contributed by the verb *fehlen* is the expression $\check{}P(x)$. In accordance with what we have said above about the SP, when the verb combines with the subject *eine Schraube* (*a screw*) as in (15), the SP only requires that the verb's IN-CONT value be in the scope of the quantifier. Since this IN-CONT value is the expression $\check{}P(x)$, this requirement is met in both readings. On the other hand, in the *de dicto* reading, the main semantic constant of the verb be-missing′ is not in the scope of the quantifier.[11]

3.2.3 Less Constrained than Intended?

It seems that we have achieved our goal of constructing a local semantics which does not give access to the quantificational behavior of the selected elements. In particular linking cannot made dependent on quantificational aspects of the syntactic arguments under the reasonable assumption that the antecedent of a linking constraint should only mention the SYNSEM value of a word.

It should be noted, however, that the EX-CONT value of a word may also impose conditions on the overall semantics. Since EX-CONT is part of LF, operators and quantifiers are accessible there. For example, if we specify the EX-CONT value in the lexical entry of a verb accordingly, the verb could enforce narrow scope for one of its arguments. A corresponding hypothetical lexical entry is outlined in (17).

(17) Parts of a hypothetical lexical entry:

$$\left[\begin{array}{l}\textit{word} \\ \textsc{synsem loc cat arg-st}\left\langle \ldots\left[\textsc{loc cont index var}\ x\right]\ldots\right\rangle \\ \textsc{lf}\left[\textsc{ex-cont}\ \ldots\exists x[\ldots]\ldots\right]\end{array}\right]$$

The lexical entry in (17) specifies that the VAR value of a syntactic argument (x) must be bound by a certain quantifier within the EX-CONT value of the verb.

In this context it becomes relevant that the EX-CONT domain of a head is relatively restricted. For nouns it does not extend beyond the operator which binds the noun's VAR value. For verbs the

[11] To deal with cases such as '*A unicorn appears to be approaching*' the SP in Richter and Sailer (2004a) specifies that the IN-CONT value of a raising verb is identical with the IN-CONT value of its infinitival complement. Thus we account for the narrow scope readings without a QSTORE mechanism or a QUANTS list in LOCAL. This principle also ensures that the IN-CONT values are shared in verbal complexes in German and other languages which are analyzed as instances of argument raising in HPSG (Hinrichs and Nakazawa, 1989).

EX-CONT is clause-bound. Syntactic arguments can in general take wider scope than the EX-CONT of their head. This is illustrated with the examples in (18).

(18) a. [A representative from every city] was present.
$\forall y[\mathsf{city}'(y) \wedge \underline{\exists x[\mathsf{representative}'(x) \wedge \mathsf{from}'(x,y) \wedge \mathsf{be\text{-}present}'(x)]}]$

b. Peter believed [that someone from Spain had called]
$\exists x[\mathsf{from\text{-}Spain}'(x) \wedge \mathsf{believe}'(p, \underline{\hat{}\mathsf{call}'(x)})]$

In the logical forms in (a) and (b) we have underlined the EX-CONT value of the noun *representative* and the verb *called* respectively. It can be seen that a quantifier introduced by a dependent of these words can outscope the underlined subexpressions of the logical form. In (a) there is a case of inverse scoping of the PP complement *from every city*, in (b) the *de re*-reading of an indefinite complement NP *someone from Spain* is given.

This indicates that the quantificational characteristics of a syntactic argument can only be restricted by a lexical specification as in (17) if the scope of this quantifier is also restricted. But, in this case, we are dealing with a genuine clausal semantic property.

At present it is unclear whether there are lexical entries which exploit the potential outlined in (17). The English *there*-construction is a possible candidate. It has been noted that "definite NPs" are excluded in sentences such as (19).[12]

(19) a. There are two/ some students in the park.

b. * There are both/ the students in the park.

Zucchi (1995) argues that the presuppositions of "definite" NPs are not compatible with the felicity conditions of the construction. In a reply to this Keenan (2003) provides a characterization of the class of NPs which are permissible in *there*-sentences in terms of their semantic entailments. If Keenan's approach is correct, it seems that our claim from Section 2.2 that lexical heads are ignorant with respect to the quantificational nature of their dependents needs to be revised.

What is most crucial in the light of our discussion, however, is the fact that the NPs in *there*-sentences cannot have wide scope. This is reflected by the fact that (20a) can have both a *de re*- and a *de dicto*-reading, whereas (20b) can only have the *de dicto*-reading.

(20) a. Jane believes that a spy was in her office.

b. Jane believes that there was a spy in her office.

In the *de dicto*-reading the scope of the indefinite is within the EX-CONT value of the embedded verb. This, however, is exactly the domain which is made available for quantifier constraints in lexical entries.

We conclude that lexical entries of the form outlined in (17) might be needed. Our architecture of semantics embodies strong restrictions on which kinds of quantifier-sensitivity of a lexical head can be expressed: a lexical head can only restrict the quantificational aspects of one of its complements if: (i) the head also constrains the scope of these quantifiers, and (ii) this scope is narrow, i.e., within the head's EX-CONT. These restrictions seem to be empirically correct, and thus, provide further support for our proposal.

[12] We are grateful to Olivier Bonami for pointing these cases out to us.

4 Conclusion

In this paper we made an attempt to establish a connection between LRS and the research on local semantic phenomena. Because of space limitations we could only present the main motivation and the technical realization of the proposal. We demonstrated that by using LRS it is possible to establish a distinction between local and combinatorial semantics, which is analogous to the distinction between syntactic category and constituent structure.

We motivated this split in semantics empirically. In particular, the formulation of linking constraints and the expression of semantic restrictions could be shown to be immune to CS properties of the selected elements. We made use of the modular organization of linguistic objects in HPSG to express this restriction in the architecture of a sign. The new architecture of local semantics has proved to be (i) more restrictive than the traditional HPSG proposal and (ii) still compatible with current analyses of LS and CS phenomena.

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Differential Quantifier Scope: Q-Raising versus Q-Feature Checking*

Balázs Surányi

1. Introduction

Divergent scope-taking and scope interaction possibilities of noun phrases have been the focus of interest ever since it became clear that the omnivorous scope-shifting rule of Quantifier Raising (QR) (May 1977, 1985) plainly both under- and overgenerates. Liu (1990), Ben-Shalom (1993) and others point out that in interactions with other quantifier types certain quantifiers exhibit a smaller set of inverse scopal options than would be predicted if QR applied to them. In a series of influential studies seeking to account for the rather complex pattern of differential scope-taking options, Beghelli and Stowell (1994, 1995) and Szabolcsi (1997) propose to treat various quantifier classes as performing checking operations in quantifier-specialized functional projections in the clause.

The proliferation of functional projections as descriptive devices has been a primary concern in the past decade or so, and an object of much conceptual controversy. Here I take the methodological stance that introducing functional projections as new primitives in the theory requires substantial empirical motivation. What I will demonstrate here is that in this regard Beghelli and Stowell's/Szabolcsi's quantifier-projection-based (or A-bar feature checking-based) approach to Q-scope is insufficiently grounded: their quantifier projections lack the necessary empirically motivation. In fact, some aspects of the model also create conceptual complications. Worse still, on closer inspection, the approach both under- and overgenerates in the domain of Q-interaction.

In this paper I will work with a restricted set of functional projections in the clausal domain assumed in Chomsky (1993), and demonstrate that an alternative, more conservative model incorporating QR is able to provide not only a more restricted, but also an empirically superior account of differential Q-scope. In particular, I show that independently motivated scope-affecting mechanisms interact in complex ways to yield precisely the attested scopal possibilities for the various quantifier classes. These mechanisms are existential closure, reconstruction within A-chains, and QR.

A repercussion of the present study is that Quantifier Raising exists at the level of narrow syntax—an assumption that has recently been repeatedly challenged, perhaps most strongly in the specialized quantifier-projections approach (cf. also Hornstein's 1995 approach). I argue here that the QR-view is essentially correct, though the domain of its application is more restricted than commonly believed. If the analysis of Q-interaction presented here is correct, then A-reconstruction also must be available (alongside A-bar reconstruction), contra Chomsky (1995) and Lasnik (1999).

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The paper is structured as follows. Section 2 makes preliminary notes on existential indefinites and introduces the most immediately relevant data from differential scope-taking. In Section 3, we briefly review and illustrate the A-bar checking model. This is followed by a critical appraisal in Section 4, where this model is shown to be untenable both on conceptual and on empirical counts. Section 5 spells out the proposed alternative tying together independently motivated assumptions about existential closure, A-reconstruction, QR, and a focus interpretation of numerals. It is demonstrated that no quantifier scope specific machinery is necessary to treat scope-interaction of various Q-classes: the interaction patterns fall out without further stipulations.

2. Scope deviations

2.1. The scope of existential indefinites

The classical QR approach has turned out to undergenerate in a class of cases and overgenerate in another set of cases. The area where the QR approach strikingly undergenerates is the area of existential indefinites. These expressions are known to have a lot more freedom in scope-taking than would be predicted by a movement analysis (like QR). Crucially, the scope of existential weak NPs is unbounded: it is in fact insensitive to islands (like coordinations, *if*-clauses, or complex NPs, for instance).

An early attempt that sets out to explain the apparent unbounded scope of existentials originates with Fodor and Sag (1982), who argue that these indefinites are ambiguous between a quantificational (existential) reading and a referential/specific reading, the latter corresponding to wide scope interpretation (referential expressions, like proper names, can be interpreted in situ, without QR[1]). A prediction of this analysis is that so-called intermediate scope readings (with the indefinite having *inverse* (i.e. wider than surface) scope, but not *maximal* scope) should not exist. However, it has been demonstrated repeatedly (Farkas (1981), Ruys (1992) and Abusch (1994)) that such intermediate readings do in fact exist.

In dynamic models of semantics like Discourse Representation Theory (DRT) or Heim's approach (Kamp 1981, Kamp and Reyle 1993; Heim 1982) indefinites introduce discourse referents by restricted free variables (instead of being quantificational expressions, cf. Lewis 1975). In Heim's model, these variables can then be unselectively bound by some operator (hence their quantificational variability). Their existential force is due to binding by an existential operator, which can be text-level or appended to the nuclear scope of true quantifiers. Then, the unboundedness of their existential scope as well as the availability of the intermediate scopes are derived, and as desired, no movement is involved.

A potential problem for this approach is posed by the fact that it leaves the restriction in situ. This means that assignments not satisfying that restriction (i.e. not being members of the N-set of the indefinite NP) will also be considered, failing to capture the correct truth conditions. (1a) is a frequently cited illustration of this point. (Reinhart (1997) demonstrates that the problem is rather broad, involving not only overt implications, but also restrictive terms of universal quantifiers, the scope of negation, and it concerns not only regular indefinites, but also *wh*-in-situ and *wh*-expressions in sluicing as well).

[1] Some variants of this analysis involve unselective binding of the 'specific' indefinite by a remote, maximal scope existential operator.

(1) a. If we invite some philosopher, Max will be offended
b. $\exists$x ((philosopher (x) & we invite (x)) $\rightarrow$ (Max will be offended))

(1b) involves unselective binding of an individual variable, which is locally restricted by the predicate philosopher internal to the NP, which is in situ. This representation, however, is incorrect, given that implications are true vacuously if their antecedent clause is false: here any non-philosopher value for *x* will make the antecedent clause true, hence the whole proposition true—contrary to fact. A QR representation of (1a), in contrast to (1b), would pull up the restriction, and thus only philosophers would be considered when assigning a truth value to the implication—a correct result. In fact, Heim (1982) proposes that in such examples QR of the indefinite is at work. However, then we run into a different complication, namely the Subjacency-problem: this instance of QR would not be Subjacency-respecting. As Reinhart (1997) points out, a further problem here is that if we QR an indefinite, we expect it to allow a distributive reading (plural indefinites in general do). However, indefinites scoping out of an island do not allow a distributive reading, as illustrated by the example in (2) (as observed by Ruys 1992):

(2) If three relatives of mine die, I will inherit a house

According to the wide scope interpretation of the plural indefinite in (2), there are three relatives of mine and if all of them die, then I'll inherit a house. On the distributive wide scope reading, however, I will inherit a house even if only one relative of mine (of the three) dies—a reading actually unavailable in (2). Then, a movement (QR) analysis of wide scope indefinites is problematic in view of these facts as well.

Reinhart (1997) proposes a variety of the unselective binding approach which resolves this complication, and which avoids the problem illustrated in (1) as well. Her proposal is that the existential quantification involved is in fact over choice functions (cf. Reinhart 1993, Winter 1995), which apply to the NP-set (i.e. the predicate) denoted by indefinites. Choice functions apply to any (non-empty) set and yield a member of that set. In her approach the existential operator is introduced much in the same way as in Heim's framework. (1a) will receive a representation like (3):

(3) $\exists f$ (CH (*f*) & (we invite *f*(philosopher) $\rightarrow$ Max will be offended))

(3) says that there is a choice function such that if we invite the philosopher that it selects, then Max will be offended. Note that in case of plural indefinites like *three relatives* the choice function will pick appropriate collectives from the denotation of the NP, i.e. a collective made up of three relatives in the case of *f*(three relatives). First, this treatment correctly predicts the lack of distributivity with island-external scope for existentials (cf. (2)), inasmuch as the indefinite NP itself is not present outside the island in order to be distributed over. Second, it straightforwardly resolves the problem of the interpretation of sentences like (1) inasmuch as a choice function by definition can only output a member of the set denoted by the restriction (i.e. the NP it applies to).[2]

[2] Reinhart also argues that applying existentially bound choice function variables to plural indefinites derives their collective reading, hence such readings do not require an independent semantic treatment. This appears to be in support of the choice function analysis.

In this picture, we have (i) unselective binding of choice function variables, which strategy is available only to existential indefinites, and which is the only strategy that is available to achieve island-*external* scope for these elements, and we have (ii) QR for generalized quantifiers.[3]

We will return to these results in Section 4 and 5. We move on now to another area where an omnivorous QR rule fails, namely the scope-taking differences that apparently exist between different classes of quantifiers. Such scope-taking differences should not exist if QR applies in the same way to all quantifiers, hence they pose a problem to a uniform QR analysis of quantifier scope.

2.2. Differential scope

Such scope-taking differences received a detailed discussion in Liu (1990), and are illustrated below. First consider (4a). Besides the branching reading of (4a) where there is a group of students and a group of classes and each is matched with each, there are two distributive readings (4a) has: one where each of the two students passed possibly different sets of four classes, and one where each of the classes was passed by a possibly different set of students. Now (4b) is crucially different in that the second one of these readings, where the subject co-varies with the object, i.e. the inverse scope distributive reading is absent.

(4) a. Two students passed four classes S > O / O > S[4]
b. Two students passed fewer than four classes S > O / *O > S

That this is a syntactic effect is shown by (5). In (5a), the *fewer than n*-expression occupies the subject position, and a bare numeral indefinite occupies the object position. In (5b), we have the same, but a universal quantifier as object. In (5c), the comparative numeral expression functions as indirect object, c-commanding the direct object. In these examples, the *fewer than n*-expression c-commands a bare numeral indefinite or a universal overtly, and can take distributive scope over it.

(5) a. Fewer than four students passed two classes S > O / O > S
(inverse scope: Beghelli 1993: 67, Liu 1997: 47)
b. Fewer than four students passed every class S > O / O > S[5]
c. She gave fewer than four articles to two students DO > IO / IO > DO

Fewer than n-type indefinites are not only unable to take inverse scope over a higher plural indefinite, they are also unable to take inverse distributive scope over a c-commanding universal quantifier, as in (6).

(6) Every student passed fewer than four classes S > O / *O > S

[3] A question that is still open is the treatment of existential indefinites inside an island boundary (or in lack of one), in a clause-bounded domain. Reinhart (1997) suggests that QR is available to them as well, due to her assumption that they also have a generalized quantifier (GQ) interpretation, alongside the choice-function interpretation (the GQ interpretation is due to a typically covert existential determiner). That is, she entertains an ambiguity treatment: indefinite scope is determined either via choice function application or via QR.

[4] Beghelli (1993: 66), Liu (1997: 41) (but only non-distributive wide scope is acknowledged to be available for the object QP in such examples by Beghelli and Stowell 1995).

[5] This type of examples forces Beghelli and Stowell to place DistP *below* AgrSP: 'fewer than four students' can reconstruct from AgrSP to VP for the inverse scope reading. If DistP were *above* AgrSP, then these examples would be predicted (wrongly) to invariably have the object universal scoping over the subject. The same applies if we replace the modified numeral subject with a bare numeral subject.

According to Beghelli (1993), the class of expressions that behave in this way, i.e. that are unable to take inverse distributive scope include other modified numeral expressions like *at most n* N, *exactly n* N, *only n* N, *at least n* N, and decreasing indefinites like *few* N and *no* N.

If we now try (7), which has a modified numeral both in the subject and in the object position, as Szabolcsi (1997) notes, (with some difficulty) we do get inverse distributive scope ((7) is Szabolcsi's example).

(7) More than three men read more than six books S > O / ?O > S
(Szabolcsi 1997: 116)

Another generalization relates to *bare* numeral indefinites, like *two books*. We have just seen in (4a) that an object bare numeral indefinite can take wide scope over a subject bare numeral expression, or over a subject modified numeral expression, as in (5a). However, as illustrated in (8), when they function as objects, they cannot scope inversely to distribute above a distributive universal. Of course, the bare numeral indefinite can be interpreted as referentially independent of the subject universal, but crucially, it cannot have distributive wide scope over it (the set of students cannot co-vary with the students).

(8) Every student adores two teachers S > O / *O > S

The interaction patterns appear to be rather complex, and clearly, wholly unexpected if QR applies to all the quantifier expressions involved.

Now Beghelli and Stowell / Szabolcsi put forward a model in which such differential scope-taking options are accounted for, and in which QR per se no longer plays any role.

