# Extraposition as a nonlocal dependency

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## 1 Introduction

Recently, it has been argued (Keller, 1995; van Eynde, 1996) that extraposition (of complement clauses, relatives, and PP's, among others) is best treated as a nonlocal dependency. To this end, a feature EXTRA is introduced, whose function and distribution is similar to that of SLASH, except that it accounts for filler-phrases which follows rather than precede their head.

In this paper, we first summarize the account of (*it*-) extraposition of complement clauses in Dutch presented in Bouma (1996). Two arguments for a nonlocal treatment are presented: the extraposed complement is sometimes in a position where it clearly cannot be a local complement of its governor, and, second, the interaction of fronting and extraposition with insertion of expletive *it* suggests that both phenomena must be analyzed using nonlocal features. In section 3 we present an nonlocal approach to complement extraposition, based on the 'head-driven' approach to nonlocal dependencies outlined in Sag (1995).

The remainder of the paper discusses various consequences of the analysis. First, we address the question how to extend the analysis to extraposition of adjunct phrases, such as relative clauses or PP's. We argue that these are best handled by a lexical rule which adds (extraposable) adjuncts to the EXTRA-list of the heads they modify. Second, we observe that, given an 'head-driven' approach to extraposition, the *right-roof constraint* on extraposition is not easily accounted for. Finally, we focus on the interaction between extraposition and fronting. In Dutch, it is possible to extrapose out of a fronted clause, as well as front an element out of an extraposed clause. We demonstrate that such cases can be accounted for without introducing spurious ambiguity.

## 2 Extraposition of Complement Clauses is Nonlocal

In Pollard and Sag (1994, pp. 145 ff.), the lexical rule in (1) is proposed to account for extraposition of complement clauses in English, as illustrated in (2b,d) below.

(1) The Extraposition Lexical Rule removes an S[*comp*] from a SUBCAT list replacing it by $\text{NP}_{it}$ and appends the S[*comp*] to the end of the SUBCAT list, preserving role assignment.

(2) a. That Sandy snores bothers me.

b. It bothers me that Sandy snores.

c. I regret that we could not hire Mosconi.

d. I regret it that we could not hire Mosconi.

The LR in (1) treats extraposition as a local process (the extraposed clause is moved to the last position on SUBCAT) and obligatorily inserts *it*. There are two sets of data that are problematic for this proposal. First, it can be argued that at least in some cases the extraposed clause is in a position where it cannot be a local complement of the head verb which selects it. Second, the fact that expletive *it* is always absent if the complement clause is fronted, is hard to explain given the rule in (1). If extraposition is a nonlocal process, however, this fact is accounted for immediately.

The local nature of extraposition is challenged by examples such as (3) (Pollard and Sag, 1994, p. 146) and (4) (Keller, 1995, citing Haider (1994)).

(3) I regret it very much that we could not hire Mosconi.

(4) a. It struck a grammarian last month, who analyzed it, that this clause is grammatical.

b. *It struck a grammarian last month, that this clause is grammatical, who analyzed it.

In (3), we find an extraposed clause to the right of the adjunct *very much*. If both *it* and the extraposed clause are to be combined with their head *regret* by means of the HEAD-COMPLEMENT schema proposed in Pollard and Sag (1994, p. 38), the position of the adjunct is completely unexpected. In (4a), we find an extraposed complement clause to the right of an extraposed relative clause. Extraposition of relatives separates a relative from the N or NP it modifies and thus is clearly a nonlocal process (see also section 4). If extraposition of relatives requires a nonlocal EXTRA-feature and a corresponding HEAD-EXTRA schema (Keller, 1995) for combining a (saturated) phrase with an extraposed element, the position of the clausal complement is unexpected. In fact, if extraposition of clauses is a local process, one would expect the order in (4b) to be grammatical, but this prediction is not correct.

Extraposition of complement clauses in Dutch gives rise to similar data as in English. If a complement clause is extraposed, the expletive element *het* may be inserted:

(5) a. dat Arie beweert dat Bert niet komt
that Arie maintains that Bert not comes
*that Arie maintains that Bert isn't coming*

b. dat Arie het betreurt dat Bert niet komt
that Arie it regrets that Bert not comes
*that Arie regrets Bert isn't coming*

c. *dat Arie het beweert dat Bert niet komt

d. dat Arie betreurt dat Bert niet komt

e. dat Arie het haat dat Bert niet komt
that Arie it hates that Bert not comes
*that Arie hates it that Bert isn't coming*

f. *dat Arie haat dat Bert niet komt

(6) a. dat het Arie verbaasde dat Bert niet komt
that it Arie surprised that Bert not comes
*that it surprised Arie that Bert isn't coming*

b. *dat Arie verbaasde dat Bert niet komt

Note that if the extraposed complement is an object, the possibility of inserting *het* is governed by the head verb (5) (see also Bennis (1986, p. 103 ff.). Extraposed subject clauses are normally accompanied by *het* in subject position (6).[1]

A difference between English and Dutch is the fact that in Dutch, complement clauses must always follow the verb in subordinate clauses. As objects in Dutch subordinate clauses normally precede the verb (i.e. Dutch is an SOV-language), this suggests that clausal complements are always extraposed, independent of the question whether *het* is present. Note also that if a *verb cluster* is present, the complement clause must follow the cluster, and thus can be separated from its verbal governor:

(7) dat Arie het betreurd zou hebben als Bert niet zou komen
that Arie it regret would have if Bert not would come
*that Arie would have regretted it if Bert wouldn't come*

At first blush, it may seem that examples such as (7), provide further evidence for the fact that extraposition of complement clauses must be nonlocal. However, as modal and auxiliary verbs in Dutch have been analyzed as 'argument-inheritors' (Rentier, 1994; van Noord and Bouma, 1996), it might be argued that *zou* inherits a clausal complement (from *hebben*, which inherits) from *betreuren*, in which case a local account of extraposition would still be feasible.

