WPFG

working papers in functional grammar

wpfg no. 67, februari 1999
prijs: *f* 5.00

FG Expression Rules: from templates to constituent structure

Dik Bakker
Universiteit van Amsterdam

FG Expression Rules: from templates to constituent structure

Dik Bakker
Dept. of General Linguistics
University of Amsterdam[1]

1. Introduction

Since its first proposal in Dik (1978), the main effort in Functional Grammar has been directed to underlying representations. This has provided the theory with the respective versions of the layered clause model, among other things (cf. Hengeveld 1989, Dik 1997a). More recently, attention has shifted to yet deeper, or higher, levels of linguistic description: pragmatics and discourse (cf. Hannay 1991; Hengeveld 1997; Kroon 1997). These developments are quite natural, given the major tenures and requirements of adequacy held by the theory. However, it is the conviction of the current author that the expression rules - i.e. good old syntax, morphology and phonology - have been relatively neglected. While examples of underlying representations abound in the literature, no fully worked out example of a complete expression may be found at all, not even of the simplest 'John gives a book to Mary' type. There may be historical, or psychological, or even practical reasons for this state of affairs. There are, however, several more compelling reasons why it should be deplored, and made up for. To mention just a few:

a. FG aims at being a complete theory of language, not a semantic theory, or a discourse theory. This implies that all components distinguished within the grammar models or speaker/hearer models proposed by the theory should be developed in a uniform fashion, with a clear idea about the nature of the interfaces between them, and the distribution of the respective grammatical features over them. Only then the theory may be put to empirical test in the full sense of the word.

[1] I gratefuly acknowledge the work of the members of the Working Group on FG expression rules that was held in the winter of 1998: Riet Eestermans, Michiel Feij, Femke Fleur, Rik van Gijn and Marieke Valstar. Not only did we discuss the ideas proposed in this paper, getting rid of he worst errors along the line. Each of the members of the group also worked out a case of complex expression discussed in Bakker (1998fc) vis à vis the standard FG expression rules in order to find the problematic aspects of an earlier proposal.

b. Underlying representations in FG contain the semantic and pragmatic information both necessary and sufficient for the computation of the form of the corresponding sentence. This means that an underlying representation may only be correct if for each of its elements we are able to show that it is (co-)responsible for the triggering of at least one expression rule. In other words: we can only be sure about our theory of wellformed underlying representations if we have a complete theory of wellformed expressions.

c. Over the last decades, a great amount of knowledge has been acquired concerning the syntax of natural language (cf. Culicover 1997 for a recent introduction to syntactic theory). This enterprise has taken place, to a large extent, within the so-called formal paradigm, and many solutions to problems would be, or are already, catered for outside the realm of syntax in a functional theory. However, other phenomena and insights should be incorporated, *mutatis mutandis*, in the FG expression component.

d. It has been shown, formost in computational implementations of FG, that the traditional tripartite decomposition of the expression component into generation, linearization and phonematization cannot work properly, even in relatively simple cases (cf. Bakker 1994:266f and section 3 below).

e. In FG, syntax and morphology boil down to ordering rules, and do not include any type of structure on any level of the sentence or (complex) words. All decisions about form and order are taken on the basis of the semantic and pragmatic information contained in underlying representations, disregarding possible structural aspects. As far as there is any form of autonomy to be found in syntax or morphology, FG in its current practice takes, in fact, a rather extreme functionalist position in terms of Croft (1995:509).[2]

---

[2] Van Valin & LaPolla (1997) devote a 700 page book on the development of a syntactic component for another functionally based theory, Role and Reference Grammar (RRG). In order to get their model typologically adequate, quite an amount of syntactic sophistication is called for in their excercise. Since

In this paper I will propose a partial reorganization of the Expression Rules (ER), my goal being to make up for at least part of the problems a-e mentioned above. The proposal takes into consideration several of the current principles of expression and constraints on it. For instance, templates and placement rules will reappear, be it in a disguised way. The strict separation between function and form is maintained in the sense that no interpretation takes place once expression has sparked off. Transformations will be excluded in the sense that no structures will be generated that have to be altered at a later stage; i.e. there is no movement and no deletion. Filtering, though not ruled out here in principle and in face of the facts, is restricted as much as possible. A major difference in comparison to the current organization of the expression component is that Stage I - computation of forms - and Stage II - linearization - will be conflated. This integrated version of the expression rules has been introduced in Bakker (1994), but will be worked out further here.[3] Stage III - phonological realization, will only be touched upon in passing, much as it is in the original version of the expression rules (henceforth: the standard model). It remains an open question whether and to what extent functionally oriented proposals to phonology (cf. Boersma 1998) may be integrated into the model of the expression component that I will propose. As another major deviation from the original expression rules, the flat templatewise organization will be replaced by a hierarchical structure, much like underlying representations (UR), or constituent structure trees for that matter. This implies the introduction of notions such as subcategorization, syntactic heads and domains, inheritance, feature percolation and adjacency. Furthermore, the proposal made here has a dynamic as opposed to a static nature. This means that expressions will be developed in a top down, left to right fashion under the assumption that this order is essential for the forms that we may, and may not get. The standard model is neutral in this respect, although the requirement of cognitive adequacy seems to at least encourage such a dynamic approach.[4]

---

semantic representations in RRG are not principally simpler than those of FG, it is not clear why FG could do with less syntax.

[3] In Dik (1997a) it is suggested that a 'sandwich' approach to expression might turn out to be necessary. The proposal made in Bakker (1994) could be seen as a concrete elaboration of that idea.

[4] Indeed, Simon Dik, in a paper at the 1990 Functional Grammar Conference in Copenhagen has suggested a 'conveyor belt' model for stage II, which implies both a dynamic and left to right approach.

Sofar for a brief motivation to further develop the expression rule component of the FG grammar model, and some of the major characteristics of the extended version that I will propose below. The rest of this paper is organized as follows. In section 2 I will give a short survey of the standard version of the expression rules as they are presented in the literature. In section 3, some problematic aspects of this model will be discussed on the basis of concrete form and order phenomena from several languages. In section 4 a reformulation of the expression rules will be proposed that takes care of most of the problems observed in section 3. Section 5 gives a somewhat detailed example of the working of the model proposed in section 4 on the basis of a none too simple problem of expression.

2. Expression Rules: the current state of affairs

In their strictest form, the FG Expression Rules may be defined as follows. Given the (infinite) set of wellformed underlying representations S_U of language L, there is a function or algorithm E_L that maps S_U onto the set of expressions S_E of L. E_L embodies the expression rules of L. In the FG literature, the assumptions A1 and A2 are generally made, following the above definition:

A1. Every wellformed underlying representation is expressible.

A2. There is precisely one expression for each wellformed underlying representation.

In other words: there are no formal filters (I1), and there is no synonymy (I2) in language L. Below, we will see that there are counterexamples to A1. However, these are rather marginal, and I will assume that A1 may nevertheless be seen as a sound principle in general. A2 would mean that there are, in fact, no pure, neutral options in grammar, and that a difference in form implies a difference in function, i.e. meaning or pragmatics. Therefore, in the case that the expression rules generate more than one sentence for some underlying representation this would mean that this underlying representation is underspecified, and in fact describes a set of cohyponymous expressions rather than precisely one sentence. In other words, the underlying representations should be made more specific. Furthermore, I will assume that the following also holds, although I am not aware of its having been stated explicitly:

A3. Every wellformed expression of L has an underlying representation.

In other words: there are no expressions without meaning. This trivially holds if we assume that the ER component needs a UR for an input, and will not trigger without it. Autonomous productions of ER then fall outside the scope of the full grammar of L. A3 has implications for the reverseability of E_L and the parseability of the FG grammar model. If we indeed assume A1 and A2, then the output of ER is restricted by the constraints on its input - wellformed URs - and by constraints on the expression rules themselves. The latter in the sense of the way they work rather than that they were to have a filtering function.

As has already been observed above, the rules determining wellformed underlying representations have been given relatively much attention to. In general, we can say that URs of language L are constrained by URC1 through URC5 below.

URC1: The set of functions and operators of L. This will be a subset of the universal set of functions and operators, further determined by universal and typological constraints, and possible idiosyncracies of L.

URC2: The scope relations determined by the theory of underlying representations, i.e. the layered clause model.

URC3: Accessibility, i.e. the extent to which functions and operators may be assigned to elements of URs. Some well-known domains are relativization, raising and subject assignment.

URC4: The predicates in the lexicon of L, including predicate formation rules.

URC5: Compositional semantics, including selection restrictions on argument and satellite positions.

URs, thus constrained, are fed to the ER component. In this component they are processed in three steps:

Stage I: the computation of forms. Here, the definitive forms are produced. So, these rules represent inflectional morphology. They also take care of the generation of

grammatical elements of L, such as articles, adpositions and auxiliaries. The result is a set of separate phonological strings ('words').

Stage II: linearization. After all forms have been computed, the strings of Stage I will be ordered according to the word order rules of L. This could be seen as the syntactic stage, though notions like 'constituent' and 'structure' do not seem to play a role whatsoever.

Stage III: phonological realization. To the ordered strings of stage II the set of phonological rules will be applied that make a wellformed sentence out of them. This includes 'sandhi' (i.e. the phonotactic processes at the word boundaries) and the application of sentential stress patterns and prosodic contour.

The rules for Stage I take the form of one or more μ (for morpho-syntactic) operators, to be applied to an operand O, leading to some value V, provided that a certain condition C is met. (1) below gives the general format of Stage I rules; the condition does not have to be present[5]:

(1) μ+ [O] = V, IF C

μ operators may be of two types. The first type are the primary operators. These are direct reflections of the π and Ω operators and the respective functions in the corresponding UR. The second type are the auxiliary operators. These are introduced by the expression rules themselves. Examples are the cases, such as Ablative and Genitive, and verbal categories, such as Infinitive, Past Participle and Subjunctive. Typically, auxiliary operators have no direct and unique semantic interpretation themselves; they are formal categories which are the projection of a number of underlying semantic or pragmatic distinctions. In an earlier version of the theory there was a third type of μ operator: contextual operators. These were mainly introduced to take care of agreement (cf. Dik 1989:300f). In the version in Dik (1997a:353f), they have been replaced by a second type of auxiliary operators. These are copies of primary operators, added to the UR after its completion. This is done by the expression rules, before expression proper starts. So, in the

[5] In fact, there were no conditions in the 1989 version of the expression rules. The + sign in (1) indicates that there may be one or more μ operators.