3. The Q-feature checking approach

Beghelli and Stowell / Szabolcsi propose that apart from undergoing Case- an agreement-driven A-movements, quantifier NPs do move to scope positions, as in the QR-based model. However, these scope positions are not created by the movement itself, as with QR, but they are instances of substitution to specifiers of a series of specialized functional projections. This effectively eliminates QR as a non-feature-checking operation.[6]

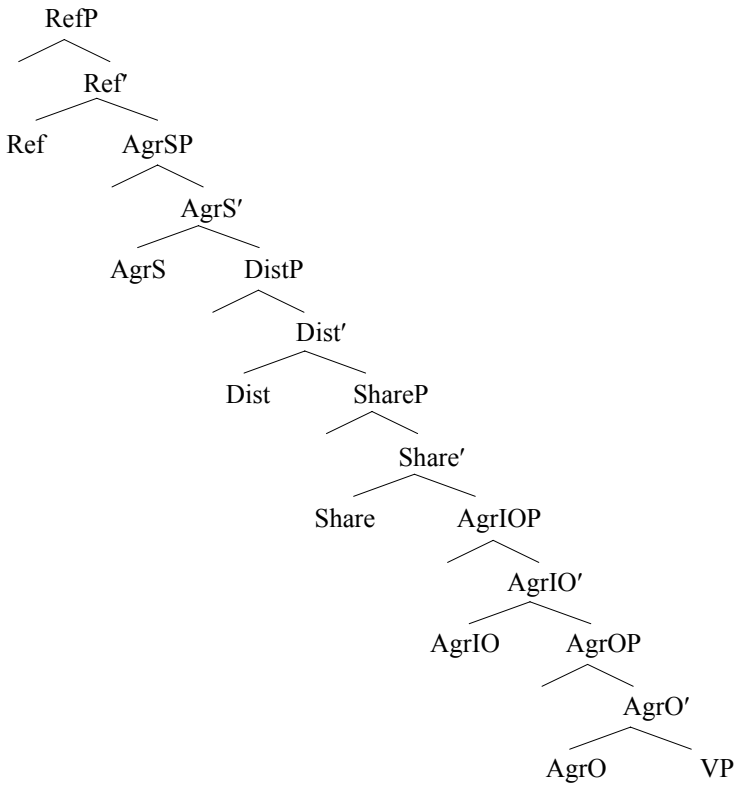
3.1. Beghelli and Stowell

Let us now have a look at how Beghelli and Stowell's model treats asymmetries in scope-taking reviewed in Section 2.2 above.

The core idea is to introduce a number of quantifier-specialized A-bar projections, where different lexical classes of quantifiers can check their characteristic quantifier feature. Certain ambiguities are incorporated in the system by allowing some quantifiers to bear a quantifier feature optionally. The functional hierarchy is given in (9).

[6] The model shares this property with Hornstein's (1995), only Hornstein's approach attempts to reduce Q-scope to independently existing A-movements. Among various other drawbacks, Hornstein's theory also suffers from an insensitivity to differential scopal options of different Q-classes, much like the pure QR approach.

(9)



RefP is a checking-site for definites and specific wide scope bare numeral indefinites. DistP houses distributive universals. ShareP hosts bare numeral indefinites that are specific in the sense of Enc (1991) (i.e. range over individuals whose existence is presupposed), but that are being distributed over. Non-specific bare numeral indefinites, as well as modified numeral indefinites move only as far at their appropriate Case-checking A-position (which are assumed to be AgrP projections, but the model would work the same way with A-positions in Spec,*v*P/TP). A difference that Beghelli and Stowell assume to hold between bare numeral indefinites and modified numeral indefinites is that only the latter can reconstruct to their VP-internal base positions, bare numeral indefinites cannot.

Let us briefly review how the account predicts the relative scope facts by way of re-examining some of the examples above. Consider (4b) again, repeated as (10a):

(10) a. Two students passed fewer than four classes S > O / *O > S
b. [$_{AgrSP}$ two students . . . [$_{AgrOP}$ fewer than 4 classes. . .]]

The inverse distributive scope here is impossible because the object modified numeral indefinite is in [Spec,AgrOP], while the subject bare numeral indefinite that is in subject position cannot reconstruct to VP by assumption. Consider now (5b), reproduced as (11a). The universal must be located in DistP. Because the modifier numeral expression can reconstruct to VP as an option, the scope ambiguity is derived.

(11) a. Fewer than four students passed every class S > O / O > S
b. [$_{AgrSP}$ fewer than 4 students [$_{DistP}$ every class …[$_{VP}$ fewer than 4 students…]]]

If the object is also a modified numeral indefinite, then the subject modified numeral expression is able to reconstruct below it, as in (7), repeated as (12a), with the LF structure in (12b):

(12) a. More than three men read more than six books S > O / ?O > S
b. [$_{AgrSP}$ (more than 3 men) [$_{AgrOP}$ more than 6 books… [$_{VP}$ more than 3 men…]]]

Given that distributive universals don't reconstruct, and given that an object modified numeral indefinite can raise only as high as AgrOP, only direct scope is generated for (6), repeated as (13a):

(13) a. Every student passed fewer than four classes S > O / *O > S
b. [$_{DistP}$ every student [$_{AgrOP}$ fewer than 4 classes… [$_{VP}$ (fewer than 4 classes)…]]]

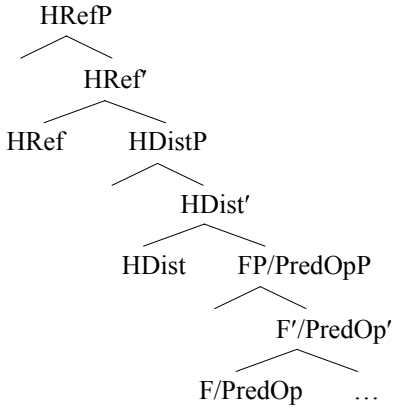
In an analogous situation, as in (14a) repeated from (8), a bare numeral indefinite is able to escape the scope of the subject universal, but cannot distribute over it. This is derived by Beghelli and Stowell by means of moving the object bare numeral to highest position RefP. RefP is stipulated not to allow distributing the quantifier it houses, hence wide non-distributive scope is correctly generated:

(14) a. Every student admires two teachers S > O / *O > S
b. [$_{RefP}$ two teachers [$_{DistP}$ every student . . .]]

3.2. Szabolcsi

Szabolcsi (1997) argues that Hungarian, with its preverbal overt movements, provides strong evidence for Beghelli and Stowell's (1994/1995; 1997) theory of scope. She transposes Beghelli and Stowell's analysis to Hungarian by positing the following hierarchy of functional projections in the preverbal domain of this language:

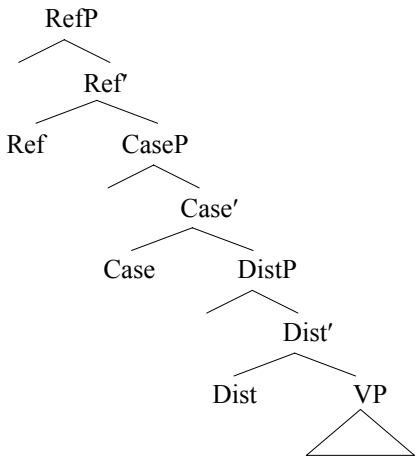
(15)



HRefP is targeted again by referential expressions (definites and wide scope indefinites), HDistP by increasing distributive quantifiers, FP by focus operators (cf. Brody 1990), and PredOpP by the modified numeral class of QPs (as well as bare numeral indefinites with stress on the numeral), which are referred to as counting quantifiers (such as *kevés* N 'few N', (*pontosan*) *hat* N '(exactly) six N')—all in overt syntax. By stipulation, out of the latter two projections (FP and PredOpP), only one can appear in one clause. In the field marked by three dots we find the verb and AgrP projections.

Now, this picture in itself unfortunately does not account for the full set of even the most basic data. Therefore Szabolcsi proposes that the following hierarchy is present in the *postverbal* field of Hungarian, below the raised verb (that is (16) is a continuation of (15)):

(16)



In distinction to HRefP and HDistP, movement to these second instances of RefP and DistP is covert. Inhabitants of CaseP (a recursive Case-checking projection postulated by Szabolcsi where all arguments have a chain link by LF at the latest) can optionally A-reconstruct.

Here too quantifiers bearing the relevant features raise to the corresponding projections. Some Hungarian examples are provided in (17), along with their analysis in the style of Szabolcsi (left arrows indicate LF raising, right arrows signal LF-reconstruction, where the latter one is an optional operation).

(17) a. $[_{HRefP}$ Péter$_i$ $[_{HDistP}$ mindenkit$_k$ $[_{FP}$ a névnapján köszönt fel
P.-nom everyone-acc the nameday-his-on greets Pref
$[_{CaseP}$ t_i $[_{CaseP}$ t_k $[_{VP}$ t_i ... t_k
'Peter congratulates everyone on his name day'

b. $[_{PredOpP}$ Kevés lányt$_i$ köszöntött fel $[_{RefP}$ $[_{CaseP}$ t_i $[_{VP}$ az osztályfőnök t_i
few girl-acc greeted Pref the headmaster-nom
'The headmaster congratulated few girls'

c. $[_{HDistP}$ Mindkét fiú$_i$ $[_{PredOpP}$ két könyvet$_k$ hozott $[_{CaseP}$ t_i $[_{CaseP}$ t_k
both boy-nom two book-acc brought
$[_{DistP}$ $[_{VP}$ ... t_i ... t_k ... minden órára ...
every class-to
'Both boys brought along two books to every class'

d. $[_{FP}$ Egy keddi napon harapott meg
a Tuesday day-on bit Pref
$[_{CaseP}$ hatnál több kutya $[_{DistP}$ $[_{VP}$ ...minden fiút... (ambiguous)
more than six dog-nom every boy-acc
'More than six dogs bit every boy on a Tuesday'

In (17a) the various quantifiers move to the respective quantifier projections overtly: the proper name to HRefP, the universal to HDistP, and the focus operator to FP. In (17b), PredOpP replaces FP, and that is where the counting quantifier raises to, while the postverbal definite NP moves to RefP of the postverbal domain covertly. (17c) contains a postverbal universal quantifier, which moves to DistP covertly. Finally, the ambiguity of (17d) is derived by assuming that on the one hand, the universal quantifier moves to DistP covertly, and on the other, the expression *hatnál több kutya* 'more than six dogs' optionally reconstructs from CaseP to its VP-internal position—this being responsible for the ambiguity. The postulation of CasePs is crucially instrumental for Szabolcsi to treat postverbal scopal optionalities.

Having reviewed the mechanisms of the Beghelli and Stowell/Szabolcsi, I will now show why this account is unworkable.

4. Bringing the Q-feature checking approach down

In this section I demonstrate that (i) Hungarian does not provide support for an A-bar checking approach to Q-scope, (ii) the postulation of projections RefP and DistP create serious problems, and (iii) the A-bar checking account is severely challenged by various instances of under- and overgeneration.

4.1. Hungarian does not support the Q-feature checking account

Although Szabolcsi underscores the similarity of the Hungarian and the English clause, and suggests that this similarity appears to support Beghelli and Stowell's theory, in actual fact this similarity is much more limited than what would make a convincing argument. The more different the set of functional projections of English and Hungarian clause structure, as well as the hierarchical order of these projections are, the more the potential justification derivable from such an alleged symmetry diminishes, and at the same time, the more the ideal of reducing cross-linguistic variation to a minimum in the theory is contravened. I will show next that the evidence that can be extracted from Hungarian for English-type quantifier projections targeted by covert movement is inconsequential.

4.1.1. Discrepancies between Q-projections in English and Hungarian

First, as acknowledged by Szabolcsi herself (Szabolcsi 1997: 122), FP does not parallel ShareP of the English clause, neither does PredOpP correspond to AgrP in English. FP is matched with focus interpretation, and it can host definite expressions as well—neither is true of ShareP (as Szabolcsi acknowledges). While AgrP is the locus of phi-feature checking and an A-position, FP/PredOpP is not. Further, reconstruction of bare numeral indefinites from CasePs needs to be optional for Hungarian, but needs to be banned for English.

4.1.2. A free hierarchy?

Second, I show that when we consider a wider range of data, the extensions of the functional hierarchy that are made necessary result in a radically *liberal* functional architecture. Inasmuch as a fixed (absolute or relative) position is an important motivation for postulating a functional projection, the basis of positing the functional projections involved here is considerably weakened.

Let us see what reason there is to believe that the quantifier projection hierarchy must be more liberal than Szabolcsi claims it to be. Hungarian has true multiple foci constructions in the sense of Krifka (1991), involving two independent identificational foci (as opposed to a language like Italian). As has been demonstrated (É.Kiss 1998, Surányi 2002), the second identificational foci

moves to its own separate FocP projection, below the preverbal FocP (which on analyses following Brody (1990) houses the verb itself in its head). Postverbal focus operators may optionally scope inversely over other postverbal quantifiers such as universals, as will be illustrated shortly (in (18) and (20) below). Thus, movement of secondary identificational foci to their FocP projection is covert, and this FocP can be projected either below or above the LF position of the other postverbal quantifier (say, a universal) (Surányi 2002).

Consider the example in (18), with a postverbal focus and a postverbal distributive universal. The scope ambiguity between these two postverbal quantifiers is represented structurally in (b) and (b'). Namely, postverbal FocP can be projected either below or above postverbal DistP.

(18) a. Péter mondott el egy diáknak mindent csak kétszer egymás után
P.-nom told Pref a student-dat everything-acc only twice in turn
'It is Peter who told a student everything only twice in turn'
OK (Peter >) only twice > everything / OK (Peter >) everything > only twice
b. [FocP Peter . . . [FocP only twice [DistP everything [VP]]]]
b′. [FocP Peter . . . [DistP everything [FocP only twice [VP]]]]

In addition to the ambiguity arising from the relative scope of the postverbal distributive universal and the postverbal focus, there is a further ambiguity, which derives from the interpretation of the indefinite 'a student'. Indefinites that have relative *wide* scope with respect to some operator are placed in RefP in the system being considered. The point here is that the postverbal 'a student' in (18a) can be understood as either co-varying with the two occasions (i.e. the focus) or not, and further, as either co-varying with the things being told (i.e. the distributive universal) or not. That means that we need to revise the range of options in the *postverbal* field at least to (19):

(19) . . . [RefP [DistP [FocP [RefP [DistP [VP

In fact, it is possible to construct examples with yet richer structure, corresponding to rich postverbal scope relations, such as (20a). The representation of (20a) (on the surface scope interpretation of the universal and focus quantifiers) should be (20b), where RefP-s mark the possible LF positions of the indefinite 'a room'.

(20) a. Péter beszél meg minden vizsga elõtt csak kétszer
P.-nom discusses Pref every exam before only twice
minden diákkal csak három vizsgakérdést egy teremben
every student-with only three test questions-acc a room-in
'It is Peter who discusses only three test items with every student only twice before every exam in a room'
b. [FocP Peter . . . [RefP [DistP before every exam [RefP [FocP only twice . . .
. . . [RefP [DistP with every student [RefP [FocP only three test items [VP]]]]]]

The picture we have arrived at by simple logical extension of Szabolcsi's model for Hungarian appears rather unconstrained: in the postverbal field, RefP, DistP and FocP can be projected at any point freely, interspersing with each other.

Curiously, the same does not hold of the same projections in the preverbal field: there they can only be projected in the order RefP > DistP > FocP. We return to this, as well as further asymmetries between the preverbal and the postverbal quantifier-projections directly.

4.1.3. RefP is unlike HRefP

I will argue now that the presumed parallel between Hungarian overt HRefP and English covert RefP[7] does not hold: these two projections are essentially different in their properties. Further, in some crucial cases when we expect overt movement to Hungarian HRefP to happen if HRefP did parallel English RefP, these movements do *not* happen. I will also argue that HRefP is distinct not only from English RefP but also from Hungarian (postverbal) RefP.

Let us start with this last point, i.e. the difference between Hungarian preverbal HRefP and postverbal RefP. A syntactic asymmetry is that movement to HRefP is overt, and movement to postverbal RefP is covert. As for phonological and semantic interpretation, putative inhabitants of RefP have no special status, which is especially clear if we contrast them with inhabitants of HRefP. First, definites and indefinites do not bear obligatory stress (can be deaccented) when in HRefP, whereas when they are in RefP, deaccenting is not available (cf. É.Kiss 1994).

(21) Az (')igazgató bemutatta minden lánynak egyenként a 'fiúkat
the director-nom Pref-introduced-3sg every girl-acc one-by-one the boys-acc
'The director introduced the boys to every girl one by one'

Intonation can be rising on elements in HRefP, but not on elements in RefP. Also, an intonational boundary can be found after HRefP, but not after RefP.

From a discourse semantic perspective, it can be observed that inhabitants of HRefP need to be high accessibility entities in the sense of Ariel (1990, 1994), while inhabitants of RefP need not. This explains the acceptability contrast of the intended co-reference in (30), where judgments refer to a discourse-initial position (the pronoun in (30a) is supposedly in RefP, while it is in HRefP in (30b)).

(22) a. Mindig veszekszem vele$_i$, Péter$_i$ mégsem haragszik meg
always quarrel-1sg with-him P.-nom still_not become_angry Pref
'I always quarrel with him, Peter nevertheless is not angry with me'

b. ?* Vele$_i$ mindig veszekszem, Péter$_i$ mégsem haragszik meg
with-him always quarrel-1sg P.-nom still_not become_angry Pref

Further, it is a long-standing generalization that expressions that are in HRefP for Szabolcsi function as logical subjects of categorical judgments (cf. e.g. Kuroda 1972). Now the same does not hold true of postverbal referentials/specifics.

Observe further that the *English* RefP originally proposed by Beghelli and Stowell also systematically differs with respect to the properties we have just enumerated from Hungarian overt HRefP. The properties of the inhabitants of HRefP (high accessibility, logical subject interpretation, overtness of movement, special prosody) make them similar more to English topicalized constituents, while inhabitants of English RefP are an unmarked case. (Note that English topicalization falls outside the domain described by Beghelli and Stowell: it is a syntactically higher, CP-related phenomenon.)

Thus, we can conclude that the claim that Hungarian overt HRefP is parallel to English RefP and that therefore Hungarian provides overt support for a Beghelli and Stowell style analysis cannot be upheld.

[7] Here and elsewhere 'overt HRefP' is shorthand for 'HRefP, movement to which is overt', while 'covert RefP' stands for 'RefP to which movement is covert'.

There is a crucial set of constructions where, if HRefP really paralleled English RefP, then we would expect *overt* movement to Hungarian HRefP to take place. This case is illustrated in (23), and we can see that the expected movements do *not* happen to derive the readings in (b) and (c).

(23) Mindkét fiú minden lánynak kölcsönadott két könyvet
both boy-nom every girl-dat Pref-lent-3sg two book-acc
'Both boys lent two books to every girl'
a. both boys > every girl > two books
b. both boys > **two books** > every girl
c. **two books** > both boys > every girl[8]

The same effect can be replicated with a preverbal focus instead of preverbal universals. Hungarian, once again, fails to supply the relevant *overt* evidence for movement to RefP. The proper generalization is not that if an indefinite takes scope over a preverbal QP than it has to overtly move to HRefP, but the reverse: if an indefinite has moved overtly to HRefP (i.e. has been topicalized, as I am arguing), then it takes scope from there.

