Chapter 6

Cross-Serial Dependencies in Dutch

"Bluebirds and thrushes work beautifully together," said Bravura.
Raymond Smullyan, *To Mock a Mockingbird*

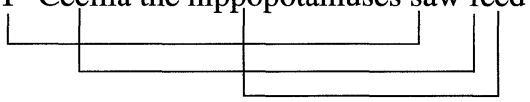
To see how the theory sketched in part I generalizes to other languages and other linguistic phenomena, it is interesting to begin with Dutch.[1] Although Dutch and German are predominantly SOV or verb-final languages, they are very close relatives of English in historical terms. A good theory of English should therefore be convertible into a theory of either language with minimal changes. Ideally, one would hope that little more would be necessary than a change in the directional specifications in the lexicon, at least for those constructions where the lexical heads are most closely related semantically.

This observation presents a challenge for any theory of grammar, since Dutch and German differ dramatically from English in word order and the constraints upon the long-distance dependencies that are involved in relative clauses, coordinate constructions, and infinitival complementation in raising and control constructions. In particular, as we saw for example (20) in chapter 2, Dutch is notable for allowing cross-serial dependencies in certain "verb-raising" sentences that translate directly into English and German sentences in which the dependencies entirely nest.

Intersecting or cross-serial dependencies arise when the elements of a discontinuous constituent (such as a relative-pronoun and the verb that governs it in a relative clause) are intercalated in the surface string with elements of another discontinuous constituent.

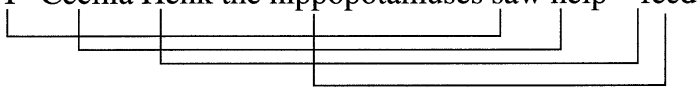
The Dutch construction is illustrated by the following subordinate clauses:

(1) ... omdat ik Cecilia de nijlpaarden zag voeren.
... because I Cecilia the hippopotamuses saw feed



'... because I saw Cecilia feed the hippopotamuses.'

(2) ... omdat ik Cecilia Henk de nijlpaarden zag helpen voeren.
... because I Cecilia Henk the hippopotamuses saw help feed



'... because I saw Cecilia help Henk feed the hippopotamuses.'

The connecting lines indicate the dependencies between NPs and verbs that are generally assumed to be represented in the semantics of these sentences, as reflected in Deep Structure or the equivalent. The construction—which is commonly used—will be examined in detail below, but it is worth noting that for these particular verbs, although some dialects allow some variation (Evers 1975; Zaenen 1979), the orders shown in (1) and (2) are preferred and in most cases obligatory. The phenomenon is therefore of intense interest, both because of its strength and because it arises in a language so closely related to English. This chapter shows how the theory originally proposed to account for extraction and coordination in English will also account for these crossed dependencies, for the somewhat greater freedom of order in the related infinitival "equi" construction, and for the extraction possibilities that these constructions allow. The related question of the coordinate structures that these constructions allow is mainly deferred until chapter 7.

Context-free grammars are known not to be adequate to capture crossed dependencies (Wall 1972). The phenomenon therefore provides an important case to consider in choosing among the various mildly context-sensitive extensions to context-free grammar that are on offer. Interestingly enough, crossed dependencies remain in a distinct minority, a fact that prompted Fodor (1978) to propose a performance-related Nested Dependency Constraint (NDC) on natural languages, and that others have taken to be evidence that natural language competence grammar is some rather minimal generalization of context-free grammar. Nevertheless, many (and perhaps all) natural languages undoubtedly do include constructions with intersecting dependencies.

The argument in this chapter will go as follows. Section 6.1 briefly reviews the basic facts of clause constituent order in Dutch and German with particular attention to the construction introduced above. Sections 6.2–6.6 then anatomize the subordinate-clause orders.

First, section 6.2 shows that the way in which the bare infinitival complement verbs in Dutch and German form a cluster in advance of combination with their arguments can be captured via (a) rules of functional composition of the kind already invoked for English and (b) a systematic difference in the

directionality of the lexical categories for these verbs. This section also shows that it is a prediction rather than a stipulation that the dependencies in Dutch can cross, whereas the corresponding dependencies in German generally nest. However this section leaves open the question of why the Dutch dependencies for these verbs *must* in general cross, and it leaves some overgeneralization still to be excluded. Section 6.3 then argues that this degree of freedom is in fact necessary to capture the freer word order of the closely related equi verbs like *proberen* 'to try,' so that it is reasonable to expect to capture the difference via minor featural differences between types, and to defer this question until further problems regarding the preverbal argument sequence have been dealt with in section 6.4.

Section 6.4 uses coordination and extraction data to elucidate the structure of the preverbal NP sequence, arguing that Dutch NPs are obligatorily type-raised by the same order-preserving rules as English. Possibilities for argument cluster coordination (identical to that in English apart from being on the left of the subordinate verb cluster rather than the right) arise from the involvement of a suitably restricted composition rule. Detailed consideration of further cases of coordination of contiguous fragments of the Dutch subordinate clause is deferred until chapter 7. The fact that arguments are type-raised finally provides the means to further limit the constituent orders allowed by bare infinitival complement verbs, while still permitting greater freedom for the equi verbs.

Section 6.5 then analyzes the relative clause in greater depth, using only the apparatus already invoked for English relative clauses to correctly limit extraction and exclude scrambling in Dutch. Section 6.6 shows that the lack of a subject-object extraction asymmetry in Dutch, as manifested in the equivalent of the English Fixed-Subject Condition or **that*-trace effect (Bresnan 1972; Chomsky and Lasnik 1977), is a prediction, as claimed in chapter 4.

Section 6.7 then shows that this apparatus generalizes to the main-clause orders, including topicalization to sentence-initial position. (The further question of coordination is again deferred to chapter 7). Section 6.8 looks at some ways in which Dutch and German word order limits quantifier ambiguities under the account sketched in chapter 4. The concluding section 6.9 briefly reviews the question of the conditions under which crossed dependencies can arise, and why they should be rarer than the nested variety. An appendix summarizes the assumptions and corresponding notations that are progressively introduced, for reference as the chapter proceeds.

6.1 Word Order in Dutch

As examples (1) and (2) suggest, the grammatical orders of constituents in the Dutch clause to some extent resemble those of German. In subordinate clauses all the verbs generally occur in a clause-final group, with arguments such as NPs and adverbials preceding the verb group in the sentence. In main clauses, although the same verb-final pattern generally holds, the tensed verb itself (which may of course be the only verb) must occur in first or second position in the sentence. (This constraint, which is somewhat confusingly called the "verb-second" or V2 constraint, is widespread among Germanic languages, although the English topicalized clause constitutes an exception.) Dutch differs from German in that the left-to-right order of the auxiliaries and other nonmain verbs in the clause-final verb group is predominantly the same as in English. Thus, the basic orders for a Dutch clause including a subject, a tensed modal, a main verb, and an NP complement are as follows:

(3) a. Hij moet appels eten. (Declarative)
He must apples eat
'He must eat apples.'
b. Moet hij appels eten? (Interrogative)
c. Appels moet hij eten! (Topicalization and Obj. Question)
d. (... dat) hij appels moet eten. (Subordinate Clause)
e. (appels) die hij moet eten (Obj. Relative)

German predominantly requires the verbs to be in the mirror-image order, with the tensed verb rightmost as in the following example, in contrast to (3d):

(4) (... daß) er Äpfel [essen muß].
(... that) he apples [eat must]
'(... that) he must eat apples.'

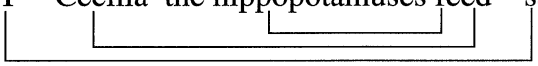
(There are many systematic exceptions to this generalization, some of which are discussed below.)

It is because of this combination of verb-finality with the English verb order that Dutch frequently exhibits crossed dependencies between verbs and the NPs that they govern in nested infinitival complements of certain verbs of perception and causation, like *zien*, 'to see' and *helpen*, 'to help' (see Seuren 1985; Evers 1975; Huybregts 1976, 1984; Zaenen 1979; de Haan 1979; Bresnan et al. 1982; Shieber 1985). In subordinate clauses the constructions introduced in (1) and (2) result. (Again, there are systematic exceptions to this generalization, some of which are discussed below.)

The following are in some sense the standard orders for the parallel German sentences.

(5) ... weil ich Cecilia die Nilpferde füttern sah.

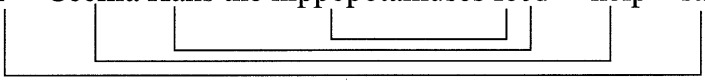
... because I Cecilia the hippopotamuses feed saw



'... because I saw Cecilia feed the hippopotamuses.'

(6) ... weil ich Cecilia Hans die Nilpferde füttern helfen sah.

... because I Cecilia Hans the hippopotamuses feed help saw



'... because I saw Cecilia help Hans feed the hippopotamuses.'

Evers (1975, 51), following Bech (1955), notes that in German sentences including multiple infinitives, there is a strong tendency for all but the two most deeply embedded verbs to occur in the Dutch tensed-first order. This propensity reinforces the observation first made by Evers and since confirmed experimentally by Bach, Brown and Marslen-Wilson (1986) that, far from being strained or unnatural, the dependency-crossing version of the construction is at least as natural in Dutch as the nested version is in German.[2]

Because the construction can embed, indefinitely many crossed dependencies are allowed in Dutch.[3] In most dialects the alternative in which the verb group is in the German order is actually disallowed (see Zaenen 1979, fn. 3), and in all dialects it appears to be uncommon, particularly when there are more than two verbs:

(7) a. ?... omdat ik Cecilia de nijlpaarden voeren zag.
b. *... omdat ik Cecilia Henk de nijlpaarden voeren helpen zag.

That this option can be excluded or dispreferred is remarkable, for it would restore the nested dependencies exhibited in the corresponding German constructions (5) and (6) between the verbs and their complements. In no dialect are sentences allowed that have any of the NP dependencies in the reversed, nesting order, except when these NPs are clitic pronouns, which are ignored here.[4]

The verbs that demand the construction are all verbs of perception and causation, plus a few that probably also belong under the causation heading, such as *helpen* 'to help' and *leren* 'to teach'. The rather similar verbs such as *besluiten* 'to decide', *schijnen* 'to seem', and *toelaten* 'to allow', which take

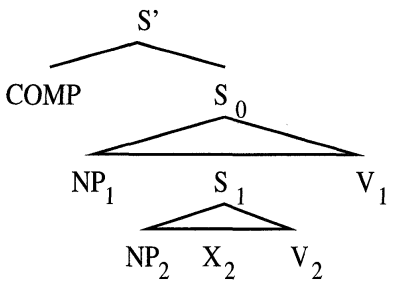


Figure 6.1
Generic underlying structure for Germanic verb raising

the other Dutch infinitive with the particle *te* (cf. English *to*), behave similarly in that they allow crossing, but differently in that they allow certain alternative orders as well (Zaenen 1979).

In the sections 6.2–6.4 the syntax of these two types of verb group and the preverbal NP sequence will be considered at length. The assumptions and corresponding notations introduced in these sections are summarized in the appendix to the chapter, for ease of reference.

6.2 Verb Raising as Composition

Although there is continuing controversy surrounding the Surface Structure of sentences (1) and (2) with which the chapter begins, all the authors cited above agree that the entire verb group *zag ... voeren* constitutes a surface constituent of type V. There is less agreement about how this constituent is structured internally, and how the NP sequence is structured, but there is a similar consensus that the predicate-argument structure underlying (2) (however expressed) is the one shown in figure 6.1. This of course is the structure that in the German version of this construction seems to be straightforwardly compatible with the surface word order. Again, there is considerable disagreement over how this underlying structure maps onto Dutch surface order.

