Constructions in Word Grammar

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Abstract

In this paper we consider the relationship between Word Grammar (WG) and Construction Grammar (CG). We first of all argue that the two frameworks share all of their fundamental assumptions, naming specifically the following: a requirement to deal with 'noncore' as well as central patterns, rejection of the traditional division between rules and separate lexical items, declarative monostratal grammatical structure (no transformations), full integration of syntactic and semantic structures, decomposition of linguistic structures into simple constructions which (by an inheritance mechanism) determine the structures and properties of utterances, and a requirement to include all relevant information (including illocutionary force, presupposition etc) among the properties of a linguistic item.

Next we consider two differences between the two frameworks: WG uses dependency structure where CG uses phrase structure, and WG uses default inheritance where CG (in some versions) uses strict unification-based inheritance. The first of these differences is held to be a material, but not a fundamental, difference between the frameworks. We show that a dependency-based network approach with 'normal' mode inheritance (Flickinger, Pollard, and Wasow 1985) allows for a more flexible characterisation of linguistic structures and that the box-based approach usually applied in CG analyses both excludes some patterns found in existing linguistic structures and requires arbitrary stipulations to rule out patterns that are not found.

In order to demonstrate the similarities and differences between the two frameworks we present a WG analysis of two structures which have both been covered in the CG literature. Using Kay and Fillmore 1999 as a source of data, we give a WG analysis of the *What's X doing Y?* construction as a combination of (specialisations of) five smaller constructions which all have uses in other structures. We go on to compare a WG analysis of the double object construction with that given in Goldberg 1995. The double object construction in WG is a network of morphosyntactic and semantic properties structured around the indirect object relationship and we consider some core uses of this construction, as well as some motivated extensions which exploit particular semantic relationships associated with the indirect object (namely beneficiary and owner).

We conclude that the descriptive mechanisms of WG provide for a full and flexible characterisation of the kind of explicit non-derivational grammar envisaged by Kay and Fillmore 1999.

1. Word Grammar and Construction Grammar

Word Grammar (**WG**) shares almost all of the general assumptions of Construction Grammar (**CG**) relating to the nature of language and its place in human knowledge. As a named theory WG has existed for somewhat longer than CG, but of course it has been deeply influenced by the tradition out of which CG grew so the following rather bald list can be taken as evidence of an intellectual debt from WG to CG and its founders. The unattributed quotations are from the article which seems to be most widely accepted as a 'manifesto' for CG, Kay and Fillmore 1999, all of which can be matched in the introduction to the main WG reference (Hudson 1990: 3-14).

- The goal of linguistic theory is "to account for the entirety of each language",

including "noncore" patterns as well as the central core.

- No distinction is assumed (or found) between 'rules' and 'lexical items', so a linguistic theory must include "an explicit system of representation, capable of encoding economically and without loss of generalization all the constructions (or patterns) of the language, from the most idiomatic to the most general".
- The list of constructions is the database of "an explicit, nonderivational (constraint based) grammar", so the grammar is generative (explicit) but not derivational (transformational).
- Syntactic patterns are intimately bound to semantic ones so that "syntactic and semantic information is represented within a single feature structure"; each grammatical construction is "a conventional association of linguistic form and content".
- Complex patterns in sentence structure are generated by the interaction of a multiplicity of individually much simpler patterns. In CG the simpler patterns are called 'constructions', so the grammar must be able to integrate "both constructions and the words, phrases and sentences of the language which they license - which we call 'constructs' ..." (It is true that the terms "construction" and "construct" have not been generally used in WG, but they apply perfectly to the very simple basic patterns of WG and the more complex patterns that they license. In both theories the term 'inherit' is used for the relation of a construct to its licensing constructions.)
- Semantic structures must show the fine grain of lexical semantics as well as the broader structures due to syntax; for example, the analysis of GIVE must include "a set with four members, each ... representing a minimal predication, consisting of a frame plus its participants or arguments ...". The semantic structure must accommodate pragmatic information such as illocutionary force (e.g. request for information) and presupposition (e.g. that the scene described is "incongruous" as in the famous *What's X doing Y?* construction).

All these important assumptions which WG shares with CG will be illustrated below.

The point of this paper is to raise a somewhat technical issue on which WG and CG are different, and to suggest that CG might be even more fruitful if it were to move closer to WG. The question concerns the nature of sentence structure. CG has followed the USA mainstream in assuming, without discussion, that sentences are built box-wise out of phrases, so the assumed model of sentence structure is a version of phrase structure. In contrast, WG stands firmly in the European tradition of dependency grammar in which the basic building block of syntax is not a phrase but a dependency between two words. Ignoring labels, the two models of sentence structure are illustrated in the three diagrams in Figure 1. The first two are exactly equivalent in terms of the information they convey, and both represent a phrase-structure analysis of the kind which (we guess) CG might assign; the third is a WG dependency structure. The third is not a mere notational variant of the first two, but embodies a different analysis; for example, the subject is *students* for WG but *good students* for CG; and CG recognises a VP which is not recognised at all (at least not in the syntax) by WG.

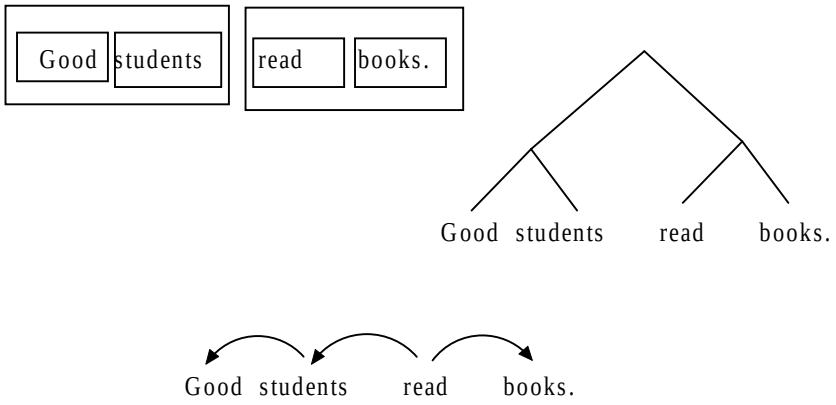

Figure 1

In contrast, WG does agree with CG in treating morphological structure in terms of wholes (words) and their parts (morphemes or more complex 'forms'); for example, *students* consists of the morphemes {student} and {s}. We shall not discuss the WG treatment of morphological structure in this paper, but it is worth pointing out one immediate consequence of using dependency structures in syntax: that the word is the meeting point of two quite different kinds of structure: phrase structure within the word, dependency structure between words. This view of grammatical structure is very close to the model that dominated European grammar for centuries (Percival 1990), in which morphological structure ('accidence') was strictly separated from syntax; but it is very different from the phrase-structure view of an undifferentiated continuum from morpheme through word to sentence. The choice between these fundamentally different models is important and is ultimately a matter of fact: which gives the best account of the similarities and differences between patterns and within words. On balance we believe the evidence favours the traditional view: there are syntactic patterns such as free word order which are difficult or even impossible to match within words and morphological patterns such as semitic interdigitation which seem unique to morphology.

What we shall try to defend, therefore, is the claim that syntactic constructions - i.e. patterns of co-occurring words - are best described directly, in terms of co-occurring words, rather than in terms of the abstract phrases of which they are parts.

2. WG notation: graphs not boxes

We start with a brief introduction to WG syntax and semantics. For a reader familiar with CG the ideas will be quite familiar but the notation is different as it uses a network of arrows rather than boxes. It is true that CG analyses could also be presented as branching arcs (Kay and Fillmore 1999) but boxes are the favoured option, whereas in WG they are not an option for reasons that we shall see. Indeed we believe that the choice between boxes and arrows reflects a choice between two fundamentally different views of cognitive structure - quite the opposite of the view that it is merely a matter of "visual convenience".

