
Locality and Extended Projection

Jane Grimshaw

One of the most fundamental developments in the theory of phrase structure has involved the extension of X-bar theory beyond the familiar lexical categories, such as N, V, A, etc. This extension is made possible by recognizing that elements belonging to the minor syntactic categories, like Comp, Determiner, and even some bound morphemes, like Inflection, are X-zero level categories for X-bar theory and consequently head their own projections. This position is taken in Jackendoff (1977). The second step in the development involves dividing the syntactic categories into two groups, the 'lexical' categories and the 'functional' categories. Roughly, the lexical class includes the major syntactic categories, the functional class the minor categories. The third step in the reasoning hypothesizes that the lexical categories and their projections characteristically occur enclosed within functional projections, as complements to functional heads (Chomsky 1986; Fassi Fehri 1987; Fukui 1986; Fukui and Speas 1986; Abney 1987). In this analysis the head of an expression composed of a lexical head plus a functional head and the projections of both, is functional, and not lexical.

This version of the theory of phrase structure allows the extension of the standard principles of X-bar theory to many elements such as Determiners and Complementizers which previously fell outside it, in the sense that the theory said nothing interesting about them. In the current theory, these (functional)-heads are complement-taking items, just as (lexical)-heads are. Each zero level category now heads a maximal projection. Every phrase is the maximal projection of some zero level category. Every phrase has the same internal structure; head final at the XP level and head initial at the X-bar level in the case of English. Every head is in principle complement-taking.

The functional-head hypothesis has proved particularly fruitful in the domain of
been the structure of the nominal system, where evidence has been growing to show that what was previously taken to be the projection of an N is really the projection of a D, i.e. a 'DP' (Brame 1981, 1982; Fukui 1986; Hellan 1986; Abney 1987; Ritter 1987).

In a theory which posits heads and projections of two different kinds, an issue immediately arises: what combinations are possible? Can any 1-head take any functional projection as its complement? Can any F-head take any lexical projection as its complement? The key idea to be explored here is that a proper subset of the logically possible combinations have a special property: they form what I will call 'extended projections'. Closely related proposals can be found in Van Riemsdijk (1990), and Haider (1988).

1. Extended projection

Extended projection involves an extended notion of an X-bar theoretic projection, in which the nominal system and the verbal system form (extended) projections, which include both the projection of their lexical heads and the functional shell which surrounds the lexical projection. This idea can be made precise by exploiting a feature analysis of the kind familiar from work on X-bar theory. The key is the hypothesis that N, D, and P have the same categorial features, and hence are of the same syntactic category, once we abstract away from the lexical/functional distinction. (There are some complexities in the behaviour of P which I leave unaddressed here. See Van Riemsdijk 1990; Zwarts 1995 for recent discussion.) V, I and C also have identical category features, which are different of course from those of N and D. Similarly adverbs and adjectives each have their own distinct feature analysis, although I will largely ignore them here. For the sake of concreteness, I will simply designate the feature complex of N, D and P as [nominal], and that of V, I and C as [verbal]. The basic idea of extended projection depends only on same versus different categorial specification.

Since the functional heads are of the same category as their lexical counterparts, what distinguishes them is their functional status, encoded as a value for the functional feature {F}. {F0} is assigned to the lexical categories, {F1} to the lowest level functional category (D, and I so far) and {F2} to the next (C and P so far). The {F} value of a node is independent of its categorial analysis. There are several reasons for this. First, the value of {F} plays a role in the formation of extended projections which is different from that played by the categorial features. Second, {F} is not a binary feature. Third, {F} is cross-categorial: it does not interact with the categorial features in any way. These points will be illustrated shortly. The categorial theory which forms the basis for extended projection makes explicit the hypothesis that a functional category is a relational entity. It is a functional category by virtue of its relationship to a lexical category. DP, for example, is a functional category for N, as IP is for V.

