Argument Realization Principles and Dutch R-Pronouns: Solving Bech's Problem without Movement or Deletion

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Abstract

Dutch R-pronouns have been the subject of extensive study. Two of the most intriguing aspects of these pronouns are that (a) they can be the object of a preposition, but have to surface either in a position preceding the preposition in the Middle field, or as a filler in an unbounded dependency construction, and (b) several functions of the R-pronoun *er* (such as being the (expletive) subject of an impersonal passive or existential clause as well as being the object of a preposition) can be amalgamated into a single occurrence of the word. In this paper we investigate these two phenomena from the perspective of Head-driven Phrase Structure Grammar, and argue for an account in which (a) R-pronouns are treated as adverbs, which may be freely added to the argument structure of a verb to form a extended argument structure (known as *dependency structure* or DEPS), (b) the relationship between a preposition and the R-pronoun which is its object is analyzed in terms of SLASH and BIND (the features used to account for extraction), and (c) amalgamation of functions is accounted for by assuming that the presence of any R-pronoun *er* (be it expletive or prepositional) on DEPS implies that the verb BINDs all occurrences of similar items on SLASH. Our account is purely lexicalist and constraint-based, as it is formulated solely in terms of general constraints on possible mappings between ARG-ST, DEPS, and valence, and does not employ lexical rules or special phrase structure schemata. Of course, it also eschews the machinery from transformational grammar which has been proposed to account for these data, such as clitic-movement rules, syntactic and/or phonological deletion rules, and conditions on chain-formation.

1 Introduction

Extraction out of prepositional phrases in Dutch is only allowed if the extracted element is a so-called R-pronoun (van Riemsdijk, 1978):

(1) a. **Waar** heb je **aan** gedacht?
Where have you on thought
What were you thinking about?

b. **Hier (* Deze oplossing)** had Kim niet **aan** gedacht.
Here (this solution) had Kim not on thought
Kim had not thought about this (* this solution).

Contrary to ordinary NP's, R-pronouns must always precede the preposition of which they are an object, and in spite of the fact that adjacent occurrence of an R-pronoun and preposition are written as a single word, the two elements are not inseparable:

(2) a. Kim heeft **eraan/hieraan/daaraan** gedacht
Kim has there+on/here+on/there+on thought
Kim has thought about this.

b. * Kim heeft aan **er/hier/daar** gedacht.

c. Kim heeft **er/hier/daar** niet **aan** gedacht
Kim has there/here/there not on thought
Kim has not thought about this.

R-pronouns not only occur as objects of prepositions, but can also be used as locative adverbs. In addition, the pronoun *er* occurs in impersonal passive constructions and in existential constructions as an expletive element filling the subject position:

(3) a. Er wordt gepraat
There is talked
One is talking.

b. Er heerst onzekerheid over de rente.
There rules uncertainty about the interest
There exists uncertainty about the interest.

One of the puzzling aspects of *er* is that in some cases several functions can be combined:

(4) a. **Er** wordt **over** gepraat
There is about talked
One is talking about it.

b. **Er** heerst onzekerheid **over**.
There rules uncertainty about
There exists uncertainty about it.

In the examples in (4) *er* can be argued to have an expletive function, as only expletive subjects may occur sentence initially. However, since prepositions cannot occur without an object, *er* must also have the function of a prepositional object. This puzzle was first observed in Bech (1952) and is therefore known as *'Bech's problem'* (Model, 1991, chapter 10).

Previous work within transformational grammar has accounted for some of the properties of R-pronouns in general and *er* in particular by assuming that R-pronouns may occupy a structurally unique position in phrase structure or by appealing to a deletion rule. Van Riemsdijk (1978) assumes that there is a unique R-position within the sentence, where *er* must be moved to, and which may block the presence or (long-distance) movement of other R-pronouns. In Model (1991, chapter 10) an account is presented which is similar in spirit, but which relates the distribution of *er* to that of pronominal clitics in general, and complex conditions on R-chains (chains headed by an R-pronoun) are formulated to account for the interpretation of sentences containing multiple R-pronouns. In Bennis (1986), it is argued that there is no reason to introduce special transformation rules or phrase structure positions for R-pronouns. A solution for *Bech's problem* is offered, in which multiple occurrences of *er* at S-structure are reduced to a single occurrence at PF by means of a phonological deletion rule.

In this paper, we develop an account of the distribution of R-pronouns within the framework of Head-driven Phrase Structure Grammar, a non-transformational, lexicalist, theory of grammar. The core of our analysis is the observation that, except in those cases where there is a clear filler-gap relation between a fronted R-pronoun and a preposition, R-pronouns are adverbial pronouns. Adverbs may be freely added to the lexical argument structure of verbs to form an extended argument structure known as *dependency structure* (Bouma, Malouf, and Sag, 1998). Verbs whose dependency structure contains an R-pronoun have several special properties. First of all, they may bind a gap introduced by a preposition, thus allowing an R-pronoun in the Middle Field to be interpreted as the (extracted) argument of a preposition. Second, in impersonal passives and existential constructions, an R-pronoun (and more in general, a locative adverb) may fill the subject position of the verb. The combination of these two properties leads to a natural account of one of the most problematic instances of function amalgamation. In addition, we propose that some the data which have been used to argue for the clitic-status of *er* can be accounted for in the present framework by adopting a distinction between major and minor categories, as defined in van Eynde (to appear). Finally, we briefly address how the present analysis might account for some of the constraints on multiple occurrences of R-pronouns.

Our account is thoroughly constraint-based and lexicalist. In contrast to transformational accounts, it does not rely on movement-transformations, deletion-operations, or constraints on derivations and structural configurations. Instead, it introduces a flexible mapping between lexical *argument structure* (i.e. the level which establishes a connection between the semantic arguments of a lexical item and its syntactic arguments) and lexical *valence* (i.e. the level of representation which defines the combinatoric potential of a lexical item, in terms of its argument structure). This mapping is subject to a number of general and a number of category-specific constraints. We argue that a constraint-based perspective provides the ideal setting for an analysis of the promiscuous behaviour of R-pronouns.

Our analysis draws heavily on the analysis of adjuncts as complements and the lexicalist account of extraction presented in Bouma, Malouf, and Sag (1998). The analysis of impersonal passive and existential constructions below is compatible with the approach to grammatical relations in Manning (1996) and Manning and Sag (1998), who argue that pronominal binding in passive constructions and in ergative languages may be accounted for by distinguishing between grammatical relations at the level of argument structure and at the level of syntactic valence. Finally, our account of prepositional R-pronouns in the Middle Field bears a close resemblance to accounts of clitic climbing developed for the Romance languages, especially the SLASH-based account of *en*-clitization in Miller and Sag (1997).

2 Data overview

The class of R-pronouns consists of the elements *er* (*there*), *daar* (*there*), *hier* (*here*), *waar* (*where*), *overal* (*everywhere*), *ergens* (*somewhere*) and *nergens* (*nowhere*). In this section, we present an overview of R-pronouns as arguments of prepositions, and as locative adverbs and as subjects of impersonal passives and existential constructions. Finally, we discuss examples where several functions of an R-pronoun coincide. We will largely ignore the so-called *'quantitative'* use of the pronoun *er*. Although there are some important issues relating the quantative use of *er* to the phenomena discussed here (most importantly the fact that quantative *er* participates in the function amalgamation phenomenon in some cases), it is also the case the quantitative *er* is sufficiently different from other uses of *er* to justify a discussion of the data restricted to prepositional, locative, and subject R-pronouns only.

2.1 Prepositional R-pronouns

Dutch prepositions take full NP's as well as most pronouns as argument, but not the impersonal pronouns *het (it), dit (this)* and *dat (that)*:

(5) Kim denkt aan ons/ de kinderen/ *het/ *dit/ *dat
Kim thinks about us/ the children/ it/ this/ that

Instead, in cases where one might expect an impersonal pronoun, a so-called *R-pronoun* can be used, which precedes rather than follows the preposition:

(6) Kim denkt eraan/hieraan/daaraan.
Kim thinks there+on/here+on/there+on about
Kim thinks about it/this/that

The R-pronouns *overal, ergens, nergens* can be seen as counterparts of the pronouns *alles, iets, niets*. However, there is no complementary distribution in this case, as a preposition may combine with both:

(7) a. Karel heeft overal/ergens/nergens over gesproken.
Karel has overywhere/somewhere/nowhere about talked

b. Karel heeft over alles/iets/niets gesproken.
Karel has about everything/something/nothing spoken

As illustrated in example (1) of the introduction, extraction out of PP's is not allowed in general, but it is allowed if the argument is an R-pronoun. Extraction may be long-distance (8a). Also, extraction is not restricted to verbal complements, but may also involve extraction out of AP's (8b) and NP's (8c).

(8) a. **Waar** denkt Kim dat Karel **bij** betrokken is geraakt?
Where thinks Kim that Carl with involved is gotten
What does Kim think that Carl got involved with?

b. **Waar** is Kim verliefd **op**?
Where is Kim in love at
What is Kim in love with?

c. **Waar** schreef Karel een boek **over**?
Where wrote Carl a book about
What did Carl write a book about?

A large number of prepositions can be combined both with regular NP's and with R-pronouns as argument. However, some prepositions exhibit a form alternation when their argument is an R-pronoun:

(9) a. Kim snijdt het vlees **met een mes**
Kim cuts the meat with a knife

b. Kim snijdt **er** het vlees **mee**
Kim cuts it the meat with
Kim cus the meat with it

c. Deze beslissing leidt **tot problemen**
This decision leads to problems

d. **Waar** leidt deze beslissing **toe**?
Where leads this decision to
To what does this decision lead?

Whereas the relationship between *met* and *mee* and *tot* and *toe* is relatively transparant, there are also some cases where the two forms are not likely to be morphologically related:

(10) a. Ik beloof direct **naar school** te gaan
I promise immediately to school to go
I promise to go to school immediately

b. Ik beloof **er** direct **heen** te gaan
I promise there immediately to to go
I promise to go there immediately

c. Ik kom trouwens net **van school**
I come incidentally just from school
I happen to come just from school

d. Ik kom **er** trouwens net **vandaan**
I come there incidentally just from
I happen just to come from there

Also, there are a number of prepositions, including *namens* (*on behalf of*), *behalve* (*except*), and *sinds* (*since*) and a large number of prepositions restricted to formal or archaic registers (see Geerts et al. (1984, p. 384)) which cannot be combined with R-pronouns at all.