UR given in (2a) below, an expression rule adds those features of the subject which are relevant for agreement, here number and person, to the main predicate, giving (2b) as a result (example adapted from Dik 1997a:351):[6]

(2) a. Pres e_i: talk [V] (d1 x_i: man [N])AgSubj

b. Pres <1,p3> e_i: talk [V] (d1 x_i: man [N])AgSubj

Such auxiliary operators are marked in URs by angled brackets. Apparently, also inherent features, such as animacy, gender and person, may be copied.[7] In Stage I rules, as formalized in (1) above, there may be just one μ operator or there may be more than one, as in the case of fusional as opposed to agglutinative morphology. E.g. the rule that computes the final form of the tensed verb in the expression of (2b) will have the following constellation of μ operators:

(3) Pres <1,p3>

As for the operand in rules of type (1), this is typically a predicate stemming from the UR. So, the rules that would give us the right form of the main verbal predicate of a clause would look like (4) below. In (4) PRED is a variable ranging over the predicates in the lexicon.

(4) Pres <1,p3> [PRED [V]]

However, the output form cannot be calculated in a straightforward way since there are conditions as to its precise form. The English suffix for 3rd person singular present tense is *-iz*, *-s* or *-z*, depending on the last phoneme of the verb being a sibilant, a voiceless consonant or otherwise. A more or less complete version of this rule could look like (5) below (I have refrained from formalizing the condition part; this can not be done without a formalized

---

[6] Here, and below, I will use the term 'feature' loosely for any type of function or operator, primary or auxiliary, both in underlying representations and in expression rules.

[7] As an alternative to this copying operation, Dik (1997a:356) suggests contextual retrieval, i.e. the addition of the relevant features precisely at the moment when they are necessary for the calculation of the right form. In the case of example (2a), number and person of the subject term would then be retrieved when the form of the tensed verb is to be calculated. The argument given for the preference of the copying operation is that 'in the computational implementation as developed in ProfGlot (Dik 1992) it turned out that the copying method was easier to implement than the contextual retrieval method'. This seems to be a technical rather than a linguistic argument.

morphophonemic subtheory):

(5) Pres <1,p3> [PRED [V]] =

[PRED-*iz*], IF (last phoneme of PRED is sibilant) ELSE

[PRED-*s*], IF (last phoneme of PRED is voiceless) ELSE

[PRED-*z*]

For the PRED part, the actual UR element will be substituted before rule application. Then the conditions can be applied. In the case of (2), this would result in (6):

(6) Pres <1,p3> [talk [V]] = [*talk-s*]

In the representations above and below, the italicized elements indicate so-called terminal forms, i.e. phonological strings that may not be operated upon anymore by some later Stage I rule, but that are ready for linearization. All other forms may be taken as an input by later rules, and changed in some way or other. In fact, apart from deletion, any transformation may be performed on an operand (cf. Dik 1997a:352). However, empty operands are not acceptable. One of the possible transformations is the introduction of auxiliary operators. An example of this is found in (7) (adapted from Dik 1997a:357):[8]

(7) Pres <1,p3> e_i: Perf talk [V] (d1 x_i: man [N])AgSubj

One of the rules this constellation calls for is the application of the relevant operators on the main predicate. This is done in (8) below. Notice that first only the Perf operator is applied (8b), which introduces the auxiliary operator PaP (for Past Participle). PaP is applied recursively, in (8d), before the rest of the operators may do their job in (8e), leading to a string that consists of terminal forms only.

[8] Note that Perfect is coded as an aspect rather than a tense operator in (7); Dik (1997a:357) treats it as a tense operator. See the discussion in Comrie (1976:52f) and Comrie (1985:32f) on the English Perfect. In what follows I leave out details on the ordering of rules and the communication between them, and fill in other details where the theory does not explicitly say anything about it. This will precisely be one of the major points to be discussed in the next section.

(8) a. Pres <1,p3> Perf [talk [V]] =>

b. Perf [talk [V]] = [have [V] PaP [talk [V]]]

c. Pres <1,p3> [have [V] PaP [talk [V]]] =>

d. PaP [talk [V]] = *talk-ed*

e. Pres <1,p3> [have [V] *talk-ed*] = *has talk-ed*

An important principle in ER is that of so-called lexical priority. It has been applied in (8e), where a deviating form in a lexical paradigm is inserted instead of the form that would result from the application of a rule, as in (5) and (6).

A last feature of the Stage I rules I want to introduce here is the relative ordering of the terminal forms. In principle, ordering at the template level is left to the Stage II rules. However, examples in the literature suggest that the local ordering of Stage I grammatical material, such as affixes, articles and auxiliaries vis à vis their lexical heads, i.e. nouns, adjectives and verbs, is determined by the corresponding Stage I rules themselves. These orderings are all based on one principle: the assumed iconicity between scope relations among operators in the UR on the one hand and the order of the elements resulting from the application of these operators on the other hand. More specifically, the operators are supposed to have a centripetal, i.e. an inside out way of expansion, resulting in an inside out ordering of the values. Interestingly, as shown in the literature, there are quite a few examples in morphosyntax where centripetal expansion leads to grammatically right orders. The order of the auxiliaries resulting from the expansion of passive and several π operators in English is a rather convincing example, as shown in (9) below (for the complete derivation see Dik 1997a:383).

(9) Pres <1,p3> Perf Progr Pass [*call* [V]] $(John)_{Ag}$ $(Bill)_{GoSubj}$

=>

(Bill) has been be-ing call-ed (by John)

However, it remains an open question whether this sole principle could explain the vast majority of ordering instances of grammatical material in a typologically

convincing way, and the (few) counterexamples could be seen as language specific idiosyncracies. In fact, it is not hard to find counterexamples, as we will see in the next section.

On the assumption that all grammatical material has been generated and ordered relative to the corresponding lexical material, these ordered chunks are now brought into line by the linearization rules. These consist of two types of instruments: templates and placement rules. Templates give the relative order of the functional positions at several levels of syntactic description, typically the sentence and the noun phrase. Example (10) gives a (tentative) template for the Dutch main clause; I leave out the extraclausal constituents such as Theme and Tail.

(10) P1, V_{fin}, Subject, X, Object, X, V_{infin}, X

The slot labels are functional rather than formal. They serve to identify the UR constituent that should land there. Taken in its most straightforward form, this implies that there is a one-to-one relationship between UR elements and template slots and that this relationship is still identifiable after Stage I. A less straightforward interpretation would open up the possibility that the Stage I rules alter existing functional categories and create new ones. As far as I can see, the latter position is never taken in the literature. Now, in no one of the world's languages can there exist a strict correspondence between UR elements and any template for two reasons. Firstly, most elements may optionally be absent from a specific sentence, especially when we take into consideration holophrastic sentences as discussed in Mackenzie (1998). Secondly, probably no language in the world has completely fixed orders at all levels of syntactic description.[9] This means that, apart from rigid templates, which give the basic positions, we need placement rules to specify the alternative orderings. The typical example of such a rule is the one going with the P1 position of template (10), that (obligatorily) hosts the first constituent of the sentence. Somewhat informally stated, this placement rule may take the following shape:

[9] This is at least the case for the languages of Europe. For the 12 'Greenbergian' constituent pairs discussed in Bakker (1997), even the most inflexible languages, i.e. those belonging to the Altaic phylum, have some variation, while some languages, notably Latin and some Finno-Ugric languages, are almost completely flexible. Flexibility runs from 8% of the languages for the most conservative parameter (Definite article-Noun order) to 73% for the most flexible one (Verb-Object order). This is not to say, of course, that these are mere options, and that there are no rules behind them.

(11) Q-word to P1, IF NOT PRESENT THEN

Focal constituent to P1, IF NOT PRESENT THEN

Topic to P1, IF NOT PRESENT THEN

Subject to P1

The following should be observed, among other things. Alternatives are put in the order of preference. UR elements may be referenced to in a multiple fashion (e.g. some element may be both Topic and Subject). And reference is made to a category, Subject, that has its own slot in template (10). The latter implies that, optionally, the functional position labelled 'Subject' will remain empty. An alternative to placement rules is having several templates for the same level of analysis rather than one. E.g. for the Dutch sentence, a separate template has been suggested for subordinate as opposed to main clauses. A crucial point is that such elements be uniquely identifiable in URs on the basis of their function.

This completes our brief survey of the expression rules. In the next section we will have a critical look at them, and see whether they would work for some more or less complicated cases of morphosyntax.

3. Some fundamental problems

First, let us look at the expression rules in a general way, restricting ourselves to Stage I and II.

The first point that may strike us is that, in comparison with the rules that generate URs, we seem to know much less about constraints on expression rules. Nothing has been established in FG theory that even remotely looks like URC1-URC5 in section 2 above. In fact, it seems that virtually anything is possible in expression. The only constraints I can see for Stage I rules is that they may not delete material, that operands should be identifiable elements of URs and that there may be no empty operands. Local order of generated grammatical material is either iconic with underlying representations or idiosyncratic. Templates are constrained by the fact that the functional positions that they define should be the basic positions, and that deviating (marked) orders

should be defined via placement rules.[10] Apart from these constraints, those on URs, the potential constraints determined by Stage III, maybe some general optimality criteria, and the obvious fact that this all should lead to precisely the set of well-formed expressions of the language concerned, there seem to be no limits to:

- the copying of primary operators in URs;
- the combination of μ operators;
- what could be an operand;
- the operations that may be performed on them, and the resulting values;
- the type of conditions there may be, both on input and output;
- the order in which these rules should be applied;
- the shape and number of templates;
- the type and number of template slots;
- the relation between the respective templates;
- the way the slots are filled; and
- the nature of placement rules

Even if we exclude deletion, the fact that there would be no constraints in all these areas would mean that we are dealing with extremely powerful rule systems here. This would have severe implications for their acquisition. We can, of course, interpret the points above as a research programme with regard to the further development of the ER component, taking the requirements of typological, pragmatic, cognitive and diachronic adequacy into consideration.[11] However, we should be convinced, then, that the overall architecture of the ER component as sketched above can handle all kinds of expressions that we may come across in the languages of the world while by the same token it should not overgenerate. The following examples show that the current expression rules fail to produce several types of structures that occur quite frequently in the languages of the world.

The first two examples concern problems that are created by relying just on iconicity to get the right order for the forms that are generated by a complex set of operators. Both

---

[10] The definitions in Dik (1997a:358) seem to be suggestive of the fact that primary operators may not be recycled, i.e. they may be applied only once. However, they get unrestricted extra application via the copying operations on the UR.

[11] Cognitive replaces psycholinguistic adequacy here. In Bakker (1998) I plead for diachronic adequacy as a fourth criterion. I think that this is especially called for with respect to the expression rules, since language change affects form more often than not.

may be illustrated by the generation of auxiliary verbs. Above, in section 2 we have seen that these are produced by centripetal application of the π operators on the verbal predicate. For English, this results in verbal strings like the one in (9) above, that may be inserted in a template slot in a more or less straightforward way. However, for Dutch this does not seem to work. Compare:

(12) Hij heeft dat horloge misschien willen stelen.
he have:3SG that watch perhaps want:INF steal:INF
'Perhaps he wanted to steal that watch.'