4.2. The problematic nature of RefP

As a last blow to the status of RefP, while (overt) movement to the HRefP position has in fact been demostrated to respect Subjacency (e.g. Puskás 2000), existential indefinites are known to be scopally free (e.g. Abusch 1994, Reinhart 1995), i.e. to violate Subjacency. Given this fact, *the scope* of existential indefinites *itself* does not motivate a functional projection as a landing site, since the syntax/semantics mapping must minimally incorporate a NON-movement mechanism for the treatment of the scope of such NPs in any case. The same consideration applies to English RefP. Given that in Beghelli and Stowell's system, the scope of specific indefinites is the only remaining motivation for RefPs, this means that whatever mechanism we may choose to treat the unbounded scope of such indefinites, this mechanism (typically a variety of unselective binding) inevitably *subsumes* the coverage of movement to RefP—which then appears redundant.

In fact Beghelli and Stowell need a special stipulation related to RefPs, which is we don't need to formulate if we work with a combination of the unselective binding approaches and QR, i.e. the conservative approach. The stipulation is that nominals in RefPs cannot be interpreted distributively, as opposed to inhabitants of all other projections, for according to Beghelli and Stowell, projections like ShareP, AgrSP and AgrOP *do* get associated with a silent EACH distributive morpheme, but RefP does not. That on Beghelli and Stowell's approach inhabitants of RefP must not receive a distributive reading is shown by specific indefinites with *inverse* wide scope that requires them to be moved to their scope position.[9]

Now, considering the conservative model, QR-ed quantifiers are interpreted distributively by definition. On the other hand, existential closure mechanisms are not distributive operations. If inverse wide scope of existential indefinites is derived by existential binding under closure, such existentials can only have non-distributive wide scope. On such an approach we can relate non-distributivity of such expressions and their non-movement properties.

[8] On the first reading, the two books co-vary with the girls, on the second reading, the two books co-vary only with the boys but not with the girls, while on the third, the two books are referentially independent.
[9] Silent 'each' in fact weakens the motivation for the Dist head as a separate head, given that other heads also contain the same Dist (or EACH) morpheme (except for the exceptional Ref).

4.3. The problematic nature of DistP

Let me comment finally on what Hungarian has revealed about DistP. We have seen before that basically DistP can be projected between any two quantifier projections, hence its positional motivation seems to dissolve in Hungarian.

Similar considerations again extend to English. Consider a sentence with more than one universal quantifier and a reading where another quantifier takes scope in between them, such as illustrated in (24).

(24) Every teacher told (exactly) two students everything he knows
OK every teacher > (exactly) two > everything

(24) does have among its readings, not even very difficult to get, a reading where 'every teacher' outscopes 'two students' which phrase has the object universal in its scope. Now Beghelli and Stowell cannot generate such scope relations in sentences of this (or of an even more complex) sort—at least without introducing further DistP projections along the clausal hierarchy.

Another complication related to DistP is the following. In order to be able to generate distributive wide scope of a subject over a distributive universal object, as in (5b) repeated here as (25a), DistP is crucially posited BELOW the surface position of the subject (i.e. AgrSP), as in (25b).

(25) a. Fewer than four students passed every class S > O / O > S[10]
b. [AgrsP fewer than 4 [DistP every class …]]

However, this entails that when the subject itself happens to be a distributive universal, we have either improper movement from DistP (an A-bar position) to the subject position (an A position), or we have first A-movement to subject position followed by a lowering movement to DistP—both analyses are clearly problematic.

Finally in this series of conceptual counter-arguments, a serious drawback of treating the scope of universal quantifiers as A-bar checking is that we apparently lose all hope of accounting for the (rough) clause-boundedness of such quantifiers (in terms of scope economy, in terms of the status of non-checking movements in phase theory[11], or otherwise), given that the corresponding movement in Beghelli and Stowell's / Szabolcsi's system is a feature-checking driven A-bar movement: nothing rules out long movement of an *every*-QP to DistP of a superordinate finite clause.

4.4. Descriptive coverage: under- and overgeneration

So far we have seen that Hungarian does not provide overt evidence for the assumed hierarchy in that some crucial putative parallels do not hold, and even the English hierarchy needs to be

[10] This type of examples force Beghelli and Stowell to place DistP crucially *below* AgrSP: 'fewer than four students' can reconstruct from AgrSP to VP for the inverse scope reading. If DistP were *above* AgrSP, then these examples would be predicted (wrongly) to invariably have the object universal scoping over the subject.

[11] Given that QR is non-feature checking movement on present assumptions (the QP does not bear an offending feature), it cannot even be moved by IFM (Indirect Feature-driven Movement) to edge of phases to escape upwards (cf. Chomsky 2000, 2001). Hence, a possible reasoning goes, QR cannot involve intermediate steps. Given that in a strong phase only the next lowest phase is accessible, that entails (finite) clause-boundedness. For relevant discussion on the clause boundedness issue, see Sauerland (1999).

loosened up to get the fact right, and finally we have seen some *conceptual* arguments against the RefP and the DistP analysis.

Let me now point out some specific cases where the Beghelli and Stowell account fails to be *descriptively* adequate. One case of undergeneration we have already seen illustrated in (24), with two distributive universals and an interfering other quantifier.

A second case in point is (26), which is essentially analogous to our earlier example (4a).

(26) Four students read three books[12] S > O / O > S

Given that Beghelli and Stowell assume that, first, an object bare numeral indefinite never moves above the subject position, and second, that bare numeral indefinites do not reconstruct to their base position, it follows that only direct scope is generated for such examples. However, as Beghelli (1993: 66), Liu (1997: 41) and Reinhart (1997: 369) note, inverse distributive scope is in fact available.

A third case is illustrated by (27).

(27) Less then four students read exactly three books S > O / *O > S
Liu (1997: 18)

In (27), inverse distributive scope is unavailable. Given that modified numeral indefinites are able to reconstruct back to VP, on Beghelli and Stowell's assumptions we expect such inverse scope to be available. We saw that it is indeed available in some cases, such as (7) above, repeated as (28). (27) then involves overgeneration.

(28) More than three men read more than six books S > O / ?O > S

A fourth case involves internal arguments. Consider (29a):

(29) a. Mike showed five films to every guest
b. [DistP every … [AgrOP five [VP …five…]]]]

Beghelli and Stowell's system predicts that the VP-internal QPs involved in such a sentence type can occur at LF as schematized in (29b). The direct object raises to DistP, while the indirect object, being a bare numeral indefinite, cannot raise higher than AgrOP. This predicts that only an *inverse* scope reading should exist between these two expressions—this is contrary to fact: a rather prominent reading of (29a) is one with direct scope. This reading fails to be generated for (29).

A last example involves overgeneration again. In (30a) we have a sentence with two modified numeral indefinites and a universal quantifier. One LF-representation generated by Beghelli and Stowell's model is (30b). This corresponds to the scope relations with DO scoping over IO in turn scoping over the Subj. Such scope relations, however, don't actually obtain for (30a) type examples.

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[12] Beghelli (1993) provides the following context to make inverse scope less dispreferred. "Classes in this department are becoming incredibly tough; it has gotten to the point where maybe three students would pass. Last month has been the worst ever: two students passed four classes."

It appears considerably easier to get the distributive inverse scope reading too if we make the direct scope reading pragmatically implausible:

(i) In the gigantic polygamous wedding ceremony, two women married one hundred men

(30) a. Exactly two teachers showed less than five tree diagrams to every student
b. [AgrSP exactly 2 [DistP every [AgrOP less than five [VP …]]] S> IO > DO

In fact, similarly to (27), Beghelli and Stowell generate DO > S scope relations, erroneously. Even if we stipulate (on the basis of sentences like (27) and the present example) that in certain cases—including (27) and (30)—the modified numeral in subject position cannot reconstruct across the DO modified numeral for some reason, we would then *only* generate a S > IO > DO scope order, other scope orders would not be generated. This is because the IO *every*-quantifier must be located in DistP, its position being fixed. If the subject modified numeral expression cannot reconstruct, as we would be assuming, then the only scope order, once again, is: S > IO > DO. This means that in Beghelli and Stowell's system, stipulating that the subject cannot reconstruct in cases like (27) and (30) does not help: another prominent available scope order, namely IO > S > DO, would still be missed.

To sum up, we have seen that the Q-checking approach to Q-scope faces severe challenges. Not only Hungarian fails to provide any evidence in favour of such an approach, but also, positing RefP and DistP projections creates acute problems of both a conceptual and an empirical nature. In the last subsection I established that unfortunately, the descriptive coverage of the account itself also leaves much to be desired.

5. A QR-based approach

I will demonstrate now that a model incorporating Quantifier Raising, when augmented with independently motivated assumptions of existential closure over choice function variables (cf. Section 2.1 above) and A-reconstruction, is able to provide a more constrained, and at the same time empirically superior account of differential Q-scope.

In general terms, I believe that as a methodological ideal it would be appealing to connect the differential scope-taking options of quantifier classes to their lexical semantic characterization, in particular, to relate their semantic characterization to the different mechanisms of scope-taking that they can participate in. In a broad sense, this methodological stance is the same as the one taken in Beghelli and Stowell's / Szabolcsi's work.

In what follows, I will first lay out the assumptions I adopt. These assumptions have been independently argued for, and I will argue that, when combined, they yield precisely the complex interaction patterns reviewed above. The central one of these assumptions is that QR exists as a movement serving *purely* scope-shifting, and that it applies to GQ-NPs.

5.1. Bare numeral indefinites: closure and A-reconstruction

First, following a Heimian treatment, the class of bare numeral indefinites[13], being open expressions with an unbound restricted variable, can be bound under closure. For concreteness, I adopt Reinhart's choice function approach here, but the particular choice among the closure approaches will not play a role here.

Bare numerals are taken to be cardinality predicates, following Milsark's (1977) analysis of Definiteness Effect contexts. Bare numeral cardinality predicates are second order predicates

[13] The class of bare numerals may be understood to also contain the indefinite article *a(n)*, or alternatively, this article may be taken to be a semantic determiner creating generalized quantifiers. This choice does not matter for our purposes.

applying to sets, assigning to them their cardinality. Hence, bare numerals only restrict, but do not bind the given variable (Kamp and Reyle 1993).[14]

(31) *four classes* $\{X \mid \text{class}(X) \,\&\, |X| = 4\}$

The 'binding of choice function variable under closure' approach to (plural) existential indefinites correctly predicts unbounded wide scope. The closure approach predicts that such expressions do not have inverse *distributive* scope, since distributivity is not introduced by existential closure higher up[15] (distributivity is a property of GQs only). That is, this is the prediction, provided that plural (bare numeral) existential indefinites are *only* interpretable as restricted indefinites with a free variable. We have seen, however, that such indefinites *are* in fact able to have distributive inverse scope, as in (4a), and (5). Some examples are repeated here in (32).

(32) a. Two students passed four classes S > O / O > S
b. Fewer than four students passed two classes S > O / O > S
c. I gave fewer than four articles to two students IO > DO / DO > IO

Now, inverse scope in these examples can be treated without adding anything to a standard model, given that in minimalism bare numeral indefinites as noun phrases participate in A-movement dependencies (Case- and/or agreement-related A-movements). Assuming, as is standard, that A-movement can occur covertly and that A-movement chains can reconstruct[16], there is a possibility for these quantifiers to exhibit inverse scope in interaction with certain other quantifiers merely by virtue of forming A-chains. Inverse scope effects will arise due to A-reconstruction either if the bare numeral indefinite in question undergoes A-reconstruction itself, or if another quantifier A-reconstructs *below* the bare numeral indefinite.

Up to this point we have left it an open issue whether bare numeral indefinites are in fact ambiguous between a variety of plural Heimian indefinite, and a GQ interpretation (involving an existential quantifier). Now, if bare numeral plural indefinites did have a GQ interpretation and QR applied to them, we would certainly make a number of false predictions.

Among them, we would predict that an object bare numeral indefinite take distributive scope over a subject universal quantifier—this is false (cf. (8)). If bare numeral indefinites did QR, another prediction that would be made is that inverse scope of an object bare numeral indefinite over a subject bare numeral indefinite can be achieved without A-reconstruction of the subject: the object needs to QR above the subject. But if A-reconstruction is not involved in such cases, then this makes an interesting prediction: namely, we do not expect any interference with respect to the binding options for the subject, given that the subject does not need to A-reconstruct. On the other hand, if QR is *not* available to bare numeral indefinites, then the subject *does* need to reconstruct for inverse scope, and we expect interference with binding of the subject.

To test this, consider (33):

(33) a. Bill believes two pictures of himself to have outraged three Hungarian critics
b. Bill believes that two pictures of himself have outraged three Hungarian critics

[14] A usual notation for an indefinite like *four classes* is $\{X \mid \text{classes}(X) \,\&\, |X| = 4\}$. The numeral leaves the X variable unbound, hence it is available for existential closure, therefore (non-distributive) wide scope in general is possible for unmodified numeral indefinites.

[15] A distributive operator is sometimes introduced at the point where the indefinite restriction is interpreted.

[16] Reconstruction in A-chains has recently become debated, most notably by Lasnik (1999). Boeckx (2001), however, argues strongly that A-reconstruction is available.

If the reflexive embedded in the subject has to reconstruct to obtain inverse distributive scope, than the reflexive will at the same time get out of the local domain of its antecedent—hence, such inverse scope reading is expected to be unavailable in this case. In light of (33), this is indeed what happens: a scenario involving two different pictures matched to each of the three critics (i.e. a distributive inverse scope) is not among the interpretations of (33). Hence, (33) makes an argument again against QR-ing bare numeral indefinites. This contrasts with examples similar to (33), but with a universal quantifier in the object positon of the embedded clause: there inverse scope of object over subject is available precisely because universal quantifier can QR above the subject (e.g. *Bill believes two pictures of himself to have outraged every Hungarian critic*).[17, 18]

It seems then that bare numeral indefinites do not QR, and can take inverse distributive scope only if A-reconstruction occurs. However, for these cases, i.e. for the cases when their inverse scope is *distributive*, we need to provide a source for distributivity. Existential closure (over choice function variables) may apply in principle at any syntactic point (including intermediate readings (shown to be available a.o. by Farkas (1981), Ruys (1992) and Abusch (1994))), that is, including locally, immediately above the bare numeral indefinites. However, existential closure over choice function variables does not yield a distributive reading, as we have already pointed out.

Such distributive scope is available to bare numeral indefinites only *in situ*, in their A-position (e.g. when they are in subject position, or when another QP A-reconstructs below their Case-related A-position); more precisely, distributivity is available for them in their A-position if the verb is compatible with such an interpretation. We can then relate these distributive readings of bare numeral indefinites locally to the distributive component (often modeled in the form of a distributive operator) in the semantic representation of the relevant verb (or other predicate). This produces exactly the effect we have witnessed: distributive interpretations of bare numeral indefinites available only locally, in the A-positions.

Thus far, we have A-movement / A-reconstruction, as well as binding under closure in the picture.

5.2. Modified numeral indefinites: A-reconstruction and the role of focus

I take Liu's (1990) basic observations of the inability of modified numeral indefinites to take inverse distributive scope (in most of the cases) to be crucially important. In a model that incorporates QR, this should mean that these quantifiers do not participate in QR. They clearly participate in (agreement- and Case-related) A-movement dependencies. The null hypothesis is that, similarly to bare numeral indefinites, modified numeral indefinites can undergo A-reconstruction.[19]

Modified numeral indefinites and nouns modified by *few*, as opposed to bare numeral indefinites, do not have unbounded wide scope. This means that their numerals do not get interpreted as cardinality predicates, they don't have a free variable to come under closure, i.e. they are quantified independently of closure.[20] If QR exists as a scope-shifting operation, then it should

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[17] Another piece of evidence against QR-ing bare numeral indefinites comes from Hungarian, where QR is (optionally) overt: bare numeral indefinites do not QR overtly in Hungarian (they only move to focus position) (cf. Surányi 2002).

[18] In a recent manuscript Fox and Nissembaum (2002) make use of analogous syntactic scenarios involving the interaction of A-bar reconstruction and binding Condition A (in order to show that A-bar reconstruction is narrow syntactic).

[19] The raising construction in (i) shows that this is the case. (i) has a reading according to which what is allowed is the absence of few students.

(i) Few students are allowed to be absent

[20] There is clear evidence that the numeral of non-increasing modified numeral indefinites is not interpreted as a cardinality predicate. If an example like 'There are fewer than six students in the room' is interpreted as $\exists$ X [|X|<6 & $\forall$ x of X [student(x) & in the room(x)]], then this would allow there to be *more* than six students as well: it only says

apply to modified numeral indefinites provided that their modified numeral is a determiner and they are simple GQs.

I have argued in independent work based on Hungarian (Surányi 2000, 2002, 2004) that decreasing and non-monotonic modified numeral indefinites are, and increasing ones can be, interpreted as focus and occupy a syntactic focus positon. Krifka (1999) proposes that modified numerals including the 'at least n N' or 'more than/less than n N' type are cases of focus, and they are not GQs (essentially 'at least'/'more than' etc. are similar to a focus particles). This means that the modified numerals are not simply determiners, but involve focus on the numeral in a domain of alternatives. Then we understand why modified numeral indefinites do not appear to undergo QR: this is because they are not GQs to begin with.

The basic assumptions have now been spelt out. We have A-movement and A-reconstruction for both *bare* numeral indefinites and *modified* numeral indefinites, where the former are bound under existential closure, and the latter are quantified by focus. QR applies only to the remaining GQs, like distributive universals, *most*, proportional *many*, etc.

5.3. A-reconstruction and focus

The focus treatment of modified numerals, in fact at the same time buys us something extra as well. It is argued in Boeckx (2001) that A-reconstruction is sensitive to quantificational interveners.[21] Now since focus is a quantificational intervener, this should mean that modified numeral indefinites are expected not to allow A-reconstruction to happen across them.

In fact this is what seems to happen. Consider the contrast from (4) again.

(4) *A-reconstruction of subject*

a.	Two students passed four classes	S > O / O > S
b.	Two students passed fewer than four classes	S > O / *O > S

In (b) the subject cannot reconstruct below the Case position of the object (SpecAgrOP or Spec*v*P), because the object is interpreted as focus, hence quantificational.