R-pronouns must precede the preposition of which they are an argument. However, it is not necessarily the case that pronoun and preposition occur as a phrase. The R-pronoun may also appear in positions in the Middle Field where they are separated by adjuncts or complements of the verb from the preposition:

(11) a. We offeren **er** geen stukje park **voor** op.
We sacrifice there no patch park for PRT
We do not sacrifice a patch of park for it.

b. Ik sprak **er** overigens met mijn vriend Willemsen **over**.
I talked there by-the-way with my friend Willemsen about.
I happened to talk about it with my friend Willemsen.

c. De groep vormt **hier** een fijn voorbeeld **van**.
The group forms here a fine example of
The group is a fine example of this.

2.2 Other functions of R-pronouns

R-pronouns not only occur as arguments of prepositions, but can be used as locative adverbs as well:

(12) Laten we hier/daar/ergens gaan zitten
Let us here/there/somewhere go sit

Let us sit here/there/somewhere

(13) Maria bleef er dertig jaar
Maria stayed there thirty years

Furthermore, the R-pronoun *er* in particular can occur as an expletive subject in existential and impersonal passives:

(14) Er stond een moeder op.
There stood a mother PART.

A mother stood up.

a. Er werd gebeld.
There was called.

The phone rang.

One reason to distinguish between the expletive *er* in existentials and impersonal passives and locative *er* is the fact that it may occur sentence-initially only if it is an expletive, and not if it is a locative adverb:[1]

(15) * Er woonde Maria dertig jaar
There lived Maria thirty years

Although the property to appear as a subject is often attributed to *er* only, it should be noted that the other R-pronouns may appear in the same position as well:

(16) a. Daar stond een moeder op.
There stood a mother PART.

There, a mother stood up.

b. Ergens werd gebeld.
Somewhere was called.

The phone rang somewhere.

In the discussion below, we will focus on the use of R-pronouns as objects of prepositions, as locative adverbs, and as subjects. There are one other use of the R-pronoun *er*, which is not taken into consideration. In (17) *er* is used *quantitatively*.

(17) Kim kent **er drie (van)**
Kim knows there three (of)

Kim knows three (of those)

[1] In a Dutch-corpus (the so-called Eindhoven-corpus of Uit den Boogaart (1975)) I found the following examples which seem to challenge this assumption:

(i) Er wordt de verbranding van een Amerikaanse vlag op het Leidseplein vertoond.
There is shown the burning of an American flag at the Leidseplein.

(ii) Er bestaat de behoefte aan opvoeding, aan kuren, aan genezing.
There exists the need for education, for taking a cure, for healing.

(iii) Er is de man die na het drinken van de tweede, derde borrel het servet op de knieen spreidt
There is the man who after drinking a second, third drink spreads the napkin on his knees
om aandachtig te tafelen.
to dine carefully.

The analysis of examples such as these, as well as the interaction of this phenomenon with other uses of *er* is outside the scope of this paper.

2.3 Bech's Problem: Amalgamation of Functions

A sentence may contain more than one occurrence of an R-pronoun:

(18) **Er** stond **daar** een groot huis.
there stood there a large house

(19) Hier wil de apostel er ons de ogen voor openen

(20) hier en daar is er wel een collega die ook zijn / haar best doet .

(21) er zijn hier in Nederland zo ongeveer 140 honderassen vertegenwoordigd

The pronoun *daar* is interpreted as a locative in this case, and the initial *er* as an expletive. Two occurrences of the same R-pronoun are generally not allowed however. In such cases, the two functions of a pronoun maybe fused or amalgamated into a single word. This phenomenon is is most pregnant if expletive and prepositional uses of the R-pronoun *er* are combined:

(22) **Er** wordt **aan een oplossing** gewerkt.
there is on a solution worked.
One works on a solution.

(23) * **Er** wordt **eraan** gewerkt.
there is there+on worked.

(24) **Er** wordt **aan** gewerkt.
there is on worked
One works on it.

(25) **Er** kwam een prins **in het verhaal** voor.
There came a prince in the story PART
A prince figured in the story.

(26) * **Er** kwam een prins **erin** voor
there came a prince there+in PART

(27) **Er** kwam een prins **in** voor.
there came a prince in PART
A prince figured in it.

Example (22) is an impersonal passive containing a PP and an expletive R-pronoun as subject. Replacement of the PP with an R-pronoun + preposition combination leads to ungrammaticality (23). On the other hand, (24), which contains only a single *er*, and a preposition without a following object, is grammatical. The same situation also occurs where *er* is the expletive subject of an existential clause (25-27). Expletive *er* in general is optional in impersonal passives if there is another (preferably locative) phrase which can fill the subject position. In sentences with an indefinite subject, the occurrence of *er* is also optional. Note, however, that it is not likely that the *er* in (24) and (27) is only prepositional, as it occurs sentence-initially and prepositional *er* normally cannot occur in sentence-initial position. Therefore, the usual explanation for such examples is that two functions of the R-pronoun *er* are fused or amalgamated into a single word.

Amalgamation of functions is claimed to be possible for combinations of locative and existential interpretations as well. For instance, Geerts et al. (1984) present the following example:

(28) Ik kwam op het dak en er lag een dode vogel.
I came on the roof and there lay a dead bird.

In this case, one might argue that *er* is not just an expletive subject of an existential sentence, but also has a locative interpretation. This amalgamation of functions seems less problematic, however, than the examples involving a prepositional R-pronoun function, as expletive *er* is sometimes considered to be a special case of locative *er*, which has a (weak) locative semantics even in its expletive use (Klooster, 1992).

Prepositional R-pronouns can also be used in combination with more than one preposition. Consider for instance the following example (Geerts et al., 1984, p. 398):

(29) a. Vandaag staan **er** weer twee artikelen over zure regen in de krant.
Today stand there again two articles on acid rain in the newspaper.
Today, the newspaper contains two articles on acid raid.

b. Vandaag staan **er** weer twee artikelen **over in**.

Example (29a) contains an expletive *er* and two PP's. In (29b) the objects of both PP's are gone, and thus *er* combines both an expletive function and two prepositional functions.

The situation is more complex for quantative *er*. In such cases, two occurrences of *er* are allowed (Geerts et al., 1984, p. 397):

(30) **Er** bleken maar twee hondjes in de kist te zitten.
There appeared only two dogs in the box to sit.
There appeared to be only two dogs in the box.

a. **Er** bleken **er** **maar twee** in de kist te zitten.
There appeared there only two in the box to sit.

b. **Er** bleken **er maar twee in** te zitten.

c. Tot mijn verbazing bleken **er maar twee in** te zitten.

Example (30b) contains an expletive and a quantative *er*, suggesting that quantative *er* cannot amalgamate with other functions. Note, for instance, that in (30c) there are two occurrences of *er*, but there are three functions to be fullfilled be these two items: the existential (expletive), quantative and prepositional function. It seems reasonable to assume that the sentence initial *er* amalgamates the expletive and prepositional functions. There is a complication with this line of reasoning, however, as (30d) contains a single *er* which apparently has both a quantative and a prepositional function. It has therefore been assumed that there is only a ban on adjacent occurrences of quantative *er* and other functions of *er*.

2.4 The status of the reduced R-pronoun Er

The function and distribution of the reduced R-pronoun *er* differs in a number of ways from that of the other R-pronouns.

First of all, there are situations where only *er* can be used, and not the other R-pronouns. Only *er* can function as an expletive object in combination with a preposition which selects a clausal argument:

(31) Kim heeft **ervoor** (* daarvoor) gepleit **het voorstel aan te passen**
Kim has there+for (there+for) argued the proposal PART to adapt
Kim has argued for a modification of the proposal

If a preposition combines with a clausal argument, extraposition of the complement clause in combination with the insertion of *er*, is obligatory. As with other uses of prepositional *er*, it is not necessarily adjacent to the preposition:

(32) Kim heeft **er** uitvoerig **voor** gepleit het voorstel aan te passen.
Kim has there extensively for argued the proposal PART to adapt

The use of *er* in this construction is expletive, as it cannot be assigned an independent meaning. There are also a number of idiomatic expressions where *er* can be argued to have an expletive function:

(33) Kim is erbij (* daarbij).
Kim is there+with (there+with)
Kim has been caught.

In impersonal passives and existential constructions, *er* often has an equally expletive semantics. In those cases, however, *er* can be replaced by other R-pronouns (see (14 and (16)).

Second, only *er* can be used in quantitative constructions:

(34) Elke dag is er (* daar) een.
Every day is there (there) one
Every day counts.

Finally, a number of word order properties of *er* set it part from the other R-pronouns. Full R-pronouns, but not the reduced form *er*, may be fronted, both in their locative and prepositional function:

(35) a. **Daar** (* er) maak je niets **mee** goed.
there (there) make you nothing with good.
You don't make up anything with that.

b. **Daar** (* er) zag hij de rode personenwagen staan.
there (there) saw he the red car stand.
There he saw the red car.

Second, only full R-pronouns may be coordinated:

(36) Talrijke Griekse nederzettingen zijn daar (* er) en op Sicilië gesticht.
Numerous Greek villages are there (there) and at Sicily grounded.

In Model (1991), it is argued that *er* differs from the other R-pronouns in that it is a clitic. It appears in a fixed position within the phrase, the so-called Wackernagel-position. This is the position immediately following the subject.[2] The clitic status of *er* is used to account for the following contrast:

(37) Jan heeft er niet lang gewoond.
John has there not long lived.

(38) * Jan heeft niet lang er gewoond.

Model argues that (non-subject) clitics must obligatorily precede all other dependents of a verb. While there certainly is a tendency for *er* to appear in this position, there are at least two problems with this account. First, this constraint applies to some extent to the other R-pronouns as well:

(39) Jan heeft daar niet lang gewoond.
John has there not long lived.

(40) * Jan heeft niet lang daar gewoond.

Second, there are cases where a (full, non-clitic) object NP may precede *er*:

(41) a. Leslie herinnerde zijn manager er herhaaldelijk aan dat ze op moesten schieten.
Leslie reminded his manager there repeatedly of that they PRT must rush.
Leslie repeatedly reminded his manager that they had to hurry up.

b. Leslie herinnerde er zijn manager herhaaldelijk aan dat ze op moesten schieten.

In the example above, both positions of *er* are acceptible.

3 Previous Work

Van Riemsdijk (1978) assumes that extraction of prepositional R-pronouns is a consequence of a PP-internal R-movement transformation which moves an R-pronoun from the complement position inside the PP to a specifier position inside the PP. Furthermore, van Riemsdijk assumes that the R-pronouns are actually derived from their corresponding non-R pronominal counterparts (i.e. *er* is derived from *het*, *daar* from *dat*). Bennis (1986) provides a number of arguments against relating R-pronouns and the corresponding non-personal pronouns by rule (a. the interpretation of R-pronouns is not necessarily non-personal, b. in some cases both forms are allowed (nergens/ niets, overal/alles)). Furthermore, he also argues against a specific R-movement transformation, and explains the presence of R-pronouns in a position preceding the P by analyzing R-pronouns as intransitive prepositions. The fact that R-pronouns cannot follow the preposition of which they are an argument follows from the Unlike Category Condition. On the other hand, since P's do not have to receive case, they can be base generated in a position preceding the P-head.