Within the present theory the entity closest to traditional Deep Structure is the interpretation associated with each category. One set of lexical categories that could deliver predicate-argument structures corresponding to (unordered versions of) structures like figure 6.1 for German subordinate clauses, using functional application alone, is the fragment of the German lexicon shown in (8), in which all infinitival verbs are functions from whatever the verb takes as complement into functions-from-NPs-into-infinitival-Ss, and all tensed verbs

are as usual functions from the verb's complement into the predicate category $S\backslash NP$. The entries in (8) are constructed on the (not uncontroversial) assumption that the German stem *seh-* of *sah* and *sehen* is an object control verb, as *see* is in English and as the accusative case of the NP suggests, and on the assumption that everything else has the obvious category.:[5]

(8) sah := $((S_{+SUB}\backslash NP)\backslash NP)\backslash VP$
sehen, helfen := $(VP\backslash NP)\backslash VP$
füttern := $VP\backslash NP$

The result S in the first of these categories is distinguished as a tensed subordinate clause, S_{+SUB}, since the order that it gives rise to is not a legal German main clause.

These categories are quite systematically related to those of the corresponding English verbs, except that the latter take all their nonsubject arguments to the right. As in all verb-initial constructions, the order of combination specified over the rightward arguments by the English lexicon is the *reverse* of that of the corresponding German/Dutch leftward category. (In Bach's (1979; 1980) terms, the English rightward argument(s) "wrap," although the present grammar captures this in the fact that the predicate-argument structures for the English verbs are identical to those of the corresponding verbs in Dutch and German.) We noted in chapter 4 that this constraint seems to be a very widespread property of verb-initial constructions crosslinguistically. Thus, the following are the corresponding categories for English main and subordinate clauses:

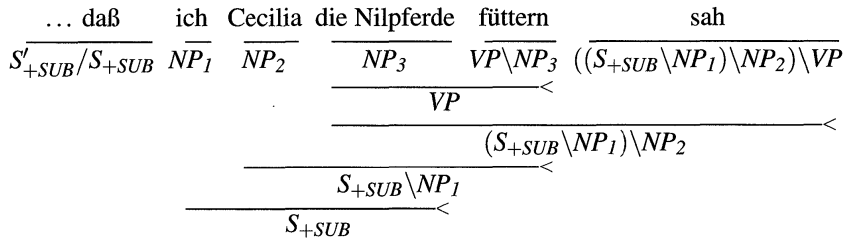
(9) saw := $((S\backslash NP)/VP)/NP$
see, help := $(VP/VP)/NP$
feed := VP/NP

Like their German counterparts, these are object control verbs, analogous to *persuade*, example (41) in chapter 4. They can be written in full with their interpretations as follows:[6]

(10) saw := $((S\backslash NP)/VP)/NP : \lambda x.\lambda p.\lambda y.saw'(p(ana'x))xy$
see := $(VP/VP)/NP : \lambda x.\lambda p.\lambda y.see'(p(ana'x))xy$
feed := $VP/NP : \lambda x.\lambda y.feed'xy$

(The interpretations "wrap" the rightward arguments, as any SVOX language must in the terms of chapter 4.)

The German categories in (8) allow the derivation of the relevant German subordinate clauses, using functional application alone, as in (11). The dependencies between NPs and the functions that take them as arguments are indicated using subscripts. (These subscripts are included purely for ease of reading; the grammar itself does not include or require them. Note also that the subscripts identify *surface syntactic* dependencies, not the deep-structural or semantic dependencies discussed before.) To further simplify the exposition, I will begin by representing NPs as un-type-raised, although I will later replaced them type-raised categories, as in the earlier analysis of English.

(11) 

(These categories do not permit the German main-clause word orders. I return to the question of main-clause order in section 6.7.)

On the reasonable assumption that the Dutch lexicon is identical in most respects to that of German except in directionality of the infinitival complements themselves, so that the stem *zie-* of *zag* and *zien* is a raising/control verb taking its infinitival to the right, we get the following corresponding fragment of the Dutch lexicon:[7]

(12) zag := $((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}$
zien, helpen := $(VP\backslash NP)/VP_{-SUB}$
voeren := $VP\backslash NP$

Again, the result of the tensed verb category is marked as a subordinate clause. The reason for marking the VP complement of such verbs as *zien* as $-SUB$ will become apparent later, but it is important to notice that the VP *result* of infinitival verbs is unmarked or unspecified on this feature; that is, it is compatible with either $+SUB$ or $-SUB$.[8]

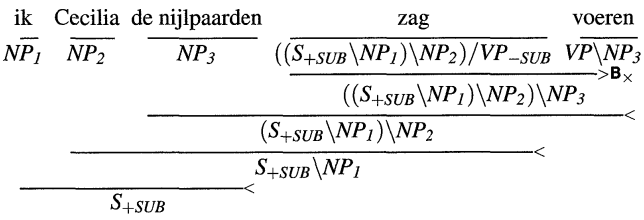
Although for the most part I will take semantics as read in what follows, the corresponding fully interpreted categories can be specified as in (13), with semantic interpretations identical to those of the corresponding English verbs in (10), apart from the fact that they do not wrap arguments, as must in the terms of chapter 4 be the case for any SOV language:

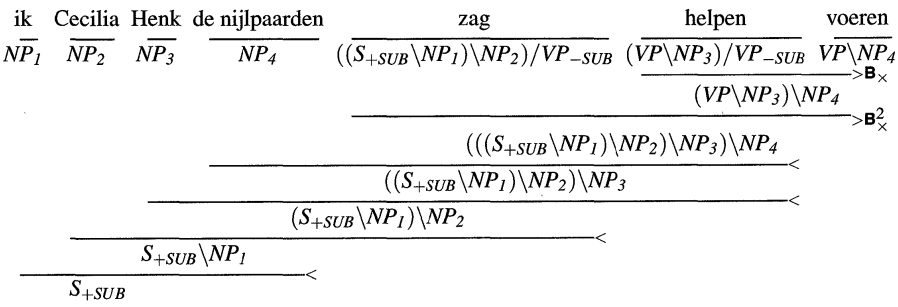
(13) zag := $((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB} : \lambda p.\lambda x.\lambda y.saw'(p(ana'x))xy$
zien := $(VP\backslash NP)/VP_{-SUB} : \lambda p.\lambda x.\lambda y.see'(p(ana'x))xy$
voeren := $VP\backslash NP : \lambda x.\lambda y.feed'xy$

With application alone, these categories do not give rise to correct Dutch subordinate clauses for the verbs in question. However, with the inclusion of a single further rule of functional composition, the grammar will accept Dutch subordinate-clause orders on these elements. The rule in question is the *crossed* version of forward composition, which I will provisionally schematize as follows using the most general version of the $ convention (32) of chapter 3 over functions with n arguments for some small finite n:[9]

(14) *Dutch forward crossed composition I* ($> \mathbf{B}^n{}_\times$)
$X/Y \quad (Y\backslash Z)\$ \Rightarrow_{\mathbf{B}^n} \quad (X\backslash Z)\$$
where $Y = VP_{-SUB}$

The restriction on this rule is more specific than the parallel restriction on the English backward crossed rule (24) in chapter 4. It will turn out later to be crucially involved in limiting the Dutch version to infinitival complement constructions. In particular, it prevents type-raised categories from composing into verbs (see discussion of example (60)). It permits derivations on the following patterns, in which the verbs and their NP arguments lie on a right-branching spine:

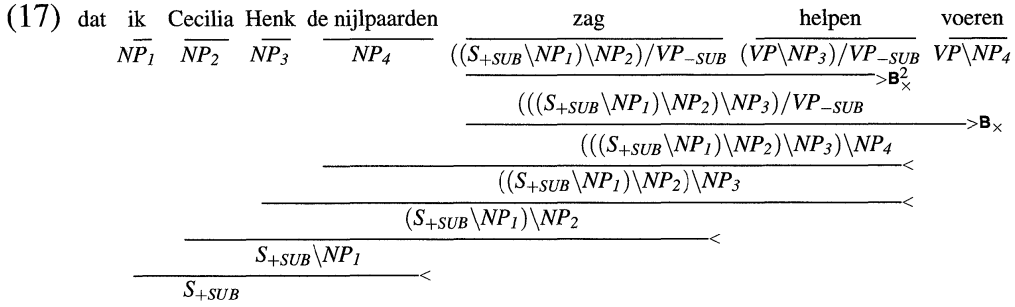
(15)


(16)


These surface orders are only accepted because the grammar includes the forward crossed composition rule. This rule is the *only* rule that the theory allows us to specify that will combine the verbal categories into a single constituent.

The rule has the inevitable consequence that *functions that combine under this rule will necessarily produce as their composition a function that demands its arguments in the crossed rather than the nested order.*

In the case of (16), there is a second possible derivation. Here the verbs combine by two compositions in the opposite order, to yield a left-branching structure, and the NPs remain as before:

(17) 

Because of the associativity of composition, the result is the semantically identical verb cluster of type $(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4$. This order of composition is the one that would be preferred by a maximally incremental left-to-right parser. Whether such derivations should be permitted by the grammar depends upon consideration of the following coordinate sentences:

(18) a. dat ik Cecilia Henk de paarden zag helpen voeren en hoorde leren wassen.
that I Cecilia Henk the horses saw help feed and heard teach wash
'that I saw Cecilia help Henk feed the horses and heard her teach him to wash them'.

b. dat ik Cecilia Henk de paarden zag helpen voeren en leren wassen.

c. dat ik Cecilia Henk de paarden zag helpen en hoorde leren voeren.

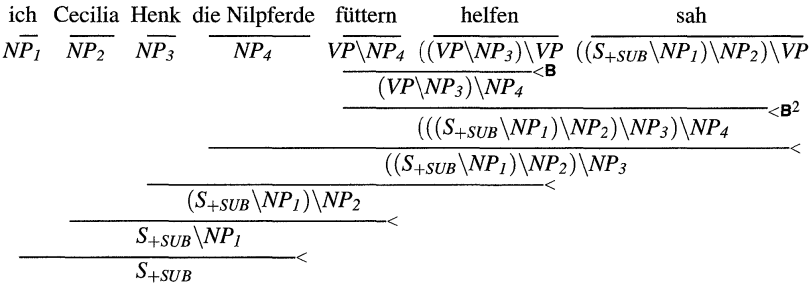
Sentence (18c) is somewhat odd. A parallel example receives a *? rating from Bresnan et al. (1982) and is used to justify the assumption of a right-branching Surface Structure for the verb group, following Evers (1975). In the earlier work I found that some informants would allow it, and I suggested that the source of its anomaly lies in the pragmatics of right node raising, which tends to make the rightmost element a rheme or comment, rather than in syntax. The rule (14) follows the earlier paper in allowing the verbs to combine in either left- or right-branching fashion and in allowing all of (18a–c). However, a more restrictive version of the present theory, conforming to the judgments reported by Evers and Bresnan et al., can be obtained by replacing the forward crossed rule (14) by the following version, using the \$ instance of the $ convention.

