

Do we need predicate frames?

Daniel García Velasco
Kees Hengeveld

1. Introductionⁱ

In this article we discuss the role of predicate frames within the theory of Functional Grammar (FG) and present the alternative possibility of replacing them by general predication frames into which lexemes, listed in the lexicon without frames, are inserted through the application of linking rules. In doing so we combine two ideas we have presented in other places.

The idea of introducing predication framesⁱⁱ into FG was originally proposed in Hengeveld (1992a: 80, 92-94). There it was meant to offer an alternative to Dik's (1980) Term-Predicate Formation Rule. This rule covers the predicative use of adpositional phrases in constructions like *Sheila is in the garden* and involves, in Dik's approach, the addition of a semantic function to a term outside of a predication. As noted by Mackenzie and Hannay (1982), such a proposal cannot be maintained in a model in which semantic functions always obtain within a predication. Hengeveld (1992a) proposes to solve this problem by creating predication frames which define the relation between the argument term and the term used predicatively. In this paper we generalize the idea of using predication frames to all kinds of predicates.

Following ideas presented in Nuyts (1992), García Velasco (1998) discusses the possibility of enriching the FG model with a prelinguistic conceptual level. One of the consequences of that move is that a great deal of the information present in predicate frames in current FG may be derived from Lexical-Conceptual Structures, as

represented by abstract meaning definitions, if a proper linking system is developed.

In this article we bring these proposals together and suggest that the notion of predicate frame has to be replaced by a combination of predication frames on the one hand, lexemes provided with abstract meaning definitions on the other, and a linking mechanism joining these two together. We will argue that such a step is not only desirable, but also helps the theory to attain a higher degree of typological, psychological and pragmatic adequacy. The feasibility of our proposal from the perspective of these three standards of adequacy is discussed in section 2 of this article. Section 3 then introduces the notion of predication frame and shows the need for a linking mechanism. This linking mechanism itself is the subject of section 4, which goes deeper into the question of how lexemes become associated with frames on the basis of their abstract meaning definitions. In the concluding section 5 we look at the consequences of our proposal for the FG model.

2. Predicate frames and the FG standards of adequacy

2.1. Predicate frames and psychological adequacy

The standard of psychological adequacy requires that FG should “relate as closely as possible to psychological models of linguistic competence and linguistic behaviour” (Dik 1997: 13). Predicate frames play a central role in the organization of standard FG in that they constitute the input for clausal generation and contain a great deal of the syntactic and semantic information relevant to the interpretive process. It is to be expected, therefore, that psycholinguistic evidence confirm their privileged status both in sentence production and comprehension.

An interesting case to evaluate the psychological adequacy of predicate frames concerns the behavior of those verbs which allow alternative argument structures. Among others, these include verbs

participating in the so-called locative and causative alternations as illustrated in (1) and (2) respectively:

- (1) a. *Bill loaded bricks onto the truck.*
b. *Bill loaded the truck with bricks.*

- (2) a. *Bill opened the door.*
b. *The door opened.*

Standard FG treats these alternations by means of Predicate Formation Rules; for example, the locative alternation in (1) is taken care of by means of rule (3) (Dik 1980: 37):

- (3) COMPLETIVE VERB FORMATION IN ENGLISH
INPUT: $\text{pred}_V (x_1)_{\text{Ag}} (x_2)_{\text{Go}} (x_3)_{\text{Loc}}$
OUTPUT: $\text{pred}_V (x_1)_{\text{Ag}} (x_3)_{\text{Go}} (x_2)_{\text{Inst}}$
CONDITION: the input predicate-frame must indicate an Action by which something is applied to some surface in such a way that the surface gets covered with the something as a result of the Action.

and the causative alternation in (2) receives the following treatment (Siewierska 1991: 28):

- (4) INCHOATIVE FORMATION
INPUT: $\text{pred}_V (x_1)_{\text{Ag}} (x_2)_{\text{Go}}$
OUTPUT: $\text{pred}_V (x_2)_{\text{Proc}}$

From a psycholinguistic perspective, the FG approach suggests that the interpretation and production of the output frames from both (3) and (4) will have to refer to the relevant predicate formation rule to establish the relation with the input frame and arrive at the appropriate semantic interpretation of the derived predicate. As Kahrel (1989: 136) points out “the implicit assumption in FG is that during the processing of language, predicate formation rules apply to

derive productively derivable predicates”. Consequently, derived predicate frames should take longer to process than basic ones since these are already available in the lexicon. Carlson and Tanenhaus (1988) have tested this hypothesis by contrasting the interpretation of these predicates with ambiguous verbs such as *set* in the following examples:

- (5) a. *Bill set the alarm clock for six in the morning.*
 b. *Bill set the alarm clock onto the shelf.*

The verb *set* has two possible senses, “adjust” as in (5a) and “place” as in (5b). In the interpretation of these examples, disambiguation does not take place until the presentation of the final prepositional phrase. There seems to be agreement in the psycholinguistic literature that multiple senses of ambiguous verbs are normally accessed in parallel until one of them is selected on the basis of the context and general knowledge (Boland 1993; Boland et al. 1995; Carlson and Tanenhaus 1988; Shapiro et al. 1989). In the case of the *set* examples above, lexical access will make available all senses of the verb, but only the contextually more appropriate will remain active. Upon selecting the wrong sense, reinterpretation forces the natural language user to retrieve the right sense by unfolding the lexical entry again. This process should obviously cost processing effort.