To account for the fact that R-pronouns may occur in positions in the Middle Field where they are non-adjacent to the preposition which selects them, van Riemsdijk (1978) and Model (1991) assume a designated position within the phrase where R-pronouns may be moved to.

[2]In main clauses, *er* will often appear in the position immediately following the finite verb, which is explained by assuming that in normal declarative sentences the subject has been moved to sentence-initial position.

Van Riemsdijk assumes that there exists a phrasal node PRO, which acts as a landing site for pronouns (and which may contain pronominal objects as well as R-pronouns). Model analyzes this position as a special clitic-position, where elements with clitic-status must move to. An important argument in favour of adopting a structurally marked position for (weak) R-pronouns comes from the observation that the following example (van Riemsdijk, 1978, p. 211) has only one interpretation:

(42) **Waar** heeft zij **er** vaak **over** gesproken?
Where(LOC) has she there(P) often about spoken?
Where has she often talked about it?

In examples such as (42) the R-pronoun *waar* cannot be interpreted as the object of the preposition *over*. Van Riemsdijk assumes that *subjacency* requires that all extracted prepositional R-pronouns must pass through the R-position. Since *er* in (42) fills the R-pronoun position, it blocks movement of *waar* to clause initial position. The R-pronoun *er* on the other hand can be interpreted as the object of the preposition. In the latter case, the locative adverb *waar* is assumed to originate in a position where it is adjoined to S, and thus can be fronted without having to pass through the R-position. Model tentatively proposes an account for the same data in terms of a constraint which prohibits (certain instances of) crossing chains headed by R-pronouns.

Bennis (1986) argues against a designated position for R-pronouns, and accounts for the fact that they can be moved leftward within the Middle Field by appealing to a general tendency for 'light' elements to move leftward.

Bennis also extends the analysis to other uses of R-pronouns. Most importantly, he addresses the question of function-amalgamation. He briefly considers an analysis in which a single R-pronoun could potentially be co-indexed with traces occupying different argument positions, but concludes that such a 'parasitic-gap' analysis raises a number of serious problems. He then opts for a solution in which multiple occurrences of the identical R-pronouns are allowed at S-structure, and proposes a phonological deletion rule to account for the fact that typically only a single R-pronoun is realized. (The phonological rule is motivated by the fact that there is a tendency in Dutch to avoid sequences of the form rVr, where V receives no stress. See Klooster for counterarguments.... Also, this only accounts for constraints on adjacent er, no exist[subj] + prep[clitic] ??)

Within the framework of HPSG, an analysis of extracted prepositional R-pronouns is provided in Rentier (1993; 1994). Extraction of the complement of a preposition is accounted for by means of a complement extraction lexical rule. The effect of this rule is to create SLASH*ed* PP's. Below, we achieve the same effect by introducing an argument realization principle for prepositions, which will licence only non R-pronouns as complements of prepositions, and only R-pronouns on SLASH of a preposition. Rentier does not address the problem of how to account for the presence of R-pronouns in the Middle field in detail, although Rentier (1994) hints at the possibility of a FILLER-COMPS-HEAD structure, which would allow complements and a filler phrase to occur as sisters. Such a phrase structure schema seems at best an *ad-hoc* solution, as it introduced to account for prepositional R-pronouns in the Middle field only. Note also that rather specific constraints must be imposed on the filler, to prevent the rule from overgenerating. Finally, a phrase structure schema of this kind fails to provide any solution for cases where various functions of R-pronouns are amalgamated.

4 Argument Realization Principles in HPSG

The introduction of argument structure (ARG-ST) as a level of representation independent from valence, has opened up the possibility of accounting for a range of data in terms of dissociations between argument structure and valence. Initially ARG-ST was understood as a (slightly redundant) level of representation which always consisted of the append of the valence features SUBJ, SPR and COMPS, and which was introduced mainly to facilitate the formulation of binding theory. Thus, for verbal lexemes, the following constraint would valid:[3]

(43)
$$\begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \rightarrow \begin{bmatrix}\text{SUBJ} & \langle\boxed{1}\rangle \\ \text{COMPS} & \boxed{2} \\ \text{ARG-ST} & \langle\boxed{1}\rangle \oplus \boxed{2}\end{bmatrix}$$

In later work, the strict correspondence between valence and ARG-ST is broken, and *argument realization principles* are formulated which allow for different mappings between the two levels.

In particular, the following mappings can be observed:

- Promotion and Demotion: passive, ergative languages, ...
- Extending ARG-ST: adjuncts-as-complements, negation in French and English, argument/complement inheritance
- Arguments which do not contribute to valence: pro-drop, lexicalist extraction, clitics as affixes.

4.1 Adjuncts as Complements

There is by now an extensive literature within HPSG on treating adjuncts as complements (Miller, 1992; van Noord and Bouma, 1994; Manning, Sag, and Iida, 1997; Przepiórkowski, 1999a; Przepiórkowski, 1999b). In Bouma, Malouf, and Sag (1998), this idea is formalized using an auxiliary level of representation, called DEPS (for dependents), which acts as an intermediary between argument structure (ARG-ST) and valence. The idea is that verbs come with a specific argument structure, and that the value of DEPS and valence is defined in terms of argument structure. To introduce adjuncts on COMPS, for instance, Bouma, Malouf, and Sag (1998) propose the following two principles:

(44) Argument Extension
$$\begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \rightarrow \begin{bmatrix}\text{DEPS} & \boxed{1} \oplus \textit{listof}(\textit{`adverbial'}) \\ \text{ARG-ST} & \boxed{1}\end{bmatrix}$$

(45) Argument Realization:
$$\begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \rightarrow \begin{bmatrix}\text{SUBJ} & \boxed{1} \\ \text{COMPS} & \boxed{2} \text{ - } \textit{listof}(\textit{gap-ss}) \\ \text{DEPS} & \boxed{1} \oplus \boxed{2}\end{bmatrix}$$

[3]The $\oplus$-operator denotes the append of two lists.

Given a verb whose argument structure is a list containing two elements, as in (46), Argument Realization imposes the constraint that its list of dependents should contain these two elements plus an arbitrary list of adverbial *synsem*'s. Thus, the feature structure in (46) satisfies the constraint in (44), as it contains one adverbial element in addition to the elements on ARG-ST. Dependent Realization states that the first element of DEPS is the subject, and that a subset of the tail of DEPS forms the list of complements of a verb. The elements on DEPS not realized on COMPS are required to be of type *gap-synsem*, i.e. the type used for gaps in the lexicalist approach to extraction introduced below. Assuming that none of the dependents is a gap, this implies that in (46), COMPS has to contain exactly two elements, namely the prepositional object and the adverbial adjunct.

(46)
$$\begin{bmatrix} \text{PHON} & \textit{denken} \\ \text{SUBJ} & \langle \boxed{1} \rangle \\ \text{COMPS} & \langle \boxed{2}, \boxed{3} \rangle \\ \text{DEPS} & \langle \boxed{1}, \boxed{2}, \boxed{3}\text{ADV} \rangle \\ \text{ARG-ST} & \langle \boxed{1}\text{NP}[\textit{nom}], \boxed{2}\text{PP}[\textit{aan}] \rangle \end{bmatrix}$$

The order on COMPS not necessarily corresponds to surface word order, so that the entry in (46) could be used to derive a sentence such as the following:

(47) Kim denkt nooit aan dit probleem.
Kim thinks never about this problem.
Kim never think about this problem.

4.2 Lexicalist Extraction

Sag (1997) develops a lexicalist, traceless, constraint-based, theory of extraction, which is extended to account for subject and adjunct extraction in Bouma, Malouf, and Sag (1998).

Instead of positing phonologically empty elements, it is assumed that there exists a class of *synsem*'s whose LOC and SLASH values are reentrant:

(48)
$$\textit{gap-synsem} \rightarrow \begin{bmatrix} \text{LOC} & \boxed{1} \\ \text{SLASH} & \{\boxed{1}\} \end{bmatrix}$$

The type *gap-synsem* is a subtype of *synsem*:

(49)
synsem
canonical-synsem *gap-synsem*

As a lexical entry will usually only require of its arguments that they must be of type *synsem*, the introduction of *gap-synsem* in general allows any argument to be realized as *gap-synsem* or *canonical-synsem*. The Dependent Realization principle introduced above ensures that all depedents which are realized as canonical synsems appear on COMPS, and that none of the gap synsems surfaces on COMPS.

Gaps do contribute to the value of SLASH, however, as a consequence of the following constraint:

(50) **Slash Amalgamation Constraint (SLAC):**

$$
\textit{word} \rightarrow \begin{bmatrix} \text{DEPS} & \langle [\text{SLASH } \boxed{1}], \ldots., [\text{SLASH } \boxed{n}] \rangle \\ \text{SLASH} & (\boxed{1} \cup \ldots. \cup \boxed{n}) - \boxed{2} \\ \text{BIND} & \boxed{2} \end{bmatrix}
$$

This constraint defines the value of SLASH of a given lexical entry as the union of all the SLASH-values of its dependents, minus those elements on SLASH bound by this particular entry. The latter is used to account for so-called *easy*-constructions, where an adjective selects for a complement with a non-empty SLASH-value and 'binds' this element locally.

4.3 Argument Realization Principles

Manning (1996) and Manning and Sag (1998) develop a theory which accounts for variation in the mapping from argument structure to valence. That is, whereas for English verbs it is typically the case that the first element on ARG-ST is reentrant with the single element on SUBJ, there are also languages where this assumption does not alwasy hold. For instance,....

5 The analysis

In this section we develop an account of the locative use of R-pronouns, and the passive, and existential use of *er*. We will assume that these elements are all introduced lexically as adverbs, and that passive and existential *er* may fill the subject role of verbal lexical entries.