The basic units are **nodes** and **links**. The nodes are labelled to distinguish them from one another - for example, the nodes labelled HORSE and Horse belong respectively to the lexeme HORSE (a kind of word) and the concept Horse (a kind of animal). Most links are labelled to show the similarities between them; for example the link between HORSE and Horse is labelled 'sense' in order to show its similarity to other sense links. A link is shown as an arrow which points towards the node which is indicated by the link label - e.g. the 'sense' arrow points from the word to its sense. The only links which are not labelled in this way are those which show class-membership, which in WG are called 'isa' relations; these are

distinguished by a small triangle whose base rests on the super-category. This simple pattern is shown in Figure 2, which shows that Horse isa Animal, HORSE isa Word, and Horse is the sense of HORSE.

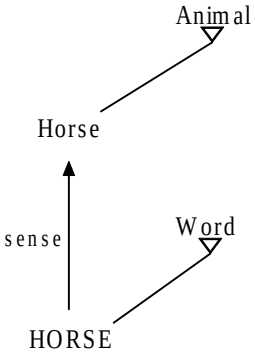

Figure 2

It is easy to translate this simple representation into standard CG box notation as in Figure 3, where 'inherit' corresponds to the WG 'isa' link and 'sem' to 'sense'. It is somewhat harder to find a convenient way to identify the 'owner' of each box - HORSE or Horse; Kay and Fillmore identify the lexical item as 'lexical-head' so we adopt this for the word, but we have had to invent 'type' for the animal.

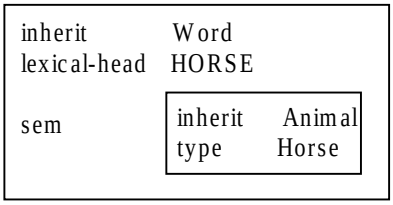

Figure 3

Why might one prefer the WG notation to boxes? The weakness of boxes, in our view, is the same as the weakness of phrase structure: excessive rigidity. For example, if the Horse box is part of the HORSE box, this rules out any extension of the analysis which would reverse this relationship so that HORSE was part of Horse. Seen positively this can be seen as a strong and testable hypothesis; but seen negatively, the hypothesis seems implausibly strong, even false. What we are ruling out, for example, is a relationship between Horse and HORSE whereby the latter is the former's 'name'. If we were to change the example from a common noun to a proper noun such as England, this is surely exactly what we do need: a pair of attributes pointing in opposite directions and both linking the word ENGLAND to the place England. According to this analysis, England is the 'sem' (WG 'referent' rather than 'sense' as in Figure 2) of ENGLAND, at the same time that the former is the name of the latter. This is easily shown in the WG graph of Figure 4, but seems impossible to show in box notation.

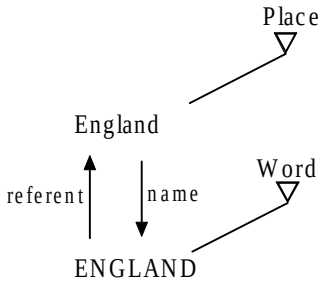

Figure 4

The general problem with box notation, as with the basic idea behind phrase structure, is that it is much more simple and rigid than the structures that we wish to diagram, which cannot be squeezed into a simple tree structure. The same is even more true when we consider semantic structures. For example, returning to the HORSE example, we assume (with CG) that its meaning, Horse, must be located in a 'frame' of conceptual information which (in this case) must mention such things as legs and eating grass; at the same time the word itself is located in a frame of linguistic information about nouns, prepositions, morphemes and so on; Figure 5 shows, as an illustration, that HORSE is a noun and that the complement (labelled 'c') of a preposition must be a noun. In network notation it is easy to expand the encyclopedic analysis to bring in cows (which also eat grass) and humans (which also have legs, though not four of them), and to allow Grass in turn to be related to further networks of information about plants and food, and so on and on. However if each of these 'semantic frames' is contained in a box, it will be necessary to allow boxes to overlap freely - the box for food overlapping with those for plants, animals and humans. It is not clear whether this is permitted in CG notation, but even if it is the diagrams will be much harder to work with than a WG network.

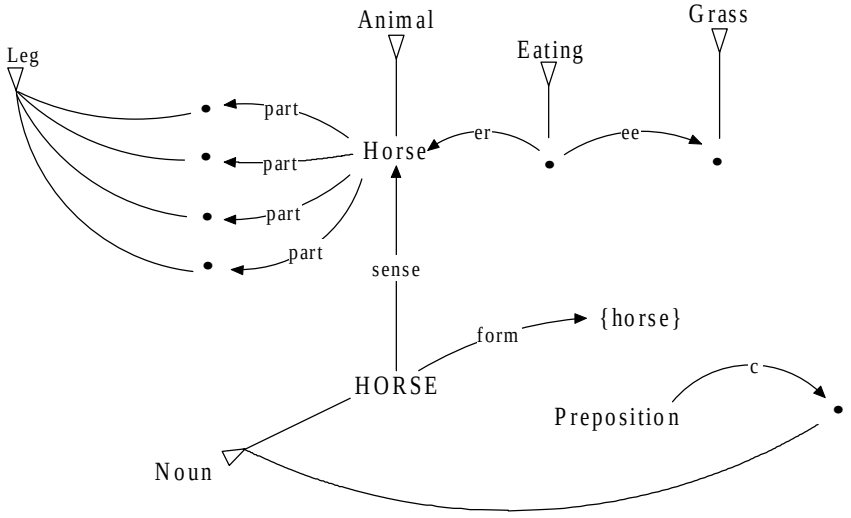

Figure 5

3. Inheritance in WG

Inheritance plays a similar role in WG and in CG, though the relationship which licenses inheritance is called 'isa' rather than 'INHERIT'. Just as in CG (and other unification-based theories such as HPSG), the inheritance relationship between a sub-category and its super-

category is stipulated, but for this small price we gain an enormous increase in generalisation and flexibility. It is true that WG assumes default inheritance - the inheritance of properties only by default, so that potentially inheritable properties can be blocked (overridden) by more specific ones. In contrast, Kay and Fillmore appear to assume that inheritance simply adds all the properties of the supercategory willy-nilly to those of the inheritor. In the terminology of Flickinger, Pollard, and Wasow 1985, WG assumes the 'normal' mode of inheritance whereas Kay and Fillmore seem to assume 'complete' mode. However we are aware that other versions of CG do assume default inheritance (albeit under other names) - for example Goldberg espouses it explicitly (Goldberg 1995: 73) - so we do not see this as a fundamental difference between the theories.

A more important difference is that in CG 'INHERIT' is applied to a boxful of information, so for example the VP construction inherits from ('isa' in WG terms) the Head-Complement construction. In WG, by contrast, the 'isa' relationship is available more widely and in particular, it applies to other relationships. For example, the syntactic relationship 'object' isa 'complement'. In syntax this allows a great deal of flexibility for stating generalisations at the correct level since it allows any given relationship to be classified simultaneously at the highest level ('dependent') or at lower levels ('object' or 'clausal object' or even, where needed, 'object of the verb .... '). That relationship automatically inherits generalisations from all the higher levels including the most general (e.g. regarding word order) to the most specific ones regarding class or lexical selection. Figure 6 shows the double inheritance hierarchy around which grammars are built: one hierarchy of words and word-types, and another one containing grammatical relations (dependencies). Once a word or relationship is recognised as an example of some category in the grammar, it automatically inherits from this category, which means that it inherits from all the supercategories in the 'isa' hierarchy; so in Figure 6, *her* inherits from Pronoun, Noun and Word (and in reality, of course, a number of other categories including the lexeme HER); and the link from *like* to *her* inherits from Object, Complement and Dependent.

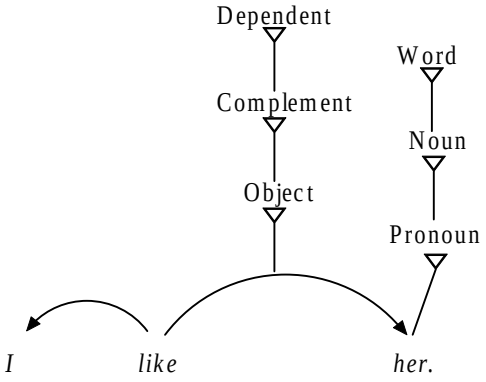

Figure 6

One of the benefits of organising relationships hierarchically is that it allows multiple inheritance. Just as a word may inherit from two models at the same time (e.g. *students* inherits from both STUDENT and Plural), so may a grammatical relationship. Take the Subject relationship. On the one hand this is like Complement in as much as it is selected by the verb and expresses one of the verb's arguments: so both Subject and Complement are subsumed under the supercategory Valent. On the other hand, Subject and Complement are very different both in terms of word order and in terms of the way in which they are selected by the verb. In terms of word order, subjects belong with a small number of other clause elements which precede the verb - Wh-phrases and other 'extracted' items and pre-verbal

adverbs. To show these similarities we group Subject, Extractee and Pre-adjunct together under Pre-dependent, which of course excludes Complement. The analysis is shown in the partial network in Figure 7. This kind of cross-cutting classification of relationships cannot be shown (so far as we can see) in other theories, including CG.