A category label is now a pair consisting of a categorial specification, and a functional specification.

\begin{enumerate}
  \item a. V [verbal] [F0]
  \item b. I [verbal] [F1]
  \item c. C [verbal] [F2]
\end{enumerate}

Under this analysis, we can define head and projection as in (3):

\begin{enumerate}
  \item X is a head of YP, and YP is a projection of X iff:
    \begin{enumerate}
    \item YP dominates X
    \item YP and X share all categorial features
    \item All nodes intervening between X and YP share all categorial features,
      (where a node N intervenes between X and YP if YP dominates X and N, N dominates X, and N does not dominate YP.),
    \item No node intervening between X and YP is lexical.
    \end{enumerate}
\end{enumerate}

The standard notion of head and projection, which I will refer to as a 'perfect head/projection', is obtained by imposing the requirement that both categorial and \{F\} values be shared within a projection.

\begin{enumerate}
  \item a. V [verbal] [F0]
  \item b. I [verbal] [F1]
  \item c. C [verbal] [F2]
\end{enumerate}

Extended heads and extended projections differ from perfect heads and perfect projections only with respect to the \{F\} value. An extended head is a head which is not a perfect head. An extended projection is a projection but not a perfect projection.

We may want to impose the further constraint that the \{F\} value of YP must be higher than the \{F\} value of X, when they form an extended projection. This will rule out combinations like CP-IP-CP-VP as well as CP-CP. Alternatively we could require that the \{F\} value be the same or higher, allowing now the CP-CP case but still excluding CP-IP-CP-VP as an extended projection. These are refinements which are potentially important but must be left for further investigation. In addition, it may be necessary to add the requirement that only complements, and
not specifiers, participate in extended projections, by requiring that all maximal projections intervening between Y and X be complements.

The effect of this system is that a noun and the functional projections which form a shell around it count as a single extended projection, as does a verb and its functional shell, because of their categorial uniformity. For example, DP is a perfect projection of D and D', which they share both categorial and functional features with, but not of N, N', and NP, which it shares just categorial features with. It is, however, an extended projection of N, N' and NP. Crucially, the fact that the components of the extended projection are not uniform with respect to [F] does not prevent them from forming an extended projection — [F] is not categorial. So it is important that the definition of head and projection requires identity of categorial features only.

Under this proposal, then, a phrase can be both a configurational complement to a head, and also part of the same extended projection. The IP in (5) is a complement to C and also part of the same extended projection; the VP is a complement to I and part of the same extended projection.

\[
\begin{align*}
\text{CP} & \quad \text{[verbal] [F2]} \\
\text{C} & \quad \text{[verbal] [F2]} \quad \text{[verbal] [F1]} \\
\text{IP} & \quad \text{[verbal] [F1]} \\
\text{I} & \quad \text{[verbal] [F1]} \quad \text{[verbal] [F0]} \\
\text{VP} & \quad \text{[verbal] [F0]} \\
\text{V} & \quad \text{[verbal] [F0]} \quad \text{[nominal] [F1]} \\
\text{DP} & 
\end{align*}
\]

However, the definition of extended projection will not be satisfied where a head and its complement differ in syntactic category, thus a V and a direct object DP do not form an extended projection. (Since adjectives and adverbs are categorially distinct from nouns and verbs, and from each other, they will each form their own extended projection, along with any degree elements.) Moreover, although an I with a VP complement does count as an extended projection, a V with an IP complement does not. The reason is that V has a lower [F] value than I, hence they do not meet either version of the requirement discussed above, which dictates that the [F] value of the complement-taking head must be higher than (or alternatively equal to or higher than) the [F] value of the complement.

As a general consequence, I-heads do not form extended projections with their complements, since I-heads have the lowest possible [F] value. Thus an I-head and its projection are always the most deeply embedded members of any extended projection, and the complement of an I-head is always the top of a new extended projection. By the same reasoning, the phrase with the highest possible [F] value (CP and PP so far) will never form a projection with a phrase on top of it. This makes CP and PP the highest extended projections of the verbal system and the nominal system respectively. C standing in the same relationship to IP and VP as P does to DP and NP. This proposal is similar to that of Emonds (1985) in treating P and C in a parallel fashion: the essential difference is that P and C are of different categories in the present proposal, whereas Emonds analyzes them as belonging to the same category. The status of P with respect to the lexical-functional distinction is particularly complex. The evidence to be examined in §3.2 strongly supports the hypothesis that at least some Ps are functional (see also Van Riemsdijik 1990 and Zwarts 1995).