As shown in (10), in the Dutch template for the main clause there is a separate slot in the second position for the verb that is marked for Tense and Subject agreement. In the case of (12) the tense marking auxiliary *heeft* 'has' is the inflected verb form. The other two verb forms, the infinitives *willen* 'to want' and *stelen* 'to steal', are inserted towards the end of the template. This means that, unlike the English example in (9), these three verb forms cannot be generated as a cluster, unless we assume that the terminal forms are still marked for their respective functional categories, as to make them selectable for the Stage II rules. If, on the other hand, we would want to generate the tensed form separately, in order to be in the position to process it independently, then we would have to admit an empty operand in case this turns out to be an auxiliary: the latter is the expression of one or more μ operators, without any lexical material for an operand.

A second problem arises when languages divert from the centrifugal scheme. English yes-no questions are an example of this. If we assume that, for the sentence in (13a) we have a UR that contains an Interrogative operator at the illocutionary level, we will, at a certain stage, end up with the rule in (13b):

(13) a. Did your brother like the girl next door?

b. Interrogative Past <Pers3 Sg> [like [V]]

If we work out the sequence of operators in (13b) in an inside out fashion, we would end up generating the ungrammatical string in (14):

(14) *do liked

So, separate generation of the tensed auxiliary seems to be

called for also in this case.

More in general, any type of discontinuity will create a problem for the standard ER model. More specifically, this will be the case for languages that are traditionally called non-configurational, such as the languages of Australia. The example from Djaru in (15) may serve to illustrate this.

(15) Jalu-ngu lani-i mawun-du dadi jambi-gu.
that-ERG spear-PAST man-ERG kangaroo big-ERG
'That big man speared a kangaroo.'

If we analyse (15) such that, in its underlying representation, the three ergative elements are united in one term, as operator, nominal head and restrictor, respectively, then the placement rules will have the complicated task to disentangle the set of terminal forms that result from the expansion of this term. On the other hand, if we analyse the three elements as being in apposition, and see them as independent entities of the underlying representation on the basis of their detached expression, then we will need a major adaptation of the theory of well-formed underlying representations for such cases.[12]

That at least some sophistication is necessary with respect to the ordering of processes at Stage I may be shown by an example from Latin. In this language, as in others, auxiliary operators such as Case may not only be generated directly, e.g. triggered by a function in the UR, but also indirectly, via markers that have themselves been generated by ER, such as adpositions. These I will call indirect auxiliary operators. So, while some cases may directly express a semantic function, like Dative in the case of Beneficiary, the Temporal function in (16) will be expressed by the preposition *post* 'after' which, in its turn, introduces the Accusative.

(16) (d 1 x_1 : memoria [N] : (d m x_2 : homo [N])$_{Poss}$)$_{Temporal}$

Post hom-inum memori-am.
After people-PlGen memory-Acc
'From time immemorial.'

So, the 'outer' function Temp should be expanded first, giving the preposition *post*, and the corresponding Accusative Case operator, before any 'inner' operators may be expanded, such

[12] This would extend the notion 'non-configurational' to the UR level. A much more in depth study of word order is called for, of course, to decide on such matters.

as number or definiteness.

A further problematic point, which is of a very fundamental nature, are cases where there is a mutual interaction between form and order. The following examples, from Dutch (17), Breton (18) and Arabic (19) illustrate this point.

(17) a. Jij speel-t vandaag goed!
you play-2Sg today well

b. Vandaag speel jij goed!
today play-0 you well
'Today you play well!'

(18) a. Ar vugale ne lennont ket levrioù
the children PCL read:3pl not books

b. Ne lenn ket ar vugale levrioù
PCL read:3sg not the children books
'The children do not read books.'

(19) a. 'akawat-i jalasna
sisters-my sat:PL

b. jalasat 'akawat-i
sat:SG sisters-my
'My sisters sat.'

In all cases, the agreement marking on the verb only appears when the subject has been expressed before the inflected verb form appears. It is as if the right features are not fully accessible, or assumed to be relevant, when the corresponding source of agreement has not been processed by the expression component.[13] Interestingly, this is in line with the assumption made by von der Gabelentz (1901; quoted by Plank 1998:197) that noun-adjective agreement would be more likely to occur in languages with NA orders than those with AN orders. Note that, also in this case, the source of the

[13] This is a very loose observation that will remain unsubstantiated here. On closer inspection there may well be different reasons for such cases in different languages. The Breton example in (18) stems from Borsley & Stephens (1989:411), and is discussed in depth from a syntactic perspective, in this case as an argument for Breton having VSO rather than SVO underlying structure.

agreement should precede the target.[14] This is illustrated by the example (20) from Spanish. The adjective *bueno* 'good' gets the short form *buen* when it is in front of the noun it modifies.

(20) a. un buen hombre
a good man

b. un hombre bueno
a man good
'a good man'

Of course, from the perspective of FG, only gender agreement would be really crucial in this respect, since features like number and case originate from the term rather than the noun level, and are 'available' as soon as the term as a whole is processed for expression, if we assume that this is the case, of course.

An interesting example from the area of speech errors is highly suggestive of the fact that linguistic forms are not computed autonomously as in Stage I, independent of their relative position in the syntactic structure. Consider the following examples from Dutch:

(21) a. een klein huis-je
a little house-DIM

b. een huis klein-tje
a house little-DIM

c. *een huis klein-je
a house little-DIM

(21a) is the right form, with the Diminutive suffix form phonologically adapted to the noun. The speech error in (21b) reverses the noun and the adjective. However, the Diminutive remains on the noun position, adapted to the form of the adjective. Errors like the one in (21c), where the suffix is not adapted, and has the form it would have on the noun, are never observed. Apparently, the Diminutive marker is not applied to the noun in isolation, and at an early stage of the production of the sentence, but retains a rather abstract

[14] Greenberg's (1963:95) universal U40 points in the same direction, though it makes slightly different predictions: 'When the adjective follows the noun, the adjective expresses all the inflectional categories of the noun'.

status until the moment of expression. Also, it seems to be associated to the noun position rather than to the noun itself.[15]

The above are examples with respect to which the ER component undergenerates, i.e. fails to produce grammatical forms. These are empirical facts, and they need to be repaired in order for the FG model to be even observationally adequate. However, given that there are hardly any constraints on most of its subprocedures, it is extremely likely that ER will as well overgenerate, i.e. that it is too powerful and that it potentially produces forms that would never occur in any of the worlds' languages. This point is of an entirely different nature, given the rather dependent position of morphosyntax in FG theory, and in functionalist, as opposed to formalist approaches to grammar in general. It could even be claimed that overgeneration is of no real empirical interest since superfluous forms will never crop up in the first place as long as no underlying representations trigger them. They are just potentially there. There are reasons, however, to pursue this matter anyway. Even though the ER component may be highly subordinate and subservient to the functional aspects of language, and (diachronically) shaped by the functional component for that matter, it may well turn out that it is not completely arbitrary, and should be granted some autonomy, in the sense of Croft (1995). Motivation for this may be derived from the fact that, in the Greenbergian tradition in language typology, a large number of formal universals have been proposed that go counter to the idea that in the realm of expression 'anything goes' (cf. Greenberg 1963; Hawkins 1983; Dryer 1992; Bakker 1997). The Chomskyan tradition in linguistics even takes the autonomy of form as a point of departure, by assuming syntactic structures to be innate in some more or less abstract way (Chomsky 1965; 1995). Of course, within the functional paradigm, proposals have been made to explain a great many of the formal patterns on the basis of higher, generally cognitive, categories and principles (cf. Bakker & Siewierska 1992 on word order explanation). Within FG proper, the Principle of Functional Explanation (Dik 1986) encourages the researcher to seek explanations as high as possible on the hierarchies of (21a) and the more detailed version of it in (22b) below:

[15] This example would also suggests that diminutive in Dutch is a term (or predicate) operator in ER rather than a predicate formation rule. Cf. Carroll (1994:191f) for more relevant examples of speech errors.

(22) a. Social > Discourse > Functional > Formal Factors

b. Social >

Discourse >

Pragmatic > Semantic >

Syntactic > Morphological > Phonological Factors

However, this still leaves open the possibility that we are confronted with phenomena that can only be explained on the basis of formal assumptions, be they of a syntactic, morphological or phonological nature. This is evidently the case when we have to face expressions which have a fully interpretable underlying representation but which are ruled out on the basis of an unsolvable conflict between expression rules. Stated somewhat differently: in cases where the expression rules work as a filter. The Latin example in (23) below, taken from Dik (1997b:208), is a case in point.

(23) *Romani in et ex Asiam/Asia transierunt.
romans into and out-of Asia-ACC/Asia-ABL cross-over
'The Romans crossed over into and out of Asia.'

In (22) we find the coordination of two prepositions, *in* 'into' and *ex* 'out of', which have the same prepositional object. The problem is that the former governs the Accusative while the latter governs the Ablative Case. This leads to a conflict with respect to the form of their object, *Asiam* or *Asia*, respectively, which comes out only during expression.[16] But even though such 'hard' examples of formal constraints, and autonomous operation by the ER component seem to be rather marginal, we would like to know what are the constraints on expression for its own sake, since this is an aspect of grammar, and language, as well.

---

[16] Of course, technically this conflict could be detected on the basis of the underlying representation, but this would imply that part of the expression rules has to be preprocessed. One wonders, however, whether such sentences would have been avoided or interrupted in their spoken form by a native speaker of Latin, and whether this is simply a correction at the level of written language. In this respect it is interesting to see that languages tend to solve such conflicts by selecting the neutral, or the least marked or the nearest form. See for this Corbett (1991:261f) who discusses the resolution of conflicts in gender agreement under coordination. And probably all languages with subject or object agreement are bound to run into this kind of problem under coordination. Cf. example (i):
(i) ?Either his parents or his sister have/has done this for him

Concluding this section, I make the following observations. The standard model of expression, that separates the construction of forms from their linearization falls short empirically: it gives rise to both undergeneration and overgeneration. The facts above suggests that we should look for a model of ER in which form and order of expression are interdependent, a model, in other words, that directs the right functional and lexical information to the right place in an abstract way, while postponing the computation of eventual grammatical forms as long as is necessary and possible. Since left-to-right order of expression - in terms of actual speech production in fact: time - seems to play a role, such a model should preferably be dynamic rather than static. In the next section I will propose a model for the expression rule component which attempts to meet these requirements.