5.4. A-reconstruction and the Mapping Hypothesis

We have taken bare numeral indefinites to be able to A-reconstruct. However, this should not be as free as with modified numeral indefinites. In particular, under some version of Diesing's (1992) Mapping Hypothesis, *specific* existential indefinites cannot appear inside the predicate phrase, i.e. *v*P/VP, at LF. Modified numeral expressions like 'exactly five boys' or 'less than three books' can freely reconstruct to *v*P/VP, given that they do not introduce discourse referents, they don't have a specific interpretation. However, although bare numeral subjects may take narrower scope than a

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that there is a set of less than six students, but there could be more (Beghelli 1993: 74, citing Schein 1993 and Ben-Shalom 1993). Of course such examples only *indicate* that they are not interpreted as a cardinality predicate, but do not explain why.

[21] For instance, (i) and (ii) are not ambiguous, in the way indicated, due to the presence of the quantificational interveners *not* and *always*:

(i) Two students did not read this book
2 > Neg / *Neg > 2

(ii) Few students are always likely to be absent
few > always > likely / *always > likely > few

bare numeral object (as in (4a)), this clearly appears to be a dispreferred interpretation. It is in fact next to impossible if the subject bare numeral indefinite is a partitive, as in (34).

(34) Two of the men read three books S > O / *?O > S

As Szabolcsi points out, inverse distributive scope is extremely degraded here. Our explanation comes from the Mapping Hypothesis: 'two of the men', being partitive and specific (in the sense of Enc 1991), cannot reconstruct to *v*P/VP. To the extent that ordinary bare numeral indefinites in subject have a preference to be interpreted as specific (they are the default topic), their A-reconstruction is also dispreferred—though possible.[22]

5.5. The model at work

Let us see how the model I have drawn up derives the other scope-asymmetries above (we have just seen what explains (4a,b)). For ease of reference, I repeat illustrations as well as their numbers from the previous examples. The reason of why the inverse scope is possible (or why it is impossible) is indicated above each example.

Consider again sentences in (5). (5a) involves a modified numeral indefinite subject, which may undergo A-reconstruction in order to yield an inverse scope effect. (5b) is different from (5a) only in that it has a universal quantifier as the object. Now in addition to A-reconstruction of the subject, we also have QR of the object that can produce inverse scope relations in (5b). (5c) allows inverse scope relations between indirect and direct objects. This once again is due to A-reconstructability of the indirect object from its Case-checking A-position to below the Case-position of the direct object.

(5) *A-reconstruction of subject*

a. Fewer than four students passed two classes S > O / O > S
(inverse scope: Beghelli 1993: 67, Liu 1997: 47)

QR of Obj (to v*P / to TP) / A-reconstruction of Subj*

b. Fewer than four students passed every class S > O / O > S

A-reconstruction of IO

c. I gave fewer than four books to two students IO > DO / DO > IO

The inverse scope relations here are all derived.

Consider now (6). (6) does not admit inverse scope. This is because on the one hand, the subject *every*-QP undergoes QR to TP and does not A-reconstruct, and on the other hand, the object is a modified numeral indefinite, which is not a GQ, hence cannot QR above the subject.

[22] Universal quantifiers also appear not to be able to A-reconstruct, based on examples like (8). (Apparent inverse scope in examples like *Everybody didn't seem to be happy* can be derived by Neg-raising above the subject, as argued by Boeckx (2001).) If this is the case, then this can be derived in at least two ways. One course to take would be to place universal quantifiers into the category of specific NPs (again, in the sense of Enc 1991), which cannot appear inside the predicate phrase at LF. Another line is to argue that subject universals need to QR above the subject position, i.e. above their highest A-position, otherwise (say, if they QR-ed to adjoin to *v*P) an improper chain would be created. Then QR fixes their scope above the subject position.

(6) *Subject QR-s + Inability of Obj to QR*
Every student passed fewer than four classes S > O / *O > S

(I will put example (7) aside for a moment, and will return to it presently.) The same scenario obtains in (8).

(8) *Subject QR-s + Inability of Obj to QR*
Every student admires two teachers S > O / *O > S

The subject expression undergoes QR, but the object bare numeral indefinite cannot take distributive scope higher than its surface position (cf. also Footnote 21).

Let us see how we can derive the scope relations in sentences which proved problematic for Stowell and Beghelli above. Consider (24) again.

(24) *Subject QR-s + IO in [SpecAgrIOP]/[SpecvP] + DO (short-)QR-s*
Every teacher told (exactly) two students everything he knows
OK every teacher > (exactly) two > everything

Here the subject *every*-QP undergoes QR, the indirect object undergoes A-movement to its Case position ([SpecAgrIOP] or (outer)[Spec*v*P]), while the direct object undergoes short QR to adjoin to *v*P (or VP) a position below the Case position of the indirect object.[23]

(27) is a sentence with a modified numeral indefinite subject and a modified numeral indefinite object.

(27) *Subject cannot A-reconstruct across focus*
Less then four students read exactly three books S > O / *O > S
Liu (1997: 18)

What we have seen is that in such a sentence the inverse scope interpretation is unavailable. In the present terms this means that A-reconstruction of the subject cannot take place. Indeed it should be impossible, inasmuch as the object is a (non-monotonic) modified numeral expression, which we have claimed to be focused, and hence to be an intervener for A-scope-reconstruction.

Another example that posed a complication for the A-bar checking approach was (29a).

(29a) *Object QR*
Mike showed five films to every guest

The direct scope is straightforward to derive here: the indirect object needs to QR to a position below the Case position of the direct object. Example (30a) has proven even more notoriously difficult for the Beghelli and Stowell approach.

[23] Bruening (2001) argues within a *v*P-based (vs. AgrP-based) approach that direct objects in such double object constructions undergo QR to an inner [Spec,*v*P]. This achieves exactly the same result. Bruening argues based on the IO > DO scope freezing effect in double object sentences for a 'tucking in' effect à la Richards. However, many researchers have argued that the IO > DO scope freezing effect is one of specificity, given that the IO in double object constructions functions as the logical subject of a posessive/existential predication (cf. Brandt 2003 and references therein). Nakanishi (2001a,b) shows that IO >DO holds even island-externally, i.e. when both scope out of an island, that is, in syntactic contexts where movement cannot apply.

(30a) *Subject cannot reconstruct across focus IO + Obj QR*
Exactly two teachers showed less than five tree diagrams to every student

Here the direct object can QR to *v*P. The subject and the direct object can only have direct scope relations. This is because the subject cannot A-reconstruct across a focused direct object, and hence the S > DO scope relations are invariable in this sentence. When the indirect object QR-s above the subject position AgrSP, we have IO > S > DO, i.e. the scope relations not captured by Beghelli and Stowell.[24]

Let us come finally to the example that we have put aside: (7). (7) involves two modified numeral indefinites, just as (27), but it contrasts with (27) in marginally allowing the inverse scope reading.

(7) More than three men read more than six books S > O / ?O > S
(Szabolcsi 1997: 116)

Now the first observation to be pointed out is that 'more than six N' is special among modified numeral indefinites in Hungarian as well: it can appear either in focus position, or can be fronted to the left of the focus position. This means that not only a focus interpretation is available to 'more than'-modified numerals. Second, as Liu (1997: 23) notes, there is a felt contrast between (35a) and (35b).

(35) a. Five teachers graded more than twenty students
b. Five teachers graded fewer than twenty students

In (35b) the scope-independent reading does not obtain: (35b) cannot mean that there is a set of teachers and a set of students and each graded each. However, (35a), with some difficulty, can have such a reading, introducing a referent set of students. In Liu's terms, although 'more than n' NP-s are basically non-G-specific, they can be marginally interpreted as G-specific, where 'more than n' is interpreted similarly to a *bare* numeral. Now inasmuch as an interpretation other than focus is marginally available to 'more than n' NP-s, which is similar to the interpretation of bare numerals, introducing a discourse referent, they are expected to be able to be crossed over by A-reconstruction. This is what happens in the examples in (7) and (35a).[25, 26]

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[24] To the extent that (i) is possible on an DO > S reading (i.e. each paper was introduced by different sets of fewer than three teachers), it indicates that indeed as it is expected, subject reconstruction below the (Case position of the) *bare* numeral DO is available.

(i) Fewer than three teachers introduced two of Chomsky's papers to a class of students

[25] As (i) shows, 'more than n N' can be topicalized, or can be postverbal non-focus position in Hungarian.

(i) (?Több mint száz diák) tegnap az egyetem előtt tüntetett (több mint száz diák)
more than hundred student yesterday the university outside demonstrated more than hundred student
'More than one hundred students made a demonstration outside the university'

'More than n N' corresponds to two nominal constructions in Hungarian: (ii) and (iii). (iii) differs from (ii) in that it can only stand in focus position.
(ii) több mint három diák
more than three student
(iii) háromnál több diák
three-suff more student

A final note concerns Weak Crossover (WCO). Consider (36) first. Here the indirect object *every teacher* cannot bind the pronoun inside the subject. In (37), in contrast, the object *two of the teachers* can. The present account captures this contrast in a straightforward manner. In (36), A-reconstruction of the subject is blocked due to the presence of the focussed object *few students*. Then the only possibility for the *every*-QP to bind the pronoun is to QR above it; but that results in a WCO violation. On the other hand, in (37) the subject is able to A-reconstruct and in this reconstructed *vP*-internal position the bare numeral object can bind the pronoun from AgrOP. No WCO violation is triggered.

(36) a. *Exactly two of his$_i$ colleagues introduced few students to every teacher$_i$
b. [every teacher$_i$ [AgrSP exactly 2 of his$_i$ colleagues … [AgrOP few [VP …]]]]

(37) a. Exactly four of their$_i$ students adore two of the teachers$_i$
b. [AgrSP … [AgrOP 2 of the teachers$_i$ [VP exactly 4 of their$_i$ colleagues …]]]

This account is made possible by the assumptions that I have put forward and in this sense it provides further support in their favour.

What I have tried to show is that the rather complex scope interaction patterns fall out in a model incorporating QR, where QR does not apply to bare numeral indefinites or modified numeral indefinites. Bare numeral indefinites can be existentially closed (non-distributive wide scope), and other NPs can A-reconstruct below them to create an inverse scope reading. Modified numerals are not cardinality predicates, but involve focus—they cannot be existentially closed, they can undergo A-reconstruction, but due to the focus status cannot be crossed over by scopal A-reconstruction themselves.

6. Concluding remarks

In this paper I hope to have substantiated the following two points. First, the A-bar checking approach to Q-scope, which involves directed movements to pre-fabricated functional positions, is both conceptually and empirically problematic (and Hungarian is far from supplying evidence in its favour). Second, when we combine the independently motivated covert scopal mechanisms of (i) QR, (ii) existential closure, and (ii) A-reconstruction, which is constrained by quantificational interveners like focus and by the Mapping Hypothesis, then the intricate pattern of Q-scope interactions is correctly predicted in an elegant manner.

Inasmuch as the present results prove to be on the right track, besides the effects of closure and A-chains, Q-scope continues to involve QR.

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[26] Most informants share the judgments reported here, mostly taken from the literature. However, it appears to me that there is some speaker-variation with respect to how inaccessible the bare numeral-like construal of modified numeral indefinites is. For some speakers, even ‘exactly n N’ and ‘fewer than n N’ can (rather marginally) be forced to be construed the same way (Gilliam Ramchard, p.c.).

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The dynamic semantics of aspectual adverbs

Alice G. B. ter Meulen

1. Introduction

In ordinary English aspectual adverbs such as in French and English *encore*/*still*, *ne pas encore*/*not yet*, *déja*/*already*, and *enfin*/*finally* are used to create temporal coherence in local contexts, as well as to carry prosodic features that directly indicate the speaker's epistemic attitudes towards the course of events described. In multi-agent contexts factual information, or the content asserted by the speaker, is presented as descriptive information about part of the world to be incorporated into the common ground. But it may be questioned, accepted as true or rejected as unverifiable or even false by its recipient. However, subjective information about his attitudes about what is happening any speaker issues with first person authority. It is logically guaranteed to be veridical and directly referential, since it is caused by privileged access to the speakers private information state. Clauses with aspectual adverbs effectively combine factual and subjective information about what is happening. They constitute a good case study of how temporal information gets shared in the common ground by triangulation between communicating agents in the world.
Aspectual adverbs are often used in temporal reasoning, where premises affect the contextually determined reference time, shifting it at times to a later one during the interpretation of the premises. Syntactically, aspectual adverbs occur within INFL in IP clauses describing events, as in (1)-(4), and semantically they contribute new information about the onset or end of the described action relative to its contextually determined reference time.

(1) John is not yet asleep — Jean n'est pas encore endormi.
(2) John is already asleep — Jean est déja endormi.
(3) John is still asleep — Jean est encore endormi.
(4) John is not asleep anymore — Jean n'est plus endormi.

What exactly is the information the aspectual adverbs contribute in addition to the descriptive factual content of the clauses they occur in? From premises without aspectual adverbs presented in temporal sequence a conclusion may be validly inferred that does contain one, as in (5).

(5) a. When Mary arrived, John was asleep
Quand Marie arriva, Jean était endormi
b. John woke up
Jean se réveilla
c. Bill left
Bill partit
d. |= When Bill left, John was not asleep anymore
|=Quand Bill partit, Jean n'était plus endormi

Even though there are no aspectual adverbs in the premises in (5a-c), *not anymore* in (5d) supports a valid conclusion. When *still/encore* is added to the first premise in (5a), this conclusion remains valid, as in (6).

(6) a. When Mary arrived, John was still asleep
b. John woke up
c. Bill left
d. |= When Bill left, John was not asleep anymore

Adding *still* in (6a) does not affect the conclusion in (6d), so in this inference *still* seems *prima facie* not to contribute any useful information at all. But when *still* is used in English with marked high pitch, ordinarily indicative of new, focused content, it indicates subjective information regarding the speaker's assessment of the timing or duration of John's sleep.

(7) When Mary arrived, John was STILL asleep

Given the marked prosody in (7) anyone competent in English understands that the speaker had counterfactually expected, planned, hoped or perhaps feared that John would have woken up before Mary arrived. We use (7) to express some form of dissatisfaction or even irritation with the actual course of events where John's sleep endures. What the speaker is dissatisfied with systematically depends on the propositional content of the clause modified by the aspectual adverb. It is a matter of rhetorics or general pragmatics to determine in each context which attitude or emotive coloring of subjective information the speaker means to convey by the marked prosody, ranging from hope, plan, fear, to expectation or even trust. Of course, this leaves lots of room for misinterpretation and misunderstanding between communicating agents. In this paper the nature of the speaker's attitude remains undetermined, using ATT as a generic intensional relation of a speaker's attitude towards the factual descriptive content on which it is based.

2. Presuppositions of aspectual adverbs

The presuppositions of indicative clauses with aspectual adverbs are shared with its corresponding polarity question and VP-internally negated form. Proper answers to polarity questions must also share the presuppositions of the question. When the presupposition of the question is not accepted as common ground, another, meta-linguistic form of negation, i.e. denial (8d), must be used. In (8ab) *still* and *not anymore* are seen to share a presupposition, not shared by *already* in (8c), and denied by *not yet* in (8d).

(8) a. Was John still asleep, when Mary arrived?
b. No, he was not asleep anymore.
c. * No, he was already asleep.
d. No, he had not even fallen asleep yet.

The interaction in (8) with internal and external negation shows that the four basic aspectual adverbs are clearly related by polarity in their temporal meaning. This relation is clarified below in the DRT-style of semantic representation.[1]
In a similar vein, presuppositions of aspectual adverbs in discourse cannot be accommodated, when the immediately preceding clause has contributed conflicting information. The accommodation of presupposition in a context that does not already entail it is hence a much more constrained process, if accommodation is considered as a general repair strategy.[2] If (9) is assumed to constitute coherent discourse, presented as continuous speech from a single source, the presupposition of falling or being asleep, i.e. being awake before, cannot be accommodated, since the context contains at the current reference time contradictory information that the referent is asleep.

(9) a. ?* John was already asleep. He fell asleep.
b. ?* John was not asleep anymore. He was asleep.

Had the aspectual adverbs not occurred in (9), the text could have been interpreted as a set of discontinuous clauses, possibly from different sources or uttered at various times. The aspectual adverbs contribute the information that the description of the course of events is produced by someone specific, representing a possibly biased perspective on what is happening. After updating the context with (9a) the information that John is asleep is current, so the presupposition of the second clause, i.e. that John was not sleeping in the given context, is inconsistent with it. Hence this presupposed information can not be accommodated at the current context, precluding the second clause from effecting a consistent and coherent update of the current information state.
When the initial context is updated by asserting the incompatible information, instead of presupposing it, the reference time is properly shifted, in order to coherently incorporate the content of the subsequent clauses, as in (10).

(10) a. John was already asleep. He woke up and fell asleep again.
b. John was not asleep anymore. He fell asleep again, so then he was asleep.

Assuming overall coherence of information, contributing information to the common ground by presupposition accommodation must hence be distinguished as updating process from asserting information, as in (9a/10a). Asserting information already presupposed by the preceding clause may create incoherence, as we see (9b/10b). A polarity conflict created by asserting information inconsistent with content of the preceding clause cannot be resolved by simply repairing the context, accommodating its presuppositions either by revising it or by shifting to a new, later reference time.

3. A DRT analysis of aspectual adverbs

Aspectual adverbs modify the factual content contained in the clause in their scope. E. g. *John was already asleep* entails that John fell asleep before, and *John is still not asleep* entails that John is not asleep yet, but falling asleep. It would be not just odd, but really misleading or perhaps predantic as

[1] Cf Smessaert and ter Meulen (2004) for a more detailed discussion on the presupposition of aspectual adverbs and comparison to other semantic accounts.
[2] Cf. Beaver (1997).

communicative act, to describe John as still not asleep, if he is actually jogging or cooking dinner, actions that are obviously incompatible with his falling asleep.
The DRT techniques of declaring reference markers and relating these in conditions with descriptive predicates produces the following representations for the four basic aspectual adverbs, linearly presented for easy exposition.[3]

(11) John is already asleep
$[r_0, r_1, e, j \mid sleep(e, j, +) \;\&\; e \supseteq r_0 \;\&\; r_0 = current \;\&$
$r_1 \supseteq START(sleep(e, j, +)) \;\&\; r_1 < r_0 \;\&\; SINCE(r_1, (sleep(e, j, +)))\ ]$

In (11) John's sleeping is anchored to the current reference time r_0 and its presupposition that he fell asleep earlier is added by representing the aspectual adverb with the corresponding aspectual verb. Ordinarily presuppositions are not automatically included in the DRS of a clause, although they may be added by presupposition accommodation or justification.[4] The presupposed event of falling asleep is telic , i.e. it does not contain sub-events which themselves are events of falling asleep. When the aspectual adverb is represented, it introduces a preceding reference time r_1, that includes this most recent occurrence of him falling asleep. The *SINCE* condition specifies that the onset of John's sleeping was not just any past event of him falling asleep, but the one after which he remained asleep up to now, i.e. the last time John fell asleep. The temporal DRS condition with *since* serves to bind John's falling asleep to his current state of being asleep.[5]
The other three aspectual adverbs are represented in (12)-(14), systematically using *SINCE/UNTIL* for binding the polarity transition to the current state and the temporal precedence order to reflect their polarity relations.

