UCL Working Papers in Linguistics 10 (1998)

Adjunct preposing, wh-*interrogatives and dependency competition*

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Abstract

Adjuncts may occur (by adjunct preposing) before a wh-interrogative clause which is a main clause, but not before one which is subordinate; for example:

(i) Tomorrow what shall we do?
(ii) I told you (*tomorrow) what we shall do.

Why should adjunct preposing be different in main and subordinate clauses? The pretheoretical answer is obvious: the wh-word must be initial in the subordinate clause that it introduces. However not all theories allow this insight to be expressed. A number of possible explanations based on standard assumptions are considered and rejected. The proposed solution is based on enriched dependency structure (Word Grammar) which does allow an analysis in which the wh-word must be initial in the subordinate clause but not in the main clause.

1 Overview of the problem and the solution

Our problem data involve an interaction between adjunct preposing, wh-movement and subordination in English which, so far as I know, has not been discussed before.

What I shall call adjunct preposing could more accurately be called adjunct-extraction (Hukari and Levine 1995, Pollard and Sag 1996:384), but the apparatus of extraction is irrelevant to our present concerns so I shall use a more neutral and traditional term. The pattern concerned involves an adjunct of a verb (i.e. an 'adverbial') which stands before both the verb and its subject. The adjunct may be of any length or type, from a single adverb such as *now* to a subordinate clause like *if you want me*.

(1) a We need help now.
b Now we need help.

(2) a I'll come if you want me.
b If you want me, I'll come.

Adjunct preposing applies quite freely in main clauses, though some adjuncts are relatively hard to prepose. In particular, it applies not only to declaratives but also to imperatives and interrogatives:

(3) a Give me the first draft tomorrow!
b Tomorrow give me the first draft!

(4) a Will you get up early tomorrow?
b Tomorrow will you get up early?

(5) a Do they really eat haggis in Scotland?
b In Scotland do they really eat haggis?

The same possibility exists for a wh-interrogative clause:

(6) a What shall we do tomorrow?
b Tomorrow what shall we do?
c *What tomorrow shall we do?

(7) a What do they eat in Scotland?
b In Scotland what do they eat?
c *What in Scotland do they eat?

Notice that when an adjunct is preposed it must precede a wh-pronoun. This is one of the crucial facts so we can call it the **Adjunct+wh Constraint**.

It is crucial to establish that adjunct preposing is indeed possible with wh-interrogatives. Some people find such examples uncomfortable, and indeed Quirk et al (1985:817) imply that they are ungrammatical when they say:

> As a rule, .. the wh-element .. comes first in the sentence (apart from some conjuncts, such as *on the other hand*).

Here are some attested examples from spoken corpora[1]; no doubt similar examples could also be found in writing. The preposed adjuncts are highlighted.

(8) a *In most developing countries*, which would you expect to be bigger, GNP or GDP? (Lecture)
b But *on the way* where do those people get the incomes from to purchase? (Lecture)
c Oh well, *if you inherit a university from bureaucrats* what do you expect? (LL12)
d but *if you're typing it up now* why can't [inaudible]? (LL21)
e Well therefore {?} OK *in which case* why couldn't the British have carried out their commitment that the border was a temporary measure? (LL28A)
f Well, *now that you can stand back and look at Ireland*, Kevin, what do you think of the mess over there? (LL28A)
g I mean all these war games they play, for instance whereby they they sort of postulate the so-and-so's attacking the so-and-so's and *then* what would you do? and this sort of thing. (LL23)
h Well now *being in Wisconsin over a period of weeks*, what's your impression of of popular feeling about McCarthy? (LL21B)
i I asked him why *since this [if this was official medical treatment you know* why didn't he have a district nurse in? (LL2X2)

Turning to subordinate that-clauses, here too adjunct preposing is possible:

(9) a I told you that we need help now.
b I told you that *now* we need help.
c *I told you now that we need help.

(10) a You know that I'll come if you want me.
b You know that *if you want me*, I'll come.
c *You know if you want me that I'll come. (* on the meaning of b)

[1] The corpora are indicated in brackets after the examples, using the following abbreviations:
LL = London-Lund Corpus (Svartvik and Quirk 1980)
Lecture = transcript of a lecture supplied by Philip King.

These examples show that adjunct preposing is possible in subordinate clauses, and that when it occurs the adjunct must follow the complementizer *that*. This is another crucial word-order fact which we can call the **Comp+adjunct Constraint**.

As we have seen, there is no general pragmatic or grammatical ban on adjunct preposing in subordinate clauses. We can even find it in subordinate yes-no interrogatives:

(11) a I wonder whether we shall do it tomorrow.
b I wonder whether *tomorrow* we shall do it.

(12) a You know whether he'll come if you want him.
b You know whether *if you want him* he'll come.

As pointed out by Quirk et al (1985:491), it is also found in adverbial clauses introduced by some wh-words such as *when*. The first of the following examples is theirs, while the other is mine.

(13) a I had scarcely got into the taxi when *suddenly* the driver started the engine.
b I was angry because *after the lecture* there was no time for discussion.

As predicted by the Comp+adjunct Constraint, the preposed adjunct follows the Comp-like word which signals the start of the clause.

We should therefore also expect to find adjunct preposing with subordinate wh-questions, but in these cases it turns out to be impossible.

(14) a I told you what we shall do tomorrow.
b *I told you tomorrow what we shall do.
c *I told you what tomorrow we shall do.

(15) a You know what they eat in Scotland.
b *You know in Scotland what they eat.
c *You know what in Scotland they eat.

The same is true even if we try to model a wh-question on a similar relative or adverbial clause of the kind illustrated in (13).

(16) *I asked when *suddenly* the driver started the engine.