4. The Expression Rules revisited

I start out from the original idea of templates with functional positions, but then combine them into a hierarchical structure. Although this is not ruled out as such by the theory, no explicit relationship has been postulated sofar between the templates for the respective levels of description, at least to my knowledge. Rather, they have been proposed as independent means for the linearization of the material contained in UR elements, such as clauses and terms. Here they will be interpreted in a more interdependent way: as a structure. This structure of interdependent templates is not postulated as a static entity, but it is expanded in a dynamic fashion on the basis of the UR material present. Depending on the specific features of the underlying representation U_i that is about to be expressed - typically: a clause - the right template T_i is selected. This template is labelled by a formal category, e.g. 'Sentence' in case a main clause is being expressed. This is the top category of the expression. The template has slots for potentially all elements that may be contained in U_i, and that have a function directly related to U_i, much like standard templates. In the case of a 'Sentence' template these could be slots for the main predicate, its arguments, and satellites and operators from the respective layers of the clause. This material is directed to the corresponding slots in a left-to-right order. Depending on its qualifications, element $U_{i,j}$ of U_i in slot $T_{i,k}$ of template T_i in its turn selects a template fit for its own expression. So, if $U_{i,j}$ happens to be a term, then it might select term template T_j with category 'Noun Phrase'. If term $U_{i,j}$ has a nominal head,

it will be directed to the Nominal Head position of T_j, together with the relevant operators that determine its final shape, such as Number and Case. Auxiliary operators are created on the fly. So, in this example, the constellation of μ operators (i.e. the term operators and functions) of term $U_{i,j}$ will generate the right Case after term template T_j has been invoked, adding it to the μ operators of the term. This value will then be available by inheritance for all templates that will sprout from T_j, and for which it is relevant. In this top down process, lexical material is directed to the relative location of expression. At the same time, auxiliary operators are created at the right moment, and grammatical elements, such as affixes, adpositions and auxiliaries, are inserted at the right position on the basis of the locally available and relevant set of μ operators. This recursive process terminates when, on all paths down from the top category, all μ operators have had their effect, and only terminal forms are available. The result is a tree-like structure such as the one depicted in figure 1 on the next page.

This is a first and rough impression of the model. We start out with purely functional information, i.e. the underlying representation that is to be expressed. As we go down the tree while selecting the right templates for the functional slots, semantic elements will be distributed in an increasingly more finegrained fashion over the respective slots, and will get gradually mixed up with and replaced by syntactic elements, such as syntactic constituents, auxiliary operators, articles, adpositions and pronouns. Still further down morphosyntactic and purely morphological elements will start to appear, such as particles, clitics and affixes. In a complete model, this could be extended to Stage III, i.e. morphophonology and the purely phonological level. The overall picture is that semantics, syntax, morphology and phonology merge at their boundaries, while blurring these boundaries much in the way they are blurred in diachronic processes.

This sketch has to be refined now in three ways. Firstly, we will have to say more about the dynamic aspects, i.e. how structures as exemplified in figure 1 come about. Next, we will discuss what could be templates, in other words: the status of nodes and the nature of branching in ER structures. And thirdly, we will have a closer look at the types of information that may be available at each template slot, or, rather, each node of the tree.

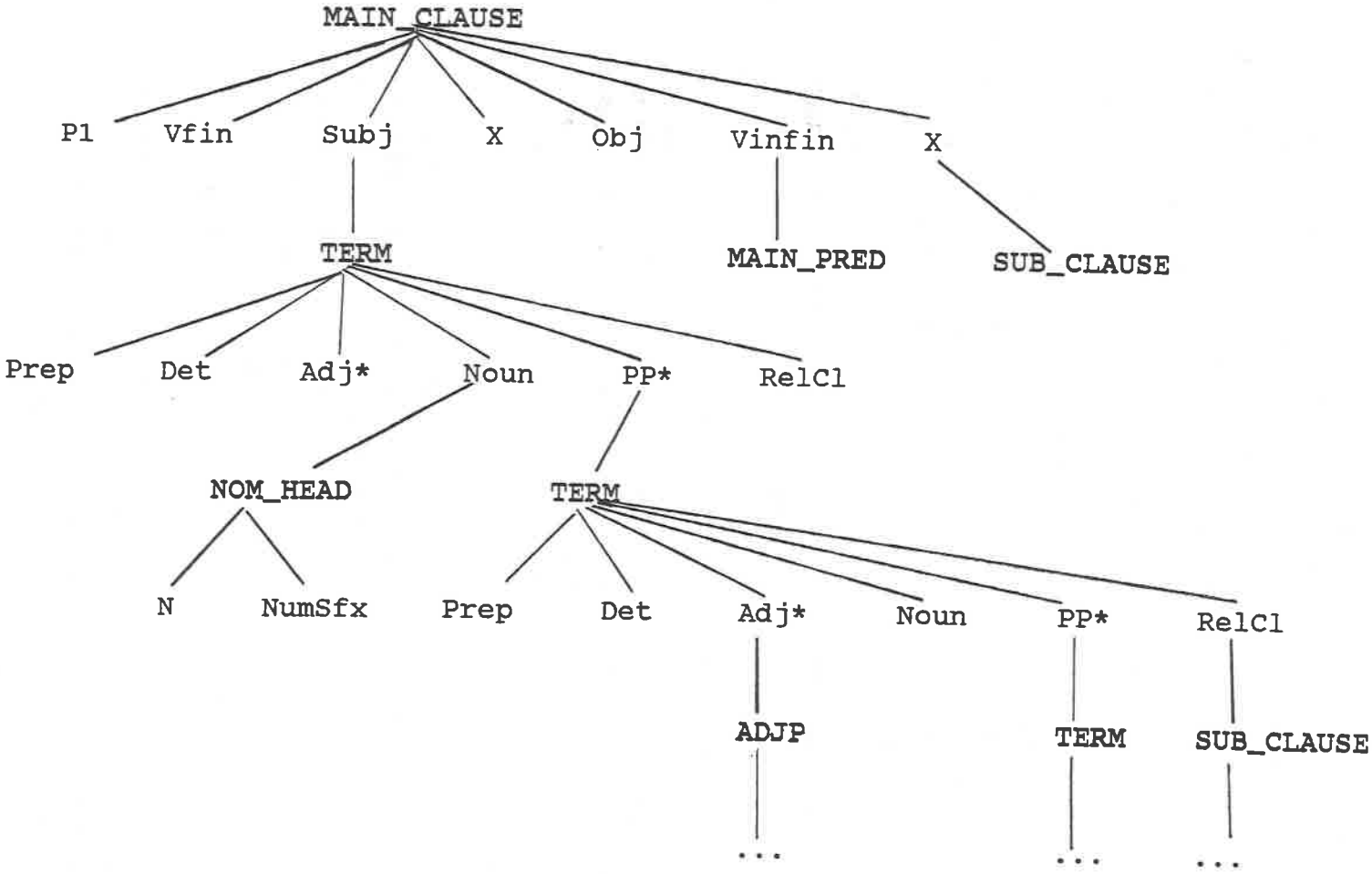
MAIN_CLAUSE
P1
Vfin
Subj
X
Obj
Vinfin
X
TERM
MAIN_PRED
SUB_CLAUSE
Prep
Det
Adj*
Noun
PP*
RelCl
NOM_HEAD
TERM
N
NumSfx
Prep
Det
Adj*
Noun
PP*
RelCl
ADJP
TERM
SUB_CLAUSE
...
...
...

FIG.1

4.1 The dynamics of tree construction

Five formal principles direct the construction of the constituent structure tree, of which three have already been introduced above. Although I will give short motivations for them, the main reason for introducing them is that they give a rationale for certain order phenomena, and that they potentially put considerable constraints to the information flow in the morphosyntactic structures that will be developed. It is then an empirical matter whether they might turn out to be the right constraints, whether we will have to relax them, or whether we will have to rehash the overall organization in the sense that we assign elements and features to the UR level that would formerly be assigned to ER and the other way around. There may also be implications for the status of certain lexical forms, i.e. whether they are mere grammatical elements or should be considered as full predicates, with semantics of their own.[17] So, for the time being, the following will hold for the syntacto-morphological constituent structures of the ER component:

a. They are developed top down. In this way, and other than in the standard model, the generation of linguistic form follows (the linguistic part of) the explanatory hierarchy given in (21b) above.

b. Development takes place from left to right. This is the 'natural' order in which linguistic forms are uttered in the first place. This may be expected to have shaped language over time, at least to some extent.

c. Development works depth first. This implies that of any two contiguous slots in a template, the leftmost one will be completely expanded up to its terminal forms before the rightmost one will be considered, and this recursively. This means that of the complete information that is necessary for the production of the whole utterance, including copies of UR material, only a fraction will be available at any one time. This considerably reduces the burden for short term memory, inherent to breadth first development. In combination with b., depth first processing may help explain certain order phenomena, such as the ones illustrated in (17)-(19) above.

[17] Compare the discussion on the status of English prepositions in Mackenzie (1992).

d. For any node X in the tree, all features found on a path from that node to the top node are in principle available to be inherited by X. Trivially, this means that overt primary operators would be available for every node in the tree. However, a distinction will be made between 'raw' UR material (functions, π and Ω operators, inherent features of predicates such as animacy or gender) on the one hand, and μ operators on the other hand. In order to be accessible for inheritance, any UR feature has to be transformed into a μ operator, either in a one-to-one or a more-to-one fashion, as in the case of a portemanteau operator. An implication of this is that only those features of URs qualify as such if they are turned into a μ operator sometime during expression. Apart from this there may be universal or language (type) specific downward barriers that make features inaccessible to lower nodes. Barriers may be both of a functional and a formal nature, i.e. determined by a layer or substructure in UR or by some syntactic or morphological boundary in ER.

e. Auxiliary operators may percolate, i.e. move upwards to higher nodes. Also for percolation there may be universal and language (type) specific upward barriers, that make them inaccessible to higher nodes. Barriers to percolation are only of a formal nature.

These dynamic principles may contribute to the (cognitive and typological) adequacy of the model. Externally, this organization means that the linguistic forms are produced precisely in the order in which they are uttered by the speaker (and reach the hearer) in a life setting, thus giving the model a procedural flavour. Apart from that, several constraints follow from these principles which restrict the formal power of the expression component, and determine which information necessarily has to come in from the UR, including its level of representation, or from an earlier stage of expression. I will mention the more obvious constraints here, and leave others for the discussion of the concrete example of expression in section 5 below.

Given the notions of inheritance and percolation under d. and e. above, top down development makes clear at which depth in the morphosyntactic tree μ operators, both primary and auxiliary, should be available for agreement purposes. These

mechanisms replace the pre-expressional copy operations on the UR in the standard model. In the latter model, it is not always clear how operators can be copied to other locations of the UR in the first place. Copying seems to be complicated for inherent features such as Gender, and virtually impossible for indirect auxiliary features, since the latter are triggered by forms that themselves are generated during expression, such as Case assigned by an adposition (see example (16) above).[18]

Left to right combined with depth first development of constituents puts constraints on the material that is available in a 'vertical' sense. This is especially relevant for inherent features and, even more so, for auxiliary operators, direct and indirect. For instance, in order for Gender information to be available for agreement purposes on nodes to the left of its source term, we will have to inspect the nominal head in question at a relatively 'early' moment of expression, i.e. high in the tree, and before the term of which that nominal head is part is processed for expression itself. Indirect auxiliary operators may only become available to other nodes by percolation, and are therefore inaccessible for nodes to the left, since these have already been expressed.