Unlike *set*, verbs participating in alternations such as the ones mentioned above do not present different senses, but rather, different argument structures. When encountering one of these verbs, the speaker/hearer will have to “decide” which predicate frame the verb is attached to. Consider the following examples (Carlson and Tanenhaus 1988: 274):

- (6) a. *Bill loaded the truck onto the ship.*
 b. *Bill loaded the truck with bricks.*

These sentences show a case of “thematic ambiguity”, in the sense that the semantic function which the sequence *the truck* should

receive is not evident until the next constituent arrives. According to Carlson and Tanenhaus, *the truck* in (6b) is a Location, whereas in (6a) it is a Theme. Dik's rule above assigns Goal function to the object of *load* in both alternatives, but this does not undermine the reasoning, as the role of *the truck* in (6b) derives from a Locative reading of the same argument within the input predicate frame, as illustrated in (1a).

The prediction stemming from the FG organization of the lexicon is, firstly, that sentence (6b) should take longer to process than (6a), since it requires to unfold the relevant predicate formation rule to arrive at the right interpretation for the predicate. Secondly, thematic ambiguities should take as much time or even longer to process than sense ambiguities since they need to interact with the predicate formation component, whereas sense ambiguities require to "look up" the lexicon again for another sense of the relevant lexical item.ⁱⁱⁱ

In Carlson and Tanenhaus' (1988) experiment both sentences with sense ambiguities and sentences with thematic ambiguities were paired with unambiguous controls. The subjects' task was to decide as quickly as possible whether the sentence "made sense". The authors proved that sense ambiguities take longer to process than unambiguous control sentences and are less often judged to make sense. In contrast, thematic ambiguities did not show significant differences with respect to the processing of their controls. This goes against FG expectations. Under the predicate formation rule approach advocated by FG, these facts are difficult to explain. However, if we assume that the different thematic variants of the *load* class of verbs are obtained from the same common core meaning, associated with two different frames, there is no need for the processor to reopen the lexical entry since the meaning of the verb remains constant. In such a case, the results of the experiment make perfect sense.

Similar arguments can be put forward on the basis of the causative alternation. Consider the following example (attributed in Carlson and Tanenhaus 1988 to Stowe 1987):

- (7) *Even before the police stopped the driver was getting nervous.*

In the absence of punctuation, the causative/ergative verb *stop* is interpreted as a transitive predicate with the term phrase *the driver* as its object. This results in a garden-path effect in the example. The authors observe that if the subject of *stop* is replaced by an inanimate entity, readers are more likely to analyze the verb as intransitive:

- (8) *Even before the truck stopped the driver was getting nervous.*

It seems then that the selection restriction $\langle \pm \text{animate} \rangle$ affects the interpretation of the transitivity of the predicate. In the experiment described, when the first argument of the verb *stop* was animate, subjects' reading times were longer than the relevant controls, but when it was inanimate no corresponding effect was found. This is unexpected if the intransitive variant were to be derived from the transitive one as FG claims. Again, it seems that this evidence might be better accounted for if we assume that alternating verbs present a common core meaning to which a syntactic frame is assigned on-line on the basis of the contextual information available during sentence comprehension. This move would also reduce the power of predicate formation rules, which, in our view, should be limited as much as possible.^{iv}

2.2. *Predicate frames and pragmatic adequacy*

The concept of predicate frame has been examined by Butler (1998, 2001) in the light of the standard of pragmatic adequacy. He argues that, given FG's commitment to this standard, "the model of predicate-argument structure encapsulated in the predicate frame should be able to account for the ways in which predicates and their arguments are used in actual communicative discourse" (Butler 2001: 56). Butler (2001) examines the use of the verbal predicate

give in the Cobuild Bank of English. Dik's (1997) representation of this predicate is as follows:

- (9) (f₁: give) [V] (x₁: <animate> (x₁)_{Ag} (x₂)_{Go} (x₃: <animate>
(x₃)_{Rec})

From his careful study of the nature of the participants in the *give*-predications and the type of transfers involved, Butler concludes that the structure in (9) is too simple to account for the actual use of the verb.

One finding which illustrates this general observation is that in almost 20% of the examples the Agent is not animate, as the frame requires. Consider the following example (Butler 2001: 58):

- (10) *His years of composing Greek verse gave him confidence.*

The high percentage of non-animate agents mentioned by Butler suggests that this example is not just a violation of the selection restrictions on the first argument, but has more serious implications. FG defines the semantic function Agent as the entity controlling an Action, that is, an entity having the power to determine whether an SoA will obtain (Dik 1997: 112). But under Dik's own tests for [+control] SoAs, the first argument in Butler's example emerges as a non-Agent:

- (11) Predication complement of order, persuade, request
**I ordered/persuaded/requested his years of composing Greek verse to give him confidence.*
I ordered/persuaded/requested Mary to give him confidence.
- (12) Predication combined with Beneficiary satellites
**His years of composing Greek verse gave him confidence for my sake.*
Mary gave him confidence for my sake.

This entails that the 20% of inanimate first arguments in Butler’s study should be assigned a different semantic function. Given FG’s inventory of semantic functions, the most likely candidate seems to be that of Force.

This alternation between Forces and Agents in first argument position is not restricted to the verbal predicate *give*. In fact, it has long been noted that instrumental satellites may take subject position, a process which in FG entails the conversion of Instrument to Force (e.g. Mairal Usón and Faber this volume):

- (13) *John cut the meat with a knife.*
The knife cut the meat.