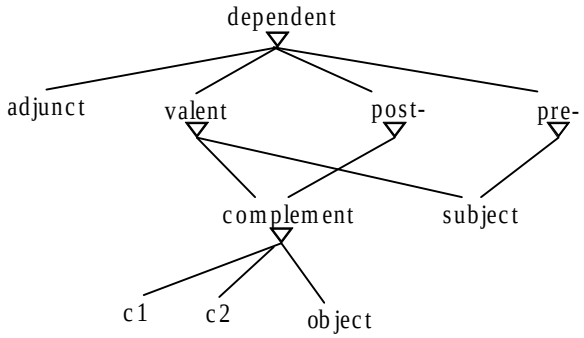

Figure 7

This hierarchical approach to relationships extends well beyond syntax, and turns out to be useful in other areas of linguistic analysis - both sense and referent can be subsumed under 'meaning', various different kinds of part can be distinguished from one another without thereby denying that they are also parts, and so on. For example, in a detailed analysis of the meaning of the verb CYCLE (Hudson and Jasper Holmes 2000) we found it useful to be able to analyse the 'rider' relationship as a sub-type of 'actor' and 'user', and 'pedal-of' as a sub-type of 'part-of'.

4. Syntax without phrase structure

As explained earlier, the most controversial difference between WG and CG lies in their treatment of sentence structure. The aim of this section is to explain how this can be done without invoking any units larger than words, and to suggest some reasons why this is a better way of achieving the goals that WG shares with CG. For reasons of space the discussion will be limited to rather simple syntactic structures but the reader should be aware that detailed WG analyses have been proposed in print for a range of more complex structures including topicalisation and Wh-fronting (Hudson 2000a; Hudson 2002, Hudson 1988; Hudson 1989), gerunds (Hudson 2000b), all of which are discussed along with other constructions in Hudson 1990.

WG is an example of Dependency Grammar (Anderson 1977; Bröker 2001; Heringer 1993; Kunze 1975; Mel'cuk 1988; Percival 1990; Tesnière 1959). According to Dependency Grammar, sentence structure is simply a by-product of applying the requirements of ' valency' - the syntactic and semantic co-occurrence requirements of each word in the sentence. WG and CG approach valency in much the same way, except that CG extends the term 'valence' (abbreviated to 'val') to include almost[1] all dependents, and not just those which we call 'valents' (which, as explained above, include subjects and complements). Each pair of a head-word and a dependent is licensed by some fact in the grammar, which in some way limits the head-word and the dependent and their syntactic and semantic relations. For example, the valency of DRINK allows it to have an object noun (NB not noun phrase - we return to this point below) whose referent is the 'Drink-ee' - the liquid consumed - and a subject noun

[1]The exception is the Subject-Predicate construction, whose status in CG is unclear. According to 3.6 in Kay and Fillmore (1999) it is not a member of 'val'; but subjects are included among the complements (sic) of *give* in 3.4.

whose referent is the 'Drink-er'. The notation is different, because the valents are brought together by the shared classification as 'valent' rather than by sharing a slot called 'val'; but the underlying principle is the same: that words define their own needs in terms of dependents, and these needs must (of course) be satisfied.

Figure 8 shows the syntactic part of the valency of DRINK and how this generates the dependency structure for the sentence *Joe drinks coffee*. (To increase readability, the 'isa' lines are broken in contrast with the solid dependency lines.) In a nutshell, what this figure shows is that DRINK requires both a subject noun and an object noun, and the token *drinks* inherits and satisfies these valency requirements.

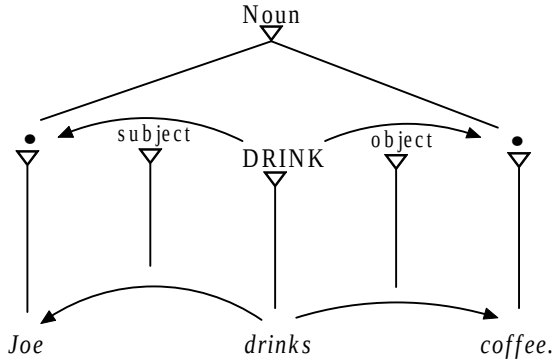

Figure 8

The general idea of inheriting a valency set is very familiar in CG, though there are important details which could be pursued here - in particular, how do we distinguish obligatory from optional valents? (This is still a matter of debate and research in WG, but the research question is how to choose among a range of plausible alternatives.) Since the CG valence set corresponds more or less exactly to the set of dependents in WG we can also draw attention to the similarities in the treatment of adjuncts, which are treated in WG, as in CG, as dependents which license themselves, in contrast with valents which are licensed by the lexical requirements of the head word. For example, the valency for an adverb such as OFTEN requires it to be an adjunct (a named dependency type) of a verb; and that for NEVER requires it more specifically to be the verb's pre-adjunct. The theories offer different notations and some differences of detail which may turn out to be important, but at present we are struck by the similarities.

However there is a major difference between the two theories which brings us back to the difference between boxes and arrows. In CG a construction constitutes a phrase whose parts are also either words or phrases; in WG the only units recognised are words. For example, one of the most basic constructions in CG is the Head plus complements construction, which is shown as a box containing the head word plus one or more complements; the equivalent part of a WG grammar is the dependency type Complement, which is shown as an arrow linking two words. Thus to show that *coffee* is the complement of *drinks*, a CG analysis encloses them both in a box and labels the two words 'head' and 'object' - more precisely, 'role: head' and 'gf: obj'; whereas a WG analysis links *drinks* to *coffee* by means of an arrow labelled 'object'. The different ways of classifying the relations may well be mere notational variants, but the two theories seem to be making fundamentally different claims about the sentence structure: for CG the object is a phrase (indicated by the label 'filler', meaning 'a phrasal role'), whereas for WG it is a single word. The difference is not great when the phrase consists of a single word (as in the example *drink coffee*) but it is much more important in other cases. For example, in *drinks black coffee*, it may seem obvious to those familiar with CG that the object is *black coffee*; so the WG claim that it is really just

coffee may seem downright perverse and needs some explanation.

The explanation involves the WG treatment of semantics. As in any other theory, semantic structures of non-idiomatic phrases are built compositionally out of the meanings of the words in the phrase, and the general principle is that the dependents modify the meaning of the head word. Thus the dependent *black* modifies the meaning of *coffee* from 'Coffee' to 'Black coffee'; so in the phrase *black coffee*, the word *coffee* actually means 'Black coffee'. (More technically, this is its sense; its referent may be a specific item of black coffee.) This means that the head word of a phrase carries the meaning of the entire phrase, so although there no node for the whole phrase exists in the syntax, one does exist in the semantics. (This is called 'semantic phrasing'; see Hudson 1990:146-151.) Figure 9 shows a simplified semantic structure for *Joe drinks black coffee* including the semantic units 'Black coffee', 'x Drinking black coffee' and 'Joe drinking black coffee' as well as the basic senses of the words concerned.