Why should adjunct preposing be possible in all main clauses, including wh-interrogatives, and in most kinds of subordinate clauses, but not in subordinate wh-interrogatives?

Intuitively, the answer is no doubt obvious. If an adjunct is preposed in a wh-interrogative clause, it must precede the wh word (this is the Adjunct+wh Constraint); but the 'complementiser' which introduces a subordinate clause must precede everything else in that clause, including any preposed adjuncts (the Comp+adjunct Constraint). In a subordinate wh-interrogative clause, the wh word doubles up as 'complementiser', so a preposed adjunct must both precede it (by the Adjunct+wh Constraint) and follow it (by the Comp+adjunct Constraint). Since no preposed adjunct could satisfy both these constraints, it follows that adjunct preposing is impossible in subordinate wh interrogatives. In contrast, when a wh interrogative is a main clause the Comp+adjunct Constraint does not apply, so adjunct preposing is possible. The challenge is to build a theoretically motivated explanation which integrates this simple insight into a general analysis of English clause structure.

In section 2 we shall consider, and reject, two solutions which assume a standard phrase-structure analysis. The first involves the 'barrier' effect of the complementiser, and the second assumes that adjunction to a complement is not possible. We shall conclude that a phrase-structure solution may be possible, but only at the cost of abandoning some important assumptions shared by standard phrase-structure theories.

The rest of the paper will present a solution in terms of Word Grammar. At the heart of this solution will be the idea of 'dependency competition', whereby a word may have multiple dependencies which compete with each other for the privilege of being its unique 'surface' dependency. In an example like *What happened*, each word depends on the other so two surface dependencies are possible - the competition allows two outcomes. But one of these outcomes is essential for adjunct preposing, while the other outcome is essential for subordination - hence the impossibility of combining subordination and adjunct preposing with wh-interrogatives.

2 Possible phrase-structure explanations

The most obvious avenue to explore in a phrase-structure analysis involves the relative positions of the wh-pronoun and the preposed adjunct. To satisfy Adjunct+wh, the landing site for adjunct preposing must be to the left of the wh phrase; so if the latter is in the specifier of the CP, as in most analyses, it follows that the preposed adjunct must be higher than the CP. Its precise status need not concern us here, but for simplicity we may assume that it is adjoined to CP:

(17) $[_{CP}$ *PA* $[_{CP}$ [WhP] C ...]]

In this formula the preposed adjunct is shown as 'PA'. For Comp+adjunct, however, the preposed adjunct must follow the complementizer. Following Lasnik and Saito (1992) and Culicover (nd), we shall assume that this is achieved by adjunction to IP, but other functional projections are available and may be preferable.

(18) $[_{CP}$ C .. $[_{IP}$ *PA* $[_{IP}$ ...]]]

These two analyses are clearly incompatible because one requires the preposed adjunct to precede C, while the other requires the opposite order. If a phrase-structure explanation is possible it must be more rest on something more sophisticated than mere position in the tree.

One possibility worth considering in the context of a Barriers-type analysis (Chomsky 1986) is that adjuncts may be attached either to CP or to IP. When attached to CP, the adjunct precedes the whole CP including the wh-pronoun, but when attached to IP it follows the Comp (e.g. *that*). A grammar that included this assumption would certainly generate the observed patterns, but it would not reflect the Adjunct+wh Constraint because it would allow the sequence *wh + adjunct* (by adjunction to IP); nor would it reflect the Comp+adjunct Constraint, because adjunction to CP would allow *adjunct + Comp* even in subordinate clauses. Our problem is precisely how to control this overgeneration.

Another possibility would be to abandon the empty Comp node of main clauses, including wh interrogatives (Hudson 1995). Wh phrases would then not be in the spec of CP, so they would never be ordered before C and the conflict with the Comp+adjunct Constraint would disappear. Subordinate clauses would still be CPs, but main clauses would belong to some lower category, such as IP. Clearly such an analysis would have

ramifications elsewhere in the grammar which would need to be explored, but even if it was otherwise problem-free, it still would not solve the present problem. If adjunct preposing in main clauses was adjunction to IP nothing would prevent it from applying to subordinate clauses as well. This would allow the pattern exemplified in the following:

(19) *I wonder [$_{CP}$ what [$_{IP}$ *in the lecture* [$_{IP}$ I should say]]].

This falls foul of the Adjunct+wh Constraint, but a purely positional analysis will not exclude it.

Yet another route to try is suggested by Lasnik and Saito's suggestion that topicalised phrases may sometimes be base-generated under TP (Topic Phrase) (1992:81). On the assumption that TPs are always main clauses, not subordinate clauses, this would solve most of the problems listed above. It would satisfy the Adjunct+wh Constraint to the extent that topicalised adjuncts would be able to occur before the CP of a main clause but not of a subordinate clause:

(20) a [$_{TP}$ Tomorrow [$_{CP}$ what shall we eat?]]
b *I wonder [$_{?}$ tomorrow [$_{CP}$ what we shall eat]]

Moreover the Comp+adjunct Constraint would also be satisfied because topicalised adjuncts could combine with an overt complementizer by adjoining to IP:

(21) I think [$_{CP}$ that [$_{IP}$ tomorrow [$_{IP}$ it may rain]]]

The reverse order of adjunct and overt complementizer would not be possible. However, the possibility of IP adjunction means that this analysis would still overgenerate by allowing it within a wh CP:

(22) *I wonder [$_{CP}$ what [$_{IP}$ tomorrow [$_{IP}$ we shall eat]]]

Another weakness of the analysis is the existence of two different positions for a topicalized adjunct. It would be hard to evaluate this proposal without considering the many consequences for both syntax and semantics.

A completely different kind of explanation which is worth considering is Chomsky's (1986:6) ban on all adjunction to a complement. Consider the next example.

(23) *He predicted *tomorrow* what we would need.