A number of issues arise in connection with the role of the [F] feature. A first question might be how many values [F] has. There is no clear answer to this under our current understanding. However the theory of extended projection never depends on the absolute [F] value of a head/projection, only on its [F] value relative to that of other nodes of the same syntactic category. Thus we can safely proceed without fixing the upper limit on the value of [F]. Additional projections, such as the clause internal projections TP, AgrP, and NegP of recent research (Laka Mugarza 1990; Pollock 1989; Zanuttini 1990), are simply members of the verbal extended projection, with the same categorial features as V, and whatever [F] values turn out to be appropriate. The inclusion of further projections thus poses no particular challenge to the basic tenets of the theory, although of course many issues of considerable importance arise in connection with the organization of such functional heads.

In sum, extended projection does not impose any principled limit on the value of {F}, although presumably there is such a limit imposed by substantive principles governing functional systems. It seems obvious that there is a high degree of predictability in all of this. There are deep reasons why the lexical head/projection is the lowest element in the extended projection, for example. Moreover the relative [F] value of functional heads seems to be quite highly predictable, even if there is cross-linguistic variation of limited extent (Bhatt and Yoon 1991; Iatridou and Kroch 1992; Hockstra 1993). The [F] value of a head is (at least partly) determined by the functional information that the head encodes. So further work can be expected to shed light on the character of [F]. There are two possible outcomes. One is that [F] will prove to be completely redundant and the fact that only certain combinations form extended projections will follow directly from semantic theory, with no cross-linguistic variation. In this case there would be no role for [F]. The other possible outcome is that [F] will prove to be highly correlated with semantic
properties, but not eliminable. This appears to be the situation for, for example, category labels. The fact that dog is a noun and walk a verb is highly predictable, but this does not mean that we can dispense with the role of 'noun' and 'verb' in the theory. The same may very well be true for (F) value.

If extended projection is correct, we gain some insight into the nature of the problem of determining the proper head for a phrase. Why was it difficult, having recognized the concept of a head, to determine whether the D or the N was the head of a nominal constituent, for example? The answer is that in some sense both are heads of the nominal: it is a bigger version of both D and N. Thus a more refined theory, which distinguishes among types of heads, is called for.

2. Possible head-complement relations

We can build on extended projection to characterize the possible and impossible combinations of lexical and functional categories and their projections into larger constituents.

Extended projection picks out certain head-complement relations, illustrated by those listed in (6), as extended-projection-forming. Other head-complement cases, those in (7) with l-heads and those in (8) with f-heads, fail to meet the definition, either by virtue of a categorial discrepancy, or by virtue of (F) value, or by virtue of both. In these cases, the theory posits two independent perfect projections, rather than a single extended projection.

(6)  
C-IP, P-DP  
I-VP, D-NP  
C-VP, P-NP

(7)  
V-PP, V-DP, V-NP, V-CP, V-IP, V-VP  
N-PP, N-DP, N-NP, N-CP, N-IP, N-VP

(8)  
I-NP, I-IP, I-PP, I-CP  
D-VP, D-IP, D-CP, D-PP  
C-NP, C-CP, C-NP, C-VP  
P-VP, P-IP, P-CP, P-NP  
C-CP, P-PP, I-IP, D-DP

There is a major discrepancy between the combinations in (7) which involve lexical heads, and those in (8) which involve functional heads. Those in (7) are either attested, or ruled out by independent principles of the theory (N-DP, for example, is ruled out by case theory). Many of those in (8), however, such as I-CP, D-PP, I-PP, C-CP, are completely unattested and not independently excluded. The position I will take here is that the combinations in (8) are in fact all impossible, despite the fact that a few of them have been posited for particular constructions with mixed properties. These cases are analyzed in Grimshaw (1991).

What distinguishes the well-established instances from the impossible ones is simple: the well-formed ones are either extended-projection forming, or combinations of a lexical head with a complement. Fundamentally, l-heads take complements of all syntactic categories and (F) values, modulo independent well-formedness conditions such as case theory. Each f-head, on the other hand, occurs only with a very limited set of complements, quite typically only with one. This will follow if f-heads take only complements that they form extended projections with, while l-heads are not required to form extended projections with their complements (indeed they cannot do so) and hence can take complements of any category. If we break up I (or indeed any of the other functional heads) into a set of heads the number of combinations increases, but the logic of the argument stays the same.

The ill-formed head-complement combinations in (8) can be ruled out by a generalized version of the theta criterion which recruits extended projection.