Given the productivity of this alternation, one could try and formulate a Predicate Formation Rule with the following general format:

- (14) INSTRUMENT-FORCE FORMATION
 INPUT: $(f_1: \text{pred}_V (f_1): \{(f_2: (x_3)_{\text{Inst}} (f_2))\} (f_1)) (x_1)_{\text{Ag}} (x_2)_{\text{Go}}$
 OUTPUT: $(f_1: \text{pred}_V (f_1)) (x_3)_{\text{Force}} (x_2)_{\text{Go}}$
 MEANING: Instrumental entity (x_3) brings about the process denoted by pred_V

However, the theoretical cost of this rule seems excessive. Firstly, it brings about a radical alteration in the derived predicate frame, which somehow hides the obvious semantic relationship between the two variants. Secondly, it forces us to accept that predicate formation rules can take predicate satellites in their input, a rather controversial claim since the application of predicate formation rules is restricted to the Fund.^v

Another piece of evidence showing that the notion of predicate frame is pragmatically inadequate derives from the study of unspecified objects. García Velasco and Portero Muñoz (to appear) show that the omission of objects is subject to two types of restriction: lexical and discursive. The basic difference between the

two processes is that lexical omission requires the absence of a possible referent for the understood object. Fillmore (1986) observes the following contrast:

- (15) a. *He was eating _____ ; I wonder what he was eating.*
b. *They found out _____ ; #I wonder what they found out.*

According to Fillmore, it does not make sense to ask oneself “I wonder what they found out” in (15b) since the referent of the understood object of “find out” should be obvious from the context. This contrasts with example (15a), in which it is totally adequate to admit ignorance of the referent of the implicit object of “eat”. García Velasco and Portero Muñoz show that it is possible to formalize this difference by assuming that predicate frames are assigned on line and that those verbs accepting lexical omission take a one-place predicate frame in their intransitive uses, thus not allowing an anaphoric process of recoverability of the referent. The authors further claim that this process may be motivated pragmatically since it allows a shift from SoA type (Accomplishment to Activity) in an economical and efficient way.

2.3. Predicate frames and typological adequacy

Hengeveld (1992a, 1992b) presents a typology of parts-of-speech systems using functional, i.e. distributional, definitions of the parts of speech. Parts-of-speech are distinguished on the basis of the syntactic slots they may occupy, i.e. head or modifier within a term phrase, and head and modifier within a predicate phrase. When applying these definitions to a wide range of languages, it turns out that in some languages the available classes of lexemes can each be used in one of these syntactic slots only, whereas others allow the use of a single class of lexemes in various syntactic slots. In Hengeveld’s terminology the former languages have a *rigid* parts-of-speech system, whereas the latter have a *flexible* parts-of-speech system. Both rigidity and flexibility come in different degree. Here

we will only be concerned with languages displaying the highest degree of flexibility.

Languages with the most flexible parts-of-speech system use a single class of lexemes for all different syntactic slots. An example of such a language is Mundari. Consider the following examples:

Mundari (Bhat 1997, based on Hoffman 1903)

- (16) a. *Sim-ke-d-ko-a-le.*
 fowl-PAST-TR-OBJ.3.PL-PRED-SUBJ.1.PL
 ‘We have (acquired) fowls.’
 “We fowl-ed them.”
- b. *Mid-ja-n-ge-a-le.*
 one-INDEF.PAST-INTR-EMPH-PRED-SUBJ.1.PL
 ‘We were equal (in a game).’
 “We one-d.”
- c. *Dal-ke-d-ko-a-e.*
 strike-PAST-TR-OBJ.3.PL-PRED-SUBJ.3.SG
 ‘He struck them.’
- (17) *ol-tea*
 write-INSTR
 ‘writing materials’
 “write-with”

In (16a-c) three lexemes occur as main predicates. In English these lexemes would correspond with a noun (*sim* ‘fowl’ in 16a), a numeral (*mid* ‘one’ in 16b), and a verb (*dal* ‘strike’ in 16c), respectively. In Mundari these lexemes may all occur as the head of a predicate phrase in their basic form. Similarly, a notional verb may occur as the head of a referential phrase, as in (17).

Another language exhibiting the highest degree of flexibility is Squamish. Consider the examples in (18). In (18b) the same lexical element *ta’q°* occurs both as the head of the predicate phrase and as the head of the referential phrase. A comparison between (18a) and

(18b) furthermore learns that in predicative function this lexeme may be used both intransitively (18a) and transitively (18b).

Squamish (Kuipers 1968: 613)

- (18) a *č-n-ta'q°*
 REAL-1.SG-drink
 'I drink.'
- b *č-n-ta'q°-an* *ta-s-ta'q°*
 REAL-1.SG-drink-TR DEF-NR-drink
 'I drink the water.'

A third example of a language with extreme flexibility is Samoan. The following examples illustrate its flexibility:

Samoan (Mosel and Hovdhaugen 1992)

- (19) a *'Ua mālosi le lā.*
 PERF strong ART sun
 'The sun is strong.'
- b *'Ua lā le aso.*
 PERF sun ART day
 'The sun is shining today.'
 "The day is sun."
- (20) a *E alu le pasi i Apia*
 GENR go ART bus LD Apia
 'The bus goes to Apia.'
- b *'o le pasi alu i Apia*
 PRSNT ART bus go LD Apia
 'the bus going to Apia.'

In (19) the lexeme *lā* is used as the head of a referential phrase (19a) and as the head of a predicate phrase (19b). In (20) the lexeme *alu* is used as the head of a predicate phrase (20a) and as a modifier within a referential phrase (20b).

It is important to note that in these languages the flexibility of lexemes is systematic. That is, the examples given are not isolated cases of zero conversion, but exemplify a systematic feature of the languages involved: all lexemes may be used in all syntactic slots, given semantic compatibility. To illustrate the latter point, let us return to Mundari. The following examples of a number of lexemes show how a single lexeme may be used to express a whole range of related meanings:

Mundari (Hoffman 1903)

- (21) *buru* (i) mountain; (ii) to heap up; (iii) to keep up certain feasts or to hold a fair (because they take place on mountains); (iv) to call something a mountain.
sim (i) fowl; (ii) to kill a fowl for one's meal; (iii) to call something or someone a fowl.
oró (i) and; (ii) more; (iii) more (of it); (iv) again; (v) do or say or ask again; (vi) ask or give or say more; (vii) the doing-it-again, the asking-for-more.