A problem for this kind of explanation is that 'argument-inheritance' must then be assumed for a much wider class of verbs than those that are traditionally analysed as 'verb raisers'. Consider, for instance, clausal complements of prepositions. As with verbal governors, extraposition is obligatory. Furthermore, the co-occurrence of an expletive element *er* (*there*) is obligatory:

(8) dat Arie er van droomt dat Bert wint
that Arie there of dreams that Bert wins
*that Arie dreams that Bert will win*

In order to account for the fact that *gedroomd heeft* can intervene between *van* and its clausal complement, we must assume that not only the auxiliary *heeft* but also the verb *dromen* is an 'argument-inheritor'. However, as *dromen* lacks all of the characteristics normally associated with 'argument-inheritance' verbs in Dutch (most notably, *dromen* does not trigger *infinitivus pro participio*), this assumption lacks independent motivation. Note furthermore that in examples such as (9), the PP *van dat Bert wint* is most likely selected by the adjectival predicate *zeker*, which implies that even nonverbal heads must be treated as 'argument-inheritors'.

(9) dat Arie er zeker van is dat Bert wint
that Arie there certain of is that Bert wins
*that Arie is certain of it that Bert will win*

As it seems highly unlikely that 'ordinary' main verbs such as *dromen*, and even adjectival predicates such as *zeker* can be treated as argument-inheritors, the data in (8) and (9) provide additional motivation for treating extraposition of complement clauses as a nonlocal process.[2]

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[1] There are a few exceptions to this rule, involving passives and examples such as:

dat alleen vast staat dat Bert niet komt
that only certain stands that Bert not comes
*that the only thing that is certain, is that Bert isn't coming*

[2] Extraposition of clausal complements of prepositions is problematic for local accounts for yet another reason. If extraposition does not remove the clausal complement from SUBCAT (or COMPS), it is predicted that (*er*) *van dat Bert wint* can form a PP. This leaves the ungrammaticality of (i) unexplained.

i. *dat Arie er van dat Bert wint heeft gedroomd

Furthermore, whereas PP's in general can be extraposed and topicalized, combinations of a preposition and a clausal complement (possibly including *er*) never can:

ii. *Arie heeft gedroomd (er) van dat Bert wint
iii. *(Er) van dat Bert wint heeft Arie gedroomd

These examples suggest that a preposition never forms a constituent with its clausal complement, a fact that is hard to account for under a local account of extraposition.

In Dutch main clauses, clausal complements may appear not only in clause-final, 'extraposed', position, but also in clause-initial, 'fronted', position. Fronted complement clauses can never be accompanied by an expletive:

(10) a. Dat Bert niet komt betreurt Arie.
that Bert not comes regrets Arie
*Arie regrets that Bert isn't coming*

b. *Dat Bert niet komt betreurt Arie het.

c. Dat Bert komt heeft Arie niet verbaasd
that Bert comes has Arie not surprised
*It has not surprised Arie that Bert comes*

d. *Dat Bert komt heeft het Arie niet verbaasd.

This observation provides a second argument against the local account of extraposition. Consider a grammar which incorporates the extraposition LR in (1) as well as an account of fronting in terms of SLASH along the lines of Pollard and Sag (1994, chpt. 4). If the fronted clause is linked to its *governor* by means of SLASH-feature passing, with a *trace* at the bottom of the dependency, it seems that there is no way to block fronting of clauses which are governed by a verb to which the Extraposition LR has applied. Consequently, expletive *het* would be possible with fronted as well as extraposed complements. A traceless analysis of extraction, as proposed in Pollard and Sag (1994, chapter 9), can account for the data, but only if it assumes that the COMPLEMENT EXTRACTION LR always applies *before* the EXTRAPOSITION LR. This kind of external rule-ordering appears to be unnecessary for other lexical rules in HPSG.

# 3 A Nonlocal Account of Complement Extraposition

In this section, we outline a nonlocal account of extraposition of complement clauses. For nonlocal feature passing we adopt the 'head-driven' approach of Sag (1995). The latter proposal is a 'lexicalist' alternative for the treatment of nonlocal dependencies developed in Pollard and Sag (1994), which eliminates traces in favour of a lexical rule, and replaces the NONLOCAL FEATURE PRINCIPLE and the associated distinction between INHERITED and TO-BIND nonlocal features by a constraint on lexical entries. Apart from avoiding traces, the advantages of this approach are that it can handle the lexical idiosyncrasies of a.o. *easy* adjectives, the verb *assure* and French *que/qui* alternations.

Following Keller (1995), we introduce a nonlocal feature EXTRA to account for the distribution of extraposed constituents. Following Sag (1995), we assume a canonical constraint requiring that the value of the nonlocal features of a word is the 'amalgamation' of the values of these features on the elements of ARG-S (argument-structure), where ARG-S is the concatenation of the elements on SUBJ (or SPR) and COMPS (Iida et al., 1994; Manning and Sag, 1995).[3]

Thus, the basic lexical entry for a verb such as *betreuren* is as follows (where $\cup!$ denotes non-vacuous set union):[4]

[3]In Sag's proposal, only the nonlocal feature values of the elements on COMPS are taken into consideration. As we want to allow extraposition of subjects, and since ARG-S is (canonically) the concatenation of SUBJ and COMPS, we define the relevant constraint on ARG-S. Note also that this seems more appropriate for grammars using 'argument-inheritance' (Hinrichs and Nakazawa, 1994).