(9) Generalized Theta Criterion (GTC)  
The largest extended projection of a lexical head must receive a role

Adjuncts and matrix clauses, as well as specifiers and complements, can be taken to receive semantic roles. However, the important cases here are arguments, whose role is assigned by theta-marking, which is possible only for specifiers or complements of an l-head.

Now we can examine how the generalized theta criterion distinguishes between the cases in (6) and (7), the possible ones, and the cases in (8) which are impossible. In (7) the largest extended projections are complements of an l-head and hence theta-marked. The cases in (6) are legitimate provided that the entire extended projection is assigned a role. On the other hand, the combinations in (8) do not have the potential to meet the criterion. Since the largest extended projections are not complements to, or specifiers of, an l-head, they cannot receive a role.

Thus a combination like a C with a DP complement, which cannot form an extended projection, is impossible. The DP is neither a complement to a lexical head, nor part of an extended projection which includes CP. The only kind of maximal projection which does not have to meet the role requirement is one which is part of a larger extended projection, because sub-parts of extended projections need not, and cannot, have roles.

This hypothesis about how projections are organized depends on the idea that the relationship between l-heads and their complements is fundamentally different from the relationship between f-heads and their complements. The relationship between a lexical head and its complement is one of theta-marking, that between
a functional head and its complement is not. (Thus attempts to assimilate them, e.g. by having I theta-mark VP, or D theta-mark NP will undermine the basic results here.) As a result, lexical heads take complements of any category (in principle) while functional heads take only complements which form extended projections with the projection of the functional head.

It is possible to extend the scope of theta-marking by making use of extended projections. Chomsky (1986:13-14) suggests a redefinition of 'sister', which we can call 'extended sister', under which VP and the subject are sisters despite the fact that the VP is embedded in I'. (The VP-internal subject hypothesis provides an alternative solution to this locality problem; see Kitagawa (1986), Koopman and Sportiche (1988), Kuroda (1988). Since the subject and VP are sisters, VP can still directly theta-mark the subject in a local fashion. Chomsky's suggestion for the definition of (extended) sister is telling: two elements are sisters if they are 'dominated by the same lexical projections'. Thus the I' which dominates VP and not NP does not prevent VP and NP from being sisters because I' is not lexical. Under extended projection, it is easy to make sense of this. Phrases which are dominated by the same lexical projections are exactly those that are in a single extended projection. The Specifier of IP and the VP node are dominated by the same lexical nodes, if and only if they are in the same extended projection, thus we might say that theta-marking is local within a single extended projection.

The phrase structural properties of coordination structures may be partially derivable from the theory of extended projection. In coordination, both category and [F] values are maintained. According to the GTC, the conjuncts must form an extended projection with the dominating node, since otherwise they will be unlicensed and the structure will be ruled out. (This assumes that the conjunction itself does not assign roles.) From this we can derive agreement for the categorial analysis, and to replace it with one that is consistent with extended projection. Some such cases are analyzed in Grimshaw (1991).

### 3. Projection and locality

Many relations between grammatical elements are local in character. Typically, this has the consequence that they are relationships between a head and a sister maximal projection (e.g. subcategorization, case-marking, and selection) or between a head and its specifier (e.g. agreement).

A rather general locality problem arises within the functional-head hypothesis, whenever properties of the lexical head seem to determine properties of the entire phrase. For example, the DP is a projection of D, and not of N. It follows that D, not N, determines properties of the entire phrase. In contrast, the prediction of lexical-head theory is that N is the head of, and determines properties of, the entire phrase. Thus a verb which selects for properties of its object noun did so locally under lexical-head theory, but does so non-locally under functional-head theory, in which a DP intervenes between the projection of N, and the V.

Functional head theory is therefore challenged whenever properties of N seem to be projected up to the phrase, and such instances suggest that the original assumption that N is the head of NP/DP, and V is the head of IP in fact has some force. Extended Projection offers a solution to this problem which makes it possible to maintain both the advantages of the functional head analysis and the advantages of the lexical head analysis.

The defining property of an X-bar projection is that it is the domain through which information flows. The defining property of a head is that it determines properties of the phrase that it is the head of. This follows from the theory of projection, in which properties of heads project, or percolate, up the tree to the entire phrase. Without extended projection, properties of the [F0] head N or V project to NP or VP, properties of the functional head D or I to DP or IP, but properties of the [F0] head do not project to the DP or IP. If the only kind of projection is a perfect one, it follows that the relationship between the lexical head N or V, and any element outside DP or IP, is non-local. This is problematic for phenomena such as the general take to be local, such as selection and agreement. Either we give up on the locality restriction, allowing many untested relationships, or we stipulate that maximal projections do not count for locality in just these cases.