A translation of these meanings into FG predicate frames results in lists like the ones given in (22)-(24):

- (22) *buru* (x_i)_Ø 'a mountain'
buru (x_i)_{Ag} (x_j)_{Go} 'to heap up', 'to call something a mountain'
buru (x_i)_{Pos} 'to keep up certain feasts or to hold a fair'
- (23) *sim* (x₁)_Ø 'fowl'
sim (x₁)_{Ag} 'to kill a fowl for one's meal'
sim (x₁)_{Ag} (x₂)_{Go} 'to call something or someone a fowl'
- (24) *oró* (α_i)_Ø (α_i)_Ø 'and'
oró (x_i)_Ø 'more', 'more of it'
oró (e_i)_Ø 'again', 'the doing-it-again', 'the asking-for-more'
oró (x_i)_{Ag} 'ask or give or say more'

oró (x_i)_{Ag} (α_j)_{Go} ‘do or say or ask again’

What these representations show is that the various related meanings that lexemes express can be differentiated on the basis of the syntactic configurations in which they occur. Hoffman (1903: xx-xxi) characterizes this feature of Mundari very aptly, when he says:

Instead, then, of Parts of Speech with well-defined functions and a precise but rich denotative power, we meet in Mundari with words of great functional elasticity, and therefore of a vague signifying power –words which, whilst *denoting* living beings, actions, qualities, and relations, do not generally by themselves *connote* the *manner* in which the mind conceives the things signified. That *connotation* is generally left to the context of the proposition or the circumstances under which it is uttered;

In other words: in Mundari (and languages like Mundari) the frames in which lexemes occur are not an intrinsic property of the lexemes themselves, but lexemes are associated with one of the frames in which they are allowed to occur as communication requires. If one wants to do justice to this feature of flexible languages like Mundari, one has to separate the syntactic contexts as they occur in the language from the lexemes that are used within those contexts. And if such an approach is required for flexible languages, it is required for other languages as well, given FG’s requirement of typological adequacy. As a matter of fact, Junger (1987: 40, 63) already claimed that the FG lexicon of Modern Hebrew consists of ‘predicate-schemes’, which are characterised as abstractions over concrete predicate frames reflecting the syntactic-semantic environment for a root and a verbal form or *binyan*.

3. Predication frames

3.1. General considerations

One way of solving the problems that the notion of predicate frame poses with respect to the standards of adequacy, is to split up predicate frames into predicates and frames, and to have a linking mechanism which associates them in the grammar. In what follows we will use the term *predication frame* for frame, and *lexeme* for predicate. The term *predicate* then becomes available for lexemes used as predicates in particular syntactic contexts. Predication frames specify the (underlying) configurations in which lexemes may occur. The set of predication frames is not identical for all languages, neither syntactically nor semantically. Before providing a list of possible predication frames, we will explore this issue in somewhat more detail.

Let us first illustrate syntactic differences as regards the availability of predication frames in individual languages with a few examples. Firstly, in many Papuan languages the maximum number of arguments with which a verb may occur is two. In order to introduce a third participant into a state of affairs, a serial verb construction has to be used. There is thus no ditransitive predication frame based on a single lexeme in these languages. Secondly, in many Australian languages secondary restrictors are not allowed within term phrases. Instead, appositional strategies are used. These languages may thus be said to lack a predication frame for adnominal modifiers.

Semantic differences with respect to predication frames are equally important. For some languages it may be sufficient to use semantic macro-roles such as Actor, Undergoer and Benefactive^{vi} to account for the grammatical behavior of lexemes; for others, more specific indications of semantic functions may be necessary. A few examples of the latter situation may suffice to illustrate this point. Firstly, in many languages Experiencer arguments are treated differently from others. Secondly, in some languages, such as Chickasaw (see Comrie 1981), the feature of Control determines the form of the main verb. Thirdly, in some languages, such as Abkhaz (see Spruit 1986), the feature of Dynamicity determines the form the main verb takes. For a more elaborate discussion of these cases, see Hengeveld (to appear b).

Finally, there are differences between languages as regards the interaction between syntactic and semantic patterns. Again we restrict ourselves to some examples. Firstly, in many African languages it is the Benefactive and not the Undergoer that acts as the second argument, A2. Secondly, in active languages the semantic status of A1, Actor or Undergoer, determines the alignment pattern.

In general, we might say that predication frames, just like lexemes, belong to the fund of a language. For every language, the number and nature of its predication frames has to be established on the basis of morphological and syntactic criteria.

3.2. Inventory

The general inventory of predication frames potentially relevant to languages contains at least frames for heads and modifiers of predicate phrases and for heads and modifiers of term phrases, frames for modifiers of predications and propositions, and frames for term predicates. This list is by no means exhaustive, but is sufficient to illustrate our approach. In defining these predication frames, we use the formalism developed in Hengeveld (to appear a). In this formalism a basic distinction is made, among others, between units at the interpersonal and at the representational level. Units at the interpersonal level are defined in terms of their function in communication. The variables used to formalize these functions are printed in capitals. The functions relevant here are reference (R) and ascription (T). In many other approaches the latter function would be called “predication”, but in Hengeveld (to appear a) that term is reserved for the linguistic instantiation of ascription. In those cases in which the communicative function is irrelevant the variable Φ (for “function”) is used. Units at the representational level are defined in terms of the entity type they designate. The variables used to formalize these entity types are printed in lower case. The entity types relevant here are properties/relations (f), individuals (x), states of affairs (e), and propositional contents (p). In those cases in which the entity type is irrelevant the variable τ (for “type”) is used.