(19) *Dutch forward crossed composition I (alternative)* ($>\mathbf{B}^n_\times$)
$X/Y \quad (Y\backslash Z)\backslash\$ \quad \Rightarrow_{\mathbf{B}^n} \quad (X\backslash Z)\backslash\$$
where $Y = VP_{-SUB}$

This version allows (16) but excludes (17) and hence (18c). All remaining examples and derivations in this chapter are compatible with the more restricted grammar.

The grammar permits neither the marginal case (7a) nor the ungrammatical case (7b) of the "German-style" Dutch orderings. (I return to the first of these below.)

The corresponding German construction, which contains the same elements but where the corresponding verbs occur in the mirror-image order and the dependencies nest, is accepted in exactly the same way, using exactly the same categories, as in (16). The only difference is that the verb group must be assembled by (a suitably restricted form of) the backward composition rule $<\mathbf{B}$. For example:

(20)


(As in the Dutch example, there is an alternative analysis, in which the verbs compose in another order. The order shown here is the one that would be favored by a maximally incremental left-to-right processor combining as rapidly as possible. Again the existence of the different constituent structures needs to be tested by coordination possibilities.)[10] The rule in question is the following (again the \$ schematization is given in the most general form, but a more restricted version schematized as $(Y\backslash Z)\backslash\$$ is compatible with the examples here):

(21) *Dutch/German backward composition* ($<\mathbf{B}^n$)
$(Y\backslash Z)\$ \quad X\backslash Y \quad \Rightarrow_{\mathbf{B}^n} \quad (X\backslash Z)\$$

Since this rule is order-preserving, it simply provides alternative derivations such as (20) for sentences like (6). However, the availability of these alternatives is crucial to the constructions considered in section 6.4.

The Dutch fragment does not permit the following ungrammatical orders, because verbs such as *zien* are defined as functions over *NP* and *VP*, rather than over "small clauses" of type S^{-IP}:[11]

(22) *... omdat ik zag [Cecilia Henk de nijlpaarden helpen voeren.]$_{S_{INF}}$

(23) *... omdat ik zag Cecilia helpen [Henk de nijlpaarden voeren.]$_{S_{INF}}$

(24) *... omdat ik zag [Cecilia Henk helpen de nijlpaarden voeren.]$_{S_{INF}}$

However, in order to prevent overgeneralization to the following word order, in which the embedded VP includes its object, we must do something more:

(25) *... omdat ik Cecilia [zag]$_{((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}}$ [de nijlpaarden voeren.]$_{*VP_{-SUB}}$

I return below to the question of what exactly prevents *de nijlpaarden voeren* from becoming a VP_{-SUB}. However, there is good reason to believe that this should be left as a question of fine-tuning, because a closely related family of raising verbs does allow orders parallel to (25). (In fact, some informants seem to feel that (25) is not as bad as (22)–(24)).

6.3 Equi Verbs

The "equi" verbs like *proberen* 'to try' (Zaenen 1979; Seuren 1985) allow greater freedom of word order. In particular, the tensed equi verb may occur either at the front of the final group, as in (26a) or in second position in a subordinate clause, as in (26b). The alternatives (26c,d) are also grammatical (Seuren 1972). A more questionable pattern is (26e) (starred in Seuren 1972).[12]

(26) a. ... omdat ik Jan het lied probeer te leren (*te) zingen.
... because I Jan the song try to teach (*to) sing
'... because I try to teach Jan to sing the song.'

b. ... omdat ik probeer Jan het lied te leren (*te) zingen.

c. ... omdat ik probeer Jan te leren het lied te zingen.

d. ... omdat ik Jan probeer te leren het lied te zingen.

e. ?... omdat ik Jan probeer het lied te leren (*te) zingen

An important detail about this construction that is likely to create complications for any theory lies in the apparently perverse conditions on the presence or absence of the particle *te* with the embedded infinitival. It is obligatory in (26c and d), but disallowed in (26a,b,e).

Given the present account of infinitives and the possibility of (26c and d), the Dutch equi verbs such as *proberen* must when tensed bear the category $(S_{+SUB}\backslash NP)/VP^{TE}$, where VP^{TE} abbreviates $S^{+TE,-IP}_{?SUB}\backslash NP$ and VP abbreviates $S^{-TE,-IP}_{?SUB}\backslash NP$. The particle *te* is VP^{TE}/VP so that *te*-infinitive verbs bear categories parallel to those of bare infinitives. To summarize:

(27) zag := $((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}$
probeer := $(S_{+SUB}\backslash NP)/VP^{TE}$
zien, leren, helpen := $(VP\backslash NP)/VP_{-SUB}$
voeren := $VP\backslash NP$
te := VP^{TE}/VP

Readers may easily satisfy themselves that the augmented fragment accepts (26a) and (26b). For example:

(28)

dat	ik	Jan	het lied	probeer	te leren	(∗te) zingen
	$\overline{NP}$	$\overline{NP}$	$\overline{NP}$	$\overline{(S_{+SUB}\backslash NP)/VP^{TE}}$	$\overline{(VP^{TE}\backslash NP)/VP}$	$\overline{VP\backslash NP}$
					$(VP^{TE}\backslash NP)\backslash NP$ (>$\mathbf{B}_\times$)	
				$((S_{+SUB}\backslash NP)\backslash NP)\backslash NP$ (>$\mathbf{B}^2_\times$)		
			$(S_{+SUB}\backslash NP)\backslash NP$ (<)			
		$S_{+SUB}\backslash NP$ (<)				
S_{+SUB} (<)						

(29)

dat	ik	probeer	Jan	het lied	te leren	(∗te) zingen
	$\overline{NP}$	$\overline{(S_{+SUB}\backslash NP)/VP^{TE}}$	$\overline{NP}$	$\overline{NP}$	$\overline{(VP^{TE}\backslash NP)/VP}$	$\overline{VP\backslash NP}$
					$(VP^{TE}\backslash NP)\backslash NP$ (>$\mathbf{B}_\times$)	
				$VP^{TE}\backslash NP$ (<)		
			VP^{TE} (<)			
		$S_{+SUB}\backslash NP$ (>)				
S (<)						

In order to capture syntactically the subtle alternation between bare and *te*-infinitivals typified in sentences like (26b–d), there seems to be no alternative to brute force. I therefore include the following additional lexical category for the complementizer as a stipulation:[13]

(30) *The* Te *Category Brute Force Stipulation*:
te := $(VP^{TE}\$/VP^{TE}_{+SUB})/(VP\$/VP_{-SUB})$

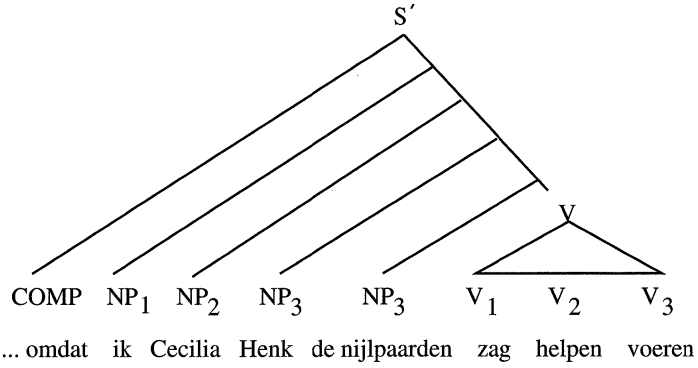


Figure 6.2
Not the Right Surface Structure

This turns *te leren* into a category that can apply to but not compose with *te*-infinitival VPs. It has the effect of allowing (26c,d) without also allowing the starred *te* particles in the earlier cases, a problem that was not solved in the earlier paper. For example:

(31) dat ik probeer Jan te leren het lied te zingen

$$\frac{\overline{NP}\quad \frac{\frac{\overline{NP}\quad \frac{\overline{NP}\quad \overline{VP^{TE}\backslash NP}}{VP^{TE}}<}{VP^{TE}\backslash NP}>}{VP^{TE}}<}{S_{+SUB}\backslash NP}>}{S_{+SUB}}<$$

The fragment as it stands still overgenerates examples like the following, in which a bare complement verb applies to an entire VP rather than composing with the verb;

(32) *... dat ik Cecilia zag de nijlpaarden voeren.

To see how such overgenerations are excluded, we must first look more closely at the preverbal argument sequence.

6.4 Argument Cluster Composition

Derivations like those in (16) might seem to commit us to the kind of combinatory Surface Structure shown in figure 6.2, in which the triangle schematizes over the multiple derivations for the verb group. In conjunction with the ar-

gument structures provided in the lexicon for the fully interpreted categories given in (13), the semantics of functional composition will ensure that this derivation yields a predicate-argument structure that might be written as follows:

(33) $see'(help'(feed'hippos'(ana'harry'))harry'(ana'cecilia'))cecilia'me'$

Thus, apart from the assumption that argument structure is order-free, forward crossed composition has much the same effect as a verb raising adjunction transformation (see Evers 1975; Haegeman 1992), "reanalysis" (Lasnik and Kupin 1977; Haegeman and van Riemsdijk 1986), the unification mechanism of LFG (Johnson 1988; Netter 1988; Zaenen and Kaplan 1995), or certain TAG analyses (Kroch and Santorini 1991; Rambow 1994a). The difference is that the CCG derivation is entirely type-driven, rather than structure-driven.

However, as far as derivation or Surface Structure goes, coordination and extraction phenomena reveal that the structure shown in figure 6.2 for the NP sequence, corresponding to the simple backward application of the verb composite, is misleading. As in the case of the verb group, there are several Surface Structures for the same NP sequence, all again yielding the same predicate-argument structure.

6.4.1 Coordination and Extraction

First, contiguous subsequences or "clusters" of arguments can coordinate, just like their English counterparts in the *give a policeman a flower* sentences (see (40) of chapter 3), albeit that in Dutch subordinate clauses these arguments are to the *left* of the verb:

(34) Ik denk dat ik [Cecilia de appels en Henk de peren] zag plukken.
I think that I Cecilia the apples, and Henk the pears, saw pick
'I think that I saw Cecilia pick the apples, and Henk the pears.'

Within the present framework, this phenomenon (to which I return at length in chapter 7) means that the NP sequences must be constituents.

Second, any of the NPs (and other arguments) in the preverbal sequence may extract under relativization, disrupting the normal cross-serial order of the sequence.[14] For example (trace notation is used to indicate the intended reading):

(35) (de appels) die ik het meisje zag plukken.
(the apples) that$_i$ I the girl t_i saw pick
'(the apples) that I saw the girl pick.'

The sentence is not accepted by the grammar of section 6.2, because the verb complex *zag plukken* is separated from the relative-pronoun *die* by the NP sequence *ik het meisje* and from the subject *ik* by the NP *het meisje*. The phenomenon is quite independent of the infinitival construction and the earlier account of the verb sequence. It is a quite general problem in Dutch/German syntax. For example, either object of a ditransitive can extract from the preverbal NP sequence in a simple relative clause:

(36) a. de appels die ik het meisje gaf.
the apples that I the girl gave
'the apples that I gave the girl.'

b. het meisje dat ik appels gaf.
the girl that I apples gave
'the girl that I gave apples.'

Whatever category we choose for the verb, one of these extractions will block for the same reason.