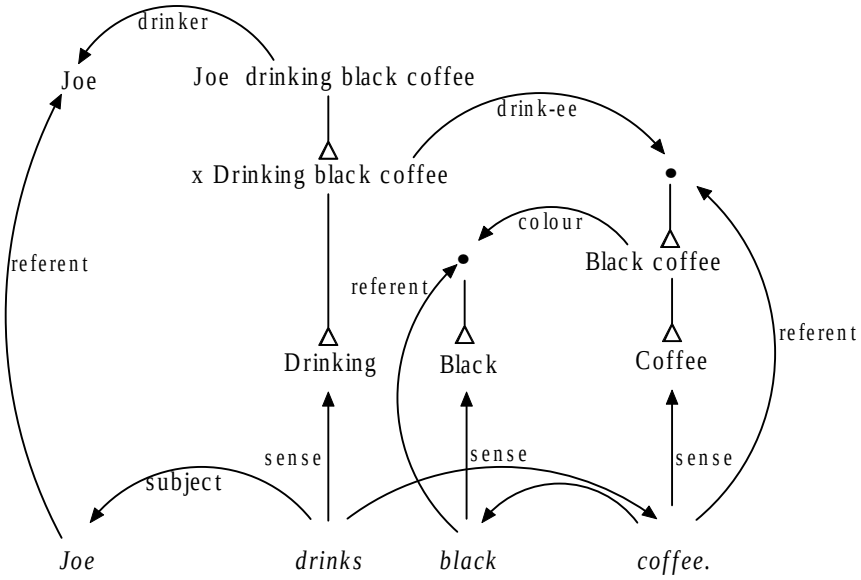

Figure 9

In short, the head word stands for the whole phrase. In this theory, phrases are simply redundant because all the information that they might be carrying is already carried either by the head word's class-membership or by the arrows which show the phrase's internal structure. Phrases can easily be read off dependency structures - each word is the head of a phrase which contains it and the phrases of all its dependents - but there is no point in doing so. This dependency approach therefore makes the following elements of CG, as defined by Kay and Fillmore, redundant:

- all phrasal constructions whose head is phrasal, such as the VP construction;
- the head feature principle (the mother shares the daughter's classification);
- the features 'maximality' and 'lexicality' which distinguish phrases from words, together with the maximality principles (heads are non-maximal, fillers and specifiers are maximal);
- the subset principle (the mother's valence and semantics lists must include those of the head, with the possible addition of adjuncts);
- the valence principle (all 'local' dependents must be licensed by the mother's valence);

The prospect of dispensing with these elements should be attractive because they include all the principles that Kay and Fillmore stipulate. All that is left is the very general and natural requirement that all inheritable requirements (including valency ones) should be satisfied.

A further important advantage of a phrase-free analysis is that lexical items are related directly to one another rather than via an intervening phrase node. For example, if a verb selects a specific preposition (as many English verbs do - consider DEPEND ON, ADHERE TO, DERIVE FROM, SMACK OF) this can be stated directly: the complement of such and such verb is such and such preposition. In contrast, if all complements must be phrases then each of these verbs requires a prepositional phrase whose head is the preposition concerned - a much less direct relationship, and therefore a much less natural restriction. In a WG analysis such lexical restrictions are easy to explain and understand, whereas phrase structure turns them into a mystery: why should so many words select a daughter of their sister? Such lexical selection patterns are especially important in the kind of fine-grained analysis that CG is so good for.

In conclusion, therefore, we believe that CG would be better if phrase structure was replaced by dependency structure, because the theory would be simpler (with fewer stipulated principles) and analysis would be more explanatory (with fewer intervening nodes between related words). So far as we can see there are no basic assumptions of CG which require phrase structure rather than dependency structure; nor, so far as we know, has the possibility of adopting dependency structure ever been considered and rejected. Rather we believe that phrase structure is simply a residue of the theory's historical roots in phrase-structure grammar. The remaining sections of this paper will show how a WG analysis can accommodate two constructions that have already been analysed in terms of CG: the *What's X doing Y?* construction and the double-object construction.

5. A WG analysis of the What's X doing Y? construction

This construction is analysed exhaustively and insightfully in Kay and Fillmore 1999, and like them we shall reduce its name to WXDY. Kay and Fillmore exemplify it with the following examples (among many others):

(2) a What is this scratch doing on the table?
b What do you think your name is doing in my book?
c What is it doing raining?

We have no quarrel with Kay and Fillmore's discussion of this pattern, or with their general conclusion that it is a special combination of a number of smaller constructions:

- interrogative WHAT plus a non-subject question with or without inversion (according to whether or not it is subordinate) - *what is it doing ...* or *what it is doing ...*;
- what they call 'left-isolation', which in WG is called by its more common name 'extraction' and which allows long-distance extraction - e.g. *What are you trying to tell me it is doing ...*;
- the auxiliary *is* combined with a present participle as complement - *is doing*;
- subject-auxiliary inversion when triggered by WHAT - *is it* or *it is*;
- a 'subject-controlled secondary predicate' acting as complement of *doing* - i.e. the Y of WXDY; in WG such predicates are called 'sharers' because they share the higher verb's subject.

As they point out, these five constructions can also combine without special effects - hence the ambiguity of the old joke *Waiter, what's this fly doing in my soup?* These analytical assumptions can easily be expressed in a WG analysis such as the one for (2c) in Figure 10 which is explained more fully below.

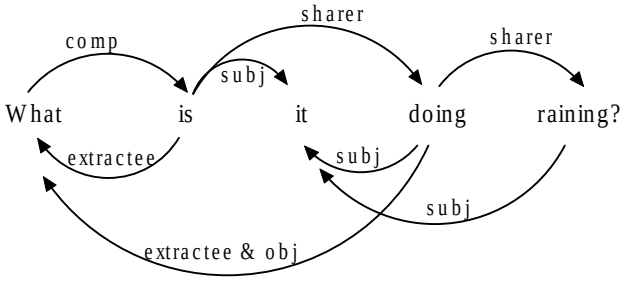

Figure 10

All the dependency patterns in the figure are found outside this construction:

- Comp(lement) is as used in other theories, and as in other theories, the rest of the interrogative clause is the complement of the Wh pronoun *what*. This makes *what* the head of the sentence[2]. The Complement arrow is written above the words in order to show that it determines the order of the words connected (a word precedes its complement, as it precedes dependents in general). A general principle requires one order-relevant dependency per word (Hudson 2000a). Figure 11 shows Complement linking *what* and a different tensed verb in a simpler structure.

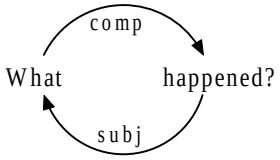

Figure 11

- Extractee is the relation between an extracted (front-shifted) word (*what*) and the word from which it takes its position (*is*), and also between the former and all the words in the dependency chain between it and its 'launching site' (*doing*). In Figure 12 *what* is taken recursively as the extractee of *said* and *wanted*.

[2] Hudson 2002 argues that Wh-interrogative clauses are generally ambiguous in structure according to whether the Wh pronoun or the finite verb is taken as the head of the whole sentence. However this is only true of main clauses, where the evidence comes from the possibility of extracting adverbials as in *Tomorrow, what shall we do?* In subordinate clauses this front-shifting is not possible because the Wh-pronoun is the link-word which has to be the clause head. The same ambiguity applies to the WXDY construction if adverbials can be extracted, but so far as we know this is not possible, so we assume that *what* can always be taken as the head.

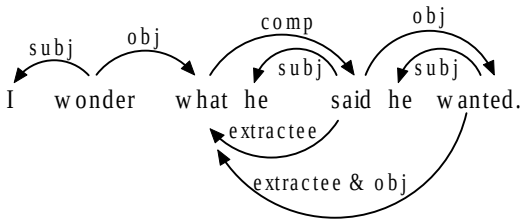

Figure 12

- Subject is used as in other theories. Although *it* is the subject of *is*, the normal order is reversed because the auxiliary is classified as 'inverting'; this Subject arrow is again written above the words because it determines the order, in contrast with the others which are irrelevant to order. The rule which inverts subjects is an example where a default word-order rule is overridden by an exception; in fact, it is an example where an exception (an inverting auxiliary precedes its subject) overrides an exception (a word follows its subject) which overrides a default (a word precedes its dependent). Figure 13 shows as simple an example of subject inversion as is possible, together with the hierarchies of word classes and dependences that license it. (In this diagram, the relationship labelled '<' is linear order; the arrow points towards the earlier of the words that it links. The same linear order relationship is used for other kinds of ordering in time, most obviously in the semantics of tense.)