[4]Non-vacuous set union is like familiar set union except that if two sets have a nonempty intersection, then their non-vacuous set union is undefined (Sag, 1995, fn. 12). For the purposes of this paper, it suffices to think of SLASH and EXTRA as list-valued, and thus to think of $\cup!$ as list-concatenation.

$$\text{(11)}\quad \textit{betreuren} \mapsto \left[\begin{array}{ll} \text{LOC} & \left[\begin{array}{ll} \text{HEAD} & \text{verb} \\ \text{SUBJ} & \left\langle \boxed{1}\left[\begin{array}{ll} \text{LC}|\text{HD} & \textit{np} \\ \text{SLASH} & \boxed{2} \\ \text{EXTRA} & \boxed{3} \end{array}\right] \right\rangle \\ \text{COMPS} & \left\langle \boxed{4}\left[\begin{array}{ll} \text{LC}|\text{HD} & \textit{verb}[\textit{dat}] \\ \text{SLASH} & \boxed{5} \\ \text{EXTRA} & \boxed{6} \end{array}\right] \right\rangle \end{array}\right] \\ \text{ARG-S} & \left\langle \boxed{1}, \boxed{4} \right\rangle \\ \text{SLASH} & \boxed{2} \cup! \boxed{5} \\ \text{EXTRA} & \boxed{3} \cup! \boxed{6} \end{array}\right]$$

Note that since the verb collects the nonlocal feature values of its complements and subject, the NONLOCAL FEATURE principle of Pollard and Sag (1994) (which, in the canonical case, assigns a value to each nonlocal feature of a phrasal sign which is equal to the union of the values for this local feature on all the daughters) becomes obsolete. Instead, a *head-driven* approach to nonlocal feature passing is adopted: in *head-valence phrases* (i.e. in phrases without filler daughters) the value of each nonlocal feature on a phrasal sign equals that of its head daughter.

Sag (1995) presents the following COMPLEMENT EXTRACTION lexical rule:

(12) CELR:

$$\left[\begin{array}{ll} \text{COMPS} & \left\langle \ldots, \boxed{1}, \ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots, \boxed{1}, \ldots \right\rangle \end{array}\right] \Longrightarrow \left[\begin{array}{ll} \text{COMPS} & \left\langle \ldots\ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots, \boxed{1}\left[\begin{array}{ll} \text{LOC} & \boxed{2} \\ \text{SLASH} & \left\{\boxed{2}\right\} \end{array}\right], \ldots \right\rangle \end{array}\right]$$

This rule removes an element from COMPS and at the same time unifies this element with the information that its SLASH value is the singleton set consisting of its LOCAL value. Applying this rule to the lexical entry in (11) leads to the output lexical entry in (13) (used to account for sentences in which the complement clause is 'fronted').

$$\text{(13)}\quad \textit{betreuren} \mapsto \left[\begin{array}{ll} \text{LOC} & \left[\begin{array}{ll} \text{HEAD} & \text{verb} \\ \text{SUBJ} & \left\langle \boxed{1}\left[\begin{array}{ll} \text{LC}|\text{HD} & \textit{np} \\ \text{SLASH} & \boxed{2} \end{array}\right] \right\rangle \\ \text{COMPS} & \left\langle \right\rangle \end{array}\right] \\ \text{ARG-S} & \left\langle \boxed{1}, \boxed{4}\left[\begin{array}{ll} \text{LOC} & \boxed{5}\left[\begin{array}{ll} \text{HD} & \text{v[dat]} \end{array}\right] \\ \text{SLASH} & \left\{\boxed{5}\right\} \end{array}\right] \right\rangle \\ \text{SLASH} & \boxed{2} \cup! \left\{\boxed{5}\right\} \end{array}\right]$$

Note that as nothing is removed from ARG-S, instantiating the SLASH-value of the removed element suffices to include this value in the SLASH-value of the verb itself as well.

The introduction of complements on EXTRA is handled by means of a COMPLEMENT EXTRAPOSITION LR similar to the CELR in (12). This rule comes in two varieties:

(14) a. EXTRAPOS-LR:

$$\begin{bmatrix}\text{COMPS} & \langle \ldots,\boxed{1},\ldots\rangle \\ \text{ARG-S} & \langle \ldots,\boxed{1},\ldots\rangle\end{bmatrix} \Longrightarrow \begin{bmatrix}\text{COMPS} & \langle \ldots\ldots \rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1}\begin{bmatrix}\text{LOC} & \boxed{2}\\ \text{EXTRA} & \{\boxed{2}\}\end{bmatrix},\ldots\right\rangle\end{bmatrix}$$

b. IT-EXTRAPOS-LR:

$$\begin{bmatrix}\text{COMPS} & \langle \ldots,\boxed{1},\ldots\rangle \\ \text{ARG-S} & \langle \ldots,\boxed{1},\ldots\rangle\end{bmatrix} \Longrightarrow \begin{bmatrix}\text{COMPS} & \langle \ldots,\text{NP}_{it}\,,\ldots \rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1}\begin{bmatrix}\text{LOC} & \boxed{2}\\ \text{EXTRA} & \{\boxed{2}\}\end{bmatrix},\ldots\right\rangle\end{bmatrix}$$

The EXTRAPOS-LR is identical to the CELR, except for the fact that a complement is shifted to EXTRA instead of SLASH. The IT-EXTRAPOS-LR is similar, but also inserts $\text{NP}_{it}$ in COMPS on the position of the removed complement.