The general problem of relativizing preverbal NPs (and other arguments) in German and Dutch can be stated as follows. The construction has n NPs (or whatever), followed by a number of verbs requiring them as arguments. The ith NP, say, is extracted and placed as a relative-pronoun to the left of the subject. The verbs can be composed into a single verblike entity $(\ldots((S_{+SUB}\backslash NP_1)\backslash\ldots)\backslash NP_n$, wanting the NPs as in section 6.2. (In Dutch the composition is the crossed forward variety, and in German it is the backward variety. The end result is the same, only the linear order of the verbs varying.) The general form of the German/Dutch relative clause can therefore be written as follows (trace notation is again used to indicate the intended reading):

(37) $(N\backslash N)/(S_{+SUB}\backslash NP_i),\ NP_1,\ldots,NP_h,\ t_i,\ NP_j,\ldots,NP_n,\ (\ldots(S_{+SUB}\backslash NP_1)\backslash\ldots)\backslash NP_n$

The verb group can pick up the NPs n down to j in the usual way by backward application, to yield (38):

(38) $(N\backslash N)/(S_{+SUB}\backslash NP_i),\ NP_1\ldots NP_h,\ t_i,((\ldots((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash\ldots)\backslash NP_h)\backslash NP_i$

But at this point, the construction blocks.

Within the present framework there is only one way that any extraction can ever be accommodated. Under the Principle of Adjacency, all material between the *wh*-item $(N\backslash N)/(S_{+SUB}\backslash X)$ and the verb that wants X as an argument must be composed by the combinatory rules into a single entity $S_{+SUB}\backslash X$. In the case of a relativized NP_i, the implication is that the arguments 1 to h, and the complex that includes NPs j to n and the verb group, must combine into a single

entity $S_{+SUB}\backslash NP_i$. Since there may be arbitrarily many NPs preceding the extraction site, they must all be type-raised functions, and they must combine by functional composition.

6.4.2 Type-raising

If type-raising can apply to English NPs and other arguments, turning them into functions that can in turn compose, thus capturing the phenomena of extraction and coordination in English discussed in chapters 3 and 4, then we are free to suppose that in Dutch and German all arguments such as NPs are rightward-looking functions whose domain is leftward verbal functions that take such arguments, and whose range is that of their results. As in sections 6.2 and 6.3, we will begin with a simple but overgeneralizing proposal, and then restrict it slightly. Since there is more than one kind of verbal function that takes an NP complement to its left, we need a variable T that ranges over categories. We can therefore regard all NPs as undergoing the rightward type-raising rule of chapter 4 (10) to yield the following familiar category, similarly constrained:

(39) *The verb-final clause NP complement category (simplified)*
$\mathrm{T}/(\mathrm{T}\backslash NP)$

Each instance of the polymorphic variable over categories, written T, is again *unique* to each individual instance of the raised category. The syntactic restrictions that this category requires will become apparent when we consider its behavior under the combinatory rules. Its semantics is simply to apply the function matching $\mathrm{T}\backslash NP$ to the original unraised NP, to yield T, its result.

As in English, I will assume that other arguments of verbs, such as subcategorized prepositional and adverbial phrases, can bear analogous categories of the form $\mathrm{T}/(\mathrm{T}\backslash X)$, where X is *PP*, *ADV*, and the like. As in the earlier chapters on English, I will often suppress the step of type-raising in derivations to save space, and I may on occasion abbreviate the raised categories themselves as $NP^{\uparrow}$ and the like when it simplifies the presentation.

The combinatory rules act on the raised categories as follows.

6.4.2.1 Forward Application of Type-Raised Arguments Type-raised NPs including object NPs of the form $\mathrm{T}/(\mathrm{T}\backslash NP)$ can combine with verbs and the verb groups that result from composition by the forward application rule. For example, the Dutch complement ... *dat Jan appels at* ' ... that Jan ate apples' is accepted as follows:

(40) dat

Jan	appels	at
$T/(T\backslash NP)$	$T/(T\backslash NP)$	$(S_{+SUB}\backslash NP)\backslash NP$
	$S_{+SUB}\backslash NP$ (>)	
S_{+SUB} (>)		

The application of the forward application rule with the raised category under the interpretation of rules set out in chapter 3 matches the metavariable T with $S\backslash NP$. Because of the semantics of type-raising, the result of this process is the same as the corresponding earlier derivation using backward application. That is, the interpretation f of $(S_{+SUB}\backslash NP)\backslash NP$ is applied to that of the NP, a, and yields $S_{+SUB}\backslash NP : fa$. It is therefore simplest to assume that all leftward arguments of the verb group including the subject must bear raised categories like (39), and only that category. It follows that NP arguments in subordinate clauses must combine with the verb group by *forward* rules.

If it were not for the inclusion of functional composition rules, such a fragment would be strongly equivalent to the earlier one. That is, the derivations of the infinitival sentences can proceed as before, except that the verb complex is combined with the preverbal type-raised arguments by the forward application rule, rather than by the backward one. For example, derivation (16) now appears as follows. (Subscripts are as usual included for the reader's guidance only.)

(41) dat

Jan	Cecilia	Henk	de nijlpaarden	zag helpen voeren
$T/(T\backslash NP_1)$	$T/(T\backslash NP_2)$	$T/(T\backslash NP_3)$	$T/(T\backslash NP_4)$	$(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4$
			$((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3$ (>)	
		$(S_{+SUB}\backslash NP_1)\backslash NP_2$ (>)		
	$(S_{+SUB}\backslash NP_1)$ (>)			
S_{+SUB} (>)				

Because of the semantics of the raised categories, the result is the same as in (16) using the simple NP category and the backward application rule. In particular, the illegal sentences (22) and (23) are still excluded.

In order to allow the word orders associated with the *proberen* class of verbs, while still disallowing the corresponding word orders with the *zien* class, we should recall that the earlier categories of infinitival complements of the *zien* class were distinguished from those of the *te*-infinitival complements of the *proberen* class by restriction to VP_{-SUB} as follows (cf. 27):

(42) zag := $((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}$
probeer := $(S_{+SUB}\backslash NP)/VP^{TE}$
zien, leren, helpen := $(VP\backslash NP)/VP_{-SUB}$
voeren := $VP\backslash NP$
te := VP^{TE}/VP

Crucially, the complement of the *zien* class is distinguished as non-verb-final, in contrast to the *te*-complement of the *proberen* class, which is unspecified on this attribute. The results of all infinitivals including *zien, te zien*, and so on are also unspecified on the feature *SUB*.

If we further assume that the variable T in the order-preserving raised NP category is a typed variable that can only match (tensed or untensed) categories of the form $S^{-CP,?IP}_{+SUB}\$$, then it will not only be able to partake in verb-final tensed and untensed clauses, but also have the important effect of causing infinitival VPs to become specified as $+SUB$. Such an effect can be achieved by writing the forward category in full as follows, though for obvious reasons I will continue to abbreviate it as $T/(T\backslash X)$:

(43) *The verb-final NP complement category (full)*:
$T/(T\backslash X) \equiv S^{-CP,?IP}_{+SUB}\$/(S^{-CP,?IP}_{+SUB}\$\backslash X)$

This stratagem will have the important effect of permitting complements like $[het\ lied\ te\ leren\ zingen]_{VP_{+SUB}}$ for verbs like $proberen_{VP/VP^{TE}}$, while forbidding those like $[de\ nijlpaarden\ voeren]_{VP_{+SUB}}$ for verbs like $zien_{(VP\backslash NP)/VP_{-SUB}}$.

Thus, the freer word order characteristic of equi verbs like *proberen* is still permitted (cf. (26)), as in the following derivations:

(44)

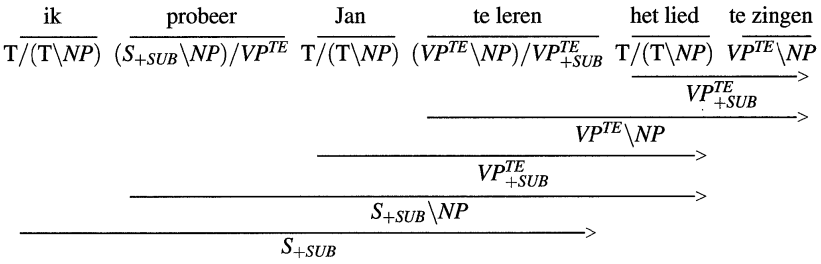
dat	ik	Jan	het lied	probeer	te leren	(∗te) zingen
	$T/(T\backslash NP)$	$T/(T\backslash NP)$	$T/(T\backslash NP)$	$(S_{+SUB}\backslash NP)/VP^{TE}$	$(VP^{TE}\backslash NP)/VP_{-SUB}$	$VP\backslash NP$
					$(VP^{TE}\backslash NP)\backslash NP$ (>$\mathbf{B}_\times$)	
				$((S_{+SUB}\backslash NP)\backslash NP)\backslash NP$ (>$\mathbf{B}^2_\times$)		
			$(S_{+SUB}\backslash NP)\backslash NP$ (>)			
		$S_{+SUB}\backslash NP$ (>)				
S_{+SUB} (>)						

(45)

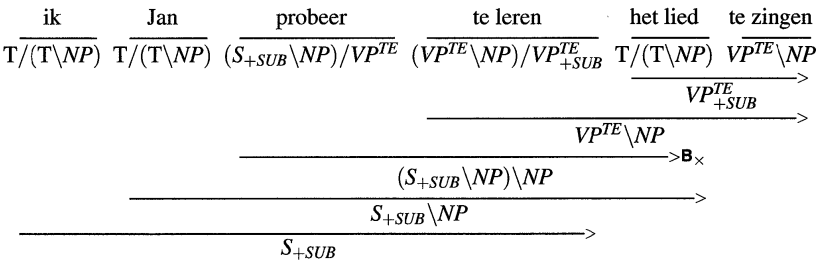
dat	ik	probeer	Jan	het lied	te leren	(∗te) zingen
	$T/(T\backslash NP)$	$(S_{+SUB}\backslash NP)/VP^{TE}$	$T/(T\backslash NP)$	$T/(T\backslash NP)$	$(VP^{TE}\backslash NP)/VP_{-SUB}$	$VP\backslash NP$
					$(VP^{TE}\backslash NP)\backslash NP$ (>$\mathbf{B}_\times$)	
				$VP^{TE}\backslash NP$ (>)		
			VP^{TE} (>)			
		$S_{+SUB}\backslash NP$ (>)				
S_{+SUB} (>)						

Because of stipulation (30), (26c, d) are also permitted:

(46) dat ik probeer Jan te leren het lied te zingen

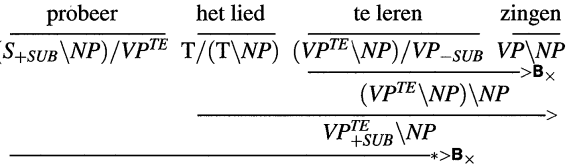


(47) dat ik Jan probeer te leren het lied te zingen



However, the doubtful example (26e) is now excluded, as Seuren (1972) claims it should be, since *het lied te leren zingen* is $VP^{TE}_{+SUB}\backslash NP$ and cannot be composed into as follows:

(48) ?dat ik Jan probeer het lied te leren zingen



The type restriction on T implicit in in the type-raised category also eliminates a number of potential overgeneralizations noted earlier, including (25), repeated here as (49a), since the object *de nijlpaarden* specifies the bare infinitival and past participial VPs as $+SUB$:

(49) a. *... omdat ik Cecilia [zag]$_{((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}}$ [de nijlpaarden voeren.]$_{VP_{+SUB}}$

b. *... omdat ik probeer Jan [te leren]$_{(VP^{TE}_{+SUB}\backslash NP)/VP_{-SUB}}$ [de nijlpaarden voeren.]$_{VP_{+SUB}}$

c. *... omdat ik [heb]$_{(S_{SUB}\backslash NP)/VP^{PPL}_{-SUB}}$ [de nijlpaarden gevoerd.]$_{VP^{PPL}_{+SUB}}$

Since verb-final bare infinitival VP complements are essential to the analysis of main clauses like the following, we must anticipate that main-clause *zag*, *heeft*, and the like must require VP_{+SUB} complements:

(50) Hij zal [de nijlpaarden voeren.]$_{VP_{+SUB}}$
He will the hippopotamuses feed
'He will feed the hippopotamuses.'