It would be reasonable to assume, first, that the subordinate clause is the complement of *predicted*, and, secondly, that *tomorrow* is adjoined to the CP *what we would need*. Given these two assumptions, Chomsky's principle would certainly explain why this example is so bad. The trouble is that the same principle focuses on the wrong characteristic of the example (Hudson 1995:52). If the badness is due to the subordinate clause's function as complement, it should disappear if we use the same clause in other positions in the sentence - but it does not:

(24) a **Tomorrow* what we would need was unclear.
b *It was unclear *tomorrow* what we would need.
c *I was thinking about *tomorrow* what we would need.
d *The big question was *tomorrow* what we would need.
e *We were considering the question *tomorrow* what we would need.

It is true that the subordinate clause is complement in some of these other examples as well, but not in all - especially noteworthy are (b) and (c) where it is subject and extraposee. Every single position which is available for a subordinate interrogative clause gives the same result, so the grammatical function cannot be relevant. Chomsky's ban on adjunction to a complement does not explain the interaction of subordination with adjunct preposing and wh-movement.

A more general consideration concerns the universality of the structures that would be needed in order to explain the patterns found in English. The challenge presented by English is that main clauses have more freedom than subordinate clauses do, but precisely the reverse is true in Modern Greek. According to Tsimpli (1990), focussed phrases may be positioned before a wh phrase in embedded clauses, but not in main clauses:

(25) a *[$_{CP}$ TO VIVLIO se pjon edhoses].
the book to whom gave.2s
'To whom did you give the book?'

b Mu-ipe [$_{FP}$ TO VIVLIO [$_{CP}$ se pjon edhose]].
me-said.3s the book to whom gave.3s
'He said to me to whom he gave the book.'

Tsimpli's explanation rests crucially on the assumption that subordinate clauses are Focus Phrases, which include CP, whereas main clauses are just CPs. This is just the reverse of the analysis suggested by Lasnik and Saito for English, where a main clause is a TP, which includes a CP, but subordinate clauses are merely CPs. It seems most unlikely that a single phrase structure will be able to explain the facts both for English and for Greek, and the more variation there is among languages, the more stipulative the explanations become.

This brief survey does not of course prove that our problem cannot be solved in terms of a phrase-structure analysis[2]. All I have tried to show is that there is no obvious and easy phrase-structure solution, so it is worth considering alternative approaches. What follows is a solution in terms of a radically different approach to sentence structure in which phrase structure plays no part.

3 Rich dependency structure in Word Grammar

Word Grammar (**WG** - see Hudson 1984, 1990, 1994a, 1998) is a version of dependency grammar, which means that the basic unit of syntactic analysis is not the phrase, but the word. With the exception of coordination, a sentence's internal structure is exhausted by the dependencies between its individual words. Once these have been analysed, there is nothing left to say. Everything which phrase-structure analyses treat as facts about phrases are translated into facts about single words. For example, the fact that the phrase *they eat haggis* is a clause translates into the fact that *eat* is a verb plus the fact that *they* and *haggis* depend on it; and the fact that *haggis* and *they* are 'maximal projections' translates into the fact that each of them is a word which needs (and has) no dependents. As in phrase-structure analysis, phrases are recognised, but they are implicit in the dependency analysis (for each word W we can recognise a phrase consisting of W plus the phrase of every word that depends on W) rather than explicit and basic.

Various notations are used to show dependency structures, but in WG I have opted for

[2]I have not yet been able to consult Rizzi (1998), which I gather contains relevant suggestions.

labelled arrows which point at the labelled dependent; for example, the arrow labelled 's' points at the subject. Figure 1 illustrates a very simple analysis using WG arrows and also using the more traditional 'stemma' notation of Tesnière (1959/1966). The vertical arrow will be explained shortly. One of the reasons for preferring arrows to the more traditional 'stemma' notation is that it allows dependency analyses to be richer, with more than one dependency per word. We can even allow mutual dependency, with two words depending on each other; this will turn out to be crucial in our explanation for the facts about adjunct preposing. The labels beneath the words indicate word-classes and inflections, so *V:r* means 'full **v**erb, p**r**esent tense', and *n* and *N* mean 'pronoun' and 'common noun'.

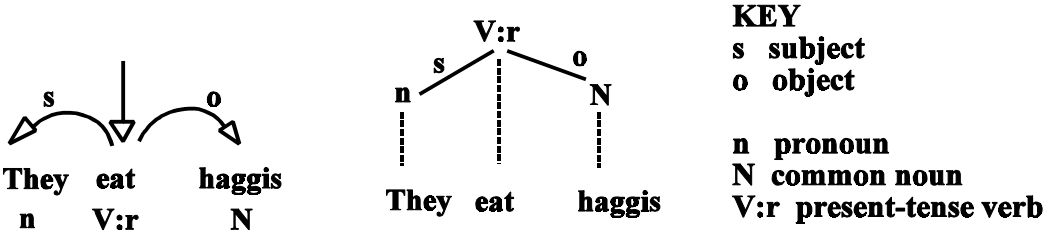

Figure 1

Such structures can be generated by a grammar in the usual sense of this word *generate*. Explicit rules define the possible dependencies, so a sentence is grammatical provided that all its individual dependencies are permitted by the grammar. All aspects of dependencies are controlled in this way - the word classes of the two words concerned, the classification of the dependency itself (as subject, object, and so on), the order of the words and the semantic structures onto which they are mapped. Various notations may be used for expressing the rules, but the simplest is ordinary unambiguous prose.

The simple structure in Figure 1 is generated by the following rules:

(26) a *They* isa pronoun.
b *Eat* isa verb:present.
c *Haggis* isa common noun.
d A pronoun isa noun.
e A common noun isa noun.