5.1 R-pronouns

In Pollard and Sag (1994), the CONTENT value of NP's is of sort *nom-obj*, with subsorts *non-pronoun* and *pronoun*. Nominal objects have an attribute INDEX, with values of sort *index*. The sort *index* has subsorts *ref, there* and *it*:

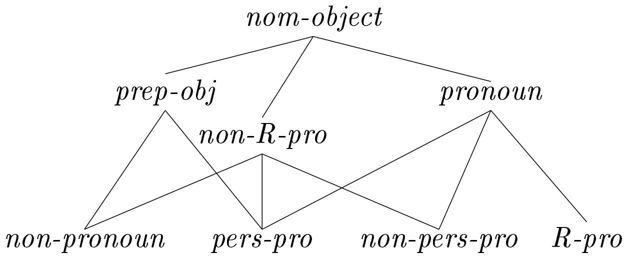
(51)
- *nom-object*
  - *non-pronoun*
  - *pronoun*

(52)
- *index*
  - *ref*
  - *there*
  - *it*

To account for the distribution of Dutch R-pronouns, we propose a refinement of the sorts *index* and *nom-obj*:

(53)
- *index*
  - *R-index*
    - *ref*
    - *there*
  - *it*

(54)



The sort *R-pro* is assigned to all R-pronouns. All other nominal objects are of sort *non-R-pro*. The sort *prep-obj* picks out exactly those nominal objects which can be the local complement of a preposition (i.e. referential NP's and personal pronouns). The sort *R-index* for subsumes both *ref* and *there*, and is used to capture the behavior of *er*, which sometimes requires a locative (referential) reading, and sometimes an expletive reading.

We will assume the following lexical entries for the R-pronouns *daar* and *er*:

(55)
$$\begin{bmatrix} \text{PHON} & \textit{daar} \\ \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{major} & \\ \text{HEAD} & \textit{noun} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \textit{R-pro} & \\ \text{INDEX} & \textit{ref} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(56)
$$\begin{bmatrix} \text{PHON} & \textit{er} \\ \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{minor} & \\ \text{HEAD} & \textit{noun} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \textit{R-pro} & \\ \text{INDEX} & \textit{R-index} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Note that an R-pronoun such as *daar* is assumed to have an INDEX of sort *ref*, and thus can never be used expletively. Other R-pronouns, such as *hier, waar* and *ergens* are assumed to have a similar entry. The R-pronoun *er*, on the other hand, has an INDEX-value *R-index*, which subsumes both *ref* and *there*. Thus, it can be used either referentially (as a locative adverb) or expletively. Another distinction between the 'full' R-pronoun *daar* and the 'reduced' form *er* is that the CATEGORY sort of *daar* is *major*, whereas it is *minor* for *er*. This distinction (due to van Eynde (to appear)) is explained and motivated in section 5.5.

5.2 Extracted R-pronouns

As for verbs, we will assume that prepositions are defined by defining their argument structure, and that the valence (and SLASH-value) of prepositions is a consequence of general mapping constraints. If these constraints allow an argument to be realized both as a complement and as a *gap*, a single lexeme suffices to account both for the situation where a preposition takes a regular NP-object, and for the case where the object of the preposition is extracted.

Examples of lexical entries for prepositions are given below.

(57) $\begin{bmatrix} \text{PHON} & \textit{aan} \\ \text{HEAD} & \textit{prep} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{HEAD} & \textit{noun}[\textit{acc}] \\ \text{CONT} & \textit{nom-obj} \end{bmatrix} \right\rangle \end{bmatrix}$

(58) $\begin{bmatrix} \text{PHON} & \textit{met} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{HEAD} & \textit{noun}[\textit{acc}] \\ \text{CONT} & \textit{prep-obj} \end{bmatrix} \right\rangle \end{bmatrix}$

(59) $\begin{bmatrix} \text{PHON} & \textit{mee} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{HEAD} & \textit{noun}[\textit{acc}] \\ \text{CONT} & \textit{R-pro} \end{bmatrix} \right\rangle \end{bmatrix}$

The canonical case is illustrated in (57). The preposition *aan* does not impose any requirements on its argument, other than that it must be an accusative NP. The forms *met* and *mee* are just listed as separate prepositions in the lexicon. The preposition *met* requires that its argument must be of semantic type *prep-obj*. The preposition *mee* selects a *R-pro* as argument. As will become clear in a moment, this ensures that the argument of *met* is never extracted, whereas the argument of *mee* must be extracted. Other forms which do not allow extraction (such as *tot*, (some uses of) *naar* and *van*, and *sinds*, *behalve*, etc.) are defined in a similar fashion as *met*, whereas elements as *toe, heen* and *vandaan* are defined as *mee*.

The relationship between ARG-ST, (DEPS), valence and SLASH is a consequence of the two constraints below.

(60) **Prepositional Argument Realization:**

I $\begin{bmatrix} \text{HEAD} & \textit{prep} \end{bmatrix} \rightarrow \begin{bmatrix} \text{SUBJ} & \langle\ \rangle \\ \text{COMPS} & \boxed{1} \text{ - } \textit{listof}(\textit{gap}) \\ \text{DEPS} & \boxed{1} \\ \text{ARG-ST} & \boxed{1} \end{bmatrix}$

II $\begin{bmatrix} \text{HEAD} & \textit{prep} \end{bmatrix} \rightarrow \begin{bmatrix} \text{COMPS} & \textit{listof}([\text{CONT } \textit{prep-obj}\ ]) \\ \text{SLASH} & \textit{setof}([\text{CONT } \textit{R-pro}\ ]) \end{bmatrix}$

The first implication defines the mapping between ARG-ST, DEPS, and valence. It is a simplified version of the realization constraints defined for verbs. Prepositions do not take a subject, nor do they take adjuncts. Thus, argument structure can be assumed to be identical to DEPS, and COMPS contains all arguments, except those which are of type *gap*.

The second implication restricts the COMPS-list of prepositions to NP's of sort *prep-obj*, and thus prevents R-pronouns and impersonal pronouns to be selected as complements of a preposition.[4] Also, it restricts the elements on SLASH to R-pronouns, thereby restricting extraction out of prepositional phrases to R-pronouns only. Note that the value of SLASH follows from SLASH-amalgamation: if the argument of a preposition is realized as a *gap-synsem*, the SLASH-value of the gap is amalgamated into the SLASH-value of the preposition. The constraints above, together with the lexical entries given in (58) and (59), imply that these entries can be expanded as follows:

[4]Bennis notes some counterexamples *van hier naar daar, zonder dat(?)*.

(61)
$$\begin{bmatrix} \textsc{phon} & \textit{met} \\ \textsc{comps} & \langle \boxed{1} \rangle \\ \textsc{deps} & \langle \boxed{1} \rangle \\ \textsc{arg-st} & \left\langle \boxed{1} \begin{bmatrix} \textsc{head} & \textit{noun}[\textit{acc}] \\ \textsc{cont} & \textit{prep-obj} \end{bmatrix} \right\rangle \\ \textsc{slash} & \{\ \} \end{bmatrix}$$

(62)
$$\begin{bmatrix} \textsc{phon} & \textit{mee} \\ \textsc{comps} & \langle\ \rangle \\ \textsc{deps} & \langle \boxed{1} \rangle \\ \textsc{arg-st} & \left\langle \boxed{1} \begin{bmatrix} \textit{gap} & \\ \textsc{loc} & \begin{bmatrix} \textsc{head} & \textit{noun}[\textit{acc}] \\ \textsc{cont} & \textit{R-pro} \end{bmatrix} \\ \textsc{slash} & \{\boxed{2}\} \end{bmatrix} \right\rangle \\ \textsc{slash} & \{\boxed{2}\} \end{bmatrix}$$

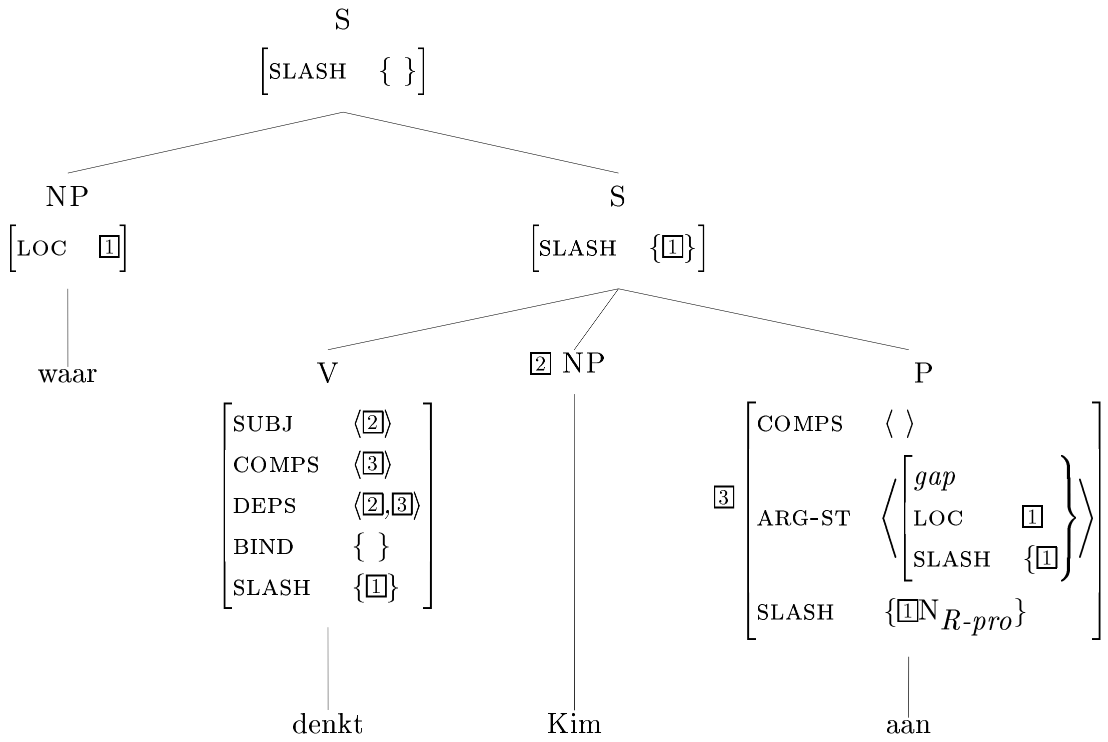
The lexical entry for *aan* can be expanded into a feature structure similar to (61) or to (62).

Prepositional Argument Realization thus accounts for the following facts:

(63)
a. Kim denkt aan de voorstelling.
b. * Kim denkt aan het
c. Waar denkt Kim aan?
d. * Wie denkt KIm aan?
e. Kim snijdt het vlees met een mes.
f. * Kim snijdt het vlees mee een mes.
g. Waar snijdt Kim het vlees mee?

The derivation of (63c) is given below.

(64)



Note that in Dutch is a verb-second language, and thus, in WH-questions, the subject follows the main verb. This is accounted for in the example above by assuming the existence of a HEAD-SUBJ-COMPS schema, which allows a head to combine with its subject and complements in a single step. While more sophisticated treatments of verb-second are possible (e.g. Pollard (1996) and Frank (1994)), we refrain from introducing those here, as the proper treatment of verb-second has, as far as we know, no connections to the issue at hand.