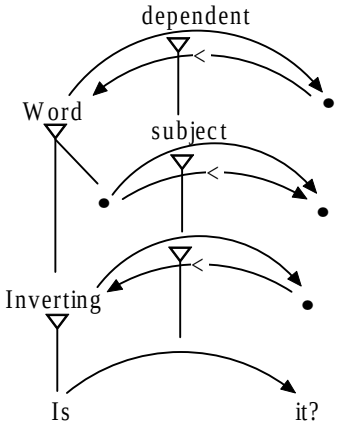

Figure 13

- Object is also used as in other theories. Because the extractee *what* is extractee of *doing*, the rules for extraction allow it also to have some kind of complement relation to the latter - in this case, Object. This possibility is illustrated in a simpler example by Figure 12 above.
- Sharer is the equivalent of the LFG function XCOMP and the traditional subject- or object-complement. It allows 'subject-raising' by both *is* and *doing*, each of which shares its subject - *it* - with its sharer. Figure 14 shows this sharing without the other WXDY patterns.

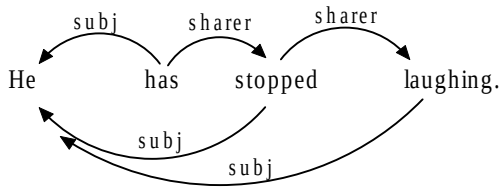

Figure 14

This, then, is the complex syntactic structure which is defined by the WXDY construction.

If each of the components is found outside WXDY, what is special about WXDY?

- The meaning as defined by Kay and Fillmore is 'incongruity-judgement' - i.e. the speaker presents the situation defined by XY (in this case 'It raining') as 'incongruous'. We shall simply accept their analysis and terminology and show how it can be included in a WG analysis. According to the general principle of WG semantics explained earlier, the meaning of the whole construction is a property of the head word, WHAT.
- Given this meaning, the words WHAT, BE and DO are fixed and not lexically variable, and BE must be finite though its tense and agreement inflections are variable (*what they are doing ...*; *what it was doing ...*). As required of a 'sharer' of BE, the inflection of DO must be the present participle.
- Again given this meaning, the verb DO has none of its usual meanings; in fact arguably it has no meaning at all, so *What is it doing raining* is synonymous with *How come it is raining?* Its lack of meaning extends to the usual meaning of the progressive inflection, which again is missing; as evidence, Kay and Fillmore quote the possibility of using it with verbs like UNDERSTAND which normally do not allow a progressive form (e.g. *What is he doing understanding the lecture?* contrasts with **He is understanding the lecture*). We can be sure that this contrast involves meaning because there are other constructions whose meaning also accepts such verbs such as the example in Croft 1998: *He is understanding aspect more and more each day*.
- Perhaps because of this lack of meaning, DO takes two complements: its object *what*, and its sharer Y. Normally DO does not allow a sharer, though a superficially similar subject-sharing adjunct is possible (e.g. *He was doing his homework sitting in front of the TV.*).

All these characteristics define the WXDY construction, so they must be represented in the grammar in such a way as to show their interconnections.

The WG analysis for a complex construction like this has to distinguish every 'special' part from the default part of which it is an example. In particular we must reflect the following facts:

- The present participle of DO which we find in WXDY is a special case of the default DO which has no meaning and takes two complements, *what* and a sharer. We can call it DO_{WXDY}.
- The form of BE has to take an example of DO_{WXDY} as its sharer, and has to be tensed. We can call it BE_{WXDY}. In other respects, however, it inherits the normal properties of a tensed verb such as the need to have a subject, and as usual the sharer shares this subject so these facts need not be mentioned.
- The WHAT found in WXDY has to have an example of BE_{WXDY} as its complement, and has to be the object of the DO_{WXDY} which is the latter's complement. We can call it $WHAT_{WXDY}$. As head of the WXDY construction, $WHAT_{WXDY}$ has the meaning

'The referent of Y is incongruous', where Y is the sharer of $WHAT_{WXDY}$'s complement's sharer - a complex relationship, but one which is quite easily diagrammed in Figure 15.

Figure 15 is the complete WG representation of the WXDY construction (pending a proper analysis of 'incongruence').

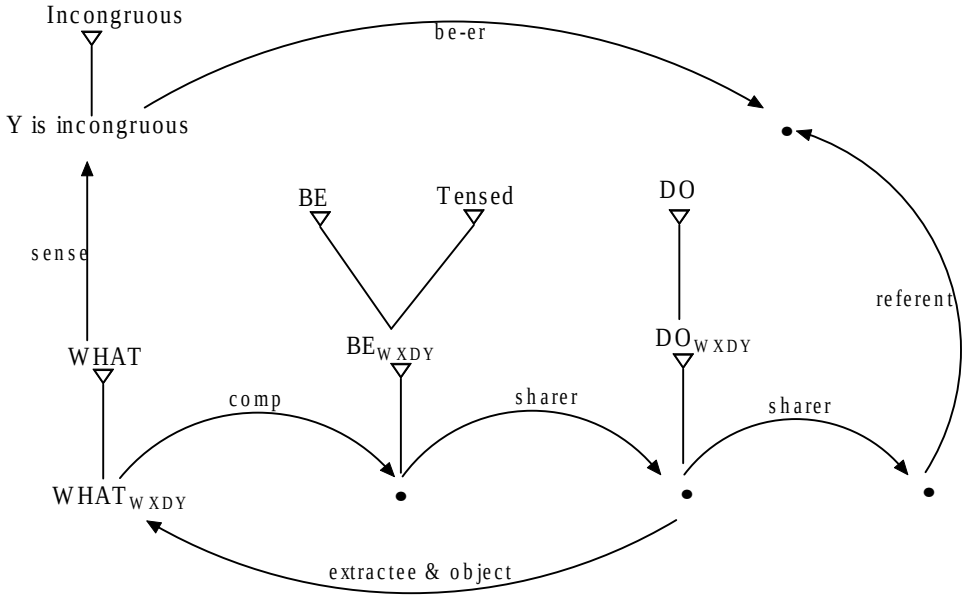

Figure 15

Our main purpose in giving this WG analysis of the WXDY construction is to show that an analysis is not merely possible in WG, but perhaps even more revealing for not being encumbered by redundant phrasal nodes. The construction is defined by three words which are linked directly to one another in a simple dependency chain. Each of these words is a version of an ordinary word - WHAT, tensed BE and DO - which has either special restrictions on the usual range of possibilities or special extra possibilities which are not usually available. So far as we can see, the analysis offered here is entirely within the spirit of CG as defined by Kay and Fillmore.

6. A WG analysis of double objects

Whereas the WXDY construction is a specialised intersection of a number of productive patterns, the double object construction is a generalisation of a single pattern to a range of other closely related patterns. In this case we closely follow the CG analysis of Goldberg (Goldberg 1995:32-39, 141-151), which we find convincing. The only addition that we shall offer is a formal framework which we believe reflects her sensitive analysis better than the mixture of prose and box diagrams that she offers (Holmes 2002). We shall exploit two features of WG theory:

- the possibility of classifying grammatical relations (such as the 'indirect object' relationship) in an indefinitely extensible 'isa' hierarchy;
- the possibility of applying an indefinitely extensible network analysis to word meanings to make interconnections explicit.

As in CG we take grammatical relations as primitives so the relations 'indirect object' and 'direct object' are available in the grammar. However we shall follow the usual practice of calling verbs which take an indirect object 'double-object verbs' because indirect objects always occur with a direct object.

Goldberg's analysis focuses on the semantic analysis so, reasonably enough, she takes the syntactic properties of direct and indirect objects for granted, but in so doing she omits half of the picture. After all, the reason for positing grammatical relations as categories is because they allow us to bring together a cluster of semantic features and a cluster of morpho-syntactic features. Indeed it is the latter rather than the former that delimit the category 'indirect object'; for instance, *gave him the book* and *gave the book to him* have the same or very similar meanings, but the former definitely does contain an indirect object and the latter does not. This interplay between syntax and semantics makes the syntax just as important as the semantics.