The two levels of analysis are in principle independent of one another. All types of entity may be referred to, and all types of entity may be predicated. Thus, a referential act (R) may make use of the description of an individual (x), as in (25), but equally well of the description of a state of affairs (e), as in (26):

(25) He saw *the child*. (R₁: (x₁) (R₁))

(26) He saw *the child make a painting*. (R₁: (e₁) (R₁))

Conversely, the description of a first order entity may be used in a referential act, as in (27), but equally well in an ascriptive act, as in (28):

(27) I'm looking for *a carpenter*. (R₁: (x₁) (R₁))

(28) My neighbor is *a carpenter*. (T₁: (x₁) (T₁))

Thus, by using the two types of variable, (communicative) function and (semantic) category are kept strictly apart.

On the basis of the variables distinguished here the predication frames in (29) may be formulated (“♦” indicates the position where a lexeme is to be inserted).^{vii} Note that, for practical reasons, the two levels of analysis, interpersonal and representational, are here represented linearly. In fact the interpersonal level should be conceptualized as the governing level of analysis, within which representational units are inserted.

(29) Predication frames

1. Head of predicate phrase

1.1. Intransitive State of Affairs: (T₁: (f₁: ♦ (f₁)) (T₁)) (R₁)

1.1.1. intrans, -con, -dyn

(T₁: (f₁: ♦ (f₁)) (T₁)) (R₁: (τ₁)_∅ (R₁))

e.g. *sleep* in *Peter slept*

1.1.2. intrans, +con, -dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{Po} (R_1))$

e.g. *sit* in *Peter was sitting*

1.1.3. intrans, -con, +dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{Pat} (R_1))$

e.g. *fall_down* in *Peter fell down*

1.1.4. intrans, +con, +dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{Ag} (R_1))$

e.g. *run* in *Peter ran*

1.2. Transitive State of Affairs: $(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1) (R_2)$

1.2.1. trans, -con, -dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{\emptyset} (R_1)) (R_2: (\tau_2)_{Ref} (R_2))$

e.g. *know* in *Peter knew the answer*

1.2.2. trans, +con, -dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{Po} (R_1)) (R_2: (\tau_2)_{Ref} (R_2))$

e.g. *keep* in *Peter kept the money*

1.2.3. trans, -con, +dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{\emptyset} (R_1)) (R_2: (\tau_2)_{Pat} (R_2))$

e.g. *burn* in *Peter burned his fingers*

1.2.4. trans, +con, +dyn

$(T_1: (f_1: \blacklozenge (f_1)) (T_1)) (R_1: (\tau_1)_{Ag} (R_1)) (R_2: (\tau_2)_{Pat} (R_2))$

e.g. *kiss* in *Peter kissed Sheila*

2. Head of term phrase

Any entity type: $(R_1: (\tau_1: \blacklozenge (\tau_1)) (R_1) \dots (R_N))$

2.1. property/relation

$(R_1: (f_1: \blacklozenge (f_1)) (R_1) \dots (R_N))$

e.g. *color* in *the color of her coat*

2.2. individual

$(R_1: (x_1: \blacklozenge (x_1)) (R_1) \dots (R_N))$

e.g. *coat* in *her new coat*

2.3. state of affairs

$(R_1: (e_1: \blacklozenge (e_1)) (R_1) \dots (R_N))$
 e.g. *wedding* in *her third wedding*

2.4. propositional content
 $(R_1: (p_1: \blacklozenge (p_1)) (R_1) \dots (R_N))$
 e.g. *hope* in *her last hope*

3. *Modifier of term phrase*

$(R_1: (\tau_1: \text{--} (\tau_1)_\emptyset: (f_1: \blacklozenge (f_1)) (\tau_1)_\emptyset (R_1))$
 e.g. *new* in *her new coat*

4. *Modifier of predicate phrase*

$(T_1: (f_1: \text{--} (f_1): (f_2: \blacklozenge (f_2)) (f_1)) (T_1))$
 e.g. *beautifully* in *She dances beautifully*

5. *Modifier of predication*

$(e_1: \text{--} (e_1): \blacklozenge (e_1)_\emptyset)$
 e.g. *yesterday* in *I met her yesterday*

6. *Modifier of proposition*

$(p_1: \text{--} (p_1): \blacklozenge (p_1)_\emptyset)$
 e.g. *probably* in *She's probably gone by now*

Note that we are here considering frames that capture the syntactic environments in which lexemes may occur. But frames can also be used within syntax itself to define possible syntactic configurations. Thus, the general frame for predications would be as in (30), which is an expanded version of (29.5):

(30) $(e_1: [(T_1: (f_1) (T_1)) (R_1: (\tau_1)_{SF} (R_1)) \dots (R_N: (\tau_N)_{SF} (R_N))] (e_1): (\Phi_1) (e_1))$

Frame (29.3) may now be turned into a more general frame, as in (31):

$$(31) \quad (R_1: (\tau_1: \text{--} (\tau_1)_\emptyset: \bullet) (R_1) \dots (R_N))$$

where the “•” indicates the position where a term modifier has to be inserted. This modifier may either be a lexical frame, or a syntactic frame, such as (30). The latter case then accounts for relative clauses. Since we are dealing with lexemes in this paper, we will not go into this issue any further.

4. Linking rules

4.1. Meaning definitions as mediators

When lexemes are separated from frames, the question of course arises how lexemes are linked to the predication frames in which they are allowed to occur. In current FG the predicate frames define the quantitative and qualitative valency of lexemes. When separating lexemes from their frames an alternative solution to the problem of linking lexicon to syntax has to be developed. The solution we adopt here follows up on García Velasco (1998), itself inspired by, particularly, Jackendoff (1990) and Van Valin and LaPolla (1997). The solution necessarily involves the introduction of abstract meaning definitions. The abstract meaning components serve as triggers in linking the lexeme involved to a specific predication frame. If linking were to be based on concrete meaning definitions, every link would have to be specified separately. Thus, we arrive at the same conclusion as Mairal Usón and Faber (this volume), even though we arrive at this conclusion on the basis of our study of syntactic configurations, whereas their study take sit point of departure in the lexicon.