These rules generate the classification of the words, including the super-class Noun which will be mentioned in later rules. The *isa* relationship allows default inheritance of characteristics. The remaining rules generate the dependencies:

(27) a A verb:present has a subject.
b *Eat* has an object.
c Subject isa dependent.
d Object isa dependent.
e A word's dependent isa noun.
f A word's dependent follows it.
g A word's subject precedes it.

Rules (a) and (b) permit *eat* to have both a subject and object dependency; (c) and (d) classify Subject and Object as dependents; (e) generalises that all dependents are nouns - this is false in general, but true for sentences like the example; and (f) and (g) allow the object to follow (by default), whereas the subject rule overrides the default. Thus each of the dependencies is fully licensed and the sentence is generated.

One of the differences between dependency- and phrase-based analyses lies in the theoretical claims that 'come for free'. In dependency-based analysis, endocentricity is free: the very definition of phrase builds on the assumption that a phrase must have a head word whose characteristics are identical to those of the whole phrase. In contrast this has to be built into phrase structure by adding the main principle of X-bar theory (Pullum and Kornai 1990).

Another difference points in the opposite direction. The continuity of phrases is free in phrase-based analysis, provided that phrases are defined in terms of bracketed strings generated by context-free phrase-structure grammars. If a phrase, by definition, is a string of words that can be bounded by brackets, then phrases must be continuous because it is impossible to bracket any string A B C in such a way that B is not enclosed in the brackets that enclose A and C; equivalent conclusions follow from context-free grammars. In dependency-based analysis, on the other hand, continuity has to be imposed by extra principles. The standard principle is called 'projectivity' (Fraser 1994), which requires each word in a stemma to be able to 'project' up to its node by a straight vertical line, as in Figure 1. If every word's projective line is straight and vertical, they cannot tangle with each other.

The WG equivalent of projectivity has passed through various formulations (including

the ‘Adjacency Principle’ of Hudson 1990:114-20), but currently (since Hudson 1994b and Rosta 1994) it is the No-tangling Principle:

(28) **The No-tangling Principle**
Dependency arrows must not tangle.

This is accompanied by the ‘No-dangling’ Principle, which requires every word to depend on a ‘parent’ - some other word, or potential word, on which it depends.

(29) **The No-dangling Principle**
Every word must have one parent, which may be virtual.

The ‘virtual word’ alternative applies to the root word which has no actual parent, but (generally) could have one; this possibility is shown by the vertical arrow. The two principles interact to reject any sentence which has ungrammatical tangling such as the (b) examples in the following pairs whose structures are shown in Figure 2. (This diagram and subsequent ones omit word-class and grammatical-function labels as they are irrelevant.)

(30) a He lives on green peas.
b *He lives green on peas.

(31) a Drink red wine!
b *Red drink wine!

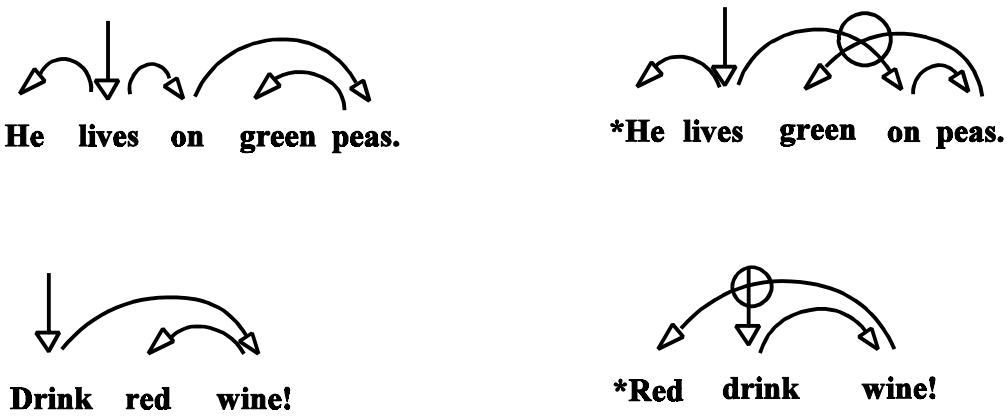

Figure 2

One reason why sentence structure is complicated is that words often have more complicated dependency relationships than we have illustrated so far. One possibility is **multiple dependency**, in which one word has more than one parent. For example, all the usual arguments show that a raised subject depends on both the verbs involved, so in *It was raining* the pronoun *it* is the subject of *was* but is also the subject of *raining*. Multiple dependencies are a problem for any theory because they define conflicting phrases: in our example, the phrase rooted in *was* is *It was raining*, while the one rooted in *raining* is *it ... raining*. Assuming phrase structure, it is impossible to show both these dependencies in a single phrase structure, so an extra node has to be recognised which can be bracketed with *raining*: *It was [# raining]*. In Principles-and-Parameters theory # is called trace and is linked to *it* by coindexing, whereas in Head-driven Phrase Structure theory it is an attribute slot which shares its filler (*it*) with another attribute. The different terminology should not hide the similarity: in both cases an abstract element must be recognised which is needed simply in order to provide a subject for *raining* which can be bracketed with it.

In contrast, the problem for a dependency-based approach is different. It is not a problem of bracketing, but of tangling. The dependency between *It* and *raining* inevitably tangles with the vertical arrow for *was* (which is assumed to be infinitely long). One solution would be to introduce an extra node like the # in phrase-structure analyses, but this is better avoided unless there really is no alternative. In WG there is an alternative: to relax the No-tangling Principle in an appropriately constrained way, so

that it continues to rule out bad examples like those considered already while accepting good examples such as the present one. We shall now consider how this relaxation can be achieved.