Under extended projection, however, there is a principled solution to this problem. Both the lexical phrase and the functional phrase are projections of the [F0] head. Suppose that in extended projections, like perfect projections, properties of the head(s) project through the head-structure, just as categorial information
Lexical projection and through the functional extended projection.

DP and PP are projections of N, and IP and CP are projections of V. Properties of N thus project to DP and PP, while properties of V project to IP and CP. NP under DP and DP under PP are transparent, and so are VP under IP and IP under CP. This is because they form larger projections of their heads. The only transparent maximal projections are those that fall within an extended projection. An IP or DP complement to a V, for example, is not transparent, since it does not form an extended projection with the VP.

The consequence is that certain relationships which are otherwise non-local, are local under extended projection. I will examine here several such cases, involving semantic selection and agreement.

3.1. Semantic selection

(10) a. They merged the files/#the file
    b. They amalgamated the files/#the file
    c. They combined the files/#the file

That this is really a relationship of linguistic selection and not simply of real world knowledge is supported by the fact that even in contexts like those in (11), the oddness of these combinations remains, while the oddness of other kinds of combinations, such as the one in (11b) involving slicing orange juice, disappears.

(11) a. *It isn't possible to merge/amalgamate/combine a file
    b. *It isn't possible to slice orange juice

If the D is the head of the DP, a verb cannot locally select for properties of its object NP, such as animacy or plurality. Under extended projection, however, the selectional relationship is local. Since both the N and the D are heads of the DP, their properties are all projected to the DP, and available for selection under sisterhood (or equivalently here, at least, we could say that the V governs the N and the D, and selection is under government.) This solution is possible only if the N counts as a head of DP, and the NP and DP projections form a single extended projection.

This kind of solution generalizes to the problems raised in Sells (1991). Sells points out the existence of a number of apparently non-local instances of selection in Korean and Japanese, and concludes that the head structure of these languages must be different from what is usually assumed. However, all of these cases fall within the verbal extended projection, and thus reduce to local relationships under the present theory.

The fact that selection is problematic for functional head theory was recognized in Abney (1987). Abney proposed that the NP/DP combination forms a 'semantic projection' or 's-projection'. It forms, in other words, a projection for semantic relations. However, the problem is more general — involving not just semantic relations but syntactic ones, including the case of number agreement to be addressed next. Hence, the solution must also be more general.

A note of clarification: extended projection explains which configurations admit selection in principle. The issue of what can select and what can be selected for is not only a matter of projection though. It depends also on the theory of selection, which characterizes what properties can be selected for by what types of heads. Thus the fact that definiteness does not generally seem to be selectable, while plurality is, for example, is to be explained by the theory of selection and not by the theory of configurational representation/projection. What can be selected for in any given case is the result of the theory of selection, determining what information is selectable in principle, interacting with the theory of projection, determining what information is configurationally available for selection. Of course this is equally true for any other theory of projection, including one which makes use of 's-projection'.

3.2. Agreement

Agreement is another typically local phenomenon, but again we find apparent violations of locality which can be resolved under extended projection.

If information projects from all of the heads of an extended projection we expect consistency within a projection for all projected features. Projected features must agree throughout the extended projection (NP-DP-PP, and VP-IP-CP), and wherever morphology records the value of these features they will be visible. Between extended projections, we expect no constraints to hold, or at least none that are attributable to projection. Thus the existence of apparent locality violations within extended projections, and within extended projections only, provides an important source of evidence.