(51) Ik heb [de nijlpaarden gevoerd.]$_{VP_{en_{+SUB}}}$
I have the hippopotamuses fed
'I fed the hippopotamuses.'

(52) Ik zag Cecilia [de nijlpaarden voeren.]$_{VP_{+SUB}}$
I saw Cecilia the hippopotamuses feed
'I saw Cecilia feed the hippopotamuses.'

Although I have so far ignored the problem of main-clause order, it is important to realize that this assumption is a forced move anyway under present assumptions, and corresponds to the lexicalist's version of base generation for the main-/subordinate-clause word order alternation. I will continue to defer detailed discussion of main-clause order until section 6.7.

6.4.2.2 Forward composition of Type-Raised Arguments Since type-raised argument categories of the form $T/(T\backslash X)$ are functions, they can potentially take part in functional composition. For example, a subject may compose into an object under the (noncrossing) forward composition rule, to yield a function that can apply to the verb:

(53) dat
$$\dfrac{\dfrac{\text{Jan}}{T/(T\backslash NP_1)}\ \dfrac{\dfrac{\text{appels}}{T/(T\backslash NP_2)}\ \dfrac{\text{at}}{(S_{+SUB}\backslash NP_1)\backslash NP_2}}{T/((T\backslash NP_1)\backslash NP_2)}\,{>}\mathbf{B}}{S_{+SUB}}\,{>}$$

However, we still need to prevent the following case of ordinary harmonic composition, since the sentence is disallowed under the relevant reading:[15]

(54) *dat
$$\dfrac{\dfrac{\text{het lied}}{T/(T\backslash NP_2)}\ \dfrac{\dfrac{\text{Jan}}{T/(T\backslash NP_1)}\ \dfrac{\text{probeert}}{(S_{+SUB}\backslash NP_1)/VP^{TE}}}{S_{+SUB}/VP^{TE}}\,{*>}\mathbf{B}\ \dfrac{\text{te zingen}}{VP^{TE}\backslash NP_2}}{S_{+SUB}\backslash NP_2}\,{>}\mathbf{B}_{\times}}{S_{+SUB}}\,{>}$$

One way to do so is to restrict the noncrossing forward rule to composition into nominal type-raised categories, as follows:

(55) *Dutch forward composition I* (>**B**)

$X/Y \quad Y/(Y\backslash Z) \quad \Rightarrow_{\mathbf{B}} \quad X/(Y\backslash Z)$

where $Y = S$

Because of the semantics of the combinatory rules and the type-raised NP complement category, the interpretation that results from the derivation (53) involving composition of type-raised categories is exactly the same as was produced in (40) by two forward applications. The result of such a composition can in turn compose with a further NP bearing the novel category, and this process can iterate indefinitely. Because the composition is order-preserving, no new orderings of the arguments are allowed. The result of such iterated composition is a function over exactly the kind of verbal functions that were produced from the composition of the verb group in section 6.2. It can therefore combine with the verb group by a forward application, as follows:

(56) dat Jan Cecilia Henk de nijlpaarden zag helpen voeren

$\mathrm{T}/(\mathrm{T}\backslash NP_1)$ $\mathrm{T}/(\mathrm{T}\backslash NP_2)$ $\mathrm{T}/(\mathrm{T}\backslash NP_3)$ $\mathrm{T}/(\mathrm{T}\backslash NP_4)$ $(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4$

$\mathrm{T}/((\mathrm{T}\backslash NP_1)\backslash NP_2)$ (>**B**)

$\mathrm{T}/(((\mathrm{T}\backslash NP_1)\backslash NP_2)\backslash NP_3)$ (>**B**)

$\mathrm{T}/((((\mathrm{T}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4)$ (>**B**)

S_{+SUB} (>)

The Surface Structure of the NP sequence that is induced by composition into the novel category is *left*-branching.[16] It is therefore directly compatible with incremental semantic interpretation of the NP sequence in advance of processing the verb group, a point to which we return in chapter 9.

Additional derivations such as the following are possible for such sentences.

(57) dat Jan Cecilia Henk de nijlpaarden zag helpen voeren

$\mathrm{T}/(\mathrm{T}\backslash NP_1)$ $\mathrm{T}/(\mathrm{T}\backslash NP_2)$ $\mathrm{T}/(\mathrm{T}\backslash NP_3)$ $\mathrm{T}/(\mathrm{T}\backslash NP_4)$ $(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4$

$\mathrm{T}/((\mathrm{T}\backslash NP_2)\backslash NP_3)$ (>**B**)

$\mathrm{T}/(((\mathrm{T}\backslash NP_2)\backslash NP_3)\backslash NP_4)$ (>**B**)

$\mathrm{T}/((((\mathrm{T}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4)$ (>**B**)

S_{+SUB} (>)

Such alternative derivations are harmless because the composition rule is order-preserving, and because all the derivations are semantically equivalent, owing to the associativity of functional composition. Moreover, the alternative constituencies that these derivations permit are necessary, in order to capture in the grammar the fact that all of the nonstandard constituents that they engender can coordinate with similar sequences. These and a number of other possibilities for coordination that have sometimes misleadingly been described under the heading of "gapping" are discussed in chapter 7.

6.5 Relative Clauses

The grammar now includes almost everything necessary to permit relative clauses, which take the following general form repeated from (37) (trace notation is again used to indicate the intended reading):

(58) $(N\backslash N)/(S_{+SUB}\backslash NP_i)$, $NP_1,\ldots,$ NP_h, t_i, $NP_j,\ldots,$ NP_n, $(\ldots(S_{+SUB}\backslash NP_1)\backslash\ldots)\backslash NP_n$

What we would *like* to happen with a Dutch relative clause meaning *who Jan saw Cecilia help feed the hippopotamuses* is the following:

(59)
$$\dfrac{\dfrac{\text{die}}{(N\backslash N)/(S_{+SUB}\backslash NP)}\quad\dfrac{\dfrac{\dfrac{\text{Jan}}{T/(T\backslash NP_1)}\quad\dfrac{\text{Cecilia}}{T/(T\backslash NP_2)}}{T/((T\backslash NP_1)\backslash NP_2)}>\mathbf{B}\quad\dfrac{\dfrac{\text{de nijlpaarden}}{T/(T\backslash NP_4)}\quad\dfrac{\text{zag helpen voeren}}{(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4}>}{((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3}>\mathbf{B}_\times}{S_{+SUB}\backslash NP_3}}{N\backslash N}>$$

First the subject *Jan* $T/(T\backslash NP_1)$ would compose with the object *Cecilia*, which bears the category $T/(T\backslash NP_2)$, to yield $T/((T\backslash NP_1)\backslash NP_2)$. (The subscripts are as usual included for guidance only.) Next, the object *de nijlpaarden*, $T/(T\backslash NP_4)$, would combine with the verb group, $(((S\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4$, by simple forward application. The entity *Jan Cecilia*, $T/((T\backslash NP_1)\backslash NP_2)$, resulting from the earlier composition would then compose with the new result *de nijlpaarden zag helpen voeren*, $((S\backslash NP_1)\backslash NP_2)\backslash NP_3$, to give *Jan Cecilia de nijlpaarden zag helpen voeren*, $S\backslash NP_3$, a function to which the relative-pronoun could simply apply as usual.

However, the crucial composition of *Jan Cecilia* with *de nijlpaarden zag helpen voeren* is not allowed by the crossed composition rule (14), because of the restriction on Y in that rule to the category VP_{-SUB}. Nor can we permit the composition by relaxing this constraint without also allowing overgeneralizations like (60) and (61), in which objects are "scrambled" over subjects, which (as de Roeck (1984) and Janeaway (1991) noted) the earlier account wrongly permitted:[17]

(60) a. *... dat Jan Cecilia zag zwemmen.
... that Jan Cecilia saw swim
'... that Jan saw Cecilia swim.'

b. *dat
$$\dfrac{\dfrac{\text{Jan}}{T/(T\backslash NP_2)}\quad\dfrac{\dfrac{\text{Cecilia}}{T/(T\backslash NP_1)}\quad\dfrac{\dfrac{\text{zag}}{((S_{+SUB}\backslash NP_1)\backslash NP_2)/VP}\quad\dfrac{\text{zwemmen}}{VP}}{(S_{+SUB}\backslash NP_1)\backslash NP_2}>}{S_{+SUB}\backslash NP_2}>\mathbf{B}_\times}{S_{+SUB}}*$$

(61) a. *... dat Jan de nijlpaarden Cecilia zag voeren.
... that Jan the hippopotamuses Cecilia saw feed
'... that Jan saw Cecilia feed the hippopotamuses.'

b. *dat Jan de nijlpaarden Cecilia zag voeren

$$\dfrac{\dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP_1)}\quad \dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP_3)}\quad \overline{\mathrm{T}/(\mathrm{T}\backslash NP_2)}}{\mathrm{T}/((\mathrm{T}\backslash NP_1)\backslash NP_3)}\,{>}\mathbf{B}\quad \overline{((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3}}{(S_{+SUB}\backslash NP_1)\backslash NP_3}\,{>}\mathbf{B}_{\times}}{S_{+SUB}}\,{*}$$

We also need to exclude overgenerations like the following:

(62) a. *Ik denk ze dat het heeft gedaan
I think she that it has done

b. *Ik denk ze dat het heeft gedaan

$$\dfrac{\overline{S/S'_{+SUB}}\quad \overline{\mathrm{T}/(\mathrm{T}\backslash NP)}\quad \dfrac{\overline{S'_{+SUB}/S_{+SUB}}\quad \dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP)}\quad \overline{(S_{+SUB}\backslash NP)\backslash NP}}{S_{+SUB}\backslash NP}\,{>}}{S'_{+SUB}\backslash NP}\,{>}\mathbf{B}_{\times}}{S'_{+SUB}}\,{*}{>}$$

c. *Ik denk ze dat het heeft gedaan

$$\dfrac{\dfrac{\overline{S/S'_{+SUB}}\quad \overline{\mathrm{T}/(\mathrm{T}\backslash NP)}}{S/(S'_{+SUB}\backslash NP)}\,{>}\mathbf{B}\quad \dfrac{\overline{S'_{+SUB}/S_{+SUB}}\quad \dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP)}\quad \overline{(S_{+SUB}\backslash NP)\backslash NP}}{S_{+SUB}\backslash NP}\,{>}}{S'_{+SUB}\backslash NP}\,{>}\mathbf{B}_{\times}}{}\,{*}{>}$$

In order to permit the desired derivation (59) without such overgeneralizations allowing "real" NPs to combine in "scrambled" orders, we must mark the extracting argument in the same way that we distinguished extractable subjects in chapter 4, using the feature value $+ANT$ in the following instance of the crossed composition rule, and the earlier assumption that type-raised categories (which for conciseness I continue to write as $\mathrm{T}/(T\backslash NP)$) are written in full as $\mathrm{T}/(T\backslash NP_{-ANT})$:

(63) *Dutch forward crossed composition II* ($>\mathbf{B}_{\times}$)
$X/Y \quad Y\backslash Z_{+ANT} \quad \Rightarrow_{\mathbf{B}} \quad X\backslash Z_{+ANT}$
where $Y = S\backslash\$$

The extraction is then permitted, as follows:[18]

(64) die Jan Cecilia de nijlpaarden zag helpen voeren

$$\dfrac{\overline{(N\backslash N)/(S_{+SUB}\backslash NP)}\quad \dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP_1)}\quad \overline{\mathrm{T}/(\mathrm{T}\backslash NP_2)}}{\mathrm{T}/((\mathrm{T}\backslash NP_1)\backslash \mathrm{NP}_2)}\,{>}\mathbf{B}\quad \dfrac{\overline{\mathrm{T}/(\mathrm{T}\backslash NP_4)}\quad \overline{(((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3)\backslash NP_4}}{((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3}\,{>}}{S_{+SUB}\backslash NP_{3\,+ANT}}\,{>}\mathbf{B}_{\times}}{N\backslash N}\,{>}$$

The general case (37) can be accepted in an analogous fashion. That is, the subject and complement NPs 1 to h that precede the site of extraction can combine by successive forward compositions into a function of the form $\mathrm{T}/((\ldots(\mathrm{T}\backslash NP_1)\backslash\ldots)\backslash NP_h)$. (As the (64) shows, the processor somehow has to cope with the problem of deciding where the extraction site actually is, but that is not a problem of grammar.) The complement NPs j to n that follow the extraction site can combine with the verb complex by successive forward compositions and/or applications into a single entity $((\ldots(S_{+SUB}\backslash NP_1)\backslash\ldots)\backslash NP_h)\backslash NP_i$. These two entities can then compose by the crossed composition rule (63), "canceling" $(\ldots((S_{+SUB}\backslash NP)\backslash NP_1)\ldots)\backslash NP_h$, to give a single entity $S'_{+SUB}\backslash NP_{i_{+ANT}}$, to which the relative-pronoun $(N\backslash N)/(S'_{+SUB}\backslash NP_{+ANT})$ can finally apply to yield the N modifier category $N\backslash N$. At every stage the interpretations of the object category $\mathrm{T}/(\mathrm{T}\backslash NP)$ of the combinatory rules ensure that the correct dependencies are established in predicate-argument structure. Exactly the same apparatus will allow either NP in (36), but not both, to extract.

Nevertheless, the potential overgenerations (60)–(62) arising from the interaction of crossed composition and the type-raised categories are prevented by the restriction of the residue of relativization to "antecedent government," or combination with arguments other than the relative-pronoun, via the $+ANT$ feature and the fact that the standard order-preserving type-raised categories are an abbreviation for $\mathrm{T}/(T\backslash NP_{-ANT})$:

(65) *dat Jan Cecilia zag zwemmen

$$\dfrac{\dfrac{\mathrm{T}/(\mathrm{T}\backslash NP_2)\quad \mathrm{T}/(\mathrm{T}\backslash NP_1)\quad \dfrac{((S_{+SUB}\backslash NP_1)\backslash NP_2)/VP \qquad VP}{(S_{+SUB}\backslash NP_1)\backslash NP_2}>}{S_{+SUB}\backslash NP_{2_{+ANT}}}>\mathbf{B}_\times}{*}$$

(66) *dat Jan de nijlpaarden Cecilia zag voeren

$$\dfrac{\dfrac{\mathrm{T}/(\mathrm{T}\backslash NP_1)\quad \mathrm{T}/(\mathrm{T}\backslash NP_3)}{\mathrm{T}/((\mathrm{T}\backslash NP_1)\backslash NP_3)}>\mathbf{B}\qquad \dfrac{\mathrm{T}/(\mathrm{T}\backslash NP_2)\quad ((S_{+SUB}\backslash NP_1)\backslash NP_2)\backslash NP_3}{(S_{+SUB}\backslash NP_1)\backslash NP_{3_{+ANT}}}>\mathbf{B}_\times}{*}$$

(67) *ik denk ze dat het heeft gedaan

$$\dfrac{S/S'_{+SUB}\quad \dfrac{\mathrm{T}/(\mathrm{T}\backslash NP)\quad \dfrac{S'_{+SUB}/S_{+SUB}\quad \dfrac{\mathrm{T}/(\mathrm{T}\backslash NP)\quad (S_{+SUB}\backslash NP)\backslash NP}{S_{+SUB}\backslash NP}>}{S'_{+SUB}\backslash NP_{+ANT}}>\mathbf{B}_\times}{S'_{+SUB}}*>$$

(68) *ik denk ze dat het heeft gedaan

$S/\overline{S'_{+SUB}}$ $T/(T\backslash NP)$ S'_{+SUB}/S_{+SUB} $T/(T\backslash NP)$ $(S_{+SUB}\backslash NP)\backslash NP$

$S/(S'_{+SUB}\backslash NP)$ (>B)

$S_{+SUB}\backslash NP$ (>)

$S'_{+SUB}\backslash NP_{+ANT}$ (>B×)

(*>)

6.6 Subject and Object Extraction from Embedded Clauses

Relativization of the kind described above can of course be unbounded, as in (69):

(69) het nijlpaard dat ik denk dat Jan Cecilia zag voeren
the hippopotamus that I think that Jan Cecilia saw feed
'the hippopotamus that I think that Jan saw Cecilia feed'

Moreover, as noted in chapter 4, the present theory predicts that the asymmetry in extractability of subjects and objects found in English depends upon the differential directionality of these arguments, and that it will not be characteristic of verb-final or verb-initial languages. The asymmetry does indeed fail to occur in Dutch (Maling and Zaenen 1978; Koster 1986, 206). Both subject and object extractions are permitted by the rules introduced above, as follows:

(70) a. de arts die ik denk dat het werk heeft gedaan.
the doctor who I think that the work has done
'*the doctor who I think that did the work.'

b. (de arts) die ik denk dat het werk heeft gedaan

$(N\backslash N)/(S\backslash NP)$ S_{+SUB}/S'_{+SUB} S'_{+SUB}/S_{+SUB} $T/(T\backslash NP)$ $(S\backslash NP)\backslash NP$

$S_{+SUB}\backslash NP$ (>)

$S'_{+SUB}\backslash NP_{+ANT}$ (>B×)

$S_{+SUB}\backslash NP_{+ANT}$ (>B×)

$N\backslash N$ (>)

(71) a. het werk dat ik denk dat ze heeft gedaan
The work that I think that she has done
"the work that I think that she did'

b. (het werk) dat ik denk dat ze heeft gedaan

$(N\backslash N)/(S\backslash NP)$ S_{+SUB}/S'_{+SUB} S'_{+SUB}/S_{+SUB} $T/(T\backslash NP)$ $(S\backslash NP)\backslash NP$

$S_{+SUB}\backslash NP_{+ANT}$ (>B×)

$S'_{+SUB}\backslash NP_{+ANT}$ (>B×)

$S_{+SUB}\backslash NP_{+ANT}$ (>B×)

$N\backslash N$ (>)

The earlier claim that the English subject/object extraction asymmetry is a consequence of the way the combinators project directionality from its SVO lexicon, rather than of an autonomous Empty Category Principle or a value on the pro-drop parameter is therefore sustained (Steedman 1997, 55).[19]

6.7 Dutch Main-clause Order

The account of Dutch word order given so far has ignored the main-clause orders exemplified in (3a—c). In terms of the standard movement metaphor, these orders are related to the corresponding subordinate-clause order, (3d) by *bounded* movement. In a lexical grammar this translates into the assumption that the main-clause orders arise from a single additional lexical entry for each verb in the language. (Of course, for Dutch inversion, unlike English inversion, we must eventually expect to capture this pattern via a lexical rule. However, I will ignore the question of how to do this here.) I will assume the following additional main-clause categories for Dutch tensed intransitive, transitive, and ditransitive verbs:[20][21]

(72) wint 'wins' := S_{-SUB}/NP
at 'ate' := $(S_{-SUB}/NP)/NP$
gaf 'gave' := $((S_{-SUB}/NP)/NP)/NP$

The feature $-SUB$ identifies the VSO clause as a main clause, in contrast to the SOV category.

The tendency noted in chapter 4 for rightward arguments to "wrap" with respect to the Logical Form means that the first of these arguments is the subject, as revealed by agreement and the interpretation in the following full categories:

(73) wint 'wins' := $S_{-SUB}/NP_{3s} : \lambda x.wins'x$
at 'ate' := $(S_{-SUB}/NP)/NP_{agr} : \lambda x.\lambda y.eat'yx$
gaf 'gave' := $((S_{-SUB}/NP)/NP)/NP_{agr} : \lambda x.\lambda y.\lambda z.give'zyx$

(Details of agreement will usually be omitted from derivations.)

I will assume that sentence-initial arguments in Dutch, including subjects, extract by the same mechanism as the English topicalized sentences discussed in note 8 to chapter 4 and the relative-pronouns discussed in chapter 3 and section 6.5. That is, they have categories parallel to example (43) of chapter 3, as in (74) below. (As in the case of the English topicalized categories, I assume that the Dutch categories are assigned only to leftmost elements of sentences.)

(74) a. $S'_{-SUB}/(S_{-SUB}\backslash NP)$
b. $S'_{-SUB}/(S_{-SUB}/NP)$
c. $(S'_{-SUB}/X)/((S_{-SUB}/X)/NP)$

As usual, S'_{-SUB} abbreviates S^{+CP}_{-SUB}, a main-clause CP in which the feature-value $+CP$ distinguishes the topicalized clause from the untopicalized clause S_{-SUB}, and the feature-value $-SUB$ distinguishes both from the corresponding subordinate SOV clause types.

This category permits the following main-clause orders for the simple tensed transitive verb:

(75) a. At Jan appels?
b. Appels at Jan!
c. Jan at appels.

I assume that NPs on the right of the verb undergo order-preserving type-raising, an assumption supported by the similar possibilities for argument cluster coordination, as in *Hij gaf de leraar een appel en de politieman een bloem* 'He gave the teacher an apple, and the policeman, a flower' (see below). It is important for future developments that these leftward-raised categories do not restrict T on the *SUB* feature as the rightward ones do (see (43)). For example:

(76)
$$\dfrac{\dfrac{\text{Appels}}{S'_{-SUB}/(S_{-SUB}/NP_2)} \quad \dfrac{\dfrac{\text{at}}{(S_{-SUB}/NP_2)/NP_1} \quad \dfrac{\text{Jan}}{\text{T}\backslash(\text{T}/NP_1)}}{S_{-SUB}/NP_2}<}{S'_{-SUB}}>$$

Such extractions can be unbounded:

(77) Appels denk ik dat Jan heeft gegeten
Apples think I that Jan has eaten
'Apples, I think that John has eaten.'