Instead of banning all tangling, we can allow some dependencies to tangle just so long as there are some that don't. To make this more precise, we can require each sentence to have a substructure of dependencies that is tangle-free as well as complete ('dangle-free'). We can call this substructure the sentence's 'surface structure', controlled by the Surface-structure Principle:

(32) **The Surface-structure Principle**
Only a subset of a sentence's total dependencies (its 'surface structure') must satisfy word-order constraints (including the No-tangling Principle) and the No-dangling principle.

We can modify our diagrams to pick out the surface dependencies by drawing these, and only these, on the 'surface' of the words (i.e. above them), with any additional dependencies drawn below. The result is an analysis in which the arrows above the words are tangle-free and equivalent to a single bracketing, but in which extra arrows may be added below the words to show further dependencies. The analysis of *It was raining* is shown in Figure 3.

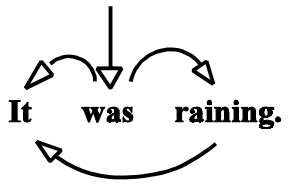

Figure 3

As in other theories, the actual dependencies have to be compatible with the grammar. A bad sentence such as **He lives green on peas* cannot be saved simply by giving the offending word an extra dependency because there is nothing in the grammar to justify such a dependency. In contrast, the grammar sanctions all the individual dependencies in *It was raining*, so the discontinuity is allowed. The complexity which can be generated in this way is as high as in other theories of grammar, but it is all packed into a single structure with just one node per word; as can be seen from Figure 4, the complexity lies

entirely in the dependency arrows. In this diagram I have tried to help the reader to track the dependencies by using dotted as well as solid lines; this distinction has no theoretical significance whatever. The solid arrows below the words are extra subject dependencies which recursively duplicate the arrows above the line that are labelled ‘s’; the dotted arrows, on the other hand, show ‘extractee’ links which mirror the arrow labelled ‘x<‘ (meaning ‘extracted to the left’).

Figure 4

We can now show the WG analyses for some of our original problem data, in which adjuncts are preposed. Let’s return to our very first pair of examples, repeated here:

(33) a We need help now.
b Now we need help.

It is probably obvious that the adverb depends on the verb whether it is in its normal post-verbal position or preposed. There are good reasons for labelling it ‘x<, >a’, meaning "an adjunct which would normally be to the right of its parent (‘>a’) but which in this case is also an extractee (‘x<‘)". In this way we can distinguish between pre-subject adjuncts as in *Now we need*, which are in the extractee position, and post-subject adjuncts as in *We now need*. The latter are labelled ‘a<‘. Moreover long-distance extraction is possible to the pre-subject position:

(34) Tomorrow I think John said that he would call in.

The easiest way to explain the semantic link between *tomorrow* and *call* is in terms of extraction.

We shall assume this extraction analysis for preposed adjuncts, but the assumption is irrelevant to our present concerns. The main thing is that there should be some surface dependency between the adjunct and the first verb. Figure 5 shows the structures not only for sentence (34), but also for its embedded equivalent (35).

(35) I told you that tomorrow I think John said that he would call in.

It is interesting to notice the challenge that this example poses for the analysis of extractees in the specifier of Comp which we have already criticised on other grounds. If *tomorrow* is an extractee it certainly is not in the correct position for the specifier of *that*.

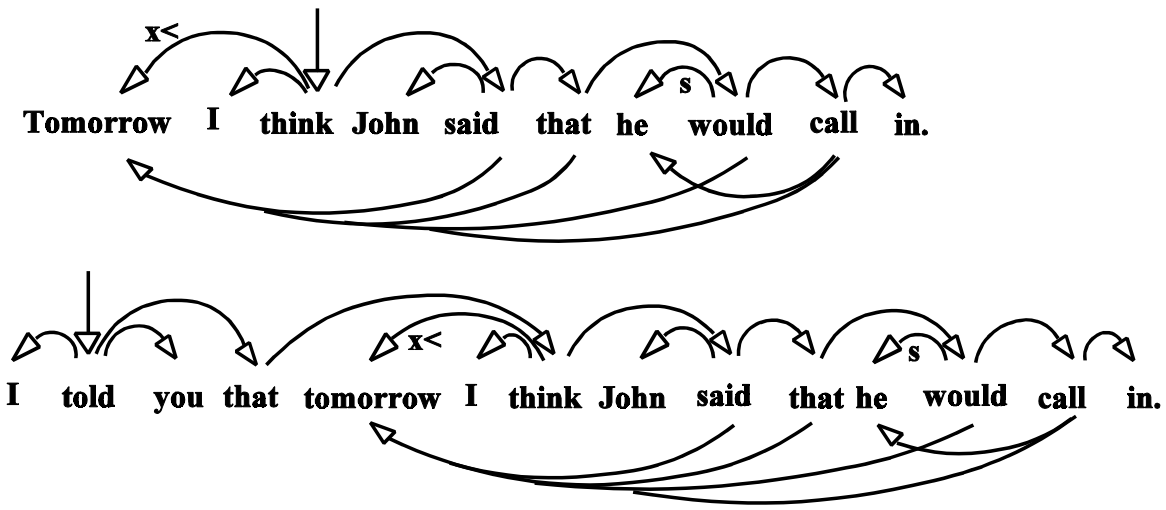

Figure 5

We now have the first part of our explanation in place: the analysis of preposed adjuncts:

(36) **Preposed adjuncts**
A preposed adjunct depends directly on the following verb.

As mentioned earlier, the label on this dependency does not matter. I have suggested that it is an 'extractee' dependency, but the same conclusions will follow even if this assumption is wrong. (For a discussion of the pros and cons of the assumption see

Pollard and Sag 1996:176-81.)