As our treatment of extraction of R-pronouns from PP's is formulated as an ordinary instance of a long-distance dependency, it straightforwardly accounts for instances of long-distance extraction and relative clause formation.

(65) Waar denkt Kim dat Karel zijn boeken vandaan haalt?

(66) de oplossing waar Kim niet aan gedacht had

5.3 Locative R-pronouns

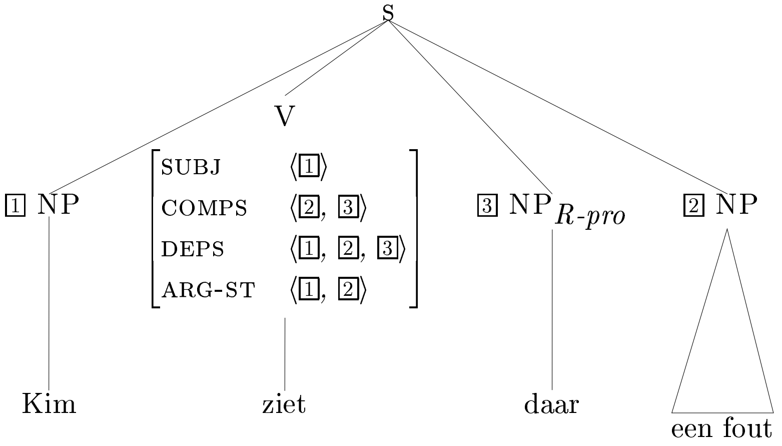
It seems reasonable to assume that locative R-pronouns are adverbs in the relevant sense, and thus can be introduced on DEPS by means of the argument realization principle in (44). Thus, given a transitive verb such as *zien*, which has an argument structure with two elements, an enriched feature structure can be derived with three elements on DEPS, including an (adverbially used) R-pronoun:

(67) $$\begin{bmatrix} \text{PHON} & \textit{zien} \\ \text{SUBJ} & \langle \boxed{1} \rangle \\ \text{COMPS} & \langle \boxed{2}, \boxed{3} \rangle \\ \text{DEPS} & \langle \boxed{1}, \boxed{2}, \boxed{3}\text{NP}_{\textit{R-pro}} \rangle \\ \text{ARG-ST} & \langle \boxed{1}\text{NP}[\textit{nom}], \boxed{2}\text{NP}[\textit{acc}] \rangle \end{bmatrix}$$

This allows examples such as (68) to be derived as in (69).

(68) Kim ziet daar een fout.
Kim sees there a mistake

(69)



We assume that verb-second arises in this case as a consequence of a SUBJ-HEAD-COMPS schema (minimally different from the HEAD-SUBJ-COMPS schema mentioned above), which orders the subject before the main verb.

One of the advantages of treating adjuncts as complements is the fact that, in combination with the lexicalist account of extraction developed in Bouma, Malouf, and Sag (1998), it predicts that adjuncts can be extracted. This is valid for all locative uses of R-pronouns, with the exception of *er*:

(70) a. Waar zag Kim nog een fout?
where saw Kim still a mistake

b. Hier volgt het verhaal over de Homerische hymne
Here follows the story about the Homeric hymn

c. de enige plaats waar Kim nog een fout zag
the only place where Kim still a mistake saw

d. Waar dacht Kim dat Karel zijn boeken gekocht had?
where thought Kim that Karel his books bought had

e. * Er zag Kim nog een fout.
there saw Kim still a mistake

As we will show below, the exceptional behaviour of locative *er* follows from the fact that it is a *minor* sign.

5.4 Prepositional R-pronouns in the Middle Field

In the previous section we have presented an account of locative R-pronouns which treats such pronouns as adverbially used NP's, Such verbal modifiers in general are introduced lexically as members of the extended argument structure of the verb, i.e. DEPS, and thus may be realized as complements. Our account of prepositional R-pronouns in the Middle field builds on this. R-pronouns can be present in the Middle Field because they can be used adverbially, and thus can be selected as complements. Below, we introduce a constraint which allows a verbal head to bind an R-pronoun on SLASH of one of its complements, if an R-pronoun is present on COMPS. This establishes a dependency between an R-pronoun realized as complement of the verb, and a SLASH*ed* PP.

Remember that BIND is the feature used in extraction constructions which allows a head to *bind* an element on SLASH of one of its dependents. Thus, if a lexical item has a non-empty BIND value, it can select a complement with a non-empty SLASH-set, without amalgamating the element(s) in SLASH of its complement in its own SLASH-set. This feature is used to account for *easy*-constructions such as:

(71) Kim is easy to please.

Here, it is assumed that *easy* selects for a slashed VP-complement, but also has a non-empty value for BIND (?? - check). As a consequence, the AP as a whole is not slashed.

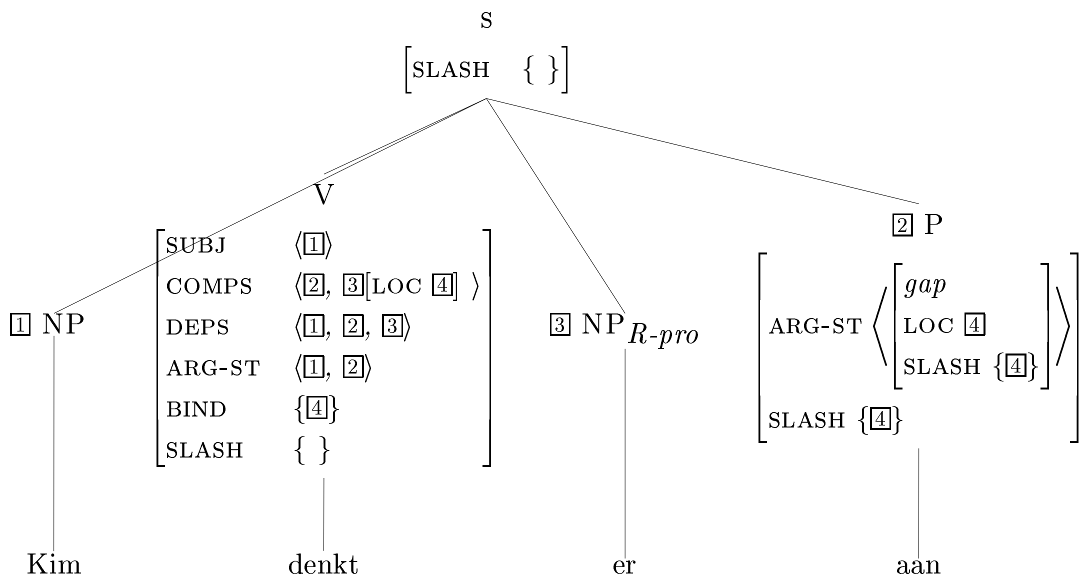
The fact that R-pronouns in the Middle Field can be interpreted as arguments of a slashed preposition is a consequence of the following implication:

(72) **The Bind R-Pronoun Principle**:

$$\begin{bmatrix}\textsc{head} & \textit{verb}\end{bmatrix} \Rightarrow \begin{bmatrix}\textsc{deps} & \left\langle \ldots, \begin{bmatrix}\textit{canon} & \\ \textsc{loc} & \boxed{1}\begin{bmatrix}\textsc{cont} & \textit{R-pro}\end{bmatrix}\end{bmatrix}, \ldots \right\rangle \\ \textsc{bind} & \{\boxed{1}\}\end{bmatrix} \vee \begin{bmatrix}\textsc{bind} & \{\ \}\end{bmatrix}$$

The first disjunct says that if a verb has an R-pronoun on its DEPS-list (which is not a gap itself), it binds any R-pronouns on SLASH of its dependents.[5] It accounts for examples such as (73) below.

(73)



[5] **CHECK** To account for English *easy*-constructions, it is usually assumed that SLASH-amalgamation is defined as the non-vacuous set-difference between the SLASH-values of the dependents and BIND. This means that if BIND is non-empty, there has to be a corresponding element on SLASH of one of the dependents which is removed in the resulting set. In the present context, a definition of SLASH-amalgamation using ordinary set-difference is required, as the presence of an R-pronoun on DEPS should not enforce the presence of a SLASH-ed element elsewhere on DEPS. The usual interpretation of set-difference allows this (i.e. $\{a, b\} - \{c\} = \{a, b\}$).

The second disjunct sets the BIND-value of a verb to the empty set. Note that in all cases where DEPS contains no R-pronoun, only the second disjunct applies, and thus examples such as (74a) are correctly ruled out.

(74) * Kim denkt aan.

Note also that fronting of R-pronouns is still possible. That is, in examples such as (74b) no R-pronoun is present on the DEPS-list of the verb *denkt*, hence the element on SLASH of the preposition is amalgamated into the sign for the phrase *denkt Kim aan*, which in turn can combine with *waar* to form a FILLER-HEAD phrase.

(75) Waar denkt Kim aan.

One advantage of dealing with prepositional R-pronouns in the Middle Field by means of SLASH is that it immediately accounts for examples such as (76), where the PP is part of a predicatively used adjective or NP:

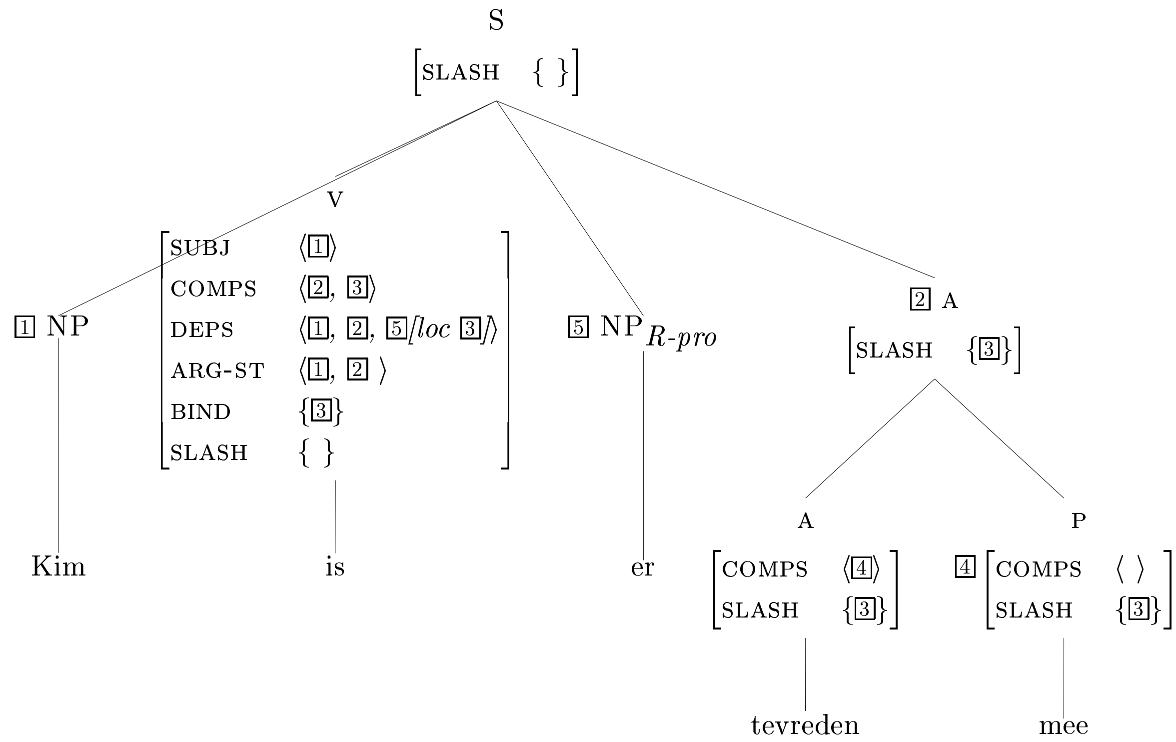
(76) a. Kim is **er** tevreden **mee**.
Kim is there happy with

b. Maar ik heb **er** wat moeite **mee**.
But I have there some difficulty with

c. Hij was **er** toch wel een beetje trots **op**.
He was there still a little bit proud of