A locality problem arises with number agreement in nominals. As (12) shows, Inf1 agrees with the number of the subject, even when that number is marked on the N, and not on the D:

(12) a. the dogs are    b. *the dog is
    c. the dog is    d. *the dog are
    e. dogs are    f. *dogs is

The N is [+plural] by virtue of its morphology, hence the entire DP is [+plural] by extended projection, and I agrees with the DP by the standard process of local Specifier-head agreement. The relationship between I and N is non-local without extended projection, since I and NP are separated by a maximal projection (DP).
In addition, the extended projection analysis requires 'agreement' between a determiner which is specified for number, and the head N of its complement. With the determiners this/these/those/a, the features projected from D to DP will include number, and the features projected from N to NP to DP will also include number. A consistency requirement will therefore automatically exclude cases where the D and the N disagree in number, allowing only combinations where both have the same value for the feature, or where at least one of the two is unspecified for the feature. The functional head and the lexical head of the extended projection can never have contradictory values for projected properties, because both sets of features are projected onto the same phrase. Thus the behaviour of Ds that do encode number follows from same principles as behavior of Ds, like the, that do not encode number.

An important class of alternative solutions requires encoding the number on the Determiner in one way or another. For example, it is possible to treat the as ambiguously singular and plural, and have it agree with its complement in number by head-complement agreement, or perhaps more plausibly have it select the number of its complement. This treats the as covertly encoding number as other determiners do overtly. Such a solution requires positing two versions of the, claiming in effect that we are just observing accidental properties of the, rather than any principled phenomenon. If positing functional structure over lexical structure requires such analyses in a substantial number of cases, this suggests that there is something systematic and more interesting than stipulated lexical ambiguity involved, namely extended projection.

The same technique can actually be appealed to in a solution to the non-local semantic selection problem of 3.1. Multiple cases of the could be posited, one each for (semantically) singular and plural animates, one each for (semantically) singular and plural inanimates and so forth. It seems hardly necessary to argue that this is not an insightful solution.

An alternative which at first sight seems more promising would exploit under-specification of a kind. Suppose we hypothesize that when the D is not specified for some feature, such as [plural], then the plurality value of the complement can project. This is essentially the percolation convention of Williams (1981). A head such as the could then be unspecified for plurality, and the NP would determine the plurality of the DP. This solution differs from those suggested above for semantic selection and number agreement, in that a feature specification projects through the extended projection only if the functional head is not marked for a value of the feature. Above we assumed that feature specifications always project. One piece of evidence that they should always project is that this allows us to explain the behaviour of agreeing determiners as we saw above. In the case of a plural noun and a singular determiner, (*a dogs, for example), the value of the number feature for the noun must project, even though the determiner is also specified for number, if the ill-formedness of the combination is to be explained by projection.

More importantly, however, it seems that the percolation of unspecified information must itself be embedded within a theory of extended projection. A V is not specified for number, but the VP does not inherit number from a DP complement to V. When, then, does inheritance occur? The answer that must be given is essentially: within an extended projection. By this reasoning, then, percolation of unspecified information is not an alternative to extended projection, but an alternative formulation of the percolation mechanism to be used within extended projection.

One residual problem concerns a possessive DP in SpecDP. The possessive DP will agree with its head by Spec-Head agreement, but number will also project up from NP by extended projection. Thus we would expect that the N and the possessive DP have to agree in number, an incorrect prediction.

But surely this question arises independently. In fact the problem seems to lie with the assumption that Spec-Head agreement occurs here, as it does between a subject DP and I. Given that D can certainly be marked for number, there is no obvious reason why agreement should not occur. Agreement for definiteness does occur here, see Grimshaw (1990).

If PP also constitutes part of nominal extended projection, we expect to find cases where P shows evidence of being in a special relationship to its object, such that DP is transparent. The Irish P inflects morphologically in response to properties of its object (McCloskey and Hale 1984: 506–7). (This example is perhaps not perfect for present purposes since the complement of the P must be omitted, complicating the picture.)

Under extended projection, this is not agreement with a complement, but projected agreement through DP. This crucially requires that PPs form extended projections with the nominal system.

The behaviour of wh-phrases provides further evidence that PF participates in
the same extended projection as NP, i.e. for the claim that NP-DP-PP is an extended projection. The evidence is that the wh-feature projects through the transparent NP/DP to a dominating PP, whereas it never projects through a dominating VP or NP, because they are not transparent, not forming extended projections with their complements.

This can be seen in what has been known since Ross (1967) as 'pied-piping'. When a wh-NP/DP is dominated by a PP and fronting occurs, whether in relativization or in an interrogative, the dominating PP can move instead of the wh-NP/DP. Thus we find the alternatives in (15):

(15) The stone which they found a note under…
    Which stone did they find a note under?
    The stone under which they found a note…
    Under which stone did they find a note?