4 Dependency competition

The Surface-structure Principle requires a sentence to have a surface structure which contains some of the dependencies but not necessarily all of them; but how do we know which dependencies belong in the surface structure? The point of the following discussion will be to show that it is settled by brute competition: a word can only have a single surface parent, but in principle any dependency which follows the word-order rules will do. In almost every case this competition yields just one successful candidate, but the next section will show that wh-interrogatives, exceptionally, yield two. This will give us the rest of our explanation for the adjunct preposing facts, but first we must establish the principle of dependency competition.

Could competition be based on dependency labels? For example, could we classify every dependency as either surface or non-surface? This possibility can be excluded straightaway just by looking at the examples analysed so far. In our first example, *It was raining*, one subject dependency was in the surface structure, and the other was not. Moreover, the one which is not in the surface in this example - the one between *it* and *raining* - would have been in the surface in other examples such as *It rained*. Similarly for all the other examples, where we find both surface and non-surface subjects, and likewise for extractees and objects. In short, whether a grammatical relationship is part of surface structure (in the WG sense) is determined by the sentential environment, not by its own inherent character.

The effect of this free-for-all can easily be seen in *It was raining*. There are two candidates for the surface parent of *it*. The link to *was* produces no tangling in the surface structure, but the one to *raining* must tangle with the vertical arrow above *was* (which must be in the surface structure because *was* has no other parent link). Therefore the only way to satisfy the Surface-structure Principle is to select the link to *was*. The same kind of reasoning produces a single outcome for most other examples which contain multiple dependencies.

There is one general restriction which is worth mentioning for completeness though it will not affect our explanation for the adjunct-preposing data. We need an additional principle to ban ‘lowering’, which we can call the Raising Principle:

(37) **The Raising Principle**
A word's surface parent is never subordinate to a non-surface parent of the same word.

Given a choice between two parents one of which is superordinate to the other, a word must always prefer the higher of the two as its surface parent.

In most cases the Raising Principle has no effect because the only tangle-free candidate is the highest one, but it is possible to invent examples where it would be crucial. For instance, what otherwise will rule out a non-sentence such as **Kept John talking*? With *John* as subject of *kept*, this breaks the normal word-order rule that a non-auxiliary verb (such as *kept*) must follow its subject; but this rule would only apply if the *kept - John* link was in the surface structure. Why not put the *John - talking* link in the surface structure instead? Without the Raising Principle there is nothing to prevent this false analysis, which is shown in Figure 6. Analysis (a) is ruled out by the Raising Principle while analysis (b) is ruled out by the normal rule for the order of subjects and verbs, which is broken by the circled dependency; neither of the two parents of *John* can be in the surface structure, so the sentence breaks the No-dangling principle. The Raising Principle solves a number of other problems as well[3], so it should clearly join the No-tangling, No-dangling and Surface-structure Principles among the universals of grammar.

Figure 6

One interesting fact about surface structure in English is that in almost every case a word's surface parent is also its first parent. (The only exception I know of is in the very

[3] Unfortunately there seem to be clear counterexamples to the Raising Principle in French, German and Icelandic, but I prefer to look for ways to accommodate these as exceptions than as evidence to withdraw the principle altogether.

rare case of sentences containing a preposed non-finite verb, such as *So read it I did*. Here the first parent for *I* is not its surface parent *did*, but its non-surface parent *read*.) This means that an incremental parser can safely assume that any candidate parent dependency has to be its surface parent, and should therefore be tangle-free - a very helpful assumption in designing a parsing algorithm (Hudson 1994b).

This section has led to a view of surface structure as a free selection from the available dependencies, subject only to the Surface-structure and Raising Principles. In most cases these restrictions leave only one candidate (or no candidate at all in the case of an ungrammatical sentence), but as mentioned earlier there are a few constructions where the choice is genuinely free, one of which is our wh-interrogative pattern. We now turn, therefore, to the analysis of wh-interrogatives.

5 Wh-interrogatives

What is the dependency relationship between an initial interrogative pronoun and the root verb of the interrogative clause - for example, between *who* and *came* in *Who came*? The outcome of the following discussion will be that each depends on the other. The discussion largely follows Hudson (1990:361-82).

First we can be sure that *who* depends on *came*, because *who* is the subject of *came* and a verb's subject is one of its dependents. The conclusion does not, however, rest on the pronoun being the verb's subject; it would have been the same even if it had been some kind of front-shifted object or a long-distance extractee. To avoid the complications of intervening auxiliary verbs consider an example like *How are you?*, where *how* is just as clearly a dependent of *are* as *you* is. After all, *how* is some kind of complement of *are*, and takes its position immediately in front of *are*. So long as subjects and complements are dependents, interrogative pronouns are dependents whether they are preposed or not.

On the other hand, there is also evidence that the verb depends on the pronoun.

- The pronoun can occur without the verb, giving the construction called 'sluicing'. This is possible even when the pronoun is syntactically subordinate, which excludes it from the scope of ordinary rules for interpreting fragmentary responses as shown by the impossibility of applying these rules in 39).

(38) a Pat: I know he's invited a friend. Jo: Oh, who?
b I know he's invited a friend, but I'm not sure who.

(39) a Pat: I know he's invited a friend. Jo: Oh, Bill?
b *I know he's invited a friend, but I'm not sure (whether) Bill.

- The verb needs the pronoun in order to be subordinate to a verb such as WONDER:

(40) a I wonder *(who) (came).
b I'm not sure *(what) (happened).

- The pronoun determines the verb's possible inflection. For most pronouns the verb must be tensed in a main clause, but *why* is different: it also allows a bare infinitive without a subject:

(41) a Who/what are/*be you?
b Why are you glum?
c Why be glum?

- The pronoun determines whether or not the verb inverts with its subject in a main clause. For most pronouns inversion is obligatory, but for *How come* it is impossible:

(42) a Why are you so glum?
b *Why you are so glum?
c *How come are you so glum?
d How come you are so glum?