Regardless of their semantics, indirect objects have the following syntactic characteristics:

- like other typical dependents they follow the word on which they depend (the verb);
- like other valents, they are limited to one per head-word (which is why we cannot combine, say, a beneficiary indirect object with a recipient one: **I gave her him a present*, meaning 'I gave him a present on her behalf');
- like other typical objects, they are nouns (i.e. in phrase-structure terms, noun-phrases or determiner phrases);
- like other objects, they passivize easily (*She was given a bottle of wine*).

They also have the following syntactic characteristics that distinguish them from direct objects (Hudson 1992):

- they only occur in the company of a direct object (contrast *I gave a present* with **I gave her*.);
- they precede the accompanying direct object;
- they cannot be delayed by 'heavy NP shift' (**I gave the book the student who was working on syntax for a final-year project*);
- they passivize more easily than the accompanying direct object (compare *She was given a bottle of wine* with ?*The bottle of wine was given her by her boss.*)
- they do not extract easily (**The student who you lent the book; *The officer who you faxed your message*).

All these facts eventually deserve a place in a comprehensive formal grammar - not a trivial task.

We do not claim to have a complete analysis to offer, but we do at least have the beginnings of one. The little network in Figure 16 incorporates some of the easier syntactic facts. It shows that a verb may have both an indirect object and a direct object, both of which inherit from 'object' the property of being a noun. Since 'object' is itself a kind of dependent, indirect objects automatically inherit the characteristics of default dependents - in this case, the characteristic of following the word on which they depend, as shown by the precedence arrow labelled '<' which points at the earlier of the two. In addition, the shorter precedence arrow requires the direct object to follow the indirect one.

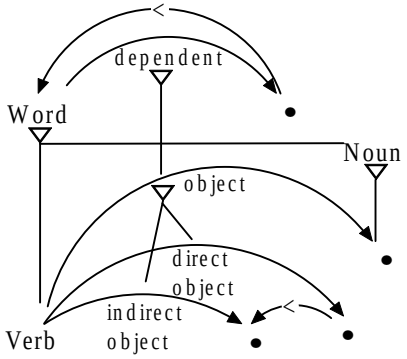

Figure 16

One important question that this analysis raises is whether to recognise verb classes that are based on valency - i.e. Transitive and Ditransitive verbs. We have three reasons for rejecting such classes.

- They simply duplicate the distinctions already made in terms of grammatical relations, and for this reason they have always been rejected in WG (Hudson 1984:110-2).
- They inevitably lead to proliferation of word classes - if we recognise different word classes for direct and indirect objects, why not do the same for all the other types of complement that verbs can take - prepositional objects, particles, 'sharers' (i.e. traditional subject- and object-complements) and so on? If the verb classes play an important role, then these additional classes must be included along with the traditional transitive/intransitive, but if the former are not needed, why have the latter?
- Any such classification based on complementation risks complicating the classification of individual lexemes. For example, the verb GIVE - the 'classic' ditransitive verb - can also be used without an indirect object and even without any object at all, as in the following examples:

(1) a She is always giving people presents.
b She is always giving presents.
c She is always giving.

If the presence of objects is necessarily tied to classification as transitive and ditransitive, then GIVE must be a ditransitive verb in (a), a (mono-)transitive in (b) and an intransitive verb in (c). One counter-argument would be that a verb's classification should be used to show its potential rather than actual complements; according to this kind of analysis, GIVE is just ditransitive, which means that it allows but does not require two objects. To this objection we would reply by pointing out the examples documented by Goldberg (Goldberg 1995:54) such as KICK which are basically transitive but may also be used with an indirect object (*Joe kicked Bill the ball*). As Goldberg points out, the semantics of KICK do not provide a role for a recipient, so this verb cannot be classified as inherently ditransitive like GIVE. It must be transitive, which ought to rule out an indirect object; but an indirect object is in fact possible, so transitivity classes cannot define potential complements and the counter-argument collapses.

Our view, therefore, is that the possibility of a particular complement pattern is determined in part by the lexical specifics of the verb concerned and in part by the syntax and semantics of the 'construction' which, in our analysis, means the grammatical relation (e.g. 'indirect object'). So far as we can see, this view is just the same as in CG. At one extreme a particular verb may be listed more or less idiosyncratically as requiring some complement pattern:

- HAND requires some overt expression of the recipient (Goldberg 1995:51), though this may be either an indirect object or a prepositional phrase or even a particle:

(2) a She handed her friend the parcel.
b She handed the parcel to her friend.
c She handed over the parcel.
d *She handed the parcel.

- ASK allows the recipient of the question to be left implicit, but if there is an overt complement it must be an indirect object rather than a prepositional phrase:

(3) a She asked her friend a question.

b She asked a question.
c She asked a question *to/?of her friend.

These details cannot be predicted from more general facts, even though there may be a general explanation for the choice of one complement pattern rather than another. At the other extreme, a complement pattern may be used freely provided it fits both the intended meaning and the rest of the syntax, as in the example of KICK above.

We now turn to the semantic analysis. We accept Goldberg's conclusion (Goldberg 1995:35) that the semantics of GIVE is the prototype for indirect objects, with the other possible meanings arranged as a radial category around this central pattern; she contrasts this kind of analysis with one in which indirect objects have a very sparse semantics which is compatible, without conflict, with all known examples. We therefore start with the semantics of Giving, the sense of the verb GIVE. We accept Goldberg's prose definition of this meaning (ibid:33) as "successful transfer of an object to a recipient, with the referent of the subject agentively causing this transfer", but Goldberg's formalisation of the ditransitive construction (ibid:50) suggests a combined analysis for GIVE as shown in Figure 17 which we find less satisfactory. For example, the term 'CAUSE-RECEIVE' labels a single node in the analysis but implies two nodes - one for causing, the other for receiving; this is confirmed in later analyses for other event types such as 'CAUSE-MOVE' and 'CAUSE-BECOME'. More generally, such semantic analyses are not sufficiently fine-grained to explain the polysemy of the double-object construction - for example, why it accommodates cases where there is no causation but there is ownership (e.g. with verbs such as ENVY). One of the advantages of a WG network analysis is that it does provide the detail that is needed for explaining extensions such as this, as we shall now show.

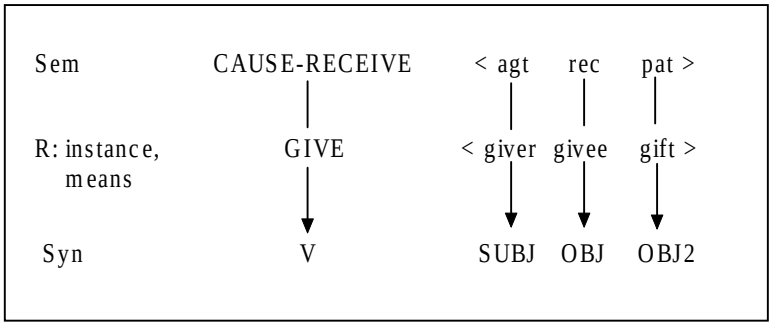

Figure 17

The next figure (Figure 18) shows a WG analysis of Giving. In this analysis the notions of causing and receiving are separated. The causation is shown by the link to Achieving, which has a purpose which is also a result - i.e. a fulfilled purpose; since Giving isa Achieving, it too has a fulfilled purpose. The receiving is shown as a specification of this purpose - an example of Having, in which a person (the 'er', short for 'have-er') has a thing (the 'ee')[3]. These two participants are also linked to the giving as its recipient and gift. In short, the (intentional) effect of giving is to put the recipient in possession of the gift. For completeness we might also have shown the state of affairs prior to the giving in which the gift belonged to the donor rather than to the recipient - normally something given by A to B previously belonged to A.

[3] More accurately, receiving should be shown as an example of Receiving, rather than Having. This can be shown but we omit it to avoid excessive complexity. Receiving isa Changing whose result isa Having, so there should be an additional node between Giving and Having. For more details see Holmes 2002.