Since the R-pronoun on SLASH of the preposition can be bound by a verb, and not by an adjective or noun, the SLASH-value of the preposition is amalgamated into the SLASH-value of the larger phrase, where it can get get bound by the verb:

(77)



It is worthwhile to compare this analysis with analyses in HPSG of clitic-climbing in the Romance languages such as Miller and Sag (1997) and Monachesi (1995). Although we see no reason to treat R-pronouns as pronominal affixes, there is nevertheless a similarity between the two phenomena in that R-pronouns apparently can be dependents of a higher predicate eventhough they are arguments of a lower predicate.

Both Miller and Sag (1997) and Monachesi (1995) take the position that clitic-climbing is a consequence of argument-inheritance, i.e. the mechanism which allows arguments of an embedded predicate to be inherited by a higher predicate. Once arguments are 'visible' to the higher predicate in this way, they can be realized as clitics by means of the same mechanism responsible for realizing 'ordinary' arguments as clitics. On the other hand, some instances of clitic-climbing (such as the account of *en*-clitization in Miller and Sag (1997)) have been accounted for by assuming a slashed dependent and a higher predicate which binds the element on SLASH of the dependent by realizing it as a clitic. In particular, Miller and Sag (1997) argue that *en*-clitization is subject to the same constraints as extraction of *de*-phrases from subjects and objects, and thus is best analyzed in terms of SLASH.

We have adopted an account which does not involve argument inheritance, but is formulated solely in terms of SLASH and BIND. Although argument inheritance plays an important role in the syntax of Dutch verb clusters (van Noord and Bouma, 1997; Bouma and van Noord, 1997), an approach based on argument inheritance seems highly unlikely for Dutch R-pronouns. First of all, prepositions which do not allow extraction (such as *sinds*) cannot be associated with an R-pronoun in the Middle field either and prepositions which exhibit a form alternation (i.e. *met/mee, tot/toe*), appear in the same form whether the argument is extracted or realized in the Middle Field. If two different mechanisms are used to account for these two phenomena, such generalizations are easily lost. Second, as argument inheritance normally involves the composition of two COMPS-lists, R-pronouns would have to be allowed on COMPS, eventhough they can never be appear in a position following the preposition. Third, all verbs must potentially be able to inherit an argument (the R-pronoun) from their prepositional complements and adjuncts, and thus all verbs would have to be defined as argument inheritors. In all other cases where argument inheritance has been proposed, it has always been resticted to a small set of well-defined verbs (usually including the auxiliaries and modals). Examples such as (76) introduce further complications for an argument inheritance approach, as it suggests that predicative adjectives and nouns must be argument inheritors as well. Finally, we will demonstrate below that amalgamation of syntactic functions of *er* follows naturally in our account, as a consequence of the fact that R-pronouns are adjuncts which are introduced independently of the question whether there is a preposition with a non-empty SLASH-value. In an argument inheritance approach, the relationship between valence and syntactically realized arguments has to be one-on-one, and thus there is no room for amalgamation of syntactic functions.

Another remarkable aspect of the account proposed above is that it does not involve the introduction of novel lexical rules, but instead is based largely on the (constraint-based) treatment of adjuncts as complements, and on the fact that lexical heads may bind an element in SLASH. The only novel aspect of our analysis is the fact that we assume that the BIND value of verbs depends on their COMPS list. We suspect that something along these lines is the minimum that needs to be stipulated to account for the facts.

The absence of lexical rules in particular, sets the present account apart from analyses for somewhat similar phenomena. Miller and Sag, for instance, argue that *en*-clitization requires a subject or object whose *de*-complement is extracted.

(78) a. le livre dont Marie lit le fin
the book of-which Mary is reading the end

b. Marie **en**-lira **la fin**

The extracted element appears on SLASH of the subject, and may surface on the ARG-ST of the governing verb as a consequence of the following lexical rule:

(79) *En*-**clitization Lexical Rule**:

$$\begin{bmatrix} \textit{lexeme} & \\ \text{HEAD} & \textit{verb} \\ \text{BIND} & \{\ \} \\ \text{ARG-ST} & \boxed{1} \oplus \langle \boxed{2}\text{NP} \rangle \oplus \boxed{3} \end{bmatrix} \mapsto \begin{bmatrix} \text{BIND} & \{\boxed{0}\} \\ \text{ARG-ST} & \boxed{1} \oplus \left\langle \boxed{2}\begin{bmatrix} \textit{canon} & \\ \text{SLASH} & \{\boxed{0}\}\end{bmatrix}\right\rangle \oplus \boxed{3} \oplus \left\langle \begin{bmatrix} \textit{p-aff} & \\ \text{LOC} & \boxed{0}\end{bmatrix}\right\rangle \end{bmatrix}$$

Note that in this case a lexical rule is used to account for the change in ARG-ST as well as a change in the value of BIND. Since R-pronouns can be used adverbially, and verbal adjuncts are introduced on DEPS as a consequence of a general constraint, we were able to provide a monotonic, constraint-based,account.

5.5 Er as a minor category

Model (1991) argues that the R-pronoun *er* is a clitic, which appears in a fixed position within the phrase, the so-called Wackernagel-position. This is the position immediately following the subject. In main clauses, *er* will often appear in the position immediately following the finite verb, which is explained by assuming that in normal declarative sentences the subject has been moved to sentence-initial position.

Van Eynde (to appear) provides an alternative account for the distribution of *er*. Van Eynde proposes a distinction between *major* and *minor* words. Major words can be heads of a phrase, can act as a filler in extraction contexts, can be the conjunct of a coordination, and can be the sole element of an elliptic phrase. Minor words lack all these properties. Although the discussion in van Eynde (to appear) concentrates mainly on personal pronouns, he also considers the distinction between *daar* and *er*, and concludes that, according to the criteria mentioned above, *daar* is a major and *er* a minor category word. The relevant examples are given below.

(80) We zijn precies daar/*er waar de Greenwich lijn de evenaar kruist.
we are precisely there where the Greenwich line the equator crosses
We are exactly there where the Greenwich line crosses the equator.

(81) Daar/*Er had ze niet aan gedacht.
there had she not of thought
Of that she had not thought.

(82) Wil je liever hier of daar/*er zitten ?
want you rather here or there sit
Would you rather sit here or there?

(83) Ik zit liever hier dan daar/*er.
I sit rather here than there
I'd rather sit here than there.

The first example demonstrates that whereas *daar* can be modified by a relative clause, *er* cannot.[6] As noted before, *er* cannot occur in topicalized position, i.e. as a filler.[7] The last two examples demonstrate that *er* cannot be coordinated or as the sole element in an elliptical construction.

The distinction between *major* and *minor* words is implemented by introducing subsorts for the sort *category*. Note that this implies that the distinction is independent of the part of speech distinction, which is expressed by subsorts of the sort *head*. Consequently, there can be major and minor nouns. It is assumed that all head-daughters in headed phrases are major. This accounts for the fact that minor signs do not take any dependents. It is also assumed that all phrases are major. In combination with the COORDINATION PRINCIPLE of Pollard and Sag (1994) (which requires the CAT values of the conjuncts to be subsumed by the mother), this accounts for the fact that coordinated phrases must have major daughters. No account is given for the fact that minor signs cannot be topicalized, but it seems reasonable to assume that this can be implemented by adding the constraint that fillers must be major to the *filler-head* schema.

Assuming that *er* is a minor category, we may now ask how the specific constraints on the order of *er* within the Middle Field may be accounted for. It is beyond the scope of the present paper to investigate the distribution of all elements classified as clitics in Model (1991) from an HPSG perspective. However, it seems a linear precedence constraint which orders minor (non-head) phrases before major phrases accounts for many of the facts noted in Model (1991).

For instance, Model observes that while normally a direct object NP must follow an indirect object NP, the order is reversed if the object is a clitic:

(84) Jan heeft Marie het boek toegezonden

(85) * Jan heeft het boek Marie toegezonden

(86) Jan heeft 't Marie toegezonden

(87) * Jan heeft Marie 't toegezonden

In van Eynde's classification, *'t* (an unstressed form of *het*, *it*) is minor. This suggests that the following LP-constraint is correct:

(88) NON-HD-DTR[CASE *nom*] < NON-HD-DTR[CAT *minor*] < NON-HD-DTR[CAT *major*]

The constraint not only accounts for the fact that *er* occurs in a position immediately following the subject, but also can be applied to other minor categories in Van Eynde's system. The Interestingly, this also accounts immediately for the fact that *er* tends to occur in the so-called Wackernagel-position.

(not if subjects are also sisters of comps...)

The LP-constraint in (88) bears an interesting similarity to the account of French word order presented in AbeilleGodard99.

[6] The behaviour of quantative *er* is different. It can take a relative clause as in:
(i) Er zijn er die zich overgeven aan drugsgebruik
There are those who start to use drugs

[7] Given the fact that expletive *er*, which is a subject, can freely occur in sentence-initial positions, in main and subordinate clauses, we are tempted to conclude that the mainstream analysis of Dutch verb-second, which assumes that all verb-second clauses involve an initial element which is a filler, cannot be correct.