(78)
$$\dfrac{\dfrac{\text{Appels}}{S'_{-SUB}/(S_{-SUB}\backslash NP)} \quad \dfrac{\dfrac{\dfrac{\text{denk ik}}{S_{-SUB}/S'_{+SUB}} \quad \dfrac{\text{dat}}{S'_{+SUB}/S_{+SUB}}}{S'_{-SUB}/S_{+SUB}}>\mathbf{B} \quad \dfrac{\dfrac{\text{Jan}}{S_{+SUB}/(S_{+SUB}\backslash NP)} \quad \dfrac{\text{heeft gegeten}}{(S_{+SUB}\backslash NP)\backslash NP}}{S_{+SUB}\backslash NP_{+ANT}}>\mathbf{B}_\times}{S'_{-SUB}\backslash NP_{+ANT}}>\mathbf{B}_\times}{S'}>$$

By contrast, the derivation of SVO order (and in general of fronting of any argument except the most oblique) crucially involves the same backward crossed composition rule as the English rule (33) and the nonperipheral extrac-

tion examples (28) of chapter 4, which we can write as follows:

(79) *Dutch backward crossed composition I* ($<\mathbf{B}_\times$)
$Y/Z_{-SHIFT,+ANT} \quad X\backslash Y \quad \Rightarrow_{\mathbf{B}} \quad X/Z_{-SHIFT,+ANT}$
where $Y = S_{-SUB}/NP$

We must also assume that in Dutch main verbs, subcategorized nonperipheral rightward arguments bear the feature-value $-SHIFT$, like English dative NP arguments of ditransitives (see (32a) of chapter 4, although I will usually suppress this feature-value by convention in the notation):

(80) a. at := $(S/NP)/NP_{-SHIFT}$
b. gaf := $(S/NP/NP_{-SHIFT})/NP_{-SHIFT}$

Subjects can then front as follows:

(81)
$$\dfrac{\dfrac{\text{Jan}}{S'_{-SUB}/(S_{-SUB}/NP_1)} \quad \dfrac{\dfrac{\text{at}}{(S_{-SUB}/NP_2)/NP_{1_{-SHIFT}}} \quad \dfrac{\text{appels}}{\mathrm{T}\backslash(\mathrm{T}/NP_2)}}{S_{-SUB}/NP_{1_{-SHIFT,+ANT}}}\,<\mathbf{B}_\times}{S'_{-SUB}}\,>$$

The $+ANT$ restriction on the argument Z in rule (79) marks it for antecedent government only, and as incompatible with any normal in situ argument NP. In this respect the rule is exactly parallel to the Forward Crossed Composition rule II (63) used in relative clauses. Examples like the following are thereby prevented:

(82) a. *[At appels]$_{S_{-SUB}/NP_{-SHIFT,+ANT}}$ het meisje.
Ate apples the girl
'The girl ate apples.'

b. *[Gaf hij appels]$_{S_{-SUB}/NP_{-SHIFT,+ANT}}$ het meisje.
Gave he apples the girl
'He gave the girl apples.'

c. *[Gaf hem appels]$_{S_{-SUB}/NP_{-SHIFT,+ANT}}$ het meisje.
Gave him apples the girl
'The girl gave him apples.'

For example:

(83)
$$\dfrac{\dfrac{*\text{At}}{(S_{-SUB}/NP_2)/NP_1} \quad \dfrac{\dfrac{\text{appels}}{\mathrm{T}\backslash(\mathrm{T}/NP_2)} \quad \dfrac{\text{het meisje}}{\mathrm{T}\backslash(\mathrm{T}/NP_{1_{-ANT}})}}{S/NP_{1_{+ANT}}}\,<\mathbf{B}_\times}{*}$$

To the extent that heavy NP shift over nonarguments is allowed in Dutch, as in examples like the following, the other English instance of the backward crossed composition rule (31) restricted to arguments compatible with $+SHIFT$ must be included in Dutch as well.

(84) Jan zag gisteren een vlucht regenwulpen.
Jan saw yesterday a flock whimbrels
'Jan saw a flock of whimbrels yesterday.'

The rule is the following:

(85) *Dutch backward crossed composition II* ($<\mathbf{B}_\times$)
$Y/Z_{+SHIFT} \quad X\backslash Y \quad \Rightarrow_{\mathbf{B}} \quad X/Z_{+SHIFT}$
where $Y = S_{-SUB}/NP$

German appears to allow examples parallel to (83), so it presumably has the more general backward crossed composition rule (24) of chapter 4.[22]

The generalization implicit in the above analysis of leftward-extraction is that fronting of a preverbal element in Dutch is the mirror-image of unbounded extraction in Dutch relative clauses, as exemplified in (64). That is, any arguments that lie between the canonical position of the extracted argument and the verb combine normally with the verb. Any arguments that lie on the other side of the extraction site combine with each other by a simple composition rule. The two fragments then combine to create the clause residue of extraction by a crossed composition rule, to form the argument of the topicalized element. The following ditransitives illustrate the point:

(86)

Hij	geeft	de politieman	een bloem
$S'_{-SUB}/(S_{-SUB}/NP_1)$	$((S_{-SUB}/NP_3)/NP_2)/NP_1$	$T\backslash(T/NP_2)$	$T\backslash(T/NP_3)$
		$T\backslash((T/NP_3)/NP_2)$ <B	
	$S_{-SUB}/NP_{1_{+ANT}}$ <B$_\times$		
S'_{-SUB} >			

(87)

De politieman	geeft	hij	een bloem
$S'_{-SUB}/(S_{-SUB}/NP_2)$	$((S_{-SUB}/NP_3)/NP_2)/NP_1$	$T\backslash(T/NP_1)$	$T\backslash(T/NP_3)$
	$(S_{-SUB}/NP_3)/NP_2$ <		
	$S_{-SUB}/NP_{2_{+ANT}}$ <B$_\times$		
S'_{-SUB} >			

(88)

Een bloem	geeft	hij	de politieman
$S'_{-SUB}/(S_{-SUB}/NP_3)$	$((S_{-SUB}/NP_3)/NP_2)/NP_1$	$\mathrm{T}\backslash(\mathrm{T}/NP_1)$	$\mathrm{T}\backslash(\mathrm{T}/NP_2)$
	$(S_{-SUB}/NP_3)/NP_2$ (<)		
	S_{-SUB}/NP_3 (<)		
S'_{-SUB} (>)			

Similarly, we can assume the following verb-initial categories for the modal *zal* 'shall/will', the perfect *heeft* 'has', and the tensed causative *zag* 'saw'. (Note that these categories also obey the lexical wrapping universal.)

(89) $zal := (S_{-SUB}/VP_{+SUB})/NP$
$heeft := (S_{-SUB}/VP^{PPL}_{+SUB})/NP$
$zag := ((S_{-SUB}/VP_{+SUB})/NP)/NP$

The interpreted categories can be written in full as follows:

(90) $zal := (S_{-SUB}/VP_{+SUB})/NP : \lambda x.\lambda p.shall'px$
$heeft := (S_{-SUB}/VP^{PPL}_{+SUB})/NP : \lambda x.\lambda p.has'px$
$zag := ((S_{-SUB}/VP_{+SUB})/NP)/NP : \lambda x.\lambda y.\lambda p.saw'pyx$

In such main-clause tensed-verb categories, the VP complements are distinguished as having OV order—that is, as $+SUB$, in contrast to the corresponding complements of the related SOV verbs. We saw in connection with (49), repeated here, that OV VPs are not permitted as complements of verbs like *zien* in subordinate clauses:

(91) a. *...omdat ik Cecilia [zag]$_{((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}}$
[de nijlpaarden voeren.]$_{VP_{+SUB}}$
b. *...omdat ik probeer Jan [te leren]$_{(VP^{TE}\backslash NP)/VP_{-SUB}}$
[de nijlpaarden voeren.]$_{VP_{+SUB}}$
c. *...omdat ik [heb]$_{(S_{SUB}\backslash NP)/VP_{EN,-SUB}}$
[de nijlpaarden gevoerd.]$_{VP_{EN,+SUB}}$

VP_{+SUB} and VP^{PPL}_{+SUB} are as usual abbreviations for predicate categories $(S_{+SUB}\backslash NP)$ and $(S^{PPL}_{+SUB}\backslash NP)$.

It will be recalled that the order-preserving forward type-raised category is restricted via the variable T to combination with $+SUB$ categories. It follows that all of the following main-clause orders are allowed:[23]

(92) a. Jan$_{(S'_{-SUB}/X)/((S_{-SUB}/X)/NP)}$ zal$_{(S_{-SUB}/VP_{+SUB})/NP}$ [appels eten.]$_{VP_{+SUB}}$

b. [Zal Jan]$_{S_{-SUB}/VP_{+SUB}}$ [appels eten?]$_{VP_{+SUB}}$

c. Appels$_{S'_{-SUB}/(S_{-SUB}\backslash NP)}$ [zal Jan]$_{S_{-SUB}/VP_{+SUB}}$ [Cecilia geven.]$_{VP_{+SUB}\backslash NP_{+ANT}}$

All of the following are excluded as main clauses:

(93) a. *Jan appels zal eten.

b. *Appels Jan zal eten.

c. *Zal appels Jan eten.

Similarly, the main clauses in (94) are permitted, but those in (95) are not:

(94) a. Jan heeft [appels gegeten.]$_{VP^{PPL}_{+SUB}}$

b. Ik zag Cecilia [de paarden voeren.]$_{VP_{+SUB}}$

(95) a. *Jan appels heeft gegeten.

b. *Ik Cecilia de paarden zag voeren.

Finally (although we will continue to ignore the details of binding theory here, directing the reader to Steedman 1996b for a fuller account), it is clear that the binding of reflexives will behave correctly, because the main-clause verb categories as usual wrap their arguments into the predicate-argument structure.

The above analysis of main clauses in Dutch makes some strong predictions concerning coordinate sentences, including nonconstituent and gapping varieties. Discussion of these predictions is deferred until chapter 7.

6.8 Interaction of Word order and Quantifier Scope

Although a full treatment of quantification remains beyond the scope of the present book, the brief outline in chapter 4 touched on the fact that, as Kayne (1983) and others have argued, embedded SVO subjects in English and several Romance languages disallow the wide scope readings that objects and more oblique arguments permit. In CCG this is a necessary consequence of the fact that subjects are leftward arguments. I noted in passing that related disallowed scope inversions are strongly predicted for verb-final constructions in German, in which many more arguments are leftward.

Kayne (1998), following Bayer (1990, 1996), points out that, although German does allow scope alternations in sentences like (96), examples like (97) do not, unlike their English counterparts:

(96) (Weil) irgendjemand auf jeden gespannt ist. *(Ambiguous)*
(Since) someone on everybody curious is
'Since someone is curious about everybody.'

(97) (Weil) jemand versucht hat jeden reinzulegen. *(Unambiguous)*
(Since) someone tried has everyone cheat
'Since someone has tried to cheat everyone.'

In present terms, this asymmetry arises because in (96), *gespannt ist* can form by composition and the quantifier *auf jeden* can then combine with the whole thing to take scope over the tensed verb. The referential *jemand* can then combine to yield the scope-inverted reading. By contrast, in (97), although *versucht hat* can similarly compose, it cannot combine with *reinzulegen* until *jeden* has combined with it. *Jeden* therefore cannot take wide scope with respect to tense, and hence cannot take inverse scope over *jemand.*

Haegeman and van Riemsdijk (1986, 444-445), and Haegeman (1992, 202), cite a number of related effects of "Verb Projection Raising" on scope in West Flemish Dutch and Zurich German subordinate clauses (see Koster 1986, 286-288 for discussion). For example both "verb raising" word order (98a) and "verb projection raising" word order (98b) are allowed for the following West Flemish subordinate clause:

(98) a. (da) Jan vee boeken hee willen lezen *(Ambiguous)*
(that) Jan many books has wanted read
'that Jan wanted to read many books'

b. (da) Jan hee willen vee boeken lezen *(Unambiguous)*
(that) Jan has wanted many books read
'that Jan wanted to read many books'

Only (98a) is ambiguous and allows "many books" to take wider scope than "wanted," yielding the reading where there are many books such that Jan wanted to read them.