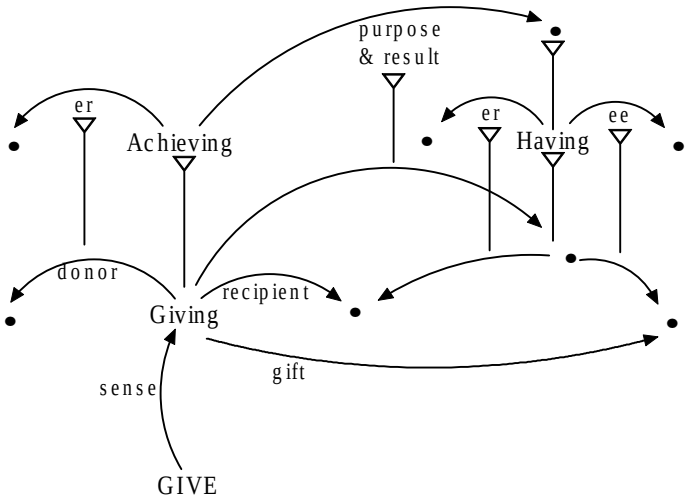

Figure 18

As we mentioned in the general introduction, one of the advantages of a network analysis is that it allows 'deep' analyses in the spirit of Frame Semantics, in which meanings are embedded in rich conceptual frames. This advantage is highly relevant to the analysis of Giving because they allow us to enrich the analysis 'for free', so to speak, simply by developing the analysis of the super-categories Achieving and Having. Both of these concepts would certainly be enriched in a complete analysis, but the more relevant for the double-object construction is Having, because this seems to provide the links which underly all the extensions of the prototype. Two aspects of having are particularly relevant:

- ownership: the have-er has socially recognised rights over the have-ee;
- benefit: the have-er benefits from the have-ee;

We can show these two links (separately) as direct links called 'owner' and 'beneficiary' between the have-er and the have-ee; in a full analysis they would be defined by detailed analyses of Owning and Benefitting. The links are shown in Figure 19, together with their inherited links in the analysis of Giving which show that the recipient is also both the owner and the beneficiary of the gift.

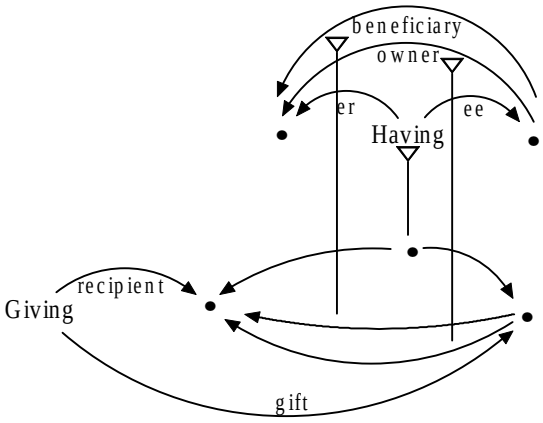

Figure 19

All that remains is to marry the semantic analysis of Giving in Figure 18 with the syntactic analysis of indirect objects in Figure 16 in such a way that the former supplies the

default interpretation of the indirect object relationship. This is achieved in Figure 20, which shows that the referent of a typical indirect object is the receiver of an act of Giving while that of the direct object is its gift. This, then, is the part of the complete network which defines the default semantics of the 'double-object construction'.

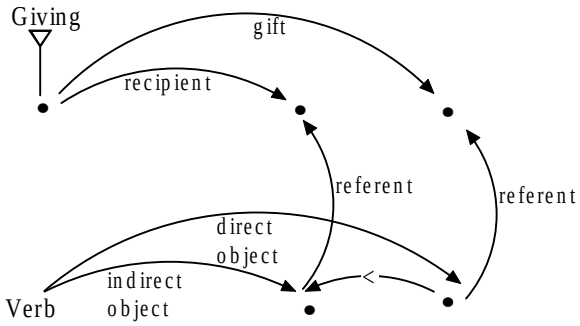

Figure 20

We now turn to some of the non-default indirect objects that Goldberg discusses. In each case the syntax associated with indirect object-hood is the same, but the semantics is different. The challenge is to offer a formal analysis which explains why indirect objects are considered (by native speakers) an appropriate way to express these meanings as an extension of the default meaning.

We start with verbs of creation such as MAKE, as in *He made her a cake*. Unlike giving, making does not inherently involve change of ownership, but it does have a result - an example of Being, the existence of the thing made. This is the first point of similarity to Giving, and the second is that the result states are highly compatible with one another if we make the common assumption that Having is a kind of Being ({Lyons 1997 875 /id}:722-3) where existence is combined with some notion of possession or relevance. The similarity between Having and Being can easily be seen in pairs such as (a) and (b):

(1) a In this sentence there is an example of the double-object construction.
b In this sentence we have an example of the double-Lyons 1997object construction.

On this assumption, then, we can recognise a concept called 'Making & giving' whose result is an example of Having, which in turn isa Being. This is recognised in English grammar as another possible semantic pattern for the indirect object in addition to the default one. Since it is not tied to any particular verb it is generally available whenever the meaning demands it - i.e. whenever the meaning is an example of Making & giving.

All this information is shown in Figure 21. This diagram shows that there is a kind of verb whose sense is Making & giving, and whose indirect object is (as usual) the recipient of the Giving. This much must be stipulated in order to make the construction available, but it is clearly a very natural extension of the default semantics of the indirect object. Of course the verb MAKE can be replaced in this pattern by any other verb of creation such as COOK, PAINT or WRITE since these all have a sense which isa Making.

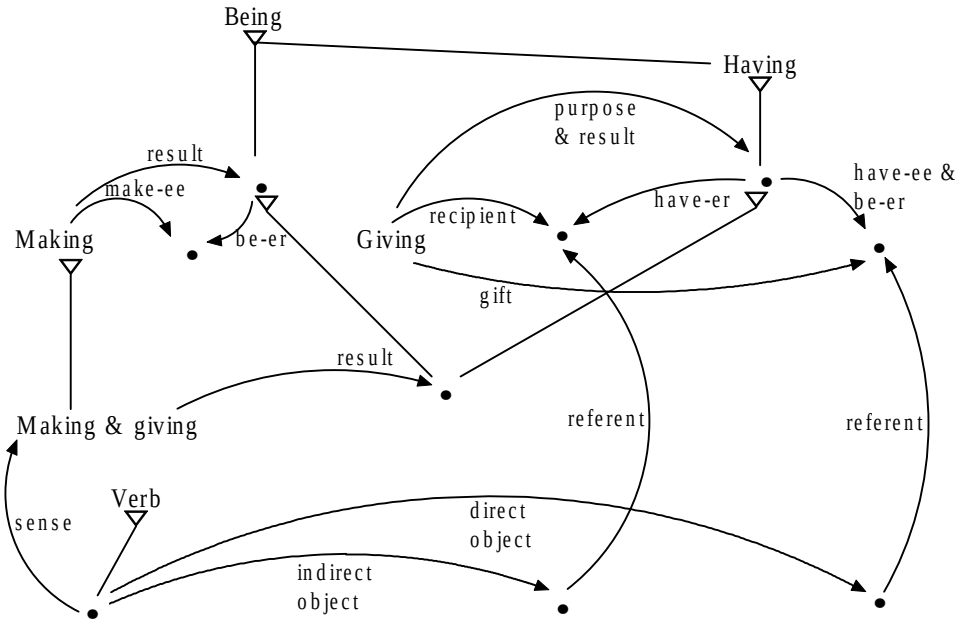

Figure 21

A different kind of deviation from the default semantics is found in verbs such as DENY, whose sense is Denying. This is roughly negative giving - the deny-er does something whose intended result is that the "recipient" (more accurately, "non-recipient") does **not** have the "gift". The formal similarities to Giving are very clear, and it is clear why the indirect object can be used for the "recipient". In Figure 22 the idea of 'not having' is shown by the crossed out 'isa' link between the variable numbered 1 and 2, which is the state of affairs in which the "recipient" has the "gift". Once again the syntactic valency of DENY must surely be stipulated, but the semantic analysis explains the motivation behind the use of the indirect object relation.