We will assume that lexemes are listed in the Fund together with a specification of their category (which generally restricts the

number of frames in which they may occur) and of their idiosyncratic morphological properties. Lexemes can furthermore give access to a lexical paradigm (Dik 1997: 84) in which irregular forms, collocational patterns, etc. are included. Abstract meaning definitions, in turn, should capture the syntactically relevant information which accounts for the lexeme's distributional properties. In the approach advocated here, abstract meaning definitions should include the information necessary to link the lexeme to an appropriate predication frame.

In the construction of our definitions we shall be making use of standard primitive relations, which, in a spirit similar to that of Jackendoff (1990), will be assumed to define basic ontological categories of conceptual nature. Lexemes should thus specify the ontological category they designate and the number of participants required in the lexical relation. The linking procedure is thus mediated by the number of entities present in the abstract meaning definition which will have to be projected onto syntax. This restriction captures the basic intuition that syntactic constructions must be tied to a semantic interpretation. It furthermore involves recognizing the relevance of FG's ontological categories at the conceptual level (Nuyts 1992).^{viii}

By way of illustration, let us consider a simple case of linking. The following could be the abstract meaning definition of the lexeme *open*:

- (32) *open* [V]
 [f₁: [CAUSE (x₁) [BECOME **open**' (x₂)]]]

This definition expresses that the lexeme *open* designates a relation (as represented by the “f” variable) between two entities (as represented by the “x” variables). The presence of these variables, together with the restriction introduced above, will guide the linking process towards the selection of a transitive predication frame. The lexeme will thus become the head of a predicate phrase.

If we further accept that semantic functions can be defined on the basis of the position which a variable takes in a given abstract

meaning definition (Jackendoff 1990; Schack-Rasmussen 1994; Van Valin and LaPolla 1997), the role of each participant in the predication can also be obtained from the lexemes's abstract meaning definition. Thus, we may assume that the argument of a CAUSE function will be assigned the role of Agent whereas the argument of the BECOME function will receive the function Patient. On the basis of this information, the lexeme *open* may be linked to frame 1.2.4 in (29), with the result presented in (33):

(33) $(T_1: (f_1: \textit{open} [V] (f_1)) (T_1)) (R_1: (x_1)_{\text{Ag}} (R_1)) (R_2: (x_2)_{\text{Pat}} (R_2))$

which would be used to account for sentences such as:

(34) *Sheila opened the door.*

However, the evidence shown in section 2 suggests that the linking of lexemes to predication frames cannot be developed on a one-to-one basis. Quite on the contrary, we showed in that section that lexemes may take different frames if they have more than one reading. Thus, the lexeme *open* has another meaning definition, given in (35):

(35) $\textit{open} [V]$
 $[f_1: [\text{BECOME } \textit{open}' (x_1)]]$

In this case, the information available in the abstract meaning definition links the lexeme *open* to the intransitive frame 1.1.3 in (29), with the result presented in (36):

(36) $(T_1: (f_1: \textit{open} [V] (f_1)) (T_1)) (R_1: (\tau_1)_{\text{Pat}} (R_1))$

which would be used to account for sentences such as:

(37) *The door opened.*

Thus, one lexeme may be linked to more than one predication frame if it has more than one meaning definition.

4.2. Predicate formation

The approach presented in the previous section seems a reasonable solution for those cases in which the existence of more than one meaning definition for a single lexeme is relatively arbitrary and unpredictable. The fact, however, that *open* may be used in the two ways illustrated above is not an arbitrary fact of English, but is an example of the causative alternation that we discussed in 2.1. As shown there, FG accounts for this alternation by means of a Predicate Formation Rule. In our approach, this option is no longer available. Predicate Formation Rules operate on predicate frames: they take a predicate frame as input and produce a predicate frame as output. In our proposal predicate frames have disappeared, so another procedure has to be developed to account for productive alternations.

Let us once more contrast the two meaning definitions for the verbal lexeme *open*:

- (38) *open* [V]
 1. [f_1 : [CAUSE (x_1) [BECOME **open'** (x_2)]]]
 2. [f_1 : [BECOME **open'** (x_1)]]

The relation between the two meaning definitions of *open* is evident: the second one consists of a subpart of the first one. This means that it is relatively easy to formulate a rule which derives one abstract meaning definition of *open* from the other, and then link each of the definitions to a different predication frame. Predicate Formation may thus be replaced by Lexeme Derivation. It remains an open question whether in (38) meaning definition 2 is derived from 1 (as in Mairal Usón and Faber this volume) or the other way around (as in Rappaport and Levin 1998), although the latter solution seems most consonant with FG's constraints on deletion (Dik's 1997: 18-24).

We should admit that this solution does not solve any of the problems involved in dealing with alternations through Predicate Formation, but it does not add new problems either. Whatever the nature of the rules, they can only be defined in terms of some open-ended class of input predicates. In most cases alternations do not seem to be fully productive, and derived lexemes may acquire specific meanings not predicted by the rule. In this respect Cuvalay-Haak (1997: 120) makes a very useful distinction between “incidental predicate formation” and “recurrent predicate formation”. In her approach, incidental predicate formation rules “account for the ability to form new predicates on the basis of perceived regularities in the lexicon”, while recurrent predicate formation rules “specify formal and semantic modifications which are completely predictable in terms of their effect on the input predicate”. Only in the latter case would we make use of Lexeme Derivation Rules. In the former case, there is a creative process of lexeme formation which is not part of the grammar. Just like a speaker may manipulate selection restrictions to create new meanings for existing lexemes, so he may manipulate perceived regularities to create new meanings for new lexemes. In doing so the speaker combines his knowledge of the world with his knowledge of the language to improve his instrument of communication. This process should be described in terms of the wider cognitive abilities of speakers, rather than in terms of their linguistic capacities. We explore this issue a bit further in the next section.