(12) John is still asleep
$[r_0, r_1, e, j \mid sleep(e, j, +) \;\&\; e \supseteq r_0 \;\&\; r_0 = current \;\&$
$r_1 \supseteq END(sleep(e, j, +)) \;\&\; r_0 < r_1 \;\&\; UNTIL\ (r_1, (sleep\ (e, j, +)))\ ]$
(13) John is not yet asleep
$[r_0, r_1, e, j \mid (sleep(e, j, -) \;\&\; e \supseteq r_0 \;\&\; r_0 = current \;\&$
$r_1 \supseteq START(sleep(e, j, +)) \;\&\; r_0 < r_1 \;\&\; UNTIL\ (r_1, (sleep\ (e, j, -)))\ ]$
(14) John is not asleep anymore
$[r_0, r_1, e, j \mid (sleep(e, j, -) \;\&\; e \supseteq r_0 \;\&\; r_0 = current \;\&$
$r_1 \supseteq END(sleep(e, j, +)) \;\&\; r_1 < r_0 \;\&\; SINCE(r_1, (sleep\ (e, j, -)))\ ]$

The DRT-construction rules for these adverbs are specified in (15) in a simplified linear format, assuming a compositional VP semantics.

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[3] The reader unfamiliar with DRT semantics is referred to Kamp and Reyle (1993) or ter Meulen (2003) for an introduction.

[4] See Kamp (2003) for a comprehensive analysis of presupposition computation and justification in DRT.

[5] Cf. Kamp and Reyle (1993: 628–635) for a discussion of the semantics of *since* and *until* in temporal contexts.

(15) a. [$_{IP}$ x [$_{INFL}$ *already* [$_{VP}$ λy P (y)]]] => [r_0, r_1, e, x | P(e, x, +)) &
e ⊇ r_0 & r_1⊇ START(P(e, x, +)) & r_1< r_0 & SINCE(r_1, (P (e, x, +)))]
b. [$_{IP}$ x [$_{INFL}$ *still* [$_{VP}$ λy P (y)]]] => [r_0, r_1, e, x | P(e, x, +)) &
e ⊇ r_0 & r_1⊇ END(P(e, x, +)) & r_0< r_1 & UNTIL(r_1, (P (e, x, +)))]
c. [$_{IP}$ x [$_{INFL}$ *not yet* [$_{VP}$ λy P (y)]]] => [r_0, r_1, e, x | P(e, x, -)) &
e ⊇ r_0 & r_1⊇ START(P(e, x, +)) & r_0< r_1 & UNTIL(r_1, (P (e, x, -)))]
d. [$_{IP}$ x [$_{INFL}$ *not anymore* [$_{VP}$ λy P (y)]]] => [r_0, r_1, e, x | P(e, x, -)) &
e ⊇ r_0 & r_1⊇ END(P(e, x, +)) & r_1< r_0 & SINCE(r_1, (P (e, x, -)))]

Aspectual adverbs make it possible to describe an ongoing event statically, systematically placing it in the context of its future or past polarity transition. This constitutes an essentially indexical account of the English aspectual adverbs and forms the basis for the semantics of prosodically marked usage of aspectual adverbs presented in the next section.

4. Prosodically Marked Aspectual Adverbs

English aspectual adverbs prosodically marked by a high pitch indicate that the described, current course of events varies from what the speaker had envisaged it to be like. The exact nature of the epistemic attitude of the speaker may vary greatly from one context to another, and is apt to lead to misunderstandings by the recipient. To abstract from all such intricacies, we use here the generic attitude ATT, systematically relating the speaker (sp) to the onset or termination of the described event.
Marked prosody cannot naturally be expressed with high pitch on *not yet*, but English has an extensionally equivalent lexicalization, that does accept this prosody in *STILL not*. There may be an interesting phonological explanation why *not yet* does not provide a suitable lexical structure to carry such marked prosody, perhaps requiring internal negation to avoid placing high pitch on it. An answer to this issue would lead us much beyond the scope of the current paper, but clearly complements this semantic account of prosodically marking in dynamic information structure. Accordingly in (16) the prosodically marked *STILL not* creates a contrast between the actual course of events, and what the speaker subjectively had envisaged it to be. It indicates that the actual course of events is slow in the eyes of the speaker, i.e. in his subjectively preferred course of events John would actually be asleep. His falling asleep should have occurred already, switching UNTIL to its counterpart SINCE to create the desired temporal binding.

(16) John is STILL not asleep
[$_{IP}$ *John* [$_{INFL}$ *STILL not* [$_{VP}$ λy *sleep* (y)]]] =>
[r_0, r_1, e, x | sleep(e, x, -)) & e ⊇ r_0 & r_1⊇ START(sleep(e, x, +)) & r_0< r_1 & UNTIL(r_1, (sleep (e, x, -))) & ATT (sp, [- | r_1 < r_0 & SINCE(r_1, (sleep (e, j, +)))])]

Now it is easy to see what the semantic representation of other prosodically marked forms of the aspectual adverbs should be. Again, English has no prosodic marking for *not anymore*, as it uses *no LONGer* to express the contrastive speaker information. The positive phase adverbs *already* and *still* are easily used with marked prosody.

(17) John is STILL asleep

$[_{IP}$ *John* $[_{INFL}$ *STILL* $[_{VP}$ λy *sleep* (y)]]] =>

$[r_0, r_1, e, x \mid sleep(e, x, +)) \;\&\; e \supseteq r_0 \;\&\; r_1 \supseteq END(sleep(e, x, +)) \;\&\; r_0 < r_1$

$\&\; UNTIL(r_1, (sleep\ (\ e, x, +))) \;\&\; ATT\ (sp, [\ - \mid r_1 < r_0 \;\&\; SINCE(r_1, (sleep\ (\ e, j, -))\ )]\ )]$

(18) John is no LONGer asleep

$[_{IP}$ *John* $[_{INFL}$ *no LONGer* $[_{VP}$ λy *sleep* (y)]]] =>

$[r_0, r_1, e, x \mid sleep(e, x, -)) \;\&\; e \supseteq r_0 \;\&\; r_1 \supseteq END(sleep(e, x, +)) \;\&\; r_1 < r_0$

$\&\; SINCE(r_1, (sleep\ (\ e, x, -))) \;\&\; ATT\ (sp, [\ - \mid r_0 < r_1 \;\&\; UNTIL(r_1, (sleep\ (\ e, j, +))\ )]\ )]$

(19) John is alREADY asleep

$[_{IP}$ *John* $[_{INFL}$ *alREADY* $[_{VP}$ λy *sleep* (y)]]] =>

$[r_0, r_1, e, x \mid sleep(e, x, +)) \;\&\; e \supseteq r_0 \;\&\; r_1 \supseteq START(P(e, x, +)) \;\&\; r_1 < r_0$

$\&\; SINCE(r_1, (P\ (\ e, x, +))) \;\&\; ATT\ (sp, [\ - \mid r_0 < r_1 \;\&\; UNTIL(r_1, (sleep\ (\ e, j, -))\ )]\ )\ ]$

The contrasts induced by the prosodically marked aspectual adverbs always concern the timing of the polarity transition from a negative phase (not sleeping) to a positive phase (sleeping) and the speed with which the current course of events develops. Using *alREADY* and *no LONGER* the speaker registers her surprise at how early the polarity transition took place. With *STILL* and *STILL not* she indicates that she had preferred the transition to have taken place, registering hence her negative evaluation or disappointment at its being late. It is remarkable how much information is added to the meaning of the original basic four aspectual adverbs in a highly effective and efficient way by prosodically marking the corresponding aspectual adverbs in English.

5. Presuppositions, polarity transitions and temporal reasoning

The four basic DRSs in (11)-(14) differ along three dimensions, referred to as POLARITY DIMENSIONS, since they relate to negation or more generally to an opposition between positive and negative values. In mapping these three dimensions into their combinatorial space, it becomes obvious that not all logical possibilities are realized. The logical constraints on lexicalizations turn out to be attributable to presuppositions. The basic opposition in (20) concerns the actual polarity of the condition involving John's sleeping at the current reference time.

(20) polarity dimension A = ACTUAL POLARITY

A = 1	positive polarity	sleep (e, j)
A = 0	negative polarity	~ sleep (e, j)

For *already* in (15a) and *still* in (15b) this A dimension is positive, since the reference time is located inside a positive phase of the sleeping-event. The other two adverbs *not yet* in (15c) and *not anymore* in (15d) have a negative A dimension.

The second polarity dimension B encodes the two aspectual operators involving opposite polarity transitions of the event. The START operator is monotone increasing since, once you have started a subevent e_1 as temporal part of e_2, you must have started e_2, corresponding to a positive B-value in (21). The END operator is monotone decreasing, since in ending e_1 any subevent e_2 that is a temporal part of e_1 is ended, yielding a negative B-value.

(21) polarity dimension B = PRESUPPOSED TRANSITION
B = 1 transition from negative to positive polarity START(P(e))
END(~sleep (e, j)) = START(sleep (e,j))
B = 0 transition from positive to negative polarity END (P(e))
END(sleep (e, j)) = START(~sleep (e,j))

B is positive for *not yet* and *already*, but negative for *still* and *not anymore*.
The linear order between these polarity transitions and the reference time constitutes the third polarity dimension of perspective in (22), where r_1 is a reference marker anchoring the aspectual operators START and END. With the positive conditions, this C-dimension is retrospective -- i.e. the information is provided by the speaker looking back upon a realized transition in the past with the START and SINCE operators. With the other conditions the C-dimension is prospective -- i.e. looking forward to possible transitions in the future with the END and UNTIL operators:

(22) polarity dimension C = PERSPECTIVITY
C = 1 retrospective $r_1 < r_0$
C = 0 prospective $r_0 < r_1$

The retrospective adverbs *already* and *not anymore* get a positive C-polarity. The prospective ones *not yet* and *still* get a negative C-polarity. The monotonicity properties of START and END, discussed above, assure their proper interaction with this C-dimension.
These different polarity assignments are summarized in the 3D polarity system in (23).

(23)

	THREE-DIMENSIONAL POLARITY SYSTEM	A	B	C
	John is asleep	1	-	-
	John is not asleep	0	-	-
	John is *not yet* asleep	0	1	0
	John is *already* asleep	1	1	1
	John is *still* asleep	1	0	0
	John is *not* asleep *anymore*	0	0	1

One advantage of this 3D calculus is its independence of the syntactic categories in which aspectual information is expressed, which may vary considerably across different languages. The composition of the paraphrases of *not yet asleep* as *will start sleeping*, or that of *not asleep anymore* as *having ended sleeping* is straightforwardly associated with these three polarity dimensions, as in (24a, b).

(24) a. *not yet P*
will (C=0)
start P (B=1)
not P now (A=0)

b. *not P anymore*
have (C=1)
ended P (B=0)
not P now (A=0)

An important observation in connection with the polarity system in (23) is that, although the interaction of three binary parameters yields a complete space of eight logical possibilities (2^3), only four of them are actually lexicalized. Since the three ABC dimensions are not logically independent, the assignment of a value to one parameter imposes constraints on the assignment of

values to the others. For instance, the combination of prospective and a *START*-presupposition constrains the combination with the A-polarity: e.g. in order to start P (B=1) in the near future (C=0) you must not now be engaged in it (A=0). Referring to the polarity combinations 11 and 00 as CONVERGENT, and to 10 and 01 as DIVERGENT, these constraints can be formulated as the equivalences in (25):

(25) a. [(AB are convergent) iff. (C = 1)]
b. [(AC are convergent) iff. (B = 1)]
c. [(BC are convergent) iff. (A = 1)]

These equivalences reveal a certain redundancy in the 3D polarity system of (23), as two binary parameters would suffice to distinguish four expressions. However, explicitly representing the three dimensions is essential to show all combinatorial possibilities and to provide a logical foundation for predicting their value: given the polarity of any combination of two parameters, the value of the third parameter is predicted. With prosodically marked adverbials the C-parameter will turn out to be pivotal to capture the essential situatedness of temporal reasoning·

Some forms of temporal reasoning may be accounted for in terms of the 3D polarity calculus, clarifying which parameters reverse their polarity from *still* to *not anymore*. The second premise in (6b), introducing an actual polarity transition, obviously switches C from 0 (prospective) to 1 (retrospective), modeling the passage of time by relegating what was once considered future to the past, i.e. introducing a new, later current reference time into the DRS. The constraints in (25) predict that as soon as the value for one parameter is reversed, the value of one (and only one) of the other two parameters must be reversed as well, if the inference is valid. In this case, the reversal of the dynamic C-parameter reverses the A-parameter for the actual polarity from positive to negative. The value of the presupposition B-parameter must be preserved, as factual changes in the world should not affect presuppositions. The temporal inference whose validity relies on reversing the A- and C-values, while preserving the B-value, is schematically represented in (26).

			A	B	C
(26)	a.	*still* asleep	1	0	0
	b.	wake up			0/1
	c.	*not* asleep *anymore*	0	0	1

Shifting reference times from Mary's arrival to Bill's departure, the examples in (27) illustrate the other two logical possibilities of changing two values, while preserving the third in temporal reasoning, both yielding invalid patterns that do not preserve the presupposition in B.

			A	B	C
(27)	a.	John was *not yet* asleep	0	1	0
	b.	John fell asleep			0/1
	c.	|≠ John was *still* asleep	1	0	0
	d.	|≠ John was *not* asleep *anymore*	0	0	1

Although in (27c) the A-value of the factual polarity is reversed with *still*, the prospective negative C-value is not changed accordingly. Instead, the presupposed polarity transition in B of starting is replaced by ending, as it were jumping forward too far inside the event. This creates temporal incoherence, resulting in an invalid inference.

An even bigger leap forward occurs in (27d); although the C-value is switched to the retrospective, positive one, the actual polarity in A is not, while the B-parameter is switched from starting to ending. As a consequence, two polarity transitions are packaged into one step, resulting in temporal incoherence and an invalid inference. The other valid inferences based on the two premises in (6a-b) are given in (28).

			A	B	C
(28)	a.	John was *not yet* asleep	0	1	0
	b.	John fell asleep			0/1
	c.	|= John was ?*already* asleep	1	1	1
	d.	|= John was *not* awake *anymore*	0	0	1

In the inference in (28c) A and C are reversed, whereas B remains constant. However, the question mark with *already* reveals that the situation may not be quite as symmetric as suggested. As discussed in the analysis of prosodically marked aspectual adverbs, the subjective evaluation of fast and easy progress so readily associated with *already* seems to interfere in our intuitions, even in the prosodically neutral case. This is not the case in (28d), where the dynamic reversal of the AC-values from (28a) to (28c) is followed by the static START P = START ~(~P) reversal of the AB-values, while substituting the antonymous verbal predicate. In other words, in going from *not yet* P in (28a) to *not ~P anymore* in (28d), switching the BC-values and substituting the antonym yields a perfectly valid dynamic inference, as the subjective information plays no role in it. However, when more sensitive notion of coherence is taken into account, it matters whether the glass is half full or half empty. In capturing coherence of context, this BC reversal with antonym substitution may no longer be considered an acceptable inference.

Given the simplified polarity calculus for the basic aspectual adverbs, we can incorporate the prosodically marked adverbs providing attitude information by expanding it from three to five polarity dimensions. Two more logically independent, but interacting polarity dimensions (i.e. binary oppositions) are defined in (29): D representing the subjectively perceived SPEED and E representing the subjectively judged PROGRESS.

(29) polarity dimension D: EVALUATION OF SPEED
- D = 1 — the speaker evaluates the course of events as fast
- D = 0 — the speaker evaluates the course of events as slow

polarity dimension E: JUDGEMENT OF PROGRESS
- E = 1 — the speaker evaluates the course of events as progressing
- E = 0 — the speaker evaluates the course of events as stalling

At both extremes of the 'scale of progress' the two evaluative dimensions converge: with *STILL (not)* what is happening is perceived as slow and stalling, whereas *no LONGER* the speaker expresses her judgment of fast and steady progress. The intermediate position is lexicalized in English by *finally (neg) P,* indicating a subjectively perceived discrepancy between making progress, but slowly. The interaction of polarity properties of all adverbs is rendered in a 5D system in (30), integrating the 3D account of the basic aspectual adverbs.

(30)

FIVE-DIMENSIONAL POLARITY SYSTEM	A	B	C	D	E
John is asleep	1	-	-	-	-
John is not asleep	0	-	-	-	-
John is *not yet* asleep	0	1	0	-	-
John is *already* asleep	1	1	1	-	-
John is *still* asleep	1	0	0	-	-
John is *not* asleep *anymore*	0	0	1	-	-
John is *STILL not* asleep	0	1	0	0	0
John is *finally* asleep	1	1	1	0	1
John is *alREADY* asleep	1	1	1	1	1
John is *STILL* asleep	1	0	0	0	0
John is *finally* not asleep/awake	0	0	1	0	1
John is *no LONGER* asleep	0	0	1	1	1

It should be noted that D and E concern non-factual, speaker dependent, subjective polarities, in contrast to the ABC dimensions that represent actual ones. To illustrate the 5D assignments of 01000 to *STILL not* and 00111 to *no LONGER* their paraphrases are decomposed in (31a-b):

(31)

a. *STILL not P*		b. *no LONGER P*	
not P now	A=0	not P now	A=0
end not P	B=1	start not P	B=0
possible future	C=0	actual past	C=1
slow	D=0	fast	D=1
stalling	E=0	progress	E=1

Notice that the combination of positive D and negative E is absent from (30), as fast stalling is clearly materially, and hence tense logically impossible. This combinatorial constraint can be formulated as the implication in (32).