So, by postulating a dynamic development for our formal framework, we may make several predictions as to the relative frequency, or possibility, of certain agreement phenomena in the languages of the world. On the basis of this, I tentatively propose the following hierarchy:

(24) Agreement Hierarchy

Overt primary operator (Number, Person (?)) >

Inherent primary operator (Gender, Animacy) >

Direct auxiliary operator (Case via function) >

Indirect auxiliary operator (Case via grammatical marker)

So, I expect there to be more languages that have agreement on Number than on Gender. Also, if a language has agreement on Gender, it is likely to also have agreement on Number. The same may be expected to hold for e.g. agreement on Number and Gender on the one hand and Case on the other hand. Finally, although the direction of agreement will be completely free

[18] The only solution also in these cases would be to preprocess part of the expression rules.

for Overt primary operators, and relatively free for Inherent ones, Case agreement left of the source will be rather rare if it is direct, and is even ruled out when it is indirect[19]

Of course, these predictions are all very tentative. They serve as a first attempt at restricting the formal power of the expression component, and should be verified on the basis of a representative language sample. However, they are clearly more open to empirical test than the standard model, and an improvement at least in this respect.[20]

4.2 Branching and the nature of nodes

In this section we will have a closer look at the global organization of tree structures. The nodes from which the tree is constructed originate from slots in functional templates. Just like slots they represent the relative order of UR elements in expressions since no movement is allowed. Although no complete set of criteria has been developed within the standard model of ER for what types of elements may be united in one specific template, I will assume that the UR elements that are linearized by the same template will stem from one specific functional level. In other words: they should have a direct functional relationship to one and the same higher UR category, such as a clause or a term. In line with this, as a general point of departure I will assume that there exists some type of iconicity between UR and ER in terms of direct constituency and of scope. Thus, branching in trees will be restricted as far as possible to acknowledged hierarchies in underlying representations, i.e. to what in the standard theory would lead to the postulation of a specific template. However, I will not rule out altogether that there may be compelling independent syntactic, morphological or phonological arguments for introducing syntactic constituency that is not completely iconically motivated. In principle, this leaves us with a rather 'flat' tree structure, where the

---

[19] The first prediction is reflected by Greenberg's (1993) Universals 32 and 36. U32 predicts that when there is Subject or Object agreement on the verb in Gender, there will also be Number agreement. U36 paradigmatically predicts Number distinctions whenever there are Gender distinctions. My second prediction may get some support from universal 39. This universal holds that, where both Number and Case of the subject are reflected on the noun, and the affixes are on the same side of the stem, the Case marker is almost always the outer one. This may serve as diachronic evidence for the primacy of Number.

[20] For falsifation, at least as important a procedure for testing the acceptability of proposals like this one, negative predictions have to be formulated to the extent that certain orders are predicted not to occur, or with extremely low frequency. For research into relative frequencies, rather large samples are required, say several hundreds of languages. See Rijkhoff & Bakker (1998) for a method that helps to establish a representative sample of the languages of the world, and make suggestions about the minimum sample size.

number of daughter nodes is, in fact, unrestricted and where there are both semantic and formal motivations and restrictions on the introduction of subconstituents.[21]

A second point is that templates, and by implication the constituent trees that are derived from them, are maximally specified in the sense that there is a slot for any functional element that may potentially be expressed by it. This means that at least part of them may have no filler - i.e. functional material that is expressed via that node - in actual cases, since the corresponding UR material is simply not present. The well-known X slots for satellites in sentence templates are a case in point. Such optional nodes may be treated in two ways. Either they are left out of the resulting structure altogether - they are deleted, or possibly: they are not generated - or they remain 'empty' but nevertheless present in the final structure. I will assume that both types of nodes are in fact needed: certain syntactic and morphological phenomena may be explained precisely if we assume that the corresponding constellations are sensitive to nodes that are structurally present but not filled in a concrete case of expression. An example of such a 'trace' phenomenon is soft mutation in Welsh and other Celtic languages (cf. Ball & Müller 1992).

A third, and last point I want to make here concerns slots that may have multiple fillers. We can think of series of adjectival term restrictors. Two solutions present themselves in this case. Either we linearize the respective elements, the operation that is indicated with an asterisk in string algebra, as in example (25) below. Or we embed the elements, the operation that is performed by a recursive rule in formal syntax, as in example (26). Note that the grammars of (25) and (26) are weakly equivalent, i.e. they generate the same language fragment but assign different structures to it: (25) produces strings of coordinated adjectives; (26) produces a right branching tree with embedded adjectives.

[21] Such flat tree structures are in stark contrast with the strictly binary character of trees in the more recent versions of Generative Grammar (but see the discussion in Culicover 1997:162f). In syntactic theories, specific subtheories and principles such as c-command and trace theory help decide on branching and other constituency matters, and thus solve certain problems such as anaphor binding. In functional theories, such tree structuring principles are absent. The shape of structures is preferably based on motivation from the functional level. However, there may be separate formal reasons to introduce syntactic structure (cf. Bakker 1994:223f on the role of constituent order in the nominal or pronominal expression of terms).

(25) Det Adj* Noun

(26) a. NP -> Det Noun
b. NP -> Det AP Noun
c. AP -> Adj
d. AP -> Adj AP

In the days of early transformational grammar there were profound objections to the intuitively unnatural embeddings that grammars like (26) tend to generate, especially for those cases where the semantic analysis would have them coordinated rather than in scope of each other. I will take the position that such syntactic embeddings are only acceptable if they serve an independent purpose, i.e. not only should they reflect the semantic scope relations iconically but they should also get formal expression in some way or other, e.g. in terms of prosody, in order to distinguish them from the corresponding non-embedded structures. In other words: such distinct representations provide a syntactic interface between function and (phonological) form. Probably, this distinction should be made in the case of (27) and (28) below. (27), with coordinated adjectives, could get a flat representation; (28), with stacked restrictors, and contrastive focus on the outer one, leading to a specific stress pattern, could get an embedded structure that reflects the scope relations.

(27) A big, bad wolf
UR: (Indef 1 x_1 : wolf [N] : (big [A] & bad [A]))
ER: [$[a]_{Det}$ $[big]_A$ $[bad]_A$ $[wolf]_N$ $]_{NP}$

(28) A bad big wolf
RU: (Indef 1 x_1 : wolf [N] : big [A] : bad [A])
ER: [$[a]_{Det}$ [$[big]_A$ [$[bad]_A$ $[wolf]_N$ $]_{AP}$ $]_{AP}$ $]_{NP}$

4.3 What is in a node?

In traditional phrase structure trees, which are typically presented as static, 'after the fact' constructions without a 'history', the information represented per node is often restricted to a category label and, possibly, a small number of features, relevant for that node. Only at the terminal nodes, which represent lexical items, are more extended clusters of semantic, syntactic, morphological and phonological information to be found. The information flow as

such is generally not made explicit.[22] Given the crucial role of order in the ER model presented here, I will try to provide a full account of the history of constituent structure, by way of a complete set of features at all levels of the structure.

The first distinction that will be made is between functional and formal information. Functional information originates exclusively from the UR level. Formal information is developed during tree expansion. Figure 2 gives a complete picture of the types of information available per node. The respective entries will be explained below.

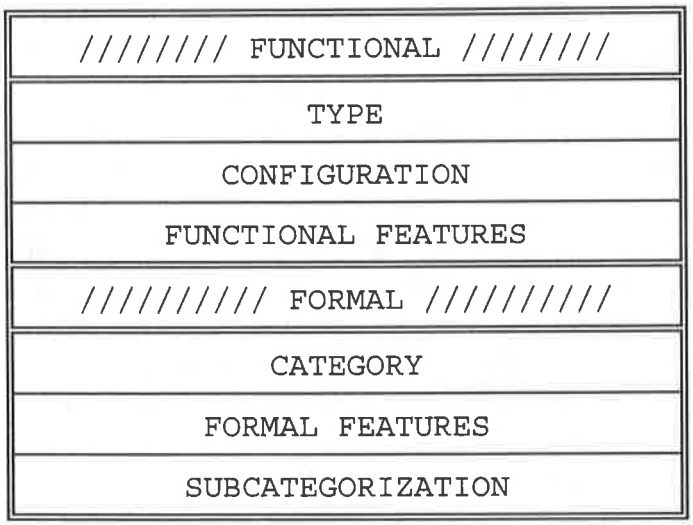

Figure 2. Structure of a node

The funcional part of a node consists of the following elements:

a. TYPE (abbreviation: Typ): an indication of the function of this particular node, much like the functional label of a template slot. Examples: P1, Subject, Vfin.

---

[22] See, for instance, the phrase markers of Head-Driven Phrase Structure Grammar (Pollard & Sag 1994). Dynamic models, as found in psycholinguistic modelling, seem to be no exception to this (cf. Kempen & Hoenkamp 1987). In the respective versions of Generative Grammar, part of the transformational history of phrase structure trees may, of course, be reconstructed on the basis of so-called traces. Furthermore, there are a number of subtheories and principles which control the well-formedness of phrase structures in a more static way. In FG, of course, underlying representations of utterances are also presented in an ahistoric fashion, the well-formedness criteria being applied on hindsight rather than dynamically. E.g. only an outside in (or inside out) development could prevent a UR to come about with both an Imperative operator at the Illocutionary level and e Tense operator at the Extended Predication level.

b. CONFIGURATION (Config): a (sub)specification describing that part of the underlying representation in the CONFIGURATION of the mother node that will be expressed via this node. Examples: the specification of the subject term or a temporal satellite. In fact, this may be a complex boolean expression stating an ordered set of alternative descriptors corresponding to potential fillers for this node, much like (formalized) placement rules in the standard model.

c. FUNCTIONAL FEATURES (FncFtrs): primary μ operators relevant for this slot. These may be derived from operators, functions and lexical elements of the CONFIGURATION, or they are inherited from the mother node. Examples: Number, Tense, Animacy.