5. Conclusion: Grammar and cognition

Jackendoff (1983: 19) has rightly observed that one could understand lexical meaning as “those conceptual structures that happen to be verbally expressible”. As such, the lexicon is a mediator between our cognitive-pragmatic abilities and our linguistic ones. This means that it is difficult to draw a sharp line between grammar and cognition, and between abstract meaning definitions and what some authors have called Lexical-Conceptual Structures

(Jackendoff 1990; Hale and Keyser 1986). As soon as a speaker wants to transmit a “conceptual structure” that is not “verbally expressible” he may want to coin a new expression. The possibilities this speaker has are restricted by the language system, so, as stated earlier, he will have to invoke his knowledge of the language next to his knowledge of the world.

The linking mechanism that we proposed in the previous section is a static one and is part of the grammar. A lexeme has one or more meaning definitions, and every meaning definition links up to a specific predication frame. The creative use of language, however, often involves the use of lexemes in configurations in which they normally would not occur, and requires more than the consistent application of a grammatical system. Yet, the creative use of language may lead to the successful introduction of a new meaning definition of a lexeme into the language (cf. Cuvalay-Haak 1997: 121). This can be illustrated by returning to an example from one of the flexible languages introduced in 2.3, Mundari. In this language lexemes are not tied to a particular syntactic slot. As a result, a single lexeme may be used with many different, albeit related, meanings. Thus, a lexeme like *buru* in (22) may mean, depending on the syntactic slot in which it appears: (i) mountain; (ii) to heap up; (iii) to keep up certain feasts or to hold a fair (because they take place on mountains); (iv) to call something a mountain. Meaning (iii) is not as evident as the other ones, probably because it is culturally determined. This particular meaning of the lexeme must have arisen at some point. Let us imagine a speaker who has no lexeme available to refer to a feast, or is unsatisfied with the one he has. In conceptualizing a feast, the image of a mountain dominates in the general picture of our speaker, since in the Munda community feasts take place on mountains. Taking advantage of the syntactic possibilities of Mundari, our speaker then coins the word *buru* in the head position of the predication frame of an intransitive predicate phrase. Our speaker is successful, and the set of meaning definitions of *buru* now includes this new meaning.

This creative process is revealing as regards the interface between cognition and language, or between conceptualization and semantics.

In our linguistic analysis we can only deal with the conventionalized uses of lexemes. But these conventionalized uses are pointers to a body of knowledge associated with the properties or relations these lexemes designate.^{ix} Yet this wider body of knowledge falls outside the scope of our linguistic analysis unless systematic relations between (meaning definitions of) lexemes can be established. This doesn't mean that conceptualization shouldn't bother us. In fact, in Functional Discourse Grammar, the most recent variant of FG (Hengeveld to appear a), the grammatical module operates within the setting of a more-encompassing cognitive one. Clearly, one aspect of this new approach that needs further elaboration concerns precisely the internal structure of the cognitive component and its interaction with the grammatical component. This paper confirms that the lexicon is the right place to start investigating this problem.

Notes

1. The authors wish to thank an anonymous referee for his/her comments on an earlier version of this paper.
2. In Hengeveld (1992a) these were called "general predicate frames".
3. It might well be possible that, through frequent usage, some derived predicates are available in the lexicon and related to their basic counterparts through redundancy rules (see De Groot (1989: 133) and Kahrel (1989) for some discussion). Still, unfolding the predicate formation rule seems to be necessary to interpret the output frame correctly, since some of its semantic properties (including its meaning definition) derive from the input predicate frame.
4. Compare also Kahrel (1989: 137) who calls for a more "liberal" lexicon in which many derived predicates are listed, thus reducing the heavy burden placed on predicate formation rules in language processing.
5. See, however, Kristoffersen (1992), who assumes that predicate formation rules can take predications and propositions as their input in his account of West Greenlandic morphology.
6. The labels "Actor" and "Undergoer" are taken from Role and Reference Grammar (Foley and Van Valin 1984; Van Valin and LaPolla 1997). The macrorole "Benefactive" is added here since it is needed to account for the differences between languages with and without applicative constructions.

7. The abbreviations used for semantic functions are the following: SF = any semantic function, Ø = Zero, Po = Positioner, Pat = Patient, Ag = Agent, Ref = Reference. Note that we do not distinguish between Goal and Processed, as does Dik (1997), but use the semantic function Patient for both.
8. This intuition has been formalized in different forms recently; see for example Van Valin and LaPolla's (1997) Completeness Constraint and Rappaport and Levin's (1998) Subevent Identification Condition.
9. Part of this body of knowledge extends over what Leech (1974) names Connotative Meaning, defined as the real world experience one associates with an expression.

References

- Bhat, D.N.S.
1997 Noun-verb distinction in Munda languages. In: Anvita Abbi (ed.), *Languages of Tribal and Indigenous Peoples of India*, 227-251. Delhi: Motilal Banarsidass Publishers.
- Boland, Julie E., Michael K. Tanenhaus, Susan M. Garsney and Greg N. Carlson
1995 Verb argument structure in parsing and interpretation: Evidence from wh-questions. *Journal of Memory and Language* 34: 774-806.
- Boland, Julie E.
1993 The role of argument structure in sentence processing: Distinguishing between syntactic and semantic effects. *Journal of Psycholinguistic Research* 22: 133-152.
- Butler, Christopher S.
1998 Enriching the FG lexicon. In: Hella Olbertz, Kees Hengeveld and Jesús Sánchez (eds.), *The Structure of the Lexicon in Functional Grammar*, 171-194. Amsterdam/Philadelphia: John Benjamins.
- 2001 A matter of GIVE and TAKE: Corpus linguistics and the predicate frame. In: M^a Jesús Pérez Quintero (ed.), *Challenges and Developments in Functional Grammar*, 55-78. (Revista Canaria de Estudios Ingleses 42.) La Laguna: Servicio de publicaciones.
- Carlson, Greg N. and Michael K. Tanenhaus
1988 Thematic roles and language comprehension. In: Wendy Wilkins (ed.), *Syntax and Semantics. Thematic Relations*, 263-288. New York: Academic Press.
- Comrie, Bernard