- The pronoun determines the verb's form in a subordinate clause. With most pronouns the verb may be either tensed or *to* + infinitive, but *to* is not possible with *why* (*how come* is rather marginal in subordinate clauses):

(43) a I'm not sure what/who/when I should visit.
b I'm not sure what/who/when to visit.
c I'm not sure why I should visit.
d *I'm not sure why to visit.

All these facts are easy to explain if the next verb is a complement of the pronoun: this would allow the usual range of lexical restrictions to be placed on the complement, and would allow the pronoun itself to be selected by a superordinate word such as a reporting verb.

It could be objected that too much of the evidence involves subordinate clauses. Granted that the evidence shows the pronoun to be the verb's parent in subordinate clauses, it does not follow that the same is true in main clauses. This reaction would still leave several pieces of evidence unexplained but it doesn't matter a lot whether or not we accept it. Our main task is to explain the distribution of preposed adjuncts, and the explanation (coming in the next section) will still work even without the dependency link from *what* to *happened* in the main clause, though this link is essential in subordinate clauses.

Our conclusion, as promised, is that the pronoun and the next verb depend on each other. I should make it clear that this mutual dependence involves two distinct dependencies, and not a single dependency which goes both ways - that would contradict the inherent asymmetry of dependency relationships. The pronoun is subject, object or extractee of the verb, while the verb is complement of the pronoun. How should we show this mutual dependency in a diagram? The candidates are displayed in Figure 7.

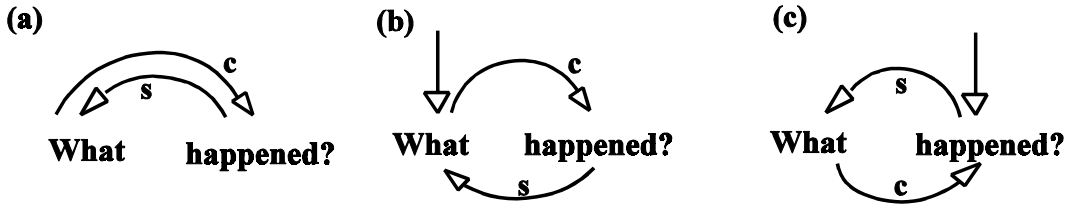

Figure 7

The most important part of our answer is that structures (b) and (c) both qualify. Each of them has a completely normal and regular surface structure, and there is no rule or principle that could exclude the non-surface dependency below the words. It goes without saying that both these dependencies must be sanctioned by the grammar, but that is easily done. (WG rules are normally expressed in ordinary prose, but can also be expressed more formally in terms of links in a grammar network.)

(44) **Wh-interrogatives**
a An interrogative pronoun has a tensed verb as its complement.
b An interrogative pronoun is the subject or extractee of its complement.

Neither (b) nor (c) infringes the Raising Principle because neither involves one word with two parents. The conclusion, therefore, is that in wh-interrogatives the competition between dependencies for a place in surface structure really is free, and either candidate may win.

What about analysis (a) in Figure 7? This is actually compatible with all the principles presented so far, and our explanation of adjunct preposing won't be affected if it remains, but it is an uncomfortable analysis because it breaks the general intuition that a surface structure should be equivalent to a phrase-structure analysis. Clearly mutual dependence is one kind of relationship which a phrase-structure analysis cannot possibly show. Fortunately we can rule it out by a further principle which is needed anyway, the Sentence-root Principle.

(45) **The Sentence-root Principle**
In every non-compound sentence there is just one word whose parent is virtual.

Without this principle there is no explanation for the badness of discontinuous phrases such as **green on peas*. The dependency arrow for *green* tangles with the one for *on* because it has to reach *peas*, so why can't we avoid this tangling by giving *green* a vertical arrow to a 'virtual' parent, like the one for *on*? Unrationed virtual arrows would allow any discontinuous phrase to avoid tangling, so we ration them by allowing just one per sentence (barring coordinate clauses in 'compound' sentences). The Sentence-root Principle thus imposes an upper limit of one on the number of virtual parents per sentence; but we can also interpret it as placing a lower limit of one: a sentence needs precisely one vertical arrow, no more, no less. On that interpretation, the principle excludes analysis (a) in which neither of the two words has a virtual parent.

6 Adjunct preposing again

We now have all the essential ingredients for an explanation of our original data. To recapitulate, we have established the following general principles (which presumably express linguistic universals):

(46) a **The No-tangling Principle**
Dependency arrows must not tangle.

b **The No-dangling Principle**
Every word must have one parent, which may be virtual.

c **The Surface-structure Principle**
Only a subset of a sentence's total dependencies (its 'surface structure') must satisfy word-order constraints (including the No-tangling Principle), and the No-dangling principle.

d **The Raising Principle**
A word's surface parent is never subordinate to a non-surface parent of the same word.

e **The Sentence-root Principle**
In every non-compound sentence there is just one word whose parent is virtual.

We have also established these interpretations of English syntax:

(47) a **Preposed adjuncts**
A preposed adjunct depends directly on the following verb.

b **Wh-interrogatives**
An interrogative pronoun and the verb following it depend on each other:

- An interrogative pronoun has a tensed verb as its complement.

- An interrogative pronoun is the subject or extractee of its complement.

Our task is to explain the badness of sentence 48a) in the light of the grammaticality of the other sentences:

(48) a *You know in Scotland what they eat.
b In Scotland what do they eat?
c You know what they eat in Scotland.
d You know that in Scotland they eat haggis.

Why should adjunct preposing be allowed in a main wh-interrogative clause (example b) but not in a subordinate one, given that subordination is normally possible for wh-interrogatives (example c) and adjunct preposing is possible in non-wh subordinate clauses (example d)? The explanation will come in two parts: why it is possible in main clauses, and why the same possibility does not exist in subordinate clauses.