(32) $[E = 0] \Rightarrow [D = 0]$

If there is no progress, then there cannot possibly be any speed either, or, by contraposition, if there is speed there must be some progress. The speaker may judge an event as changing slowly and stalling without indicating its causes or reasons. This is why the subjective D and E dimensions are somewhat indeterminate in their intended interpretation, even though their logical interactions with the ABC polarities, which interest us here, are fully determinate and transparent. Some actions, like *reading*, require a sustained and controlled effort from their agents. Other actions, like *sleeping*, supposedly do not. Sometimes external forces may limit the speed of change by interfering with the control of the agent, as in *John was STILL not here*. In other clauses, referents of arguments with thematic roles other than agents may be considered the cause of slow change or lack of progress, as in *John is STILL reading this long novel*. Sorting out exactly how the speaker intends to attribute causal forces to interactions is not a task that properly belongs to the semantics of natural language.

Complex pragmatic issues interfere and obviously also psychological perceptions of what is happening and what causal forces may affect it. Our present concern is restricted to the logical aspects of temporal reasoning, hence an account of such issues, however interesting, would lead us too far astray.
By design the 5D-polarity system in (30) exhibits a steady increase in subjectivity from A to E. By determining the speaker position -- i.e. the temporal perspective -- the central C parameter in a sense bridges the common ground factual AB dimensions of assertion and presupposition to its left and the subjective DE dimensions of speaker judgments to its right. As the equivalences in (25a) express, the polarity assigned to C constrains the possible values of A and B. At first sight, similar constraints seem to hold between C on the one hand and the subjective D and E values on the other hand. More in particular, the 5D polarity assignments in (30) obey the equivalence in (33a) and the entailment in (33b).

(33) a. $[E = 1] \Leftrightarrow [C = 1]$
b. $[D = 1] \Rightarrow [C = 1]$

According to (33a), a realized, past transition is required for the subjective assessment of progress. By virtue of the implication in (33b), the subjective judgment of speed also requires a realized transition, for which a reference marker is declared in the common ground or main DRS domain. But obviously not every available past transition is judged for speed. Although for all six 5D adverbs in (30) both constraints in (33) hold, these do not express the same logical impossibility captured in (32).
As final consideration of how aspectual adverbs serve in adjusting context in a multi-agent setting, let's briefly look at the way the counterfactual epistemic states are used in planning contexts. Suppose (34a) is uttered in a situation where agents already share the information that they are to have dinner at 9, and that John is supposed to be asleep before dinner, hence he will not participate in the dinner.

(34) a. John is ALREADY asleep, so let's have dinner at 8.
b. Let's have dinner at 8. John is already asleep.

In (34a) John fell asleep earlier than the speaker had expected, indicated by *ALREADY*. Since he fell asleep before 8, the original plan to have dinner at 9 is adjusted to have dinner earlier. From (34b), reversing the order of the two clauses, in the context containing the plan to have dinner at 8, asserted by the first clause, *already* may lose its subjective counterfactual temporal meaning. Instead, (34b) indicates that one of the first conditions necessary to fulfill the plan to have dinner at 8, i.e. that John be asleep, has been satisfied earlier than expected. Elaborating the DRT account with such interactive planning information and information shared as common ground to which agents all have equal access would be a first enrichment of the semantic representations required for (34). Such research awaits a future occasion.

6. Temporal reasoning: Semantics or Pragmatics?

Stalnaker (1999: 153-155) discussed two different ways to demarcate semantics from pragmatics, reflecting a difference in the role the notion of context plays in the explanation of the linguistic facts. On the one hand, a fact is considered pragmatic if it is independent from the truth conditional content and appeals to principles, maxims and inference rules other than logical deduction. Meaning

determines certain aspects of the interpretation of a speech act, and the context determines other aspects of its interpretation. On the other hand, a fact is characterized as semantic if it is based on rules any competent speaker of the language must know to communicate effectively. Information is pragmatic when it relies on knowing certain factual circumstances under which the speech act was performed or knowledge of the world that may be used in determining what was said.

It should be evident that the DRT account of aspectual adverbs offered in this paper is semantic on both counts, for aspectual adverbs determine factual truth conditional content and epistemic attitudes of the speaker. It is semantic since it determines temporal content, relative to contextual information about reference times, independent of matters of fact or common sense knowledge, hence part of our linguistic competence. What remains for genuine pragmatics is to determine the epistemic attitude the speaker wants to express by using marked prosody on an aspectual adverb. Perhaps a more detailed account of such issues relating to rhetorical relations arising in discourse needs a phonologically more sophisticated analysis of the nature of the intonational contour used.

Another issue worthy of further investigation is to analyze the different strategies natural languages may use to lexicalize the logical space of the five dimensions. In Dutch, as opposed to English, 5D aspectual adverbs may be lexicalized differently from 3 D adverbs. For instance, the English prosodically neutral *still* is expressed with *nog*, but its prosodically marked counterpart is compositionally expressed by *nog steeds* or *nog altijd* (*still always*). In Dutch there appears to be a preference to express the 5D adverbs by lexical composition over the prosodic marking, so characteristic of English. In French, *still* is expressed as *encore*, but the counterpart of the prosodically marked *STILL* is *toujours*, which is ambiguous as it also covers the regular quantificational adverb *always*. Perhaps prosody marks the difference between its use as the 5D aspectual adverb and its use as regular quantificational adverb. Other languages may express the logical oppositions in morphological markers, or perhaps in word order differences, as we detect in German, where *Jan schläft noch inmer* is the unmarked order, meaning John is still asleep, but *Jan schläft immer noch* is marked, indicating the speakers frustration that he is not yet awake. A proper logic of temporal reasoning in natural languages captures the linguistic variability of aspectual distinctions, while characterizing validity of dynamic temporal reasoning at a more abstract, universal level. In this account of the dynamic semantics of aspectual adverbs a story, assumed to constitute coherent discourse, constitutes the premises from which the conclusion is drawn. The interpretation of the premises is itself modeled as a dynamic process in which the reference time is shifted to later ones, when updates with dynamic information require it. The construction rules for the DRSs are semantic in nature and the standard logical notion of entailment in DRT serves to characterize validity without any appeal to notoriously problematic notions such as a 'normal' course of events or 'normal possible world' or to common sense about what the world is like or how causal connections arise, as in default logics (cf. Lascarides and Asher, 1993).

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Number as Person

Stephen Wechsler

1 Introduction

Many European languages have two second person pronouns, one for *informal* and one for *formal* address, such as French *tu* and *vous*, respectively.[1] Such pronouns pose an interesting problem for number agreement. A second person formal subject pronoun triggers plural agreement on the finite verb regardless of whether the referent is one addressee or multiple addressees. Number agreement on non-finite elements, meanwhile, corresponds to semantic number, i.e. cardinality.[2] Thus when used with singular reference, such pronouns trigger mixed agreement. Examples from French and Bulgarian are given in (1) and (2).[3]

(1) a. Vous êtes loyal.
you.PL/FORMAL be.2PL loyal.SG
'You (one formal addressee) are loyal.'

b. Vous êtes loyaux.
you.PL/FORMAL be.2PL loyal.PL
'You (multiple addressees) are loyal.'

(2) a. Vie ste učtiv i vnimatelen.
you.PL/FORMAL be.2PL polite.SG and attentive.SG
'You (one formal addressee) are polite and attentive.'

b. Vie ste učtivi i vnimatelni.
you.PL/FORMAL be.2PL polite.PL and attentive.PL
'You (multiple addressees) are polite and attentive.'

In (1) and (2) the finite verbal element (*êtes, ste*) shows plural agreement while the predicate adjective shows singular or plural agreement, depending as the subject pronoun refers, respectively, to one addressee alone or to a larger set of people that includes the addressee(s). Examples (1)a and (2)a are cases of MIXED AGREEMENT: the subject appears to be triggering different number values on the two agreement targets. The problem addressed here is how to square this mixed agreement with the assumption of normal agreement, defined here as the systematic covariation of grammatical form.

Some mixed agreement phenomena are best analyzed by distinguishing two agreement feature bundles on the trigger (Kathol 1999, Wechsler and Zlatić 2000, 2003). For example, the Serbian/Croatian noun *deca* 'children' consistently triggers feminine singular agreement on one set of targets and

[1]Thanks to Pascal Denis and Knud Lambrecht for help with French data, and to Larisa Zlatić for help with Serbian/Croatian data.

[2]—in some languages. See Section 7.

[3](2) is taken from Corbett (1983:47).

neuter plural on another (Corbett 1983). Wechsler and Zlatić (2000, 2003) posit two feature bundles on the Serbian/Croatian noun, then systematically relate each of them respectively to morphological and semantic properties of the noun. But this two-feature approach does not appear to be justified for the problem illustrated in (1)-(2) (pace Kathol 1999).[4]

A related hypothesis is that predicate adjectives show semantic agreement while finite verbs show grammatical agreement (Pollard and Sag 1994, p. 97). A pronoun like *vous* is morphosyntactically (second person) plural, and the finite verb is sensitive to this feature. But it is unmarked with respect to semantic number, i.e. cardinality. The number inflection on the predicate adjective is semantically interpreted, hence adjective number and cardinality covary, as shown in (1)-(2). Call this the SEMANTIC AGREEMENT HYPOTHESIS.

The SEMANTIC AGREEMENT HYPOTHESIS is plausible but it encounters the following problem: predicate adjectives sometimes appear to show grammatical agreement, for example with *pluralia tantum* subjects with singular reference:[5]

(3) Ces ciseaux sont idéaux/ *idéal pour couper le velour.
this.PL scissors(PL) are.PL ideal.M.PL/ *ideal.M.SG for cut.INF the velour
'These scissors are ideal for cutting velour.'

The plural adjective form is required regardless of whether we refer to one pair of scissors or many.[6] Moreover, it can be shown that no further adjustment of the features of the agreement triggers and targets will solve this problem. Let us add the second person singular *tu* to our stock of examples:

(4) Tu es loyal.
PRO.2SG be.2SG loyal.M.SG
'You (singular, informal) are loyal.'

Now compare the three respective agreement patterns for singular-referent formal *vous* (1a), pluralia tantum (3), and second person singular informal *tu* (4). As summarized in the following table, all three subjects—*vous*, *ces ciseaux*, and *tu*—are semantically singular. Yet they give rise to three different agreement patterns on the verb and adjective.

(5) The NUMBER AGREEMENT CONUNDRUM.

	Grammatical	**Semantic**	**Finite V**	**Pred.Adj.**
tu	sg	sg	sg	sg
vous (formal, one addressee)	sg?/pl?	sg	pl	sg
ciseaux (one pair)	pl	sg	pl	pl

Regardless of what grammatical number feature we assign to the triggers, we cannot explain the three distinct patterns found on the targets, because it is impossible to distinguish three agreement patterns with one bivalent grammatical number feature of the trigger. But adding a new feature or number value—such as a special plural feature for pluralia tantum nouns—would be totally *ad hoc*

[4] Applied to this problem, a two-feature approach would contradict certain cross-linguistic generalizations captured by the Wechsler and Zlatić (2000, 2003) system. On the other hand, divorced from such a theory, the two-feature account describes the facts but fails to explain them. See Wechsler and Zlatić 2000, Chapter 6, for discussion.

[5] This example is due to Sabrina Parent.

[6] A variant of the SEMANTIC AGREEMENT HYPOTHESIS that solves this problem will be proposed below.

and unsupported by French morphology. French has only one plural category. This problem will be called the NUMBER AGREEMENT CONUNDRUM.

This paper proposes a solution to the Number Agreement Conundrum, formalized within Lexical Functional Grammar. Section 2 expands the scope to include other French agreement mismatches. Section 3 presents a simple principle governing the interaction between grammatical and semantic agreement features, and introduces a formal LFG mechanism that captures that principle. This mechanism alone does not solve the Number Agreement Conundrum, assuming the traditional person/number paradigm. Traditionally forms are cross-classified by person (with three values) and number (with two values) into six cells.

(6) Traditional person/number paradigm.

	[NUMBER *sg*]	[NUMBER *pl*]
[PERSON *1st*]	*je suis loyal*	*nous sommes loyaux*
[PERSON *2nd*]	*tu es loyal*	*vous êtes loyaux*
[PERSON *3rd*]	*il est loyal*	*ils sont loyaux*

As shown in Section 4, the Number Agreement Conundrum disappears, assuming the independently motivated general principle governing grammatical and semantic agreement features, if the paradigm is modified such that the category of NUMBER is banished from the first and second person forms, surviving only within the third person. Section 5 provides substantial evidence for this alteration to the traditional paradigm. While this proposal may appear radical from the point of view of traditional grammar, it is entirely consonant with French morphology, and indeed with the results of broad cross-linguistic studies of person paradigms (Cysouw 2003, Harley and Ritter 2002). An alternative analysis is considered and rejected in Section 6. Section 7 discusses broader implications for the distinction between formal and informal second person pronouns.

2 More French number mismatches

Number agreement mismatches of the sort illustrated above occur not only in second person, but in first and third person as well. In certain contexts *nous* 'we' can have singular reference, such as the authorial *nous* found in discursive prose:

(7) Nous avons toujours été loyal envers la grammaire générative.
we AUX.1PL always been loyal.M.SG toward the.F grammar generative
'I (one male author; lit. 'we') have always been loyal to generative grammar.' (discursive prose style)

In (7) *nous* refers to the author. The masculine singular predicate adjective inflection reflects the semantic number and gender of the author(s); hence an essay containing sentence (7) must be singly-authored by a male. But the finite verb always shows first person plural agreement with *nous*, leading to a number mismatch in this example.

Similarly, the so-called generic third person singular pronoun *on* is commonly used to mean either 'we', 'people', 'someone', or 'you' (Koenig 1999, Koenig and Mauner 1999, i.a.):[7]

[7] In spoken French the weak subject form *nous* (as in *Nous sommes loyaux* 'We are loyal') has almost entirely disappeared, replaced by *on*. Other uses of nous (as object, left-dislocated topic, etc.) survive in spoken French. The first person plural verb form can scarcely be heard, except in the hortative construction (e.g. *Allons-y* 'Let's go!')

(8) a. On a été loyaux.
one AUX.3SG been loyal.PL
'We have been loyal.'

b. On a été loyal.
one AUX.3SG been loyal.SG
'You (one addressee) have been loyal.'

Again, the number feature of the predicate adjective reflects the meaning, while the finite verb or auxiliary agreeing with *on* is consistently singular.

Summarizing, number mismatches are found across the entire person paradigm: in first person *nous*, second person *vous*, and third person *on*. In all cases the finite verb's number is determined by subject *form* (*on* is singular, *nous* and *vous* are plural), while a predicate adjective reflects the cardinality of the referent.

3 Some preliminaries: default semantics of agreement targets

Before turning to our main topic, the revision of the person/number paradigm, we need an account of the interaction of semantic and grammatical agreement. As noted above, the SEMANTIC AGREEMENT HYPOTHESIS, according to which predicate adjectives show semantic agreement, encounters a problem with *pluralia tantum* subjects: they trigger plural agreement even if the referent is singular (example (3)). It seems clear that this plural agreement reflects the plural morphology of the subject, violating the SEMANTIC AGREEMENT HYPOTHESIS. This section presents a modification of this hypothesis. Then it will be shown that this modification still fails to solve the Person Agreement Conundrum, unless we fundamentally alter our model of the person/number paradigm.

We modify the SEMANTIC AGREEMENT HYPOTHESIS by making the semantic number value of the predicate adjective a default that must apply *when the subject trigger lacks plural morphology*. This is a classic markedness (or perhaps economy) phenomenon: intuitively, the plural number morphology on an agreement target must be there for a reason. It reflects either the aggregate reference (semantic plurality) of the subject or its morphological plurality. Because *ciseaux* 'scissors' is inherently (morphologically) plural, a plural agreement target loses its semantic potency with respect to number.

This common phenomenon can be illustrated with English agreement (see Farkas and Zec (1995), Wechsler (to appear), Wechsler and Zlatić (2003)):

(9) a. These scissors are dull.

b. His lifelong companion and the editor of his autobiography is at his bedside.

c. His lifelong companion and the editor of his autobiography are at his bedside.

English verbs show plural agreement with pluralia tantum subjects, as in (9a), reflecting the morphological plural of the subject. But the coordinate subjects in (9b) and (9c) lack morphological number, because coordinate structures are exocentric (Wechsler (to appear)). So the plural verb becomes semantically potent: sentence (9b), with singular agreement, is appropriate where the companion/editor is one person, while example (9c) requires that they be two distinct individuals. This observation that agreement features on certain targets have semantic content only where the agreement trigger lacks inherent morphosyntactic number can be captured formally in Lexical Functional Grammar by means of CONSTRAINING EQUATIONS (cp. 'feature checking'). Unification-based formalisms such as LFG

model agreement as a correlation arising because features of a single grammatical representation, namely the functional structure (f-structure) in the case of LFG, are specified by two distinct elements in the sentence. This specification occurs via equations, of two types: DEFINING EQUATIONS, which build the f-structure, and CONSTRAINING EQUATIONS, notated with $=_c$, which check the f-structure for the presence of a feature. We illustrate with (simplified) lexical specifications for the English verb forms *is* and *are*:

(10) LFG Lexical forms.

a.	*is:*	I	$(\uparrow \text{SUBJ PERS}) = 3\text{rd}$
b.			$(\uparrow \text{SUBJ NUM}) = \text{sg}$
c.			$((\uparrow \text{SUBJ})_\sigma \text{ AGGREGATE}) = -$
d.	*are:*	I	$(\uparrow \text{SUBJ PERS}) = 3\text{rd}$
e.			$(\uparrow \text{SUBJ NUM}) =_c \text{pl} \vee ((\uparrow \text{SUBJ})_\sigma \text{ AGGREGATE}) = +$

In this illustration, *is* encodes both grammatical and semantic information about its subject. Grammatically the subject is third person, plural; semantically it refers to a non-aggregate. The first two equations for *is*, (10a,b), are defining equations that contribute PERSon and NUMber features to the f-structure representation of the verb's SUBJect. The third equation, (10c), contributes the feature [AGGREGATE –] to the semantic structure (σ-structure) of the subject (σ is the semantic projection function). The boolean feature AGGREGATE is used here a placeholder for a more serious semantics of cardinality. A value of [AGGREGATE +] indicates an aggregate or 'semantic plural', while [AGGREGATE –] applies to all others, including singulars and masses. For simplicity we assume that the semantic structure has the same feature architecture as f-structure. Hence any semantic structure supplied with conflicting values for AGGREGATE (namely + and –) is semantically ill-formed, just as any f-structure supplied with conflicting values for a feature is grammatically ill-formed.