The formal part of a node consists of the following types of information:

d. CATEGORY (Cat): the syntactic or morphological category of the subtree that is expressed via this node. Examples: Noun Phrase, Prepositional Phrase, Auxiliary Verb, Clitic, Suffix.

e. FORMAL FEATURES (FrmFtrs): auxiliary μ operators relevant for this slot. They may be derived from the Config and the FncFtrs, be inherited from the mother node, or percolate upwards from one of the daughter nodes. Examples: Gender, Case, Word Class.

f. SUBCATEGORIZATION (Subcat): template consisting of nodes for the functional categories in which to split up CONFIGURATION. This template is selected on the basis of the functional part of the node. It may also be provided on the basis of lexical priority. Example: for a standard template see (10) above. A specific template may be inserted on the basis of lexical information, typically from the (semantic) head, for cases where the node specifications would lead to selecting the wrong syntactic environment.

In fact, the above characterization of a node is of a mixed nature. Actually, nodes may be found in three states: uninstantiated, semi-instantiated and fully instantiated. In the first state, they are theoretical constructs, slots of

templates which are waiting, as it were, to be used in the expansion of a concrete UR. In this form, in which they represent static grammatical knowledge, only Typ and Config will be fully specified. Both FncFtrs and FrmFtrs are underspecified in the sense that the relevant features are given (e.g. Tense, Number, Gender), but their values (e.g. Past, Dual, Neuter) are left open. These values will be determined on the basis of the concrete UR information that will be expressed. Cat and Subcat are left open, to be selected on the basis of Typ and Config, unless there is a one-to-one relationship between functional and formal information, in which case they may be specified by a category and a concrete template, respectively.

Tree expansion starts with a specific UR_1 and a special node: the top node. The Config field of the top node contains one or, possibly more alternative descriptors of fully specified underlying clauses. If UR_1 fits one of the descriptors, it will replace the descriptors in Config. The unspecified features of FncFtrs and FrmFtrs are now assigned values on the basis of the UR in Config, i.e. they get the values of the corresponding features in UR_1. Finally, on the basis of Config the formal category and the right subcategorizing template will be selected, the latter with its own uninstantiated nodes which are the (potential) daughter nodes of the top node. Going from left to right, for any node in the template elements will be selected from the Config of the mother node that fulfill the configurational specifications of the respective daughter nodes. This is done in the order in which alternatives are specified in Config, and to the extent that the relevant substructures are available on the mother node. If a filler is indeed found, then it replaces the Config information of the uninstantiated daughter node. Its feature fields are specified on the basis of its own Config. Features that remain unspecified are inherited from the respective fields of the mother node. They have to be explicitly specified there at an earlier stage. In this way, nodes are recursively created and instantiated. At this stage they are semi-instantiated nodes. What remains open are the values which are supposed to percolate from lower nodes. By definition, these can only be formal features, i.e. part of FrmFtrs. As a result, nodes may only be fully instantiated when all terminal nodes that are dependent on it have been created. At the same time, no node may be semi-instantiated - or uninstantiated for that matter - after all

its terminal dependents have been established.[23]

There are two types of terminal nodes: lexical and grammatical ones. Lexical terminal nodes are characterized by the fact that they have a lexical form as the single filler of their Config field. Grammatical nodes have an empty Config field. They do not select any material from their mother node, they only inherit features. Their Cat field is prespecified for a lexical or morphological category like Aux, Art, Prep, or Sfx. On the basis of this information, the right form is retrieved from the grammatical sublexicon. Lexical terminal nodes have 'lexical elements' rather than 'predicates' for their Config. This leaves open the possibility that, apart from predicate material in the UR, other types of lexemes may fill the Config field. Particularly, this will concern adpositions and specific auxiliaries. The former may assign Case; the latter may have their own subcategorization frames. As a result of this, they cannot be merely retrieved as terminal nodes on the basis of a set of features, as in the case of strict grammatical elements, since then they could not have the desired impact on their context. Therefore they have to be present in the structure at an earlier than preterminal stage. Both lexical and grammatical terminal forms may be more abstract than a mere phonological string. Only a completed phonological level of analysis ('Stage III') however may clear up the right status of terminals at this stage.[24]

This should do for a first approximation to the proposed constituent structure for FG-like grammars. Further details will be discussed on the basis of a concrete example in the next section.

5. An example of a derivation

In this section, a non too trivial case of expression will be spelled out on the basis of the notions introduced in section 4. In this excercise, rather than separate labels as they are used in the literature to indicate operators and functions, I

---

[23] One could think of a default mechanism that fills in values for features that remain uninstantiated after the top down creation of the node. I leave such procedural details out here.

[24] Note that the side effects could not be left to feature percolation since percolated features cannot be instrumental in Case assignment to their left (as for postpositions) or the retrieval of Subcats. This state of affairs has some evident implications for the discussion around the lexical or grammatical status of certain elements, such as adpositions (cf. Mackenzie 1992). If we take not only the 'own meaning' criterion but also the treatment by morphosyntax as one of the defining characteristics, then these elements get a more or less intermediate status, halfway full predicate and grammatical element, which may well reflect their diachronic history. This may help provide an answer to the 'fuzzy category' problem.

will use a feature-value notation. So, instead of 'Past' and 'Subject' one will find expressions like 'Tense=Past' and 'Syntactic_Function=Subject'. This has several advantages. First, while two separate values may not necessarily be uniquely identifiable in more complex constellations, the feature-value combination should disambiguate them. E.g. rather than 'Sg , Pl' we will have 'Number_Subject=Sg , Number_Object=Pl' where necessary. A second advantage is that this notation may be expanded to a fully formalized representational system. Unification then provides a well-defined procedural extension, which leads the way to an implementable dynamic model of the expression component. This has been done for an earlier version of ER in Bakker (1994) in the form of a computer model of an FG-like grammar. Here I will refrain from going into details, and use a liberal version of the notational system, which should be intuitively clear, and concentrate on the linguistic facts.

The example of this section will be based on a phenomenon that is known in the literature as Relative Attraction. It is demonstrated in example (29) below, from Classical Greek (Rijksbaron 1981; and see Dik 1997b:335f for a FG treatment).

(29) peristaúrõsan autoùs tois déndresin
fenced:they them the:DAT:PL:NEUT tree:DAT:PL:NEUT

hoîs /hà ékopsan
that:DAT:PL:NEUT/ACC:PL:NEUT cut:they
'They fenced them about with the trees they had cut.'

In (29) we find a relative clause, the relative pronoun of which is coreferential with the Instrument term in the main clause. This term, *tois déndresin* 'with the trees' is marked by the Dative case. Given its Goal/Object function in the relative clause we would expect the relative pronoun to get the Accusative/Plural/Neuter form *hà*. This is indeed a grammatical outcome. However, instead, we may also have a Dative here, *hoîs*. Apparently, in Classical Greek, the case of the relativized noun phrase may be copied to the relative pronoun, overruling the original case of the relative clause.[25] According to Rijksbaron (1981), three conditions

[25] I will restrict the notion of Relative Attraction here to the copying of Case rather than other features. However, in a wider approach to this phenomenon, also cases like the following example from Dutch should be considered:
(i) Het meisje dat /die ik gisteren ontmoette.
Art+Neut girl Relpro+Neut/Relpro+MF I yesterday met
'The girl that I met yesterday'

apply to this copying. First, the head term should be in Focus. Second, copying is only allowed in case the semantic function of the head term is to the right of Recipient on the Semantic Function Hierarchy (SFH), the same one that is instrumental in syntactic function assignment (cf. Dik 1997a:262f), and given in abbreviated form in (30).

(30) Semantic Function Hierarchy

First Argument > Goal > Recipient > Beneficiary > ...

This excludes attraction of the Nominative case, leaving us with Genitive, Dative and Accusative. These two conditions see to it that the head term is marked, both pragmatically and semantically. The third condition is that the case to be assigned to the relative pronoun on the basis of the function in the relative clause should be Accusative, not one of the other cases distinguished by Classical Greek. In other words, the relative should be rather unmarked itself.

I will start tree expansion more or less in the middle, when the first two words, *peristaúrosan* and *autoùs*, have been expressed, and we have reached the point where the relativized noun phrase should be pronounced. In (31) I give the relevant term from the UR of (29), in (31a) in its canonical FG form, in (31b) in the adapted feature-value notation required for this excercise.[26]

(31) a. (def pl x_3 : dendr- [N] :
(pastperf e_1 (kopt- [V] $(x_1)_{AG, SUBJ}$ $(x_3)_{GO, OBJ}$)) $)_{INSTR, FOC}$

b. [term=[def=def, number=pl, termvar=x3,
head=[lex=[form=dendr-, cat=n,
gender=neuter]],
vrestr=[extpred=
[tense=past,
corepred=
[aspect=perf,
mainpred=

Many speakers tend to use the Masculine/Feminine form of the relative pronoun in these cases, given the [+Animate] character of the antecedent. Strictly, the Neuter form should be used, the only acceptable choice in written language.

[26] In Bakker (1994), the same type of feature=value representation, and the same set of operations, are used for all levels of the FG grammar model, i.e. for ER, UR and the lexicon. This gives a unified flavour to all representations, and facilitates the discussion about and creation of interfaces.

```
                                    [form=kopt-, cat=v,
                                     arg_1=[termvar=x1,
                                            semf=ag,
                                            syntf=subj],
                                     arg_2=[termvar=x3,
                                            semf=go,
                                            syntf=obj]]]]],
                semf=instr, pragf=focus] ]
```

This term will have to fit one of the nodes at the level of the sentence template to the right of the node that expanded *autoùs*, the Object of the main clause. This satellite node may have the form given below, where it is found in its uninstantiated mode. In order not to overburden the example with formal details, I left out alternative specifiers for this node, as well as other aspects that seem to be irrelevant here.

```
Type: satellite
Config: [term=[def=D, number=N, termvar=X,
               head=[lex=[form=FH, cat=n, gender=G]],
               vrestr=RC,
               semf=SF, pragf=PF] ]
FuncFtrs: termvar=X, number=N, gender=G
Cat: npp
FormFtrs: gram=[form=FG, cat=prep,
                semf=SF, syntf=XF, headform=FH,
                case=CP],
          case=(CP ; *case(semf=SF, syntf=XF) ),
          headcase=case/((PF = focus) AND (SF > rec))
SubCat: template=TP
```