The HEAD-EXTRA schema (see also Keller (1995)) licences the combination of a sentential head with an extraposed phrase, under the condition that the EXTRA value of the head unifies with the local features of the extraposed element:

(15) HEAD-EXTRA schema:

$$\begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{HEAD} & \text{v}\end{bmatrix}\\ \text{EXTRA} & \{\boxed{2}\}\end{bmatrix}$$

$$\mathit{head\text{-}dtr}\begin{bmatrix}\text{EXTRA} & \boxed{1} \mathbin{!\cup} \boxed{2}\end{bmatrix} \qquad \mathit{filler\text{-}dtr}\begin{bmatrix}\text{LOC} & \boxed{1}\end{bmatrix}$$

An example derivation is given in Figure 1. The IT-EXTRAPOS-LR applies to *betreuren*, giving rise to a lexical entry in which EXTRA contains an S and expletive *it* is added to COMPS. The verb *zou* 'amalgamates' the EXTRA-value of *betreuren*. Since *zou* is an 'argument-inheritance' verb, it has both the verb *betreuren* as well as its complements, the expletive in this case, on its COMPS-list. We assume that a verb combines with its complements as well as the subject in one step. The result is an S with a nonempty EXTRA-value. This S can combine with the extraposed complement on the basis of the HEAD-EXTRA schema.

The 'head-driven' approach to nonlocal dependencies is characterized by the fact that it does not use traces. Instead, heads may impose constraints on the nonlocal feature values of their complements. One argument for this approach are 'exceptional' lexical items, such as *assure*, which require a fronted complement that cannot appear as a local argument (Sag, 1995, ex. 32):

(16) a. Which of the children can you assure us __ to be reliable?

b. * We can assure you him to be reliable.

Such examples can be accounted for by assuming that the required lexical entries are simply specified as such in the lexicon( i.e. they are not derived by means of the CELR).

Such examples are not limited to extraction. In the previous section we mentioned the Dutch *er*-PREP-complement clause construction (8), which obligatorily requires its complement to be extraposed. Furthermore, certain Dutch nouns which take a complement clause (such as *vrees* (*fear*) or *vraag* (*question*) sometimes obligatorily require that this clause is extraposed (Geerts et al., 1984, p. 1026):

(17) a. dat de regering de vrees heeft uitgesproken dat de belastingdruk zal toenemen
that the government the fear has pronounced that taxes will rise
*that the government is afraid that taxes will rise*

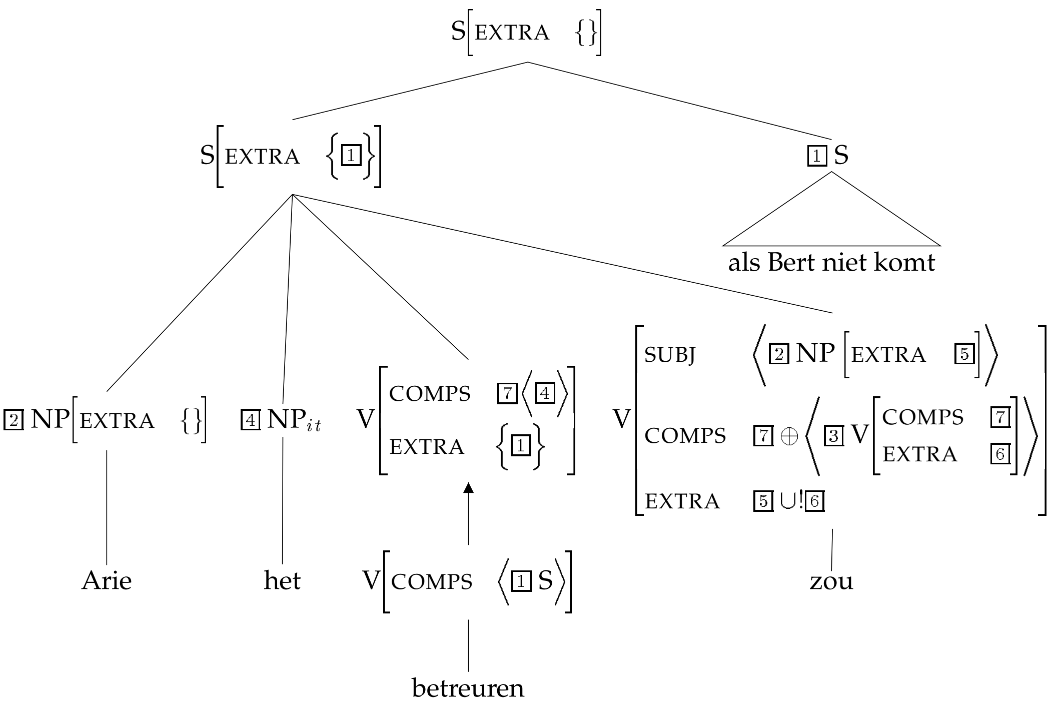


Figure 1: (dat) Arie het betreuren zou als Bert niet komt

b. * dat de regering de vrees dat de belastingdruk zal toenemen heeft uitgesproken

c. dat dit de vraag deed rijzen of de president hiervan op de hoogte was
that this the question did raise whether the president knew about this
*that this did raise the question whether the president knew about this*

d. * dat dit de vraag of de president hiervan op de hoogte was deed rijzen

Although it is unclear whether this requirement is part of the noun, or part of the idiomatic expressions *de vrees uitspreken*, c.q. *de vraag doen rijzen*, it is likely that the lexical approach to nonlocal dependencies can cope with these exceptional constraints more easily than an account involving traces.