The plural form *are* is similar, only instead of a conjunction of grammatical and semantic number equations, it specifies a *disjunction* between two equations (see (10e)): a constraining equation that checks for the *grammatical* number of the agreement trigger, and a defining equation that contributes *semantic* number. That is, a plural verb **either** checks for the [NUMBER pl] feature of its subject, **or** contributes plurality to the semantic representation of the subject. This reconciles the apparently contradictory grammatical and semantic agreement illustrated in (9), correctly predicting the following grammaticality and interpretation pattern:

(11)
a. The book is... (non-aggregate)
b. * The book are...
c. * The books is...
d. The books are... (aggregate)
e. * The scissors is...
f. The scissors are... (non-aggregate or aggregate)
g. His companion and the editor is... (non-aggregate)
h. His companion and the editor are... (aggregate)

The following table demonstrates how the lexical forms in (10) predict the grammaticality and interpretation of (11). The disjunction of two f-descriptions defines a set of two alternative f-structures (Bresnan 2000, p. 61); or, in our case, a set of two alternative f-structure/σ-structure pairs.[8] If

[8]The f-description is the set of defining equations associated with the derivation of a sentence.

both pairs are ill-formed (either at f- or σ-structure) then the sentence is ruled out; if at least one is well-formed it is grammatical; and if both are well-formed then the sentence has two derivations.

(12)

		is NUM = sg AGG = –	**are** NUM =$_c$ pl ∨ AGG = +	
the book	[NUM sg]$_f$ [AGG –]$_\sigma$	[NUM sg]$_f$ [AGG –]$_\sigma$	*no [NUM pl]$_f$!	*[AGG !!]$_f$
the books	[NUM pl]$_f$ [AGG +]$_\sigma$	*[NUM !!]$_f$ *[AGG !!]$_\sigma$	[NUM pl]$_f$ [AGG +]$_\sigma$	[NUM pl]$_f$ [AGG +]$_\sigma$
the scissors	[NUM pl]$_f$ [AGG +/–]$_\sigma$	*[NUM !!]$_f$	[NUM pl]$_f$ [AGG +/–]$_\sigma$	[NUM pl]$_f$ [AGG +]$_\sigma$
NP and NP	[(no NUM)]$_f$ [AGG +/–]$_\sigma$	[NUM sg]$_f$ [AGG –]$_\sigma$	*no [NUM pl]$_f$!	[AGG +]$_\sigma$

The cell for *The books are...* indicates two derivations with identical results: that is, the verb can either be checking the plural feature of the subject, or redundantly imposing aggregate semantics on an NP that already denotes an aggregate of books. The two derivations for *The scissors are...* differ slightly: in one, *are* checks morphological plurality, hence allowing either non-aggregate (one pair of scissors) or aggregate (multiple pairs) interpretation; in the other, *are* imposes aggregate semantics. The latter derivation provides an alternative route to an interpretation made available anyway by the former derivation.

This grammar predicts that an NP subject of *are* that lacks the [NUM pl] feature has aggregate semantics.

Returning now to French, we posit similar disjunctive equations for the plural target forms *idéaux* and *sont*:

(13) Some French lexical entries.

idéal: A
(↑PRED) = 'ideal⟨SUBJ⟩'
(↑SUBJ GEND) = m
(↑SUBJ NUM) = sg
((↑SUBJ)$_\sigma$ AGGREGATE) = –

idéaux: A
(↑PRED) = 'ideal⟨SUBJ⟩'
(↑SUBJ GEND) = m
(↑SUBJ NUM) =$_c$ pl ∨ ((↑SUBJ)$_\sigma$ AGGREGATE) = +

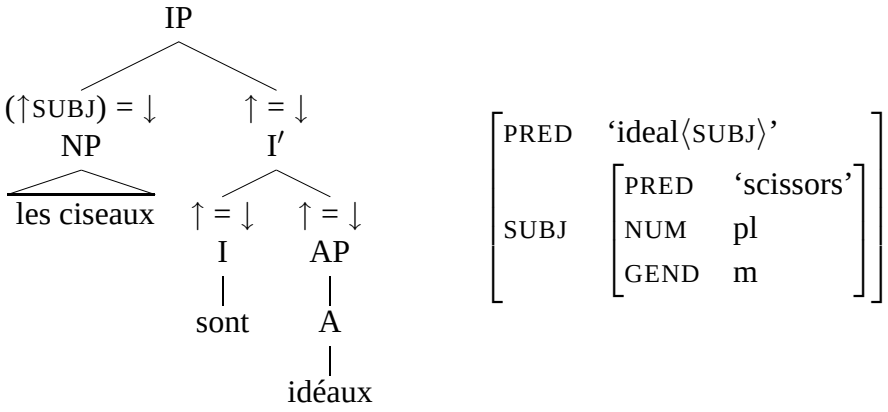
ciseaux: N
(↑PRED) = 'scissors'
¬(↑PERS)
(↑NUM) = pl
(↑GEND) = m

sont: I$_{stem}$
¬(↑SUBJ PERS)
(↑SUBJ NUM) =$_c$ pl ∨ ((↑SUBJ)$_\sigma$ AGGREGATE) = +

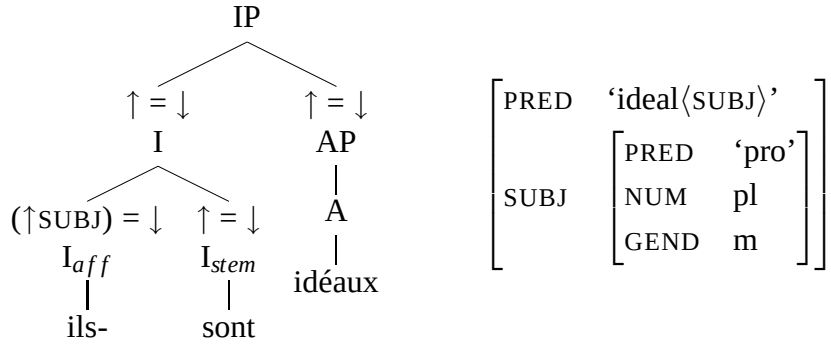
ils-: I$_{aff}$
(↑PRED) = 'pro'
¬(↑PERS)
(↑NUM) = pl
(↑GEND) = m

Weak subject pronouns are verbal prefixes (Miller 1992, Miller and Sag 1997). Assuming a word syntax model of morphology in which functional annotations appear on sublexical nodes, the first prefix slot is designated for the subject function, as illustrated in (15).

(14) c- and f-structures for (3):



(15) c- and f-structures for *Ils sont idéaux*:



Turning now to the singular form *idéal*, the lexical entry states that the subject must be morphologically *and* semantically singular (see the last two equations in the lexical form).

The semantic condition is controversial: the singular target form has been claimed to act as a default, appearing when the subject lacks agreement features, much as we have said for third person (Da Sylva 1998). Singular is used with clausal and VP subjects (examples from Da Sylva 1998, p. 57):

(16) a. Bien manger est bon pour la santé.
well eat.INF be.3SG good.M.SG for the.F health
‘Eating well is good for you.’

b. Que vous nous ignoriez n’est pas surprenant.
that you us ignore NEG’be.3SG NEG surprising.SG
‘That you ignore us is not surprising.’

However it is also possible that the singular forms in (16) reflect semantic agreement with the subject: ‘eating well’ is a single habit; ‘that you ignore us’ is a single proposition.

Coordination facts support this view. Coordinate VPs often trigger singular agreement, since the conjunction of two propositions (habits, events, etc.) can often be lumped together into a single

(conjoined) proposition (habit, event, etc.). But they trigger plural agreement as long as the meaning is readily conceptualized as an aggregate.[9]

(17) a. Manger équilibré et faire du sport sont bons / est bon pour la santé.
eat.INF balanced and do.INF some sport are good.PL / is good.SG for the health
'Eating a balanced diet and doing sports is good for you.'

b. Dormir dans un hôtel romantique et faire des ballades en gondole sont/*est inclus dans le prix.
sleep.INF in a hotel romantic and do.INF the ballads in gondola are/*is included in the price
'Sleeping in a romantic hotel and gondola ballads are included in the price.'

c. Savoir taper à la machine et connaître l'anglais sont nécessaires pour ce travail.
know.INF type at the machine and be.familiar.INF the'English are necessary.PL for this work
'Typing and English fluency are necessary for this work.'

d. Regarder la télé et boire de la bière toute la journée sont/*est les deux seules choses qui l'intéressent.
watch.INF the TV and drink.INF of the beer all the day are/*is the two only things that him'interest
'Watching TV and drinking beer all day are the only two things that interest him.'

Da Sylva (1998, p. 57) argues for the default account, pointing out correctly that there is no plausible source of a number feature in an infinitive or clause. But on the present proposal the subject infinitive or clause itself does not provides a number feature; rather the agreement targets do. The number agreement equation associated with the verb *est*, for example, is a defining equation, not a constraining equation.

4 Dissolving the person/number paradigm

The analysis proposed above fails to account for agreement with *nous* or *vous*. These pronouns must be morphologically plural, since they obligatorily trigger plural agreement on the finite verb:

(18) a. Nous sommes/*suis...
we be.1PL/1SG
'We are...'

b. Vous êtes/*es...
you.PL be.2PL/2SG
'You are...'

But if *nous* and *vous* are plural then our proposal wrongly neutralizes semantic plurality when one of these pronouns triggers plural agreement on a predicate adjective. Recall that the morphological plurality of *ciseaux* robs the predicate adjective's plural feature of its semantic potency (intuitively, because the plural agreement is understood to result from the morphology of *ciseaux*). In contrast, in

[9] Examples 17a-c are due to Pascal Denis. Olivier Bonami supplied example 17d.

the case of *nous* and *vous*, the adjective number covaries with the semantic interpretation (see (1) and (7)). The conundrum diagramed in (5) above remains unsolved.

As noted above, we can introduce new features, perhaps distinguishing the more 'morphologically salient' plurality of a pluralia tantum nouns from the plurality of *nous* and *vous*. But this would be ad hoc: there is only one plural category in French morphosyntax.

It turns out that this problem is best solved not by *introducing* unmotivated complexity into the grammar, but rather by *removing* unmotivated complexity from the (traditional) grammar.

The essential idea is simply that *nous* and *vous* are not plural forms. Semantically they are actually ASSOCIATIVE forms: *nous/vous* refer to the speaker/hearer plus associates, not to a plurality of speakers/hearers (more on this in the following section). The proposal is that morphosyntactically they are distinguished from *je* and *tu* by the PERSON feature alone. This section presents this proposed revision to the paradigm and shows how it solves the agreement puzzle, while the following section motivates the revised paradigm.

We noted above that the morphosyntactic agreement features of *je* and *nous* must differ in order to account for finite verb agreement; likewise for *tu* versus *vous* (see (18)). So two new PERSON values are proposed: 1a ('first person associative') and 2a ('second person associative'), for *nous* and *vous* respectively. Then *je* and *nous* are distinguished by PERSON, not NUMBER; and likewise for *tu* and *vous*.

(19) a. French PERSON values: 1s, 1a, 2s, 2a

b. French NUMBER values: sg, pl

Note that 1a and 2a are morphosyntactic atoms, not abbreviations for feature complexes.

Following Benveniste 1966 and many others, so-called third person is treated as the absence of a PERSON feature. Thus VP and clausal subjects, which lack person morphology altogether, trigger so-called third person on the verb (recall (16)).

In the revised paradigm, NUMBER subclassifies third person forms, but plays no role in the classification of first or second person forms. This holds for subject pronominal prefixes as well as finite verb stems:

(20) Revised first and second person paradigm.

subjects	**finite verbs**	
je-	*suis*	[PERS 1s]
nous-	*sommes*	[PERS 1a]
tu-	*es*	[PERS 2s]
vous-	*êtes*	[PERS 2a]

(21) Revised third person paradigm (all are ¬PERS).

subjects	
il-, elle-, on- *Pierre, l'eau...*	[NUM sg]
ils-, elles- *les gens, les ciseaux...*	[NUM pl]

finite verbs	
est	NUM $=_c$ sg AGG = –
sont	NUM $=_c$ pl $\vee$ AGG = +

Under this new paradigm the NUMBER AGREEMENT CONUNDRUM disappears. Finite verb agreement, first of all, is trivial. Each subject form is compatible only with the corresponding finite verb form shown in the cell to its right.

(22) a. je suis
[PERS 1s] [PERS 1s]
'I am'

b. il est
[NUM sg] [NUM sg]
'he is'

c. * tu suis
[PERS 2s] [PERS 1s]
(inconsistent f-structure)

Turning now to predicate adjectives, consider first morphologically plural NP subjects. We predict that such subjects trigger plural on predicate adjectives, but this plural (on the adjective) has no semantic force. Semantic number for morphologically plural NPs depends only on the semantics of the NP itself: an ordinary plural like *soldats* 'soldiers' denotes an aggregate, while a pluralia tantum like *ciseaux* can denote an aggregate (more than one pair of scissors) or non-aggregate (a single pair):

(23) a. Les soldats sont loyaux/*loyal .
[NUM pl] [NUM pl] [NUM $=_c$ pl]
'The soldiers are loyal.'

b. Ces ciseaux sont idéaux/*idéal.
[NUM pl] [NUM pl] [NUM $=_c$ pl]
'These scissors are ideal.'

This follows from the disjunctive equation (recall (13) above): since the subject trigger is morphologically plural, the grammatical number disjunct becomes an option, so plural semantics is not forced by the adjective.

Unlike those NPs, the first and second person pronouns lack number features. Thus the plural predicate adjective's semantic number equation must be selected.

(24) a. Vous êtes loyal.
[PERS 2a] [PERS 2a] [NUM sg]
'You (one formal addressee) are loyal.'

b. Vous êtes loyaux.
[PERS 2a] [PERS 2a] $[\text{AGG} +]_\sigma$
'You (multiple addressees) are loyal.'

The first person singular pronoun *je* lacks a morphosyntactic NUMBER feature, hence an adjective must have semantic force. Since *je* refers to the speaker, which is always non-aggregate, the pronoun cannot serve as subject of a plural adjective. Examples like (25a) are ruled out on because the left disjunct is violated and the right disjunct produces an ill-formed semantic structure.

(25) a. * Je suis loyaux.
[AGG –] [NUM $=_c$ pl] $\vee$ [AGG +]
('I am loyal.PL.')
Violates constraining equation (no NUM feature); AGG values conflict

b. On a été loyaux.
[NUM sg] [NUM sg] been [AGG +]
'We have been loyal.'

The 'generic' pronoun *on*, however, has a broader range of meanings, as noted above (roughly 'we', 'someone', or 'people'; Koenig 1999, Koenig and Mauner 1999, inter alia). The form of the adjective depends on the desired interpretation: for an aggregate that includes the speaker, plural is used (25b). This is predicted since the subject's [NUMBER sg] feature violates the constraining equation, forcing the aggregate interpretation.

5 Eliminating number from the person paradigm

It has long been noted that the word 'plural', when part of the terms 'first person plural' and 'second person plural', is a misnomer (inter alia, Jespersen 1924, p. 192; Benveniste 1966; Lyons 1968; Harley and Ritter 2002; Cysouw 2003). A plural like English *chairs* refers to an aggregate of objects each of which falls under the predicate *chair*. The first person singular refers to the speaker, so a true 'first person plural' should refer to a group of speakers. But this is not the meaning of 'we' nor of similar forms in other languages. Instead, 'we' refers to a group that includes the speaker (see Cysouw 2003, p. 69ff for discussion). Cysouw (2003, p. 69) points out that what the most common meaning of 'we' resembles within the nominal domain is not the plural but rather ASSOCIATIVE case, such as Hungarian *-ék*, as in *János-ék* 'John and associates'. Benveniste (1966, p. 203) observed that '*. . . nous* is not a quantified or multiplied *je*; it is a *je* expanded beyond the strict limits of the person, enlarged and at the same time amorphous.' Similarly, the prototypical meaning for the so-called second person plural is associative rather than a true plural: it is not specifically a group of hearers but rather any group that includes the hearer.

Cysouw (2003) complements this theoretical argument with extensive, detailed empirical evidence from person paradigms in a large set of languages of diverse typology. The results of this study are striking: while these paradigms vary considerably across languages, true 'first person plurals' and 'second person plurals' do not exist in any language. Using the standard notation in which 1, 2, and 3 represent speaker, hearer, and other, respectively, pronouns and inflections can be described as refering to 1+2 (speaker and hearer; 'first person inclusive'), 1+3 (speaker and other; 'first person exclusive'), 2+3, 1+2+3, and so on. Of the seven logical possibilities for participant groups, all are attested in the world's languages *except* the 'true plurals' of first and second person:

(26) Attested person complexes

Group	**Common term**	**Description**
1+2	minimal inclusive	'we', includes addressee, excludes other
1+3	exclusive	'we', includes other, excludes addressee
1+2+3	augmented inclusive	'we', complete
2+3		'you-all', addressee(s) and others
3+3		'they'

(27) Unattested person complexes

Group	Description
1+1	'we', mass speaking (e.g. unison)
2+2	'you-all', only present audience

Strikingly, 'true plurals', meaning 1+1 or 2+2, are the only combinations that are not grammaticalized in *any* language.

This semantic evidence is further strengthened by morphological evidence. So-called 'plural' first and second person pronouns very rarely employ the plural morphology found with nominals, as noted already by Benveniste (1966, p. 233): 'Dans la grande majorité des langues, le pluriel pronominal ne coïncide pas avec le pluriel nominal.'[10] According to Cysouw (2003, p. 70), in the few rare cases where nominal and pronominal plural morphology do coincide, the pronominal plural is restricted to only part of the paradigm, functionally superfluous, or optional.

Based on this survey, Cysouw advocates

> 'a change in emphasis from NUMBER to KIND. In other words, a change will be proposed from a QUANTITATIVE to a QUALITATIVE criterion. ... The traditional notion highlights the number of participants: there are singular (one) and plural (more than one) pronouns. ... This traditional classification is not only semantically and morphologically awkward, as set out above; it also gets tangled up when it has to incorporate the difference between an inclusive and an exclusive first person plural.
>
> 'The perspective that will be taken here is a different one. In this view, there are groups of participants, as oppposed to singular participants. ... The number is not important, only the kind of participants involved.' (Cysouw 2003, p. 70)

Returning now to French, the four proposed person values— *1s*, *1a*, *2s*, and *2a*— have the meanings shown in the following table.

(28) Speech act related semantics of the PERS feature
(S: speaker; H: hearer; $H_{intimate}$: intimate/informal hearer).