In the Config field, by specifying the Gender feature for the head noun, the corresponding value will be retrieved from the lexicon. In the field for the functional features, Number, Gender and the term variable Termvar are specified, coupled to the same variables that are used in Config, i.e. D, N and X, respectively. The scope of variables in these specifications comprises the whole node, and is restricted to it. This will take care of the fact that, when binding this node with a term that unifies with the specifier, the corresponding values will be coupled automatically to the features in the FuncFtrs list, among others, making them the Number, Gender and Termvar of the node. In the field of the formal features, several specifications are to be found. First, the gram feature specifies that for this node, it may be necessary, given the

semantic and syntactic functions of the term, to generate a prepositional form. This may depend on FH, the predicate that fills that head position of the term. If a preposition is indeed selected, then the Case that it may govern, CP, will be the Case of the phrase. If not, then the Case is derived on the basis of the combination of functions SF and XF. *case refers to a separate, language dependend procedure that computes the right Case on the basis of its parameters. In general, such procedures, which consists of a set of conditions based on feature-value pairs, will be created any time a specific set of conditions should be inserted in more than one node. Thus, it should be seen as an abbreviation. Finally, in this field, a feature Headcase is given the value of feature Case, provided that the term has pragmatic function Focus, and that its semantic function is to the right of Recipient in the SFH (this condition is the portion right of the slash). These are general instructions. What lacks, of course, are the actual values for the crucial features. These stem from the filler, i.e. the term in (29). If we instantiate this term for the specifier in the Config field, we get the following semi-instantiated version of the node.

```
Type: satellite
Config: [term=[def=def, number=pl, termvar=x3,
             head=[lex=[form=dendr-, cat=n,
                        gender=neuter]],
             vrestr=[extpred=
                       [tense=past, predvar=PV,
                        corepred=
                          [aspect=perf,
                             mainpred=
                               [form=kopt-, cat=v,
                                arg_1=[termvar=x1,
                                       semf=ag,
                                       syntf=subj],
                                arg_2=[termvar=x3,
                                       semf=go,
                                       syntf=obj]]]]],
             semf=instr, pragf=focus] ]
FuncFtrs: termvar=x3, number=pl, gender=neuter
Cat: npp
FormFtrs: case=dat, headcase=dat
SubCat: template=[det, adj*, nomhead, pp*, vrestr*]
```

Here, all relevant features in both feature sets have been bound with values, under the application of the respective conditions. Apart from this, the appropriate template with subconstituents has been selected, i.e. one for a NP rather than a PP. In the template, the asterisk is used in the string grammar sense as in (24) above. Note that the Gram feature has been removed from the list of formal features. This is in accordance with the principle I will adopt viz. that grammatical forms should be specified at the lowest point ('the last moment') possible, on the basis of inherited features, and that they should not themselves be inherited by nodes lower than the direct constituents.[27]

We will now proceed only with the node that expands the verbal restrictor, i.e. the relative clause. In its unspecified mode, this node may look as follows:

```
Type: vrestr
Config: [extpred=
           [term=[termvar=X, number=N, gender=G]]]
FuncFtrs: termvar=X, number=N, gender=G
Cat: relcl
FormFtrs: headcase=HC
SubCat: template=TP
```

This representation contains precisely the features that are necessary to select the right direct subconstituent of the Config of the mother node. Since we have, by inheritance, the Number, Gender and Termvar features of the head term, we may stipulate that we want to select for this node an extended predication which contains a term - either an argument or a satellite - with the right term variable. Note that unification takes care both of inheritance, the selection and the equality checking here. In fact, it performs another operation, provided that the right constellation is found in the Config of the mother node: it copies Number and Gender of the FuncFtrs field to the Config term with Termvar X.[28] Finally, a template is selected that expresses the relative clause. The result, i.e. the semi-instantiated node, is found

---

[27] This does not rule out the possibility that forms are determined on the basis of percolated features, of course. If it turns out that such forms in fact should be created way above the nodes that express them, then this might be an indication that we are dealing with a predicate rather than with a grammatical form.

[28] This is why, apart from inserting the right term variable, we do not need to specify any operator for pronominal terms in underlying representations. It should happen here rather than at a later stage since these features may be necessary for agreement purposes. Note that this node is an optional one, and that unification may fail to find the right filler in this case, without the expression operation coming to a halt.

below:

```
Type: vrestr
Config: [extpred=
           [tense=past, predvar=PV,
            corepred=
              [aspect=perf,
                 mainpred=
                   [form=kopt-, cat=v,
                      arg_1=[termvar=x1,
                             semf=ag, syntf=subj],
                      arg_2=[termvar=x3,
                             number=pl, gender=neuter,
                             semf=go, syntf=obj]]]],
FuncFtrs: termvar=x3, number=pl, gender=neuter
Cat: relcl
FormFtrs: headcase=dat
SubCat: template=[relpos, ..., X]
```

We will proceed now with the expansion of the template position 'relpos', i.e. the node through which the relative pronoun with its possible markers will be expressed. Roughly, it may have the following uninstantiated shape:

```
Type: relpos
Config: [term=[termvar=X,
               number=N, gender=G,
               semf=SF, syntf=XF]]
FuncFtrs: termvar=X, number=N, gender=G
Cat: relpp
FormFtrs: headcase=HC,
          gram=[form=FPR, cat=prep,
                semf=SF, syntf=XF,
                case=CPR],
          case=C(CPR;
                 *case(semf=SF, syntf=XF)/
                  (( # acc ) OR (HC = NIL));
                 HC)
SubCat: template=TP
```

The descriptive burden is now on the formal features field. It contains the instruction for the calculation of the right case form. Headcase is inherited from the mother node. Next we have to check whether this node needs a preposition, just like the

mother node above did.[29] This may introduce an obligatory case value, CPR. The following instruction is the assignment of a value to variable C of feature Case. If there is a value on CPR, then this will be the Case for variable C. If not, then the Case value will be calculated on the basis of the set of functions, as we haved seen above. This will then be the Case value provided that it is not the accusative. If these conditions do not apply, and there is a Headcase value (i.e. HC is not NIL), then this value will be the Case of this node. Instantiation with the term with Termvar=x3 will give us the following semi-instantiated node:

```
Type: relpos
Config: [term=[termvar=x3,
               number=pl, gender=neuter,
               semf=go, syntf=obj]]
FuncFtrs: termvar=x3, number=pl, gender=neuter
Cat: relpp
FormFtrs: headcase=dat,
          case=dat
SubCat: template=[relpro]
```

The last step I will take here is the expansion of the relative pronoun. This will be done via the relpro slot, the only constituent of the template selected for the relpos node. Uninstantiated, it may take the following shape:

```
Type: relpro
Config: []
FuncFtrs: number=N, gender=G
Cat: relpro
FormFtrs: case=C,
          gram=[form=F, cat=relpro,
                number=N, gender=G, case=C]
SubCat: form=F
```

After instantiation, we will have the following terminal node:

```
Type: relpro
Config: []
FuncFtrs: number=pl, gender=neuter
Cat: relpro
```

[29] In Classical Greek the relative pronoun is accessible for prepositions (Albert Rijksbaron p.c.)

```
FormFtrs: case=dat,
          gram=[form=hoîs, cat=relpro,
                number=pl, gender=neuter, case=dat]
SubCat: form=hoîs
```

Given the fact that Relative Attraction does occur in languages, and that we may represent it in ER the way it was done above, let us now see which other predictions we could derive from the ER framework with respect to this phenomenon. The following predictions seem to be plausible:

P1. Relative Attraction (RA) is universally marked, since the relevant features enter another clausal domain and overrule the local values for the corresponding features, with which they are in competition. Therefore, it will occur in only part of the languages that have the formal requirements (relative pronouns, case marking). In languages that have it, it will happen under specific conditions.

P2. Downward RA, from head to relative pronoun (DRA), is less marked than Upward RA, from relative pronoun to head (URA), since it is based on inheritance rather than the more complex process of percolation, which runs counter to natural scope relations. Therefore, DRA will be more frequent than URA both intralinguistically and crosslinguistically. It is unlikely that languages license URA while not licensing DRA as well, i.e. I predict the following implication to hold universally: if languages have Upward Relative Attraction, then they also have Downward Relative Attraction.

P3. For DRA, both NRel and RelN constellations qualify, since the necessary features, including Direct and Indirect Case, will be present at the level of the NP that expresses the whole term. Still, I expect DRA to be more frequent in NRel than in RelN constellations.[30]

P4. URA may be expected in RelN constellations, as they occur in Prefield languages. The conditions under which and the extent to which URA occurs in relation to DRA in RelN constellations may be taken as an indication for the order in which ER establishes Case for relative position and head, respectively. It is unlikely, though, that URA on Indirect Case will be more frequent than any type of DRA. It is not

[30] Note that, due to 'heaviness', fully fledged prenominal relative clauses are the exception rather than the rule even in Prefield languages.

unlikely that no cases of indirect URA may be found at all. Possible counterexamples to the above prediction may be expected in RelN (Prefield) languages rather than NRel (Postfield) languages.

P5. URA is expected to occur infrequently in NRel constellations, and only for Direct Case. I do not expect any URA based on Indirect Case crosslinguistically.

P6. I expect neither DRA nor URA to occur in Rel/N constellations where the antecedent and the relative pronoun are non-adjacent.

Apart from the mainly statistical predictions P1-P4, which need a large sample for their verification, P5 and P6 offer an opportunity for falsification on the basis of just one counterexample. As far as P5 is concerned, Upward Relative Attraction does indeed occur. Persian, a Prefield language, seems to be a case in point. See example (31) below (adapted from Comrie 1989:153f; RM is for Restrictiveness Marker and OM for Object Marker):

(31) Zan-i /Zan-i-ra ke dididd inja-st
woman-RM/woman-RM-OM that saw:2sg here-is
'The woman that you saw is here.'

Both versions, one with the bare noun stem *zani*, reflecting the subject role in the main clause, and one with the Object Marker added to the stem, reflecting the object role in the relative clause, are acceptable. However, in Persian, *ke* is a general subjunction marker, not a relative pronoun. Besides, Persian is a pro drop language. And moreover, the status of *-ra* is not undisputed: it might be an object marker, a definiteness marker or a topic marker (cf. Windfuhr 1979:47f). Therefore, it is not altogether clear whether we should analyse object marked *Zanira* as belonging to the main clause or to the relative clause, and whether we have here a case of RA at all.[31]

Latin (SOV, but arguably Postfield, cf. Siewierska et al 1997:808) seems to be more clear cut: it has both URA and DRA, as shown in examples (32) and (33) respectively (from Pinkster

[31] There is no case distinction on Persian pronouns, another indication that *-ra* is not a case suffix that marks Object, and part of the nominal paradigm, but a more general marker of definiteness or topicality, that may only be assigned to non-subjects. Mehdi Dastani (p.c.) informs me that *ra* is usually written undetached in Persian, which points towards its particle or enclitic rather than suffix status.

1984:101):

(32) Naucratem quem convenire volui
Naucratis:ACC who:ACC meet want:PERF:1SG
in navi non erat
in ship:ABL not be:PAST:3SG
'N. whom I wanted to meet was not in the ship'

(33) ... et delectatione qua dixi.
and pleasure:ABL which:ABL speak:PERF:1SG
'... and because of the pleasure of which I have spoken.'