## 4 Extraposition of Adjunct Phrases

While topicalization or fronting of (embedded) adjuncts is possible only if a number of special conditions are met (Hukari and Levine, 1994), extraposition of adjunct phrases, such as PP's and relative clauses, is quite common both in English and in Dutch. In (18), we present an example from Dutch. Note that the verb *leest* separates the noun *artikelen* from its modifier PP *over semantiek*.

(18) dat Arie artikelen leest over semantiek
that Arie articles reads on semantics
*that Arie is reading articles on semantics*

Such examples raise the question how to deal with extraposition of adjuncts, given the set of lexical rules and rule-schemata presented in section 3.[5]

It has been proposed (Iida et al., 1994; van Noord and Bouma, 1994) that adjuncts can actually appear on COMPS. A general formulation of a rule that adds adjuncts to COMPS is given below.

[5]The account of nonlocal dependencies given in Pollard and Sag (1994, chpt. 9) uses a lexical rule for extraction of embedded adjuncts, Pollard and Sag (1994, chpt. 4) does not deal with extraction of adjuncts.

(19) ADD-ADJUNCTS-LR:

$$\begin{bmatrix} \text{COMPS} & \boxed{1} \oplus \boxed{2} \\ \text{CONTENT} & \boxed{3} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{HEAD} & n \\ \text{COMPS} & \boxed{1} \oplus \left\langle {}_{\textit{adjunct}}\begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \text{ARG} & \boxed{3} \\ \text{VAL} & \boxed{4} \end{bmatrix} \end{bmatrix} \right\rangle \oplus \boxed{2} \\ \text{CONTENT} & \boxed{4} \end{bmatrix}$$

This rule can for instance be used to add relative clauses or PP's as complements to the COMPS-list of a noun. Thus, the lexical entry for *book* could be changed as follows:

(20) $$\begin{bmatrix} \text{PHON} & \textit{artikelen} \\ \text{COMPS} & \langle\rangle \end{bmatrix} \Rightarrow \begin{bmatrix} \text{PHON} & \textit{artikelen} \\ \text{COMPS} & \left\langle \text{PP} \right\rangle \end{bmatrix}$$

Combinations of a noun and a modifier are now instances of the HEAD-COMPLEMENT schema.

If adjuncts are on COMPS, one might expect that adjunct extraposition is simply subsumed by the rules and principles responsible for complement extraposition. In particular, the output lexical entry (20) could be used as input for the EXTRA LR. There are some technical problems with this proposal, however. First, we have suggested in section 3 that the EXTRA-value of a head is the 'amalgamation' of the EXTRA-values of the elements on its ARG-S-list. If adjuncts are only added to COMPS and not to ARG-S, applying the EXTRA LR to a lexical entry such as the output of (20) is therefore either impossible, or it will not have the intended result (i.e. the relative clause will be removed from COMPS but will not be added to the EXTRA value of the noun). To solve this problem, one can either adopt the constraint on nonlocal feature values as proposed by Sag (1995) (i.e. the SLASH or EXTRA value of the head is the 'amalgamation' of the SLASH c.q. EXTRA values of the elements on its COMPS-list) or add adjuncts to ARG-S as well. The first solution appears to be problematic for grammars using argument-inheritance. For the second solution there appears to be little independent motivation.

Applying the ADD-ADJUNCTS and EXTRA LR's in sequence to account for extraposition of adjuncts raises a second technical difficulty. The value of EXTRA on a head is the 'amalgamation' of the EXTRA-values of the elements on ARG-S (or COMPS). This constraint is only the default, as Sag (1995) observes that certain lexical entries, such as *easy*, must be exceptions to it. The existence of such lexical exceptions suggests that the constraint applies (by default) to basic lexical entries, i.e. lexical entries which have not been derived by means of lexical rules. If this is the case, however, adjuncts can never be visible to the constraint, as adjuncts are added to COMPS by lexical rule.

There is an alternative approach which avoids these difficulties. If adjuncts are added to COMPS by lexical rules, we may as well assume that there is a variant of this rule which adds (certain types of) adjuncts to EXTRA (see Müller (1996, chpt. 15) for a similar proposal). Although this does involve the introduction of an additional LR, it avoids the somewhat cumbersome method of first adding an adjunct to COMPS, only to remove it in the next step. The required LR is simply a variant of (19):

(21) ADD-ADJUNCT-TO-EXTRA-LR:

$$\begin{bmatrix} \text{EXTRA} & \boxed{1} \\ \text{CONTENT} & \boxed{3} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{HEAD} & n \\ \text{EXTRA} & \boxed{1}\ !\cup \left\{ {}_{\textit{adjunct}}\begin{bmatrix} \text{CONTENT} & \begin{bmatrix} \text{ARG} & \boxed{3} \\ \text{VAL} & \boxed{4} \end{bmatrix} \end{bmatrix} \right\} \\ \text{CONTENT} & \boxed{4} \end{bmatrix}$$

Figure 2 illustrates how this rule can be applied to the basic lexical entry of the noun *artikelen*, and how it leads to a derivation for example (18).