- 1981 *Language Universals and Linguistic Typology*. Oxford: Blackwell.
- Cuvalay-Haak, Martine
1997 *The Verb in Literary and Colloquial Arabic*. Berlin/New York: Mouton de Gruyter.
- Dik, Simon C.
1980 *Studies in Functional Grammar*. London: Academic Press.
1997 *The Theory of Functional Grammar. Part 1: The Structure of the Clause*. Edited by Kees Hengeveld. Berlin/New York: Mouton de Gruyter.
- Fillmore, Charles J.
1986 Pragmatically controlled zero anaphora. *BLS XII*: 95-107.
- Foley, William A. and Robert D. Van Valin, Jr.
1984 *Functional Syntax and Universal Grammar*. Cambridge: Cambridge University Press.
- García Velasco, Daniel
1998 La predicación nuclear en la GF de S.C. Dik: una perspectiva conceptual. Ph.D. dissertation, Universidad de Oviedo.
- García Velasco, Daniel and Carmen Portero Muñoz
to appear Understood objects in Functional Grammar. *Working Papers in Functional Grammar*.
- Groot, Casper de
1989 *Predicate Structure in a Functional Grammar of Hungarian*. Dordrecht: Foris.
- Hale, Kenneth and Samuel J. Keyser
1986 Some transitivity alternations in English. *Lexicon Project Working Papers 7*.
- Hengeveld, Kees
1992a *Non-verbal Predication: Theory, Typology, Diachrony*. Berlin/New York: Mouton de Gruyter.
1992b Parts of speech. In: Michael Fortescue, Peter Harder and Lars Kristoffersen (eds.), *Layered Structure and Reference in a Functional Perspective*, 29-55. Amsterdam/Philadelphia: John Benjamins.
to appear a The architecture of a Functional Discourse Grammar. In: J. Lachlan Mackenzie and María de los Ángeles Gómez González (eds.), *A New Architecture for Functional Grammar*. Berlin/New York: Mouton de Gruyter.
to appear b State-of-Affairs concepts. In: Geert Booij, Christian Lehmann and Joachim Mugdan (eds.), *Morphology: A Handbook on*

- Inflection and Word Formation*. Berlin/New York: Walter de Gruyter.
- Hoffman, John
1903 *Mundari Grammar*. Calcutta: Bengal Secretariat Press.
- Jackendoff, Ray
1983 *Semantics and Cognition*. Cambridge: MIT Press.
1990 *Semantic Structures*. Cambridge: MIT Press.
- Junger, Judith
1987 *Predicate Formation in the Verbal System of Modern Hebrew*. Dordrecht: Foris
- Kahrel, Peter
1989 On the representation of the lexicon in FG. In: John H. Connolly and Simon C. Dik (eds.), *Functional Grammar and the Computer*, 135-150. Dordrecht: Foris.
- Kristoffersen, Lars
1992 Derivation and Inflection in a Functional Grammar of West Greenlandic. In: Michael Fortescue, Peter Harder and Lars Kristoffersen (eds.), *Layered Structure and Reference in a Functional Perspective*, 143-171. Amsterdam / Philadelphia: John Benjamins.
- Kuipers, Aert H.
1968 The categories verb-noun and transitive-intransitive in English and Squamish. *Lingua* 21: 610-626.
- Leech, Geoffrey
1974 *Semantics*. Harmondsworth: Penguin.
- Mackenzie, J.Lachlan and Mike Hannay
1982 Prepositional predicates and focus constructions in a Functional Grammar of English. *Lingua* 56: 43-57.
- Mairal Usón, Ricardo and Pamela Faber
this volume *Reconsidering lexical representations in Functional Grammar*.
- Mosel, Ulrike and Einar Hovdhaugen
1992 *Samoan Reference Grammar*. (Instituttet for sammenlignende kulturforskning, Series B: Skrifter, LXXXV.) Oslo: Scandinavian University Press.
- Nuyts, Jan
1992 *Aspects of a Cognitive-Pragmatic Theory of Language*. Amsterdam/Philadelphia: John Benjamins.
- Rappaport, Malka and Beth Levin
1998 Building verb meanings. In: Miriam Butt and William Geuder (eds.), *The Projection of Arguments: Lexical and Compositional Factors*, 97-134. Stanford: CSLI.

- Schack-Rasmussen, Lone
1994 Semantic functions in perspective –reconsidering meaning definitions. In: Elisabeth Engberg-Pedersen, Lisbeth Falster Jakobsen and Lone Schack Rasmussen (eds.), *Function and Expression in Functional Grammar*, 41-63. Berlin/New York: Mouton de Gruyter.
- Shapiro, Lewis P., Edgar B. Zurif and Jane Grimshaw
1989 Verb processing during sentence comprehension: Contextual impenetrability. *Journal of Psycholinguistic Research* 18: 223-243.
- Siewierska, Anna
1991 *Functional Grammar*. London: Routledge.
- Spruit, Arie
1986 Abkhaz Studies. Ph.D. dissertation, University of Leyden.
- Stowe, Laurie
1987 Thematic structure and sentence comprehension. In: Greg N. Carlson and Michael K. Tanenhaus (eds.), *Linguistic Structure in Language Processing*, 319-357. Dordrecht: Reidel.
- Van Valin, Robert D. and Randy J. LaPolla
1997 *Syntax: Structure, Meaning and Function*. Cambridge: Cambridge University Press.