5.6 Expletive Er

The pronoun *er* which may appear in existential sentences, and in impersonal passives is usually considered to be an *expletive*:

(89) Er liep niemand op straat.

(90) Er wordt gevoetbald.

Note that the the fact that expletive *er* can occur sentence-initially sets it apart from the locative and prepositional *er*.

It has been observed (see Bennis (1986, p. 212 ff.) for instance) that expletive *er* can in general be replaced by a locative phrase:

(91) In Amsterdam liep niemand op straat.

(92) In onze straat wordt gevoetbald.

Within transformational grammar (see Bennis, p 217) is has been assumed that expletive *er* fills the (non-thematic) subject position, which has become available after the indefinite subject has been moved to some VP-internal position, or has disappeared as a consequence of impersonal passive. Bennis (1986) proposes a pragmatic account of expletive *er*.

Below, we will also assume that *er*, or, more in general, a locative phrase, may fill the subject position of certain verbs. Following the approach Manning and Sag (1998), the proposal will be formulated as an alternative option for realizing the mapping between DEPS and valence.

(93) Argument Realization:

$$verb \rightarrow \begin{bmatrix} \textit{non-pass-vb} & \\ \text{DEPS} & \boxed{1} \oplus \textit{listof}(\textit{`adverbial'}) \\ \text{ARG-ST} & \boxed{1} \end{bmatrix} \vee \begin{bmatrix} \textit{pass-vb} & \\ \text{DEPS} & \boxed{2} \oplus \textit{listof}(\textit{`adverbial'}) \\ \text{ARG-ST} & \langle \boxed{1} \rangle \oplus \boxed{2} \end{bmatrix}$$

(94) Dependent Realization:

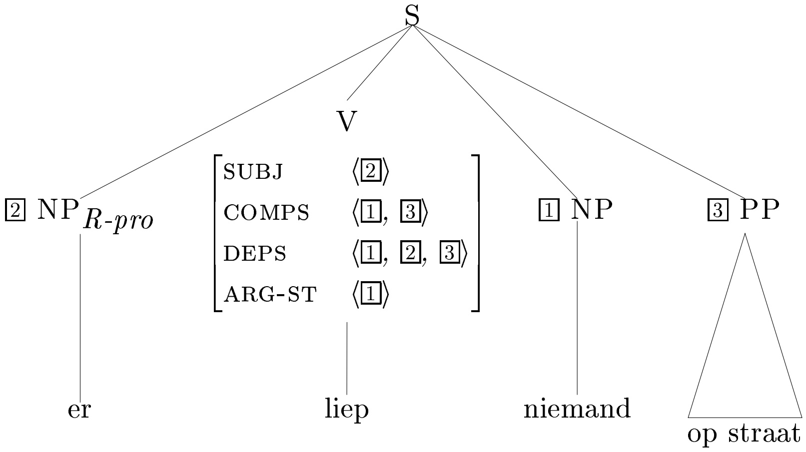
$$verb \rightarrow \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \boxed{2} - \textit{listof}(\textit{gap-ss}) \\ \text{DEPS} & \boxed{1} \oplus \boxed{2} \end{bmatrix} \vee \begin{bmatrix} \textit{imp-pass-vb} \vee \textit{indef-subj-vb} & \\ \text{SUBJ} & \langle \boxed{1} \textit{'locative'} \rangle \\ \text{COMPS} & \boxed{2} - \textit{listof}(\textit{gap-ss}) \\ \text{DEPS} & \boxed{2} \bigcirc \langle \boxed{1} \rangle \end{bmatrix}$$

Argument Realization now distinguishes between non-passive and passive uses of a verb. The second disjunct of the consequent is a simple proposal for passive, which leaves the ARG-ST subject unrealized on DEPS, compatible with the architecture introduced so far. It is loosely based on Manning and Sag (1998) in that it recognizes the need to make available both the 'underlying' and actual ordering of arguments within one lexeme. However, here it is assumed that the relevant mapping is not so much a matter of relating a SOURCE and RESULT argument structure (as it is in Manning and Sag (1998)), but that passive can be formulated as a particular mapping between ARG-ST and DEPS. Note that we do not attempt to characterize which verbs can be realized as passive verbs or which morphological consequences are associated with passive.

The second mapping principle defines an alternative mapping between DEPS and valence. Whereas in the canonical case, the first element of DEPS is realized as the subject, the second disjunct allows a locative dependent (usually this will be an adjunct) to be realized in subject position if the lexeme qualifies as an impersonal passive or as having an indefinite subject (where subject is to be understood as the first element on ARG-ST or DEPS, not the locative filling SUBJ). Note that the two disjuncts in this implication are not mutually exclusive, so that promotion of a locative dependent to subject is optional for both impersonal passives and verbs with an indefinite subject. Of course, other factors might conspire to create a situation where only a locative can fill the subject position (say, when an impersonal passive has no other dependents which could fill the subject position).

The reformulated Argument and Dependent realization principles allow us to derive sentences such as the following:

(95)



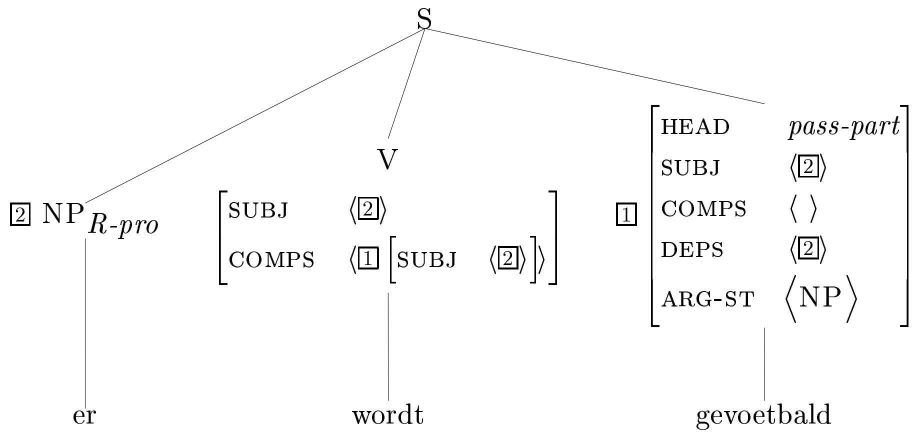
Note that *liep* is an intransitive verb with a single element on ARG-ST. Two adjuncts are added as dependent. The R-pronoun can be promoted to subject, as the 'underlying' subject of *liep* is indefinite.

Since the ARG-ST subject is realized on COMPS in this analysis, it also accounts for the fact that in existential sentences the a-subject may appear in positions non-adjacent to the finite verb:

(96) Er zit plots een man tegenover haar.
there sits suddenly a man opposite her

The example below illustrates impersonal passive:

(97)



The passive auxiliary is probably best treated as an argument inheritance verb (Bouma and van Noord, 1997). Here it suffices to observe that the auxiliary selects for a passive verb, and that it is a subject-raising verb, i.e. syntax and semantics is shared between the subject of the auxiliary and of the embedded passive participle. The participle itself has has an ARG-ST which is not realized on DEPS, and consequently, the R-pronoun on DEPS is promoted to subject.

Note that in existential as well as impersonal passive constructions, it is assumed that the expletive or locative phrase fills the SUBJ-slot. This implies, for instance, that examples involving raising verbs such as *schijnen (seem)* and *blijken (appear)* are unproblematic:

(98) Er scheen plots een man tegenover haar te zitten.

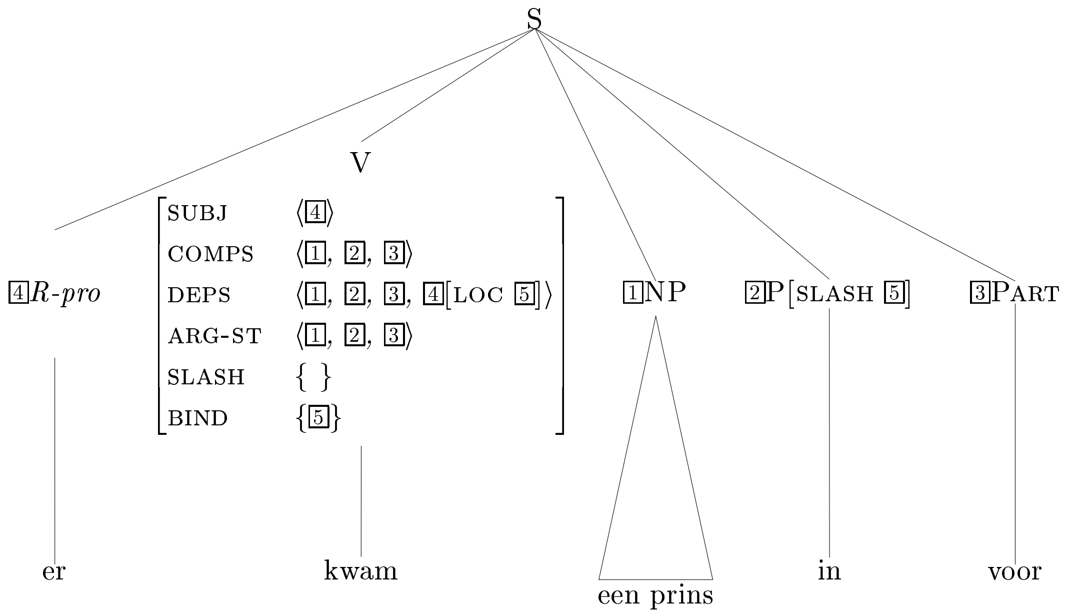
(99) In de tuin blijkt te worden gedanst.

5.7 A solution for Bech's Problem

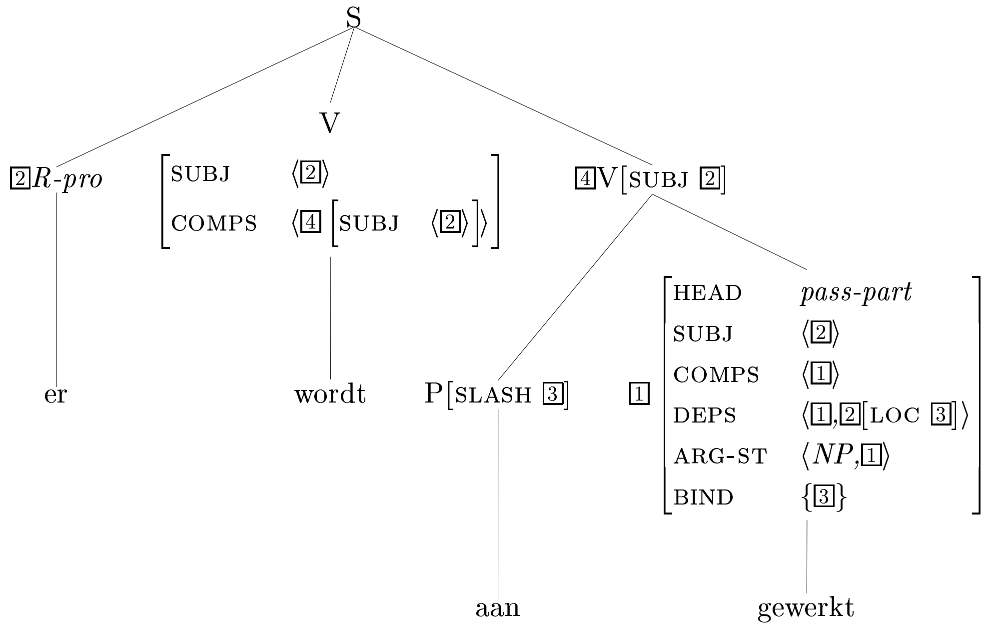
The potential amalgamation of the prepositional syntactic function of R-pronouns with other functions follows from the analysis introduced above.