Similar results apply for the equi verbs, which allow related word order alternations in standard dutch:

(99) a. (omdat) Jan veel liederen probeert te zingen *(Ambiguous)*
(because) Jan many songs tries to sing
'because Jan tries to sing many songs'

b. (omdat) Jan probeert veel liederen te zingen *(Unambiguous)*
(because) Jan tries many songs to sing
'because Jan tries to sing many songs'

We therefore correctly predict that these verbs under the latter word order will limit scope inversion similarly to Bayer's (97), making (100b) unambiguous in comparison to (100a):

(100) a. (omdat) iemand alle liederen probeert te zingen *(Ambiguous)*
(because) someone every song tries to sing
'because someone tries to sing every song'

b. (omdat) iemand probeert alle liederen te zingen *(Unambiguous)*
(because) someone tries every song to sing
'because someone tries to sing every song'

6.9 On the Rarity of Crossing Dependencies

The above Dutch fragment suffers from a number of omissions. Many important questions, including certain idiosyncrasies of clitic pronoun placement and the placement of adverbials and negation, have been passed over and await future work. However, I hope to have shown that the facts of Dutch grammar confirm a number of the assumptions that were made in formulating the grammar of English. First, the extraction and coordination possibilities in Dutch confirm the assumption that NPs and other arguments should bear order-preserving type-raised functor categories. The claim that type-raising is related to the phenomenon of case and that even nonexplicitly cased languages like English and Dutch have implicit case is borne out. Second, the existence of crossed dependencies in a language with the lexicon of Dutch is predicted, and continues to support the controversial inclusion of "slash crossing" rules of functional composition in the theory.[24]

One might ask at this point why crossing or intercalating dependencies remain comparatively rare. Although it seems to be the case that many, and perhaps all, natural languages include a few crossing dependencies, no configurational language entirely crosses dependencies, or even crosses a majority of them. The question of why they are relatively rare therefore remains crucial for any theory that allows them at all.[25]

Grammars of the kind proposed here allow crossed dependencies only when they include (a) function categories that combine with some of their arguments to one side, and with others to the other side, and (b) combinatory rules that "cross" directionality in their operands. It is well known from studies by Greenberg (1963), Vennemann (1973), Lehmann (1978), Comrie (1981), Hawkins (1982), and Mallinson and Blake (1981) that there is a strong crosslinguistic tendency for constituent types that are closely related (say, in

terms of the $\bar{X}$-theory), such as VP and PP, to have a consistent order of head and complement, a suggestion that has been recast by Dryer (1992) in terms of consistent ordering of phrasal and nonphrasal elements. German and Dutch are rather unusual in going against this trend, which is generally supposed to originate in semantic similarities between such categories, and a requirement for natural grammars to be as transparent a reflection of the semantics as possible. The latter requirement is equally widely supposed to stem in turn from requirements of ease of learning, or processing, or both.

In the terms of the present theory, this observation translates into a tendency for semantically related function categories—for example, verbs—to find their arguments consistently to one side or the other, as has been noted within other categorial approaches to Universal Grammar (Vennemann 1973; Keenan and Faltz 1978; Flynn 1983) and as seems consistent with Dryer 1992. It follows that the conditions under which crossed dependencies can arise according to the present theory are known for independent reasons to be relatively rare.

Appendix: Summary of the Dutch Fragment

Certain details of the categories and rules in the following summary of the grammar fragment developed so far for Dutch anticipate further discussion of Dutch in chapter 7.

Category Abbreviations

The following abbreviations are used:

$S = S^{-CP,+IP}$ (a tensed clause or IP)

$S' = S^{+CP,+IP}$ (a tensed clause or CP)

$VP = S^{-CP,-IP,-TE}\backslash NP$ (a bare infinitival VP)

$VP^{TE} = S^{-CP,-IP,+TE}\backslash NP$ (a *te*-infinitival VP)

Verb Categories

Four types of Dutch clause are distinguished, using the categories (tensed) S and (infinitival, participial, etc.) VP, and the feature SUB(ordinate), which may take the value + (plus), − (minus), or ? (either). Thus:

S_{-SUB} is a tensed main clause.

S_{+SUB} is a tensed subordinate clause.

VP_{+SUB} is an infinitival (etc.) VP yielding S_{+SUB}.

To avoid clutter, $VP_{?SUB}$ is often abbreviated as VP. VP can be further distinguished by minor superscript features such as TE (*te*-infinitival) and PPL (participial).

Verbs have distinct categories as heads of main and subordinate clauses, unlike their English counterparts (other than the auxiliaries). Main-clause verbs take all arguments to the right and "wrap" them into Logical Form. All other verbs take NP, PP, and the like. on the left, and S, VP, and the like. on the right. All such arguments are $?ANT$—unspecified on the feature ANT—although this detail is left implicit to save clutter. For example, *zien* 'to see' has the following categories:

zag := $((S_{-SUB}/VP_{+SUB})/NP)/NP$ (head of main clause)

zag := $((S_{+SUB}\backslash NP)\backslash NP)/VP_{-SUB}$ (head of subordinate clause)

zien := $(VP\backslash NP)/VP_{-SUB}$ (head of infinitival)

te zien := $(VP^{TE}_{+SUB}\backslash NP)/VP_{-SUB}$ (head of *te*-infinitival)

te zien := $(VP^{TE}\backslash NP)/VP^{TE}_{+SUB}$ (head of *te*-infinitival)

(The last of these arises from the brute force *te* category stipulation (30).) *Voeren* 'to feed' has the following categories:

voerde := $(S_{-SUB}/NP)/NP$ (head of main clause)

voerde := $(S_{+SUB}\backslash NP)\backslash NP$ (head of subordinate clause)

voeren := $VP\backslash NP$ (head of infinitival)

te voeren := VP^{TE}_{+SUB}/NP (head of *te*-infinitival)

NPs and Other Argument Categories

Order-preserving type-raised categories allow noun complements and verb groups to form complex constituents. Restrictions on possible type-raised categories encode the syntactic difference between infinitival verbs and full VPs. V2 main-clause order is the result of topicalization. $S\$$ is frequently abbreviated as T. All arguments except topics and relative-pronouns are $-ANT$. The latter are unmarked on this feature, and this is reflected in the raised categories, although in derivations this detail is usually suppressed (see "Rules" below). For example:

de nijlpaarden := $S\$\backslash(S\$/NP_{-ANT})$ (main-clause argument)

de nijlpaarden := $S_{+SUB}\$/(S_{+SUB}\$\backslash NP_{-ANT})$(subordinate-clause argument)

de nijlpaarden := $S'_{-SUB}\$/(S_{-SUB}\$/NP_{?ANT})$ (mainclause topic)

die/dat := $(N\backslash N)\$/(S_{+SUB}\$\backslash NP_{?ANT})$ (relative-pronoun)

Rules

Composition rules distinguish type-raised categories from others, and restrictions on composition using the feature *ANT* prevent scrambling but enable wh-movement.

a. *Forward application*
$X/Y \quad Y \quad \Rightarrow \quad X$

b. *Backward application*
$Y \quad X\backslash Y \quad \Rightarrow X$

c. *Forward composition I* (>**B**) (55)
$X/Y \quad Y/(Y\backslash Z) \quad \Rightarrow_{\mathbf{B}} \quad X/(Y\backslash Z)$
where $Y = S$

d. *Forward composition II* (>**B**)—see chapter 7, example (25)
$X/Y \quad Y/Z \quad \Rightarrow_{\mathbf{B}} \quad X/Z$
where $Y = S_{-SUB}/\$$

e. *Forward crossed composition I* (> $\mathbf{B}^n{}_{\times}$) (14)/(19)
$X/Y \quad (Y\backslash Z)\$ \quad \Rightarrow_{\mathbf{B}^n} \quad (X\backslash Z)\$$
where $Y = VP_{-SUB}$

f. *Forward crossed composition II* (>$\mathbf{B}_{\times}$) (63)
$X/Y \quad Y\backslash Z_{+ANT} \quad \Rightarrow_{\mathbf{B}} \quad X\backslash Z_{+ANT}$
where $Y = S\backslash\$$

g. *Backward composition* (<$\mathbf{B}^n$) (21)
$(Y\backslash Z)\$ \quad X\backslash Y \quad \Rightarrow_{\mathbf{B^n}} \quad (X\backslash Z)\$$

h. *Backward crossed composition I* (<$\mathbf{B}_{\times}$) (79)
$Y/Z_{-SHIFT,+ANT} \quad X\backslash Y \quad \Rightarrow_{\mathbf{B}} \quad X/Z_{-SHIFT,+ANT}$
where $Y = S_{-SUB}/NP$

i. *Backward crossed composition II* (<$\mathbf{B}_{\times}$) (85)
$Y/Z_{+SHIFT} \quad X\backslash Y \quad \Rightarrow_{\mathbf{B}} \quad X/Z_{+SHIFT}$
where $Y = S_{-SUB}/NP$

j. *Forward type-raising* (>**T**)
$X \quad \Rightarrow_{\mathbf{T}} \quad \mathrm{T}/(\mathrm{T}\backslash X_{-ANT})$
where $\mathrm{T}\backslash X$ is a parametrically licensed category, and $\mathrm{T} = S_{+SUB}\$$

k. *Backward type-raising* (<**T**)
$X \quad \Rightarrow_{\mathbf{T}} \quad \mathrm{T}\backslash(\mathrm{T}/X_{-ANT})$
where $\mathrm{T}\backslash X$ is a parametrically licensed category, and $\mathrm{T} = S_{?SUB}\$$

Two further rules corresponding to the combinator **S**, which in Steedman 1996b are used to capture parasitic gaps in Dutch, are not discussed here.

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Chapter 7

Gapping and the Order of Constituents

'O where are you going?'
Said reader to rider,
'That valley is fatal where furnaces burn,
Yonder's the midden whose odours will madden,
That gap is the grave where the tall return.'

W. H. Auden, *Five Songs, V*

The Dutch pattern of argument cluster coordination in subordinate clauses—briefly introduced in section 6.4.1 and discussed in greater depth in section 7.1—is a case of the more general universal identified by Ross (1970) noted in chapter 2, concerning the tendency of argument cluster coordination to conserve or "project" the directionality of the lexicon across SOV, VSO, and SVO languages and/or constructions (see Koutsoudas 1971; Lehmann 1978; and Mallinson and Blake 1981):

(1) a. SOV: *SOV and SO, SO and SOV
b. VSO: VSO and SO, *SO and VSO
c. SVO: SVO and SO, *SO and SVO

The SOV and VSO cases are essentially symmetrical, and are discussed in sections 7.1 and 7.2. Certain cases of Dutch main-clause argument cluster coordination fall under the VSO heading, as the choice of a VSO category for main-clause verbs predicts (see chapter 6). These are also discussed in section 7.2.

The remainder of the chapter explains gapping in SVO languages like English, as in *Dexter ate bread and Warren, potatoes*, and the related cases of forward gapping in Dutch and other Germanic languages, in terms of the combinatory theory. In particular, the theory predicts Ross's generalization that verb-medial languages and constructions necessarily pattern with the verb-initial ones rather than the verb-final ones in permitting forward, but not backward, gapping, as in (1c) above, and explains why certain SOV languages like Dutch and certain VSO languages like Zapotec show exceptions to the above pattern.[1]

Although the basic SOV and VSO cases reduce to argument cluster coordination, and (as Maling (1972) pointed out in different terms) do not require a