Adding adjuncts to EXTRA directly has the additional benefit that it eliminates some spurious ambiguity. If adjuncts are to be added to COMPS before they can be moved to EXTRA, this implies

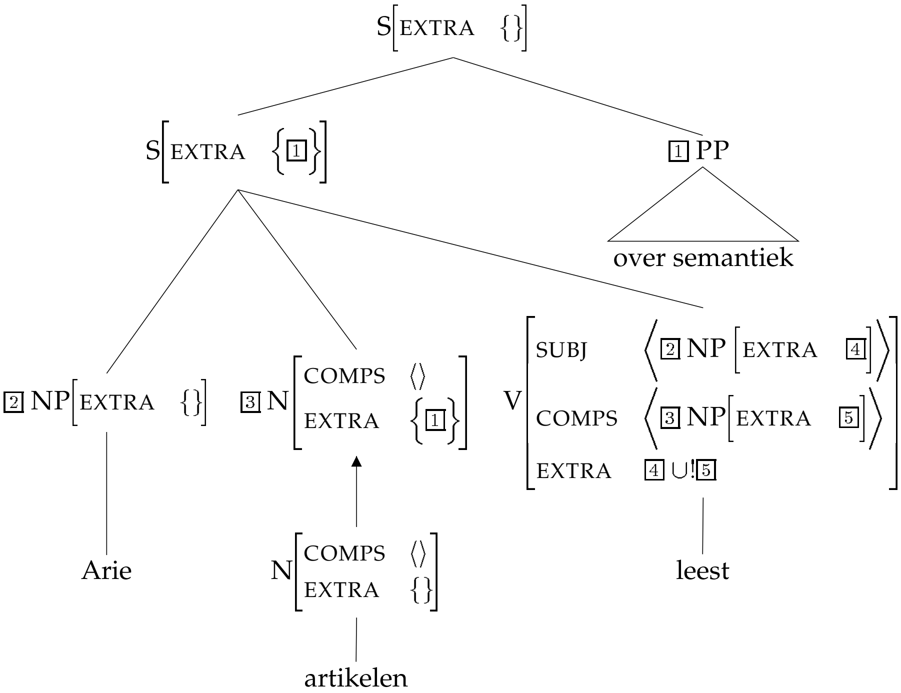


Figure 2: (dat) Arie artikelen leest over semantiek

that in case the COMPS-list contains two complements, the adjunct can be added in three positions. However, if the adjunct is moved from COMPS to EXTRA, the result will be the same derived lexical entry in all three cases. Such ambiguity arises for instance if we add a (extraposable) PP-modifier to the lexical entry of a transitive or bitransitive verb. If adjuncts are added to EXTRA directly, the spurious ambiguity disappears.

## 5 The Right Roof Constraint

The most important constraint on extraposition is the so-called Right Roof Constraint, which says, roughly, that extraposition is clause-bounded. The RRC holds for extraposition of adjuncts (22) as well as complements (23). An extraposed complement can be located at the first clause boundary to the right of its governor, but may not be located at positions further to the right.

(22) a. dat Bert het feit dat [[hij *een boek* las] *over semantiek*] ontkende
that Bert the fact that he a book read on semantics denied
*that Bert denied the fact that he was reading a book on semantics*

b. * dat [Bert het feit [dat hij *een boek* las] ontkende] *over semantiek*

(23) a. dat Bert de mededeling dat [[Arie *het* betreurde] *niet te kunnen komen*] net ontving
that Bert the message that Arie it regretted not to be able to come just received
*that Bert just received the message that Arie regretted not being able to come*

b. *dat [Bert de mededeling [dat Arie *het* betreurde] net ontving] *niet te kunnen komen*

Since we have argued that extraposition of complement clauses must be accounted for by means of nonlocal feature passing, this restriction on extraposition is not automatically accounted for.[6] Within the present analysis, it appears that there are basically two ways to account for this constraint: either one can impose additional constraints on certain rule schemata, or one can impose additional constraints on certain lexical entries.

Implementing the RRC as a constraint on rule schemata appears to be impossible. Imposing a constraint on the HEAD-COMPLEMENT and/ or the HEAD-SUBJECT schemata, requiring that the EXTRA-value of their mother must be empty would rule extraposition altogether. Imposing this constraint on the HEAD-FILLER and HEAD-EXTRA schema is not an option either, as not all clauses are instances of one of these schemata.[7] The problem appears to be at least partially due to the fact that the NONLOCAL FEATURE PRINCIPLE and the associated distinction between INHERITED and TO-BIND nonlocal features has been eliminated. Van Eynde (1996), for instance, gives the following formulation of the RRC:

> For any *synsem* object, if the LOCAL|CATEGORY value is a saturated verbal projection, then the NONLOCAL|INHERITED|EXTRA value must be token-identical to the NONLOCAL|TO-BIND|EXTRA value.

Using the distinction between INHERITED and TO-BIND values, it is possible to formulate a constraint which says that as soon as a saturated phrase is formed, it must combine with its extraposed phrases (if any) in the next step.[8] A similar constraint cannot be imposed, however, if no distinction between INHERITED and TO-BIND is made.

The alternative is to impose constraints on lexical items. Again, there appear to be two possibilities. First, one might consider imposing a constraint on heads which select a clausal complement, requiring that the EXTRA value of such clausal complements must be empty. This solution is too restrictive, however, as it would not only block extraposition *out of* complements, but also extraposition *of* these complements themselves (remember that the LR's for extraposition instantiate the EXTRA value of the extraposed complement on COMPS and ARG-S). Second, one might impose a constraint on clausal specifiers, i.e. complementizers. Extraposition out of clauses which are instances of a HEAD-MARKER schema can be blocked by adding the constraint to complementizers that their HEAD|SPEC|EXTRA value must be empty. An obvious problem for this type of solution is that it will work only if all clauses which are subject to the RRC are in fact introduced by a complementizer. Therefore, one has to accept the suggestion in Pollard and Sag (1994, p. 124-127) that non-finite VP's can be marked by a phonetically empty complementizer, and extend this to finite subordinate clauses as well.