As is well known, under certain circumstances and in certain languages the PP must undergo movement, instead of the DP. For now, the important point is the familiar but unexplained fact that the entire PP can front.

Let us assume that only a wh-phrase can undergo movement in a restrictive relative or in an interrogative. We thus distinguish these cases of fronting from the movement involved in, say, an appositive relative, where any phrase which contains a relative pronoun (and is therefore anaphorically linked to the head of the relative) can move.

It follows from positing an extended projection including DP-PP that if the D (or the N) carries the wh-feature, this feature will project to PP. Hence the PP will be [+wh], and eligible for movement. The PP is just as much a wh-phrase as the DP. Thus, to think of pied-piping as the dragging along of a Preposition is really misleading — the movement is a reflection of the fact that the prepositional phrase is part of the same extended projection as the wh-marked element and hence is indirectly a wh-phrase itself. There is an affinity between this explanation for pied-piping and the one given by Ross (1967), who suggested that PPs move because they are really just a special kind of NP. Under extended projection, PPs are indeed a kind of nominal — the biggest kind there is.

Crucially, the wh-feature will never be passed on to a verbal projection, such as V', dominating a [+wh] DP, or a [+wh] PP, since the verbal projection will never form an extended projection with the nominal element for reasons already discussed. The same point holds for N' dominating a PP: the N and its projection will not undergo wh-movement. Thus the fact that only P pied-pipes is explained: it is the category that forms an extended projection with a nominal. This of course raises the question of why P is also standable, which suggests that P has other analyses also, at least in a stranding language like English. Perhaps this should be related to the proposals mentioned above, in which P can be either functional or lexical.

There is another way to look at this argument. What counts as a wh-phrase for an interrogative complement (or in fact for a restrictive relative, as opposed to an appositive)? I assume that selection for an interrogative complement is semantic, as in Grimshaw (1979), so that a verb like wonder selects for a complement of the semantic type 'interrogative'. Clearly, though, there is a relationship between the semantic type and the syntactic form of the complement — it can only be of the interrogative type if it has a certain form. What syntactic form counts as interrogative? The answer seems to be that for a CP to be interrogative, it must be [+wh]. It will become [+wh] only if its Specifier is [+wh], or if its head is [+wh]. If a wh-phrase has been moved into SpecCP, the Spec will be [+wh] and by Spec-Head agreement the C' will be [+wh], and hence the CP and the C will also be. If no wh-phrase has moved into SpecCP, the CP can still count as [+wh] if its head, the complementizer, is [+wh].

So a [+wh] phrase in Specifier of CP satisfies the selectional requirements of an interrogative taking verb, by making the entire CP [+wh], thereby qualifying it as of the semantic type: interrogative. But what counts as a [+wh] phrase in Specifier of CP? The answer is that the phrase must inherit the wh-feature in the usual way: either from its Specifier position, or from its head.

(16) a. I wonder which book they read
    b. I wonder whose book they read
    c. I wonder whose mother's friend's book they read
    d. I wonder how big a book they read

(16) illustrates the cases where the wh-element is the head of a DP (16a,b), and the Specifier of the DP (16c). In (16c), with the structure in (17a), the wh-projects from D to the lowest DP, which by Specifier-head agreement makes the next DP [+wh]. This in turn, also by Specifier-head agreement, makes the next DP [+wh], and so forth.

    b. [DP [DP how [NP big]] a [NP book]]

In (17b), which corresponds to (16d), wh-is the degree element, the head of a Degree Phrase. The Degree Phrase is thus [+wh] by projection. The degree phrase is in the Specifier of the DP headed by a, hence by Specifier-head agreement the entire DP is [+wh], and hence can make the CP interrogative. The wh-phrase how big must occur in Specifier position in order for its wh-value to be passed to the DP. This is why the Degree Phrase cannot appear in the normal adjoined position: *A how big book.

When the wh-element is a complement, the entire phrase does not count as a wh-phrase, as (18) shows.
(18) a. *I wonder a book about who(m) they read
b. *I wonder very proud of who(m) they are

This is because features do not project from the complement of a lexical head, such as N in (18), to the head itself. Features project from complements only when the complement is part of a larger extended projection. Hence the wh-feature in the complement of the Prepositions in (19) can, as expected, make the complement to wonder interrogative (although speakers find pied-piping in subordinate interrogatives quite unnatural, for reasons which are unclear).