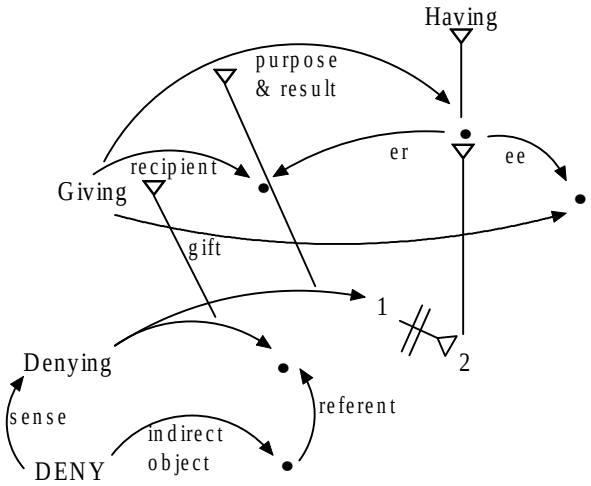

Figure 22

The main point that we have tried to make is that a fine-grained network analysis of meaning increases the ability of a grammar to explain why the indirect object pattern has extended from its natural home territory in verbs of giving to other verbs. We shall finish with briefer notes on a number of other examples.

- ALLOW (*I allowed them a break*). This is similar to DENY but involves a second negative: for example allowing someone a break means not denying them a break.
- WRITE (*I wrote her a letter but never posted it*). WRITE is a verb of creation, and the example shows that such verbs may describe a purpose which is only partly fulfilled - the thing comes into existence but does not reach the intended recipient. Again it is clear why the indirect object is used for the intended recipient.
- POST (*If you're going up to town, could you post me a letter?*). The point of examples like this (discussed by Goldberg 1995:150) is that the indirect object defines the beneficiary of the whole action; I will not have the letter (on the contrary), less still benefit from the letter itself. What will benefit me is the posting. This use of the indirect object makes some sense if we remember that having implies benefit, so the owner is also the beneficiary (see Figure 19). Although the total semantic structure of *post me a letter* is very different from that for *give me a letter*, the beneficiary relationship is enough to justify the indirect object.
- ENVY (*I envy him his brains*). Unlike all the other examples this does not even describe an action, since envying is a state of mind. However we can explain the use of the indirect object on the grounds that he is the owner of the brains. (No doubt this valency pattern is also supported by the possibility of using a direct object to define the person envied: *I envy him.*)

All these examples show some partial similarity of meaning to Giving, and in particular they all refer to a person who qualifies to some degree as the 'have-er' of the direct object's referent. The main point to emerge from this discussion is that the analysis requires a sensitive and fine-grained model of semantics such as the one offered by WG.

7 Conclusion: what is a construction?

Our point of view throughout this article has been total support and acceptance for the aims of CG combined with doubts about some of the technical details of the means currently on offer. We have focussed on the tendency in CG to conceptualise structures in terms of 'boxes' and have argued that networks are much better suited to the general view of language as a complex and sometimes messy assortment of interacting patterns. But we are not suggesting that those working in CG need to go back to square one in order to develop a different formal theory; this is unnecessary because such a theory already exists in WG. We hope to have presented enough explanations and examples to allow readers to judge this claim for themselves.

One question that we have not discussed is precisely what we think a construction is. This may seem to be a fundamental issue in any discussion of how WG can be applied to the analysis of constructions, but it is easier to discuss now that we can refer to some of the details of WG networks. In CG a contrast is drawn between the abstract 'constructions', which are stored templates, and 'constructs' which are the specific structural patterns that are each licensed by a number of interacting constructions (Kay and Fillmore 1999). For example, Kay and Fillmore quote the 'Head plus complements' construction and the 'Verb phrase' construction which unify with each other and also with the construction for a specific verb to define the construct in which this verb is the head of a VP. Constructions range in size from single words to whole phrases and in richness from very sparse (the 'Head plus complements' construction) to very rich (the construction for a specific verb such as GIVE). Indeed, this claim that all kinds of pattern ultimately reduce to a single formal type, the construction, is probably the most important and distinctive feature of CG.

What, then, is a construction in CG? It would seem to include any unit of information which is stored in the grammar, in contrast with constructs, which are built on the fly. A

grammar contains nothing but constructions, so the only question is precisely whart counts as a 'unit of information' (in our terms). This question is important when boxes are used to demarcate units of information, but it is not one that has received much, if any, attention. In a network analysis, however, the question does not arise. The only 'units' of information are the nodes and the links between them; it is pointless to try to pack these nodes and links into separate boxes. When nouns and verbs combine with one another, which of the links 'belong' to the noun box and which to the verb box? Is this question answered differently for examples like *I had a nice sleep* and *I sold the car*? If two words share a meaning, does this meaning belong to both words or just to one of them? And so on. In formal terms, therefore, we find nothing which could be identified realistically as the WG 'construction' other than the minimal link between two nodes.

On the other hand, we do find total justification in WG for the general CG claim that information is all of a piece, with the most general categories treated in the same way as the most specific and long-distance links in the same way as more local ones. In our discussion of the WXDY construction we showed how *what* can be linked, in the grammar, to *doing*, and also how this particular kind of *what* fits into the total hierarchy of words; and our discussion of the double-object construction showed how fine-grained semantic analysis in a network can explain complex interactions between syntax and semantics. All of these patterns are formalised in the same way, and all kinds of patterns are integrated by the same default inheritance logic.

References

Anderson, J. (1977). *On case grammar: Prolegomena to a theory of grammatical relations.* London: Croom Helm.

Bröker, N. (2001). Formal foundations of dependency grammar. In Ágel, V.(ed.), *Dependency and Valency. An International Handbook of Contemporary Research.* Berlin: Walter de Gruyter.

Croft, W. (1998). The structure of events and the structure of language. In Tomasello, M.(ed.), *The New Psychology*. London: Lawrence Erlbaum. 67-92.

Flickinger, D., Pollard, C., and Wasow, T. (1985). Structure-sharing in lexical representation. Proceedings of the Annual Meeting of the Association for Computational Linguistics **23**. 262-267.

Goldberg, A. (1995). *Constructions. A Construction Grammar Approach to Argument Structure.* Chicago: University of Chicago Press.

Goldberg, A. (1998). Patterns of experience in patterns of language. In Tomasello, M.(ed.), *The New Psychology*. London: Lawrence Erlbaum. 203-219.

Heringer, H. J. (1993). Dependency syntax - basic ideas and the classical model. In Jacobs, J., Stechow, A. v., Sternefeld, W., & Venneman, T.(eds.), *Syntax - An International Handbook of Contemporary Research, Volume 1*. Berlin: Walter de Gruyter. 298-316.

Holmes, J. (2002). Lexical Properties of English Verbs. PhD. UCL, London.

Hudson, R. (1984). *Word Grammar*. Oxford: Blackwell.

Hudson, R. (1988). Coordination and grammatical relations. Journal of Linguistics **24**. 303-342.

Hudson, R. (1989). Gapping and grammatical relations. Journal of Linguistics **25**. 57-94.

Hudson, R. (1990). *English Word Grammar*. Oxford: Blackwell.

Hudson, R. (1992). So-called 'double-objects' and grammatical relations. Language **68**. 251-276.

Hudson, R. (2000). Discontinuity. Traitement Automatique Des Langues. **41**. 15-56.

Hudson, R. (2000). Gerunds and multiple default inheritance. UCL Working Papers in Linguistics **12**. 303-335.

Hudson, R. (2002). Trouble on the left periphery. Lingua

Hudson, R. and Jasper Holmes (2000). Re-cycling in the Encyclopedia. . In Peeters, B.(ed.), *The Lexicon/Encyclopedia Interface*. Elsevier.

Kay, P. and Fillmore, C. (1999). Grammatical constructions and linguistic generalizations: The what's X doing Y? Construction. Language **75**. 1-33.

Kunze, J. (1975). *Abhängigkeitsgrammatik*. Berlin: Akademie-Verlag.

Lyons, J. (1997). *Semantics*. Cambridge: Cambridge University Press.

Mel'cuk, I. (1988). *Dependency syntax : theory and practice*. Albany: State University Press of New York.

Percival, K. (1990). Reflections on the History of Dependency Notions in Linguistics. Historiographia Linguistica. **17**. 29-47.

Tesnière, L. (1959). *Éléments de syntaxe structurale*. Paris: Klincksieck.