The account of prepositional R-pronouns in the Middle Field does rely on the fact that R-pronouns can be freely added to the argument structure of a verb. Therefore, there is no requirement of a one-to-one correspondence between slashed preposition and R-pronoun, as would be the case if we had analysed R-pronouns in the Middle Field as instances of a regular filler-gap dependency or in terms of argument inheritance. Consequently, it is possible for an R-pronoun to bind an element on SLASH of the verb, and at the same time to act as subject in an existential or impersonal passive. This situation is illustrated in the examples below.

(100)



(101)



5.8 Multiple R-pronouns

As we have adopted an analysis in which R-pronouns are treated uniformly as adverbial pronouns, and have refrained from introducing special phrase structure positions, we predict that the presence of multiple R-pronouns is possible. This is generally true if distinct R-pronouns are used. An example is given in (102).

(102) **Waar**$_{\text{LOC/P}}$ wordt **hier**$_{\text{LOC/P}}$ aan gewerkt?
where is here on worked

What is being worked on here?

Where is this being worked on?

This example is ambiguous between a reading where the initial R-pronoun is interpreted locative, and the R-pronoun *hier* as the argument of the preposition, and a reading where this is *vice versa*. This is as predicted by our analysis. The element *waar* can be the filler for a gap introduced by the preposition, and the element *hier* can be introduced as a locative adverb. Note in particular that the Bind R-Pronoun Principle does not block this reading, as it optionally allows an R-pronoun on DEPS to bind an R-pronoun on SLASH, but does not force this to be the case. The reverse reading can also be obtained. In this case, two R-pronouns are introduced on DEPS of the verb, one of which (*hier*) binds the gap introduced by the preposition, and one of which (*waar*) is extracted.

Multiple occurrences of (non-quantitative) *er* are in general not allowed, however:

(103) * Er wordt er hard aan gewerkt.
There is there hard on worked.
There, one works hard on it.

A simple account for this is:

(104)
$$\neg \left[\text{DEPS} \quad \langle \ldots, \begin{bmatrix} \text{CAT} & \textit{minor} \\ \text{CONT} & \textit{R-pro} \end{bmatrix}, \ldots, \begin{bmatrix} \text{CAT} & \textit{minor} \\ \text{CONT} & \textit{R-pro} \end{bmatrix}, \ldots \rangle \right]$$

It is not clear to us whether this constraint should be derived from a more general principle. For one thing, multiple occurrences of identical R-pronouns tends to lead to poor results for other R-pronouns as well:

(105) a. *? Hier wordt hier hard aan gewerkt.
Here is here hard on worked.

b. *? Daar wordt daar hard aan gewerkt.
There is there hard on worked.

c. *? Overal wordt overal hard aan gewerkt.
everywhere is everywhere hard on worked.

Finally, it seems certain combinations of R-pronouns lead to poor results:

(106) a. *? Hier wordt daar hard aan gewerkt.
Here is here hard on worked.

b. Hier wordt nergens hard aan gewerkt.
Here is nowhere hard on worked.
Here, one doesn't work hard on anything.
One does not work on this anywhere.

Note also that the same pattern of grammaticality can be obtained if a sentence contains two locative R-pronouns:

(107) a. *? Daar staan hier bordjes.
There are here signs.

b. Daar staan nergens bordjes.
There are nowhere signs.
There, there are no signs.

The ungrammaticality of the examples in (105) and the pattern in (106) suggests that an account which recognizes that all R-pronouns are basically locative adverbs and thus introduce certain semantic constraints is worth pursuing. In particular, a semantically oriented account seems the only way to explain the ungrammaticality of *hier/daar*-combinations.

While the constraint above does not seem particularly well motivated, it should probably be noted that the fact that our account assumes a single level of representation (DEPS) where all dependents of a verb are present, does make the formulation of constraints such as (104), which generalizes over complements, subjects, and adjuncts, relatively straightforward.

5.9 A constraint on interpretations

While the presence of multiple R-pronouns leads to ambiguity in some cases, combinations of *er* with another R-pronoun only rarely lead to ambiguity. Thus, van Riemsdijk (1978) observes that the following example has only one reading:

(108) Waar$_{\mathrm{LOC}}$ wordt er$_{\mathrm{P}}$ hard aan gewerkt?

Here, the initial R-pronoun has to be interpreted locatively, while *er* has to be interpreted as the argument of the preposition. The pattern can be repeated with other R-pronouns, and in examples not involving fronting:

(109) Hier$_{\mathrm{LOC}}$ wordt er$_{\mathrm{P}}$ hard aan gewerkt

(110) Kim heeft er$_{\mathrm{P}}$ hier$_{\mathrm{LOC}}$ hard aan gewerkt.

However, in the example below, it seems an ambiguity exists:

(111) Wordt er$_{\mathrm{EXPL+P/EXPL}}$ hier$_{\mathrm{LOC/P}}$ hard aan gewerkt?

Van Riemsdijk accounts for the missing reading in (108) in terms of adjacency: if the fronted element was moved from a position within the PP to its sentence-initial surface position, this would require passing through the R-position (to prevent violation of subjacency). As this position is filled, this cannot be the case. If *waar* is a locative adverb, however, it's d-structure position is such that movement to a sentence-initial surface position is possible without having to pass through the R-position.

One way to obtain a similar effect within the present framework is to formulate two additional constraints on valence-lists containing *er*:

(112) $$\begin{bmatrix}\textsc{subj} & \left\langle\begin{bmatrix}\textsc{cat} & \textit{minor}\\ \textsc{cont} & \textit{R-pro}\end{bmatrix}\right\rangle\end{bmatrix} \Rightarrow \begin{bmatrix}\textsc{slash} & \textit{listof(non-R-pro)}\end{bmatrix}$$

(113) $$\begin{bmatrix}\textsc{comps} & \left\langle \ldots, \begin{bmatrix}\textsc{loc} & \begin{bmatrix}\textsc{cat} & \textit{minor}\\ \textsc{cont} & \textit{R-pro}\end{bmatrix}\end{bmatrix}, \ldots\right\rangle\end{bmatrix} \Rightarrow \begin{bmatrix}\textsc{comps} & \left\langle \ldots, \begin{bmatrix}\textsc{loc} & \boxed{1}\begin{bmatrix}\textsc{cat} & \textit{minor}\\ \textsc{cont} & \textit{R-pro}\end{bmatrix}\end{bmatrix}, \ldots\right\rangle\\ \textsc{bind} & \{\boxed{1}\}\end{bmatrix}$$

If *er* is present, it is present either on COMPS or SUBJ. The constraints on interpretation are slightly different in both cases. If *er* is present on COMPS, it has to act as a binder for any R-pronouns on SLASH introduced by a preposition (110). If *er* is a subject, however, an ambiguity may result (111). The ambiguity only disappears if the second R-pronoun is fronted. In those cases, it is not possible to interpret the fronted R-pronoun as prepositional. This is accounted for by the first constraint. It blocks WH and fronting filler-gap dependencies if *er* is the subject. However, it does not impose the constraint that *er* itself acts as binder for slashed prepositions. Thus, the ambiguity in (111) is still accounted for.

5.10 A refinement of the R-Bind Principle

Second, Although the previous example provides some evidence for the fact that R-pronouns in the Middle Field not always correspond with a SLASH*ed* PP as sister, it is also not the case that movement of R-pronouns into a Middle Field position is truly long-distance. Consider for instance the following data:

(114) a. * Jan dacht **er** dat iedereen tevreden **mee** was.
b. **Waar** dacht Jan dat iedereen tevreden **mee** was?

Example (114a) shows that an R-pronoun in a higher clause cannot be associated with a slashed preposition in a lower clause. However, extraction of an R-pronoun out of an embedded clause is not in generally prohibited, as (114b) shows. It is difficult to see what the best account for this fact is. One possibility would be to restrict the Bind-R Principle in such as way that a non-empty value ofr BIND would only be allowed if there is a dependent of category P, A, or NP (but not S), whose SLASH-value is unifiable with that of BIND. Another possibility would be to restrict the SLASH-value of embedded clauses. For instance, one might assign a [+TOPIC] value to all elements in SLASH of an embedded clause (and ensure that R-pronouns in the Middel field as [-TOPIC], thus restricting long-distance extraction to those dependencies which involve a filler-head structure. Another way to implement this latter idea would be to require that all elements on SLASH of an embedded clause are *major*, and to require that the BIND feature on a verb always is of sort *minor*. (One would have to ensure that the sharing between the R-pronoun on DEPS and the element on BIND does not include all of LOC in this case.) The advantage of the latter solution is that it does not involve the introduction of new features.

(115) **The (Revised) Bind-R Principle**:

$$\begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \Rightarrow \begin{bmatrix}\text{BIND} & \{\ \}\end{bmatrix} \vee \begin{bmatrix}\text{DEPS} & \langle \ldots, \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CONT} & \boxed{1}\ \textit{R-pro}\end{bmatrix}\end{bmatrix}, \ldots \rangle \\ \text{BIND} & \left\{ \begin{bmatrix}\text{CAT} & \textit{minor} \\ \text{CONT} & \boxed{1}\end{bmatrix} \right\}\end{bmatrix}$$

(116) $$\begin{bmatrix}\text{ARG-ST} & \boxed{1} \bigcirc \langle\ \text{S}[\textit{fin}]\ \rangle\end{bmatrix} \Rightarrow \begin{bmatrix}\text{ARG-ST} & \boxed{1}\ \textit{bigcirc}\ \langle \begin{bmatrix}\text{SLASH} & \textit{listof(major)}\end{bmatrix} \rangle\end{bmatrix}$$

6 Conclusions

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