(19) a. I wonder under which tree they sat
b. I wonder with who(m) they sat under the tree

(For further discussion of this property of PPs, see Cowper 1987; Harbert 1990; Cole, Hermon and Sung 1993).

In sum, not only can a PP front, showing that it is a wh-phrase in the sense relevant for movement, but its presence in SpecCP is enough to make the CP interrogative. This is exactly what we expect if PP forms an extended projection with the DP it dominates, so that the wh-feature projects through DP to PP.

The argument for the verbal extended projection is identical in structure to the one just made for the nominal projection. Relations within an extended projection can span maximal projections. Outside extended projections these same relations do not cross maximal projections.

The first case to be looked at is the relationship between a higher V, a C, and I. The question at issue here is how to characterize the dependencies illustrated in (20).

(20) a. We arranged for him to leave at 6 (*left)
b. We thought that he left at 6 (*to leave)

At first glance, it appears that the relationship between V, I and C can be viewed as a local head-to-head relationship. The verb arrange might select for and for selects to. The verb think might select a finite clause/proposition, which must have that or the V selects that directly and that selects [+tense]. This solution works fine for examples like (20). The problem is that examples like (21) do not fit in with this account. Here the relationship extends across the complementizer that.

(21) a. We requested that he leave/ left at 6
b. We thought that he left/* leave at 6

The problem here is analogous to the problem of the Determiner the in number agreement, analyzed above. Just as the fails to encode number which projects up from NP, so here, that does not encode the indicative/subjunctive distinction, yet selection by the higher predicate is sensitive to this information. As before, there are basically two solutions. We could posit two different instances of that, one

subjective and one indicative. However, under extended projection the solution is already in place. The mood distinction is encoded on I. Since I is the head of IP, and IP forms an extended projection with CP, the feature will project all the way to the CP node, where it can be locally selected by a verb.

The complementizer for is positively specified for whatever feature infinitives have, as is so. The tense morphemes and that are negatively specified for infinitival features, hence they will never occur with to. that is specified as noninfinitival, but unspecified for the subjunctive-indicative distinction. Hence it will occur in both moods. The only requirement is that all projected features agree, and this is what governs the permissible combinations. The mood of the entire CP is determined by the mood of the IP via projection, regardless of whether that is specified for mood or not.

Just as with P in the nominal extended projection, we would expect that C could show overt agreement with elements in the right relationship to it. This explains the existence of a C which inflects for the number of the subject DP in certain Germanic languages.

(22) a. ... dan Jan noa Gent goan.
    ... that Jan to Ghent goes.
b. ... dan Jan en Pol noa Gent goan.
    ... that Jan and Pol to Ghent go.

C has more than one morphological form, which simply reflects the normal (silent in English) agreement pattern. The subject is in Specifier of IP, and agrees with I by Specifier-head agreement. Properties of I project to IP, and from IP to CP by extended projection. Thus the CP in (22a) is [+plural], that in (22b) is [+plural]. The head C is marked for the same information: da being [+plural] and dan [+plural]. Properties of C project to CP by normal projection, so both the number of the C and the number of Specifier of IP are registered on CP and they will have to agree. Hence when the subject is [+plural] da will have to occur, and when the subject is [+plural] the form will be dan.

One interesting consequence of this pattern of agreement is that, if we assume that the feature wh-is projectable through the verbal extended projection, it provides a new angle on the issue of whether wh-phrases in subject position must vacuously move to SpecCP (Chung and McCloskey 1983; Grimshaw 1993, 1995). A wh-DP will agree with I, making IP and therefore CP [+wh]. Thus for purposes of selection, at least, a wh-phrase in SpecIP is equivalent to a wh-phrase in SpecCP. Note that only an unmoved subject will project its wh-feature: the feature will not project from, say an object. (Specifier-head agreement for wh is apparently not obligatory, given the well-formedness of Who thinks that who is a fool?, where the presence of who in the Specifier of the lower clause does not make the complement
+[wh]. Thus selection will not require wh-phrases to move from Specifier position within the extended projection. The general point which emerges, then, is that apparently non-local agreement is actually local — it is confined to an extended projection. Hence a C can agree in number with SpecLP, but a V should not be able to agree in number with the subject of its complement clause. It is noteworthy that