At the moment, we must therefore conclude that a satisfactory account of the RRC, given the approach to nonlocal dependencies outlined in Sag (1995), is problematic. We believe, however, that an approach which imposes a constraint on the heads selecting clausal complements is the most promising. To solve the problem noted above (i.e. requiring EXTRA to be empty blocks extraposition of complement clauses themselves as well) one would have to impose a disjunctive constraint, requiring that clausal complements are either realized on COMPS, in which case their EXTRA value is empty, or on EXTRA. Such a solution requires a somewhat different perspective on the relationship between ARG-S and the various valence and nonlocal features, an issue about which we hope to say more on another occasion.

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[6] Note by the way that the fact that extraposition appears to be more restricted in this respect than extraction to the left is not by itself an argument against a nonlocal approach. As van Eynde (1996) points out, pied-piping is standardly accounted for by means of a nonlocal feature REL, but the constraints on the distribution of this feature are at least as restrictive as constraints on extraposition.

[7] Note also that if we want to allow multiple extraposition, the HEAD-EXTRA schema would have to combine a head with an arbitrary number of extraposed phrases in one step.

[8] A potential problem for this van Eynde's approach might be the fact that the RRC probably applies to non-saturated projections as well (see also Nerbonne (1994)):

i. Een conferentie bezoeken over semantiek, zou ik niet willen
a conference visit on semantics should I not want
*I shouldn't want to visit a conference on semantics*

ii. *Een conferentie bezoeken zou ik niet willen over semantiek

Here, extraposition out of a non-finite VP is ungrammatical. Extrapositions out of fronted clauses is not prohibited in general in Dutch (see section 6), so it is likely that (ii) is an instance of a right roof violation.

# 6 Extraposition and fronting

In Dutch, it is possible to extrapose out of fronted phrase as well as front out of an extraposed phrase. Both patterns can be accounted for without introducing spurious ambiguity.

Although the pattern appears to be subject to a number of restrictions, it is possible to extrapose out of fronted or topicalized phrases:

(24) a. Iedere student is geslaagd die minstens vijf vragen goed had.
every student is passed who at least five questions correct had
every student who answered at least five questions correctly, is passed

b. Ieder voorstel vinden we aanvaardbaar, waarin het milieu wordt ontzien
every proposal consider we acceptable in which the environment is respected
We consider each proposal acceptable, which respects the environment

Note that (24a) contains a subject with an extraposed relative. Given a standard analysis of verb-second in Dutch, in which all verb-second clauses are instances of a FILLER-HEAD schema (where the head is a verb-first sentence with a non-empty SLASH-value), such examples involve extraposition out of a fronted constituent. The second example must be analysed as such in any case, as it contains a fronted object.

The opposite pattern, in which an element is extracted out of an extraposed phrase, occurs as well:

(25) Met wie heeft Jan gezegd dat Arie gesproken heeft
with whom has John said that Arie spoken has
*with whom has John said that Arie has spoken*

In this case a PP which is an argument of the verb *gesproken* in the extraposed clause has been fronted.

If nonlocal dependencies are accounted for by means of the NONLOCAL FEATURE PRINCIPLE, as formulated in Pollard and Sag (1994, p. 164), and if extraposition is analyzed as a nonlocal dependency, the examples in (24) can only be accounted for if the fronted filler-phrase is combined with the main clause, before the result combines with the extraposed clause (as the filler provides the EXTRA value needed to combine with the extraposed relative). The example in (25), on the other hand, requires that the extraposed complement is combined with the main clause, before this phrase is combined with the filler (as the extraposed clause provide the value for SLASH). Thus, we are led to the conclusion that is some cases an extraposed clause must attach higher than a fronted clause, whereas in other cases it must be the other way around. The only way to avoid a contradiction is to allow both attachment-orders. But this has the undesired consequence that in cases where there is a fronted as well as an extraposed clause, but the two are unrelated (i.e. as in (26), where the fronted modifier modifies the main verb *betwijfelt*), a spurious ambiguity will result.

(26) Sinds wanneer betwijfelt Arie dat Bert zal winnen?
Since when doubts Arie that Bert shall win
*Since when does Arie doubt that Bert is going to win?*

The 'head-driven' approach to nonlocal dependencies can avoid this dilemma. First, we must make a modification to the lexical rules introducing elements on SLASH and EXTRA, however. In Sag (1995) and Pollard and Sag (1994), it is assumed that SLASH only contains LOCAL values, i.e. the *synsem* part of a sign which does not contain nonlocal features. If extraposed phrases can licence fronted phrases, and vice versa, we can no longer maintain this assumption. Instead, we will assume that SLASH and EXTRA contain *synsem* values. This implies that the CELR and EXTRAPOS-LR (and IT-EXTRAPOS-LR) need to be modified as follows:

(27) a. CELR′:

$$\begin{bmatrix}\text{COMPS} & \left\langle \ldots,\boxed{1},\ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1},\ldots \right\rangle\end{bmatrix} \Longrightarrow \begin{bmatrix}\text{COMPS} & \left\langle \ldots\ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1}\begin{bmatrix}\text{LOC} & \boxed{2} \\ \text{SLASH} & \left\{\begin{bmatrix}\text{LOC} & \boxed{2} \\ \text{SLASH} & \emptyset \\ \text{EXTRA} & \boxed{3}\end{bmatrix}\right\} \\ \text{EXTRA} & \boxed{3}\end{bmatrix},\ldots \right\rangle\end{bmatrix}$$

b. EXTRAPOS-LR′:

$$\begin{bmatrix}\text{COMPS} & \left\langle \ldots,\boxed{1},\ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1},\ldots \right\rangle\end{bmatrix} \Longrightarrow \begin{bmatrix}\text{COMPS} & \left\langle \ldots\ldots \right\rangle \\ \text{ARG-S} & \left\langle \ldots,\boxed{1}\begin{bmatrix}\text{LOC} & \boxed{2} \\ \text{SLASH} & \boxed{3} \\ \text{EXTRA} & \left\{\begin{bmatrix}\text{LOC} & \boxed{2} \\ \text{SLASH} & \boxed{3} \\ \text{EXTRA} & \emptyset\end{bmatrix}\right\}\end{bmatrix},\ldots \right\rangle\end{bmatrix}$$

Note that under this modification, it is still impossible to extract out of an extracted phrase, or extrapose out of an extraposed phrase.