The case of URA in (32) is in accordance with P5 since Case assigment is direct. In opposition to P2 and P5, however, Kurzová (1981), quoted in Pinkster (1984:121) suggests that URA is more frequent than DRA in Latin, which has NRel as the dominant order. Although the relative position is accessible for virtually all functions in Latin (cf. Pinkster 1984:101), including those that have a preposition, I have not been able sofar to locate any examples of NRel clauses with URA derived from Indirect Case in this language, so this point has to remain open here. If such an example were to be found, this would have faregoing implications. Either the framework sketched above, and especially its dynamic aspects, should be reconsidered, or the prepositions involved in such constructions should be analysed not as triggered by the expression rules, but as lexical entities.

In P6, I predict that I do not expect any Relative Attraction in constellations where the antecedent and the relative pronoun are not more or less adjacent. Thus, in Prefield languages, that have RelN order with the relative pronoun at the rightmost position of the relative clause, I expect no RA in (non-basic) NRel constellations (unless the relative pronoun takes the leftmost position). The reverse is expected to hold for Postfield languages. The basis for this is that I assume syntactic ('surface') nearness, and adjacency of the N and RelPro nodes, to be of at least as much importance as a motivation for RA than semantic nearness, i.e. the fact that they are part of the same term and that they share the term variable. If P6 would be found to hold, then this may be an example of a phenomenon that could be explained on the basis of syntactic rather than semantic or pragmatic factors.

This ends the example of tree expansion according to the principles set out in section 4. It should suffice for a first impression. Whatever the merits of this treatment of Relative

Attraction might be, it is not clear whether the copying strategy as proposed in Dik (1997a) could handle this phenomenon: case is not present in UR, so it can not be copied prior to expression. Of course, the primary operators involved might be copied downward or upward in the corresponding term, in this case semantic and syntactic functions. In asfar as decisions about form may be based on primary operators alone there seems to be no problem. However, we have seen that at least part of the constraints in Ancient Greek are in terms of case rather than function.

6. Conclusion

In this paper, a revised version of the Functional Grammar expression rules has been proposed, restricted to the morphological and syntactic aspects of that component. Some major changes in relation to the standard ER model are:

a. The integration of stage I and stage II of ER, viz. the calculation of grammatical forms and the linear alignment of lexical and grammatical material.

b. The integration of order templates into constituent structures.

c. The transformation of placement rules into conditions on nodes and constituent structure.

d. The addition of formal and procedural principles to the expansion of expressions, such as top down, left to right and depth first development, and the inheritance and percolation of features.

Taken together, this provides us with a model of ER that sets constraints on linguistic form. In this way, certain problematic aspects of the standard model may be repaired. Furthermore, this proposal has certain implications for the rest of the theory of FG. It may lead, for instance, to a reconsideration of the lexical versus grammatical status of certain forms, while a hybrid status is possible if syntactic criteria are employed. It may also throw some light on filtering phenomena, and help explain why certain speech errors occur rather than others. Also, predictions may be made as to which forms, structures and agreement phenomena one would expect to occur with certain frequencies in languages and what forms one would expect to be unlikely or even non-

existent, thus providing extra handles for the verification and falsification of the theory.

Finally, the model proposed seems to be promising as far as the integration of the phonological stage of ER is concerned. In fact, adding Stage III seems to be a quite natural extension to it. Going down in the tree structure, functional information is gradually replaced by formal information, morphological features take over from syntactic features. That the procedural approach assumed sofar for syntax and morphology might also work - *mutatis mutandis* - for the phonological level may be illustrated somewhat informally in the following way. Lehmann (1978), basing himself on older work, suggests that there seems to be a rather strong implication between progressive vowel harmony and agglutinative morphology on the one hand, and regressive vowel harmony and flective morphology on the other hand (cf. Plank 1998:208f). In the model presented above, this may be catered for by assuming that the relation between agglutinative morphemes and their heads is represented at a higher level in the tree - they are not sister nodes - than that between flective morphemes and their heads. Regressive phonological processes would be blocked in that case, since percolation does not work from right to left. Between sister nodes, on the other hand, percolation does not play a role, since the phonological features are available at the shared mother node.[32]

A last word should be said on speech recognition. The dynamics of the model presented here are geared to language production rather than reception. In that respect it is not simply part of a generative model, i.e. a model that relates underlying representations to expressions in a mode neutral fashion. However, in my proposal order - top down, left to right, depth first - is an essential aspect. In all, much weight is assigned above to production as a design principle of the expression component. However, parseability, and the ease with which forms and structures may be acquired and processed by hearers is no doubt another shaping factor of language, not in the least since speakers are also hearers of their own output, and use it to monitor their own speech (cf. Levelt 1989; and Hawkins 1997 on a performance theory of word order). For that reason, there may appear to be constraints on languages that do not comply with the principles of expression

[32] Admittedly, this is a very tentative and sweeping approach to the problem of vowel harmony. It is completely unclear to me whether it would hold under a more sophisticated, and typologically solid treatment of these phenomena.

put forth above. These further constraints might be explained, then, on the basis of constraints on comprehension rather than production. Eventually, a complete model of ER should include such aspects.

References

Bakker, Dik (1994). *Formal and Computational aspects of Functional Grammar and Language Typology*. Amsterdam: IFOTT.

Bakker, Dik (1997). 'Flexibility and consistency in word order patterns in the languages of Europe'. In Anna Siewierska (ed.), 383-420.

Bakker, Dik (1998). 'Language change: some implications for the theory of Functional Grammar'. *WPFG* 66.

Bakker, Dik & Anna Siewierska (1992). 'A contribution to the problem of constituent order explanation'. *ESF Working Papers* II-5.

Ball & Müller (1992). *Mutation in Welsh*. London: Routledge.

Besten, Hans den (1981). 'Marking WH-movement in Afrikaans'. In Pieter Muysken (ed.) *Generative Studies in Creole Languages*. Dordrecht: Foris, 141-179.

Boersma, Paul (1998). *Functional Phonology*. Amsterdam: IFOTT.

Borsley, Robert D. & Janig Stephens (1989). 'Agreement and the position of subjects in Breton'. *Natural Language & Linguistic Theory* 7:3, 407-428.

Carroll, David W. (1994). *Psychology of language*. Pacific Grove: Brooks/Cole Publishing Company.

Chomsky, Noam (1965). *Aspects of the Theory of Syntax*. Cambridge, Mass.: MIT Press.

Chomsky, Noam (1995). *The Minimalist Program*. Cambridge, Mass.: MIT Press.

Comrie, Bernard (1976). *Aspect*. Cambridge: Cambridge University Press.

Comrie, Bernard (1985). *Tense*. Cambridge: Cambridge University Press.

Comrie, Bernard (1989). *Language Universals and Linguistic Typology*. Oxford: Blackwell.

Connolly, John, Roel Vismans, Chris Butler & Richard Gatward (eds) (1997). *Discourse and pragmatics in Functional Grammar*. Berlin: Mouton de Gruyter.

Corbett, Greville (1991). *Gender*. Cambridge: Cambridge University Press.
Croft, William (1995). 'Autonomy and functionalist linguistics'. *Language* 71-3, 490-532.
Culicover, Peter W. (1997). *Principles and Parameters. An Introduction to Syntactic Theory*. Oxford: Oxford University Press.
Dik, Simon C. (1978). *Functional Grammar*. Amsterdam: North-Holland.
Dik, Simon C. (1986). 'On the notion "Functional Explanation"'. *Belgian Journal of Linguistics* 1, 11-52.
Dik, Simon C. (1992). *Functional Grammar in Prolog; an integrated implementation for English, French, and Dutch*. Berlin: Mouton de Gruyter.
Dik, Simon C. (1997a). *The Theory of Functional Grammar, part I*. Berlin: Mouton de Gruyter.
Dik, Simon C. (1997b). *The Theory of Functional Grammar, part II*. Berlin: Mouton de Gruyter.
Dryer, Matthew S. (1992). 'The Greenbergian word order correlations', *Language* 68-1, 81-138.
Greenberg, Joseph H. (1963). 'Some universals of grammar with particular reference to the order of meaningful elements'. In J.H. Greenberg (ed.), *Universals in Language*. Cambridge (Mass.): MIT Press, 73-113.
Hannay, Mike (1991). 'Pragmatic function assignment and word order variation in a Functional Grammar of English'. *Journal of Pragmatics* 16, 131-155.
Hawkins, John A. (1983). *Word Order Universals*. New York: Academic Press.
Hawkins, John A. (1997). 'Some issues in a performance theory of word order'. In Anna Siewierska (ed.), 729-780.
Hengeveld, Kees (1989). 'Layers and operators in Functional Grammar'. *Journal of Linguistics* 25.1, 127-157.
Hengeveld, Kees (1997). 'Cohesion in Functional Grammar'. In Connolly et al. (eds), 1-16.
Kempen, Gerard & Eduard Hoenkamp (1987). 'An incremental procedural grammar for sentence formulation'. *Cognitive Science* II, 201-258.
Kroon, Caroline (1997). 'Discourse markers, discourse structure and Functional Grammar'. In Connolly et al. (eds), 17-32.
Lehmann, Winfred P. (1978). 'The great underlying ground-plans'. In Winfred P. Lehmann (ed.) *Syntactic*

Typology: Studies in the Phenomenology of Language. Austin: University of Texas Press, 3-55.

Levelt, Willem J.M. (1989). *Speaking. From intention to articulation*. Cambridge, Mass.: MIT Press.

Mackenzie, Lachlan (1992). 'English spatial prepositions in Functional Grammar'. *WPFG* 46.

Mackenzie, Lachlan (1998). 'The basis of syntax in the holophrase'. In M. Hannay & A.M. Bolkestein (eds) *Functional Grammar and verbal interaction*. Amsterdam: John Benjamins, 267-295.

Pinkster, Harm (1984). *Latijnse Syntaxis en Semantiek*. Amsterdam: Grüner.

Plank, Frans (1998). 'The co-variation of phonology with morphology and syntax'. *Linguistic Typology* 2-2, 195-230.

Pollard, Carl & Ivan A. Sag (1994). *Head-Driven Phrase Structure Grammar*. Chicago: University of Chicago Press.

Rijkhoff, Jan & Dik Bakker (1998). 'Language Sampling'. *Linguistic Typology* 2-3, 263-314.

Rijksbaron, Albert. (1981). 'Relative clause formation in Ancient Greek'. In A.M. Bolkestein et al. (eds) *Predication and expression in Functional Grammar*. London: Academic Press, 235-59.

Siewierska, Anna (ed.) (1997). *Constituent order patterns in the languages of Europe*. Berlin: Mouton de Gruyter.

Siewierska, Anna, Jan Rijkhoff & Dik Bakker (1997). 'Appendix'. In Anna Siewierska (ed.), 783-812.

Van Valin, Robert D. & Randy LaPolla (1997). *Syntax: Structure, Meaning and Function*. Cambridge: Cambridge University Press.

Windfuhr, Gernot L. (1979). *Persian Grammar*. The Hague: Mouton.