Although main wh-questions generally allow two alternative surface structures, one of these is eliminated by adjunct preposing. This is because the preposed adjunct must depend on the verb, and not on the pronoun. This can be seen from Figure 8 for example (b).

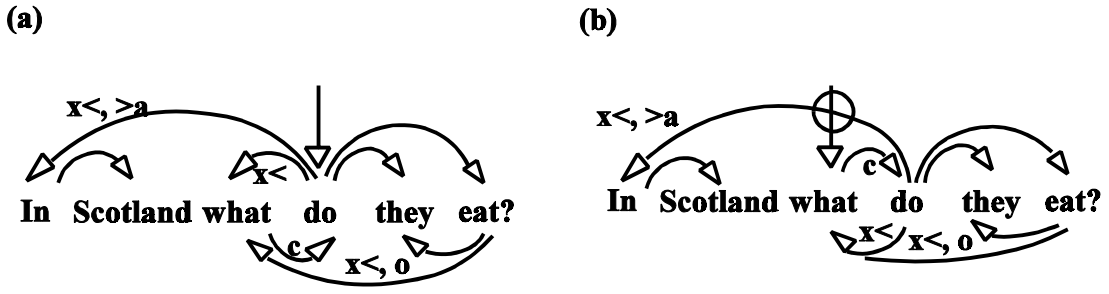

Figure 8

The relevant dependencies are labelled for clarity, but the main point is the tangling in structure (b). In other words, the extracted adjunct forces the verb, not the wh-pronoun, into the role of sentence-root.

We now compare this structure with that for a subordinate clause without adjunct preposing, Figure 9 for example (c).

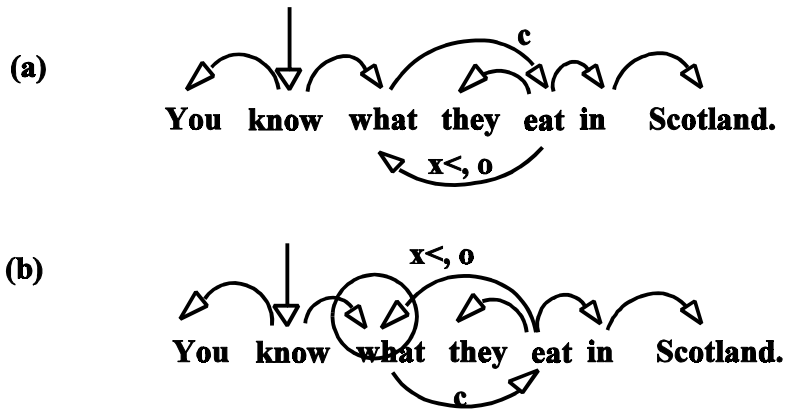

Figure 9

Once again only one of the two theoretical possibilities survives, but this time it is the other one. The one allowed with adjunct preposing is not allowed with subordination because the wh-pronoun has to provide the link to the higher verb. As can be seen from structure (b), the link from *what* to *know* prevents the one from *what* to *eat* from appearing in surface structure; and more generally, a subordinate wh-pronoun acts as a 'barrier' for preposing in just the way that we suggested at the start of section 2. More generally, the same is true of any word which in traditional terms is said to 'introduce' a subordinate clause, whether wh-pronouns, so-called complementizers or prepositions (also known as subordinating conjunctions):

(49) a You know (*in Scotland) what they eat.
b You know (*in Scotland) whether/that they eat hagis.
c You'd better eat lots in England (*in Scotland) because they eat hagis.

In each case the explanation is precisely the same: the dependency link from the main verb to the 'introducing' word would tangle in the surface structure with with one from the subordinate verb to the preposed adjunct.

We now have our explanation for the incompatibility of adjunct preposing and subordination: there are two dependencies between the wh-pronoun and the following verb which compete for the one available place in surface structure, but adjunct

preposing requires one and subordination requires the other.

7 Conclusion

This discussion has been concerned with rather a minor corner of English grammar, the intersection of three different patterns: wh-interrogatives, adjunct preposing and subordination. The effects of this interaction turn out to be quite easy to explain in terms of the WG theoretical package in which an enriched version of dependency theory is controlled by a small number of universal principles. I also suggested that these interactions may be harder to explain in terms of phrase structure, so WG would appear to have won this rather small battle.

This is not the place to ask how other battles would have ended, but it may be helpful to finish by highlighting some of the characteristics of WG which contributed to the successful outcome. The most obvious one is the use of word-word dependencies rather than phrase structure as the basis for syntactic structure. Some dependencies are implicit in endocentric (X-bar) phrase structure, of course, but phrase structure can only show a limited range of dependencies even when enriched by transformations and/or structure sharing.

In particular, interdependence where A depends on B and B on A can be accommodated in a dependency-based system, but (so far as I can see) cannot be derived from a phrase-structure account. I argued that interdependence was essential for analysing the relations between interrogative pronouns and their complement verbs; indeed, this interdependence could be described as the cornerstone of our success. There are other constructions where interdependence is needed, so this is not an isolated example (Hudson 1990:383-403).

Another benefit of basing the analysis on word-word dependencies is the possibility of multiple dependencies (i.e. multiple parents for one word). Again this is something that cannot be shown directly in phrase structure, though it can be shown by transformations or structure-sharing. Multiple dependencies did not contribute directly to our explanation, but we relied on the general principles such as No-tangling that also control multiple dependencies. It is important to stress that interdependence is subject to precisely the same principles as any other pattern of dependencies, and indeed the dependencies involved are just ordinary dependencies each of which occurs in simpler patterns. The data-problem that we have explained is just one interaction of three very general patterns; and as we should expect, the explanation involves the interaction of

general principles that control these patterns when they occur separately.

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