Now consider the derivation of (24b) in Figure 3. The CELR is applied to the verb *vinden*, giving rise to a lexical sign whose SLASH value is NP. The EXTRA-value of this NP is still 'amalgamated' by the verb, however, and therefore the verb also has a non-empty EXTRA-value. This enables the verbal projection *vinden we aanvaardbaar* to combine with an extraposed relative *before* this phrase has combined with the filler which 'licences' this phrase.

The analysis given in Figure 3 is possible because, in *head-valence* phrases, nonlocal feature values are shared between the mother and the head daughter. In the approach to nonlocal dependencies given in Pollard and Sag (1994), the nonlocal features on the mother are the 'amalgamation' of the nonlocal features of all daughters. The 'head-driven' approach therefore allows a phrase to have a non-empty EXTRA value, even if the complement which introduces this value is not included in the phrase. We can therefore impose a restriction on the HEAD-FILLER schema, requiring that the head must have an empty EXTRA-value, without blocking the derivation in Figure 3. Consequently, the spurious ambiguity noted earlier can be avoided.

## 7 Conclusion

We have presented a nonlocal, 'head-driven', account of extraposition of clausal complements and presented two arguments in favour of a nonlocal account based on *it*-extraposition in Dutch. The 'head-driven' account can be extended to include extraposition of adjuncts and can deal with the interaction of fronting and extraposition without introducing spurious ambiguity. The Right Roof Constraint, however, cannot easily be implemented as a constraint on phrase schemata or lexical entries, given a 'head-driven' distribution of nonlocal features.

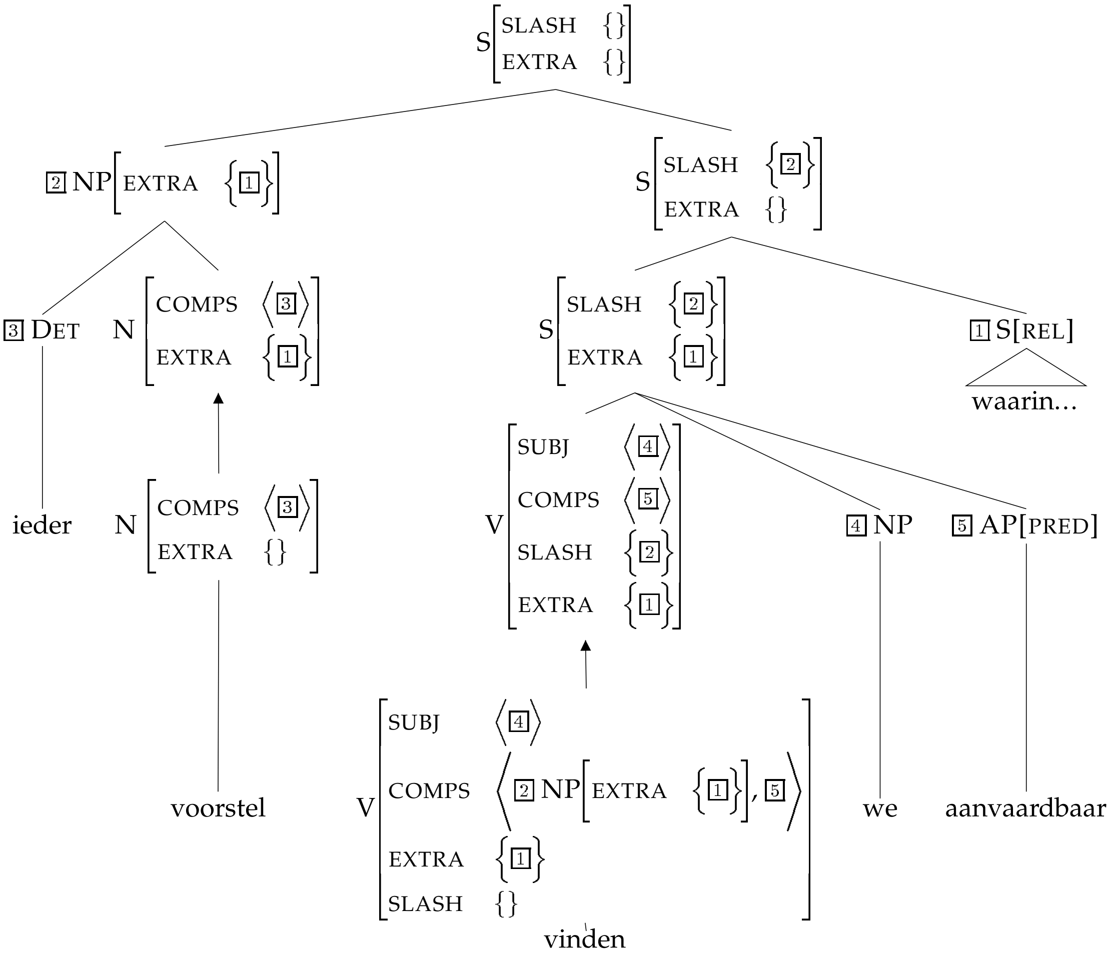


Figure 3: Ieder voorstel vinden we aanvaardbaar waarin het milieu wordt ontzien

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