PERSON	pronouns	speech act participants
1s	*je*	$= \{S\}$
1a	*nous*	$\supseteq \{S\}$
2s	*tu*	$= \{H_{intimate}\}$
2a	*vous*	$\supseteq \{H\}$
(none)	*il(s), elle(s), on*	$= \{\ldots\}$

First person singular (*1s*; *je* 'I') refers to the singleton set including just the speaker, $\{S\}$. First person associative (1a; *nous* 'we') refers to a superset of $\{S\}$. It is assumed here that this superset is not necessarily a proper one, i.e. it can equal $\{S\}$ or include other elements as well. The *1s* and *1a* values form a Horn Scale (Horn 1989, ch. 4), so by scalar implicature the stronger 1s blocks the weaker *1a*. Hence *nous* is not used to refer to the speaker alone, as long as the more specific competitor *je* is available (more on this just below).

[10] Quoted by Cysouw (2003, p. 70), who translates it thus: 'In the great majority of languages, the pronominal plural does not coincide with the nominal plural.'

Similarly, the special intimate second person singular form *tu* blocks the more general *vous*, which refers to any set that includes the hearer. As a result, *vous* has an 'elsewhere' distribution: it is used for a singular non-intimate addressee or for a plural group that contains the addressee (whether that addressee is intimate or not).

So-called third person is the lack of a PERSON feature. Assuming that the third person pronouns are in paradigmatic opposition to the other pronouns, then they will similarly be blocked by the other forms via scalar implicature, so that *il(s)/elle(s)* will not normally be used to refer to the speaker, hearer, or a group containing speaker or hearer (regarding *on*, see just below).

Apart from greatly simplifying the semantics, the assumption of blocking by scalar implicature may help to explain the special 'authorial *nous*' illustrated in example (7) above. Assuming a stylistic proscription against using the first person singular (*je*) in discursive prose, then *je* is removed from competition, leaving *nous* as the best candidate. Interestingly, this removal of the first person singular blocker is relative to register, suggesting the present pragmatic account. Similarly, as noted in footnote 7 above, weak subject *nous* is now primarily limited to written French and has all but disappeared from the spoken language. With *nous* removed as a blocker, the weaker third person *on* fills the role of refering to a first person group elsewhere in spoken French.[11]

One rather famous fact about most pronoun systems, including that of French, is not explained by the semantics given in (28). A group consisting of speaker and hearer (1+2) matches both the semantics given for *nous* ('set that includes the speaker') and for *vous* ('set that includes the hearer'). Neither semantic form entails the other, so we wrongly predict that there is no blocking and either pronoun can be used. In fact *nous* rather than *vous* is used.[12] One solution is to modify the semantics of *vous* so that it refers to a group containing any speech act participant (P), defined as either the speaker or hearer. Hence $\supseteq \{P\}$ would replace $\supseteq \{H\}$ in (28). Then the stronger *nous* ($\supseteq \{S\}$) blocks the weaker *vous* ($\supseteq \{P\}$).[13]

6 An ASSOCIATIVE feature?

Although we have proposed that *je/nous* are distinguished by person, as are *tu/vous*, an alternative is to replace Number with a new feature Associative to cross-classify the non-third person forms. On the alternative view, *je* and *tu* would be [ASSOCIATIVE –] while *nous* and *vous* would be [ASSOCIATIVE +]. But while this may be appropriate for some languages, French is not among them.

On the present account 1s and 1a form a 'natural class' with respect to semantics, as do 2s and 2a; indeed they are very similar semantically (see (28)). But with respect to morphosyntax they are atoms. There do not appear to be any phenomena from French morphosyntax that pick out these groups, except where there is an independent semantic explanation. Consider coordination, as in (29). When 1s coordinated with 3p, the resulting coordinate NP triggers 1a agreement; when 2s is coordinated with 3p, the result is 2a.

[11] Not all such special uses of pronouns can be explained in this way, however. What Zwicky (1977, p. 716) calls the 'phoney inclusive' *we* in *Are we ready for dinner?* (said by a nurse to a patient), for example, may derive from a display of empathy.

[12] This pattern, where inclusive (1+2) is morphologically grouped with first person groups, is by far the most common cross-linguistically. Purported exceptions where inclusive is expressed by second person forms include some Algonquian languages and a few others (Zwicky 1977). More recently, Cysouw (to appear) has called into question even those rare cases.

[13] However, I am unaware of independent evidence favoring this particular solution.

(29) a. [Moi et mes amis] sommes / *sont loyaux.
me and my friends be.1P / *be.3.PL loyal.PL
{*S*, ...} 1p = {*S*, ...} 3: blocked
'My friends and I are loyal.'

b. [Toi et tes amis] êtes / *sont loyaux.
you and your friends be.2P / *be.3.PL loyal.PL
{$H_{intimate}$, ...} 2p = {*H*, ...} 3: blocked
'You and your friends are loyal.'

An 'augmented' 1s triggers 1a and an 'augmented' 2s triggers 2a. If, as we have posited, 1s and 1a do not share a morphosyntactic feature that distinguishes them from the rest of the paradigm, then facts such as these are difficult to explain in terms of a computation operating on morphosyntactic features (such as the system proposed by Dalrymple and Kaplan (2000)). But there is no reason to think such a system is in fact operating. The facts shown follow straightforwardly from the semantics of the different person values. A system for morphosyntactic resolution in coordinate structures is superfluous.

Moreover, when morphological and semantic resolution diverge, it is the semantic resolution that is operative. Although this has not been tested for person resolution, we know that gender resolution is semantic rather than grammatical, wherever possible (see Wechsler (to appear) and Wechsler and Zlatić (2003), Ch. 8 for evidence from French, Serbian/Croatian, Icelandic, Luganda, and Rumanian). When a masculine and feminine are conjoined in French, as in example (30a), the result is masculine plural agreement. But is it the morphological or semantic gender relevant? We can test this with nouns such as *sentinelle* 'sentry', which is morphologically feminine but can refer to a male or female. In (30b) pragmatics dictates that the sentry be male (since he has a wife).

(30) a. Suzanne et Pierre ont été pris / *prises en otage.
Suzanne and Pierre have been taken.M / *taken.F.PL hostage.
'Suzanne and Pierre were taken hostage.'

b. La sentinelle et sa femme ont été pris / *prises en otage.
the sentry and his wife have been taken.M / *taken.F.PL hostage
'The sentry and his wife were taken hostage.'

The coordinate NP *la sentinelle et sa femme* contains two grammatically feminine conjuncts, but denotes a mixed-sex pair. As shown, masculine plural agreement is preferred, suggesting semantic rather than morphosyntactic resolution.

In conclusion, the coordination resolution facts do not support a morphosyntactic feature to pick out sets such as {1s, 1a}, {1s, 2s}, {2s, 2a}, or {1a, 2a}. Rather, a semantic account is both necessary and sufficient to explain these facts.

Moreover, French morphology supports the proposed new paradigm (20) over the traditional one (6). No French first or second (traditional) person morphemes, whether on agreement triggers or targets, are neutral with respect to number; nor is there an associative morpheme marking both 1a and 2a. Thus there appears to be no morphological justification for the first and second person rows in the traditional paradigm table (6). This is true regardless of whether the vertical dimension is the category plural or associative.

In addition, note that any ASSOCIATIVE feature would be applicable only to first and second person, begging the question of why it does not exist in the third person (as it does in Hungarian; see Section 5 above). This applies not only to the pronouns but throughout the grammar, in all agreement

targets. The distinction between *tu* and *vous* is marked *only* on person agreement targets (basically finite forms and anaphoric pronouns). Compare the following two sentences:

(31) a. Tu es loyal.
you.2SG be.2SG loyal.SG
'You (one intimate addressee) are loyal.'

b. Vous êtes loyal.
you.2PL be.2PL loyal.SG
'You (one formal addressee) are loyal.'

If we keep singular reference constant and move from informal to formal, the finite verb form changes but the adjective form remains the same. If *tu* and *vous* were distinguished by some other feature such as +/–ASSOCIATIVE, then there would be no reason necessarily to expect this feature to be limited to person agreement targets. We might expect to find it showing up elsewhere.

7 The formality (T/V) distinction

In the sociolinguistic literature (e.g. Brown and Gilman (1960)) the formal/informal second person distinction is sometimes called the *T/V* distinction, after *tu/vous* and their cognates across many Indo-European languages (most of which begin with *t-/v-*). The analysis above differs from the most common account of the T/V phenomenon in some respects. The more common story holds that plural number has been coopted to signify politeness, power, or related social constructs. In a classic sociolinguistic study, Brown and Gilman (1960) argue that 'plurality is a very old and ubiquitous metaphor for power'. Corbett (2000, ch. 7 'Other uses of number') expands and refines the 'plural equals power' metaphor, noting a broader range of uses for the plural among the world's languages. Plural can mark respect or politeness (as in the languages of Europe); ritual avoidance (Mparntwe Arrernte; Pama-Nyungan, Australia); or modesty (the Greek and Latin 'plural of modesty'; the 19th century Russian of Chekhov).

On the present account of French, *tu* and *vous* are distinguished by PERSON alone, not NUMBER. In a sense this is consistent with the 'plural means formal' (or power, etc.) story— although following Cysouw we might better say 'associative means formal.' The present claim is that this association between associative and formal is not grammaticalized in the morphosyntactic NUMBER system, but rather in the semantics of the personal pronouns: *tu* is specialized for a single informal addressee, hence implicitly grouping together 'singular' and 'informal'.

The present account does differ from the 'plural means formal' story with respect to markedness. For us, *tu* rather than *vous* is taken as the semantically marked form. We analyzed the feature [PERSON 2s] (*tu* and agreeing forms) as specialized for a singular informal addressee, with *vous* the more general form occurring when *tu* is not appropriate (see (28)).

The present claims apply to French. But some of the purported cases of plural as metaphor for power, politeness, etc. in other languages should probably be reexamined to determine the direction of markedness. Take for example the case of avoidance behavior in Mparntwe Arrernte (described by Wilkins 1989, pp. 46-7 and 123, as cited in Corbett 2000, p. 220). After a boy has been through initiation, he and his younger sisters are to avoid certain types of direct contact, such as passing objects directly to each other. In addressing one another they avoid the second person singular form, using the plural instead. If we assume that the singular is the semantically marked alternant that normally blocks the plural, then this special usage of the plural would follow automatically: the singular blocker

is removed in certain pragmatic contexts due to the taboo against direct address.[14] More research is needed to settle this issue, and the answer will likely differ across languages.[15]

As observed in the previous section, the claim that PERSON rather than NUMBER distinguishes formal from informal second person leads to a prediction: formality should be distinguished only on PERSON agreement targets, not on NUMBER agreement targets. This prediction appears to be validated for French, but how does it fare in other languages?

The Slavic languages are split with respect to this issue (Corbett 1983). Predicate adjectives show agreement in number, gender, and case, but not person. Some Slavic languages, including Bulgarian, are roughly like French, in that the predicate adjective form (roughly) reflects meaning rather than form, leading to apparent agreement mismatches. Recall Bulgarian example (2) above, repeated here:

(32) Bulgarian

a. Vie ste učtiv i vnimatelen.
you be.2PL polite.SG and attentive.SG
'You (one formal addressee) are polite and attentive.'

b. Vie ste učtivi i vnimatelni.
you be.2PL polite.PL and attentive.PL
'You (multiple addressees) are polite and attentive.'

In others, including Serbian/Croatian, predicate adjectives pattern together with the finite verb. Thus primary predicate adjectives distinguish formality:

(33) Serbian/Croatian

a. Ti si duhovit / duhovit-a.
you AUX.2SG funny.M.SG / funny-F.SG
'You (one informal male/female addressee) are funny.'

b. Vi ste duhovit-i.
you AUX.2PL funny-M.PL
'You (one formal addressee or multiple addressees) are funny.'

(See Corbett 1983 for a detailed survey of this issue across the Slavic languages.) Serbian/Croatian primary non-finite predicates, including verb participles and predicate adjectives, pattern with finite predicates. On all of these primary predicate agreement targets, the singular informal second person pronoun *ti* triggers singular agreement while the plural/formal pronoun *vi* triggers plural. The adjective lacks person agreement morphology, and its number covaries with *ti* (sg.) / *vi* (pl.), as shown. It is hard to avoid the conclusion that the traditional person/number paradigm is correct for this language: *ti/vi* are distinguished by morphological number.[16]

However, even in the Serbian/Croatian person paradigm, number has a very restricted role. Number apparently marks only those personal pronouns *in nominative case*. Three different types of agreement will establish this generalization.

[14] Similarly, English plural pronouns are often used with singular reference to avoid specifying gender when it is unknown, as in *Someone(sg.) left their(pl.) coat*. Contrast the decidedly worse *??Some girl left their coat*, blocked by *Some girl left her coat*; and **Some book is missing their cover*, blocked by *Some book is missing its cover.*

[15] Corbett (2000) himself does not explicitly state that the plural/honorific form is the marked one, but he implies as much by commenting, e.g., that 'plural forms are often used of a single addressee to indicate respect.' (Corbett 2000, p. 219)

[16] Of course, direction of markedness is an independent issue: *ti* may still be the semantically marked member of the opposition, as claimed above for French *tu*.

First, predicate adjectives that are predicated of non-nominatives, as in (34), use number to indicate cardinality, much as French predicate adjectives do. All the examples below mean 'I consider you funny', but differ regarding the addressee(s) as indicated:

(34) a. Ja te smatram duhovit-om /-im.
I you.INFORMAL.ACC consider funny-INST.F.SG /-M.SG
'I consider you (one informal female/male addressee) funny.'

b. Ja vas smatram duhovit-om /-im.
I you.PL.ACC consider funny-INST.F.SG /-M.SG
'I consider you (one formal female/unmarked addressee) funny.'

c. Ja vas smatram duhovit-im(a).
I you.PL.ACC consider funny-INST.PL
'I consider y'all funny.'

Sentence (34b), for example, has a (so-called) plural pronoun but singular agreement on the adjective. Much like the French examples above, this is interpreted as a single, formal addressee.

The second example is from reflexive binding. Serbian/Croatian reflexives must be bound by either the nominative subject, or a non-nominative 'logical subject' such as a dative experiencer (Zlatić 1996, 1997a, 1997b). Interestingly, a reflexive can only show 'semantic agreement' with a non-nominative antecedent, while 'grammatical' (masculine plural) or semantic agreement is possible with nominative *vi*. Taking nominative first, the following sentence could be uttered to one female addressee, for example:

(35) Vi ste voleli sami/samu sebe.
you.NOM.PL AUX2.PL liked.M.PL own.NOM.M.PL/own.ACC.F.SG self.ACC
'You liked yourself.' you = one female addressee

When *vi* is a Nominative binder, thereflexive can show either masculine plural, reflecting the grammatical features of *vi*, or feminine singular for one female addressee.

However, when the binder is a non-nominative form, only feminine singular agreement is possible (again, assume the addressee is one female). Examples (36a) and (36b) illustrate dative and accusative binders, respectively:

(36) *Context: One female addressee*

a. Vama je bilo žao same/ *samih/ *samog sebe.
you.DAT AUX3.SG be.NT.SG sorry own.GEN.F.SG/ GEN.PL/ GEN.NT.SG self.GEN
'You felt pity for yourself.'

b. Vas nije bilo briga za samu/*same sebe.
you.ACC NOT+AUX was.NT.SG care for own.ACC.F.SG/*own.ACC.M.PL self.ACC
'You (one female addressee) didn't care about yourself.'

Third, attributive modifiers show grammatical agreement with nominative *vi* (37) but semantic agreement with non-nominatives.

(37) a. Jadni Vi
poor.M.PL you
'poor you' (formal; male or female, one or more than one)

b. * Jadna Vi
poor.F.SG you
'poor you' (unacceptable even for one female addressee)

(38) a. Vas jadnu (niko ne postuje).
you.ACC poor.ACC.F.SG nobody NEG respect
'(Nobody respects) poor you.' (one female addressee)

b. Vas jadnog (niko ne postuje).
you.ACC poor.ACC.M.SG nobody NEG respect
'Nobody respects poor you.' (one male addresee)

c. Vas jadne (niko ne postuje).
you.ACC poor.ACC.PL nobody NEG respect
'Nobody respects poor you.' (multiple addressees)

Summarizing, nominative *vi* triggers grammatical number agreement with its inherent features, namely masculine second person plural; but targets agreeing with non-nominative forms lack grammatical number agreement and instead are semantically interpreted.[17]

Within the present framework of assumptions these facts indicate, with respect to number, that nominative personal pronouns are marked for NUMBER, while non-nominatives are not. This assumes the traditional person/number paradigm in which *ti* is [PERSON 2, NUMBER sg] and *vi* is [PERSON 2, NUMBER pl]— but only for nominatives. Other case forms like accusative *vas* are unmarked for number, so that the default semantic number applies instead.[18]

The notion that *tu/vous* are distinguished from one another by PERSON rather than NUMBER is an appealing one. After all, PERSON classifies forms of address, the more natural home for the formality distinction. But the present analysis does not invalidate the Brown and Gilman (1960) type insight that plurality is a common metaphor for power, politeness, and related social relations. We may wish to modify the metaphor, referring to 'associative' rather than than 'plural' in many cases; or perhaps, as implied by our analysis, the operative connection is really between singularity and intimacy/informality/etc., with the plural form filling in elsewhere. In any case, this metaphor can be grammaticalized in different ways, with the French system representing only one way.[19] In Serbian/Croatian, by contrast, NUMBER has apparently been coopted to express formality within the nominative pronoun paradigm.

8 Conclusion

The most extensive typological studies of person paradigms have led to a rather surprising conclusion: notwithstanding the ubiquity of the traditional person/number tables in grammatical descriptions, the grammatical category of NUMBER actually has little or no place in the person paradigms of the world's languages (Cysouw 2003; see also Harley and Ritter 2002 specifically on pronoun systems). The implications of this conclusion for the study of agreement have not yet been fully appreciated. When it is applied to French, the resulting reorganization of the person paradigm effectively dissolves certain

[17] In addition, even nominative *vi* alternatively triggers semantic agreement on reflexive pronouns; see (35).

[18] See Wechsler and Zlatić 2003, ch. 9 for discussion.

[19] Plurality may indeed be the right notion for some cases, as suggested by the use of plural for honorification in third person in some languages.

apparent agreement mismatches. At the same time, the facts of Serbian/Croatian in the previous section show that agreement systems can evince distinctions that are not reflected in the morphological paradigms themselves. More research is needed in order to exploit the insights into morphological paradigms and bring them to bear on problems of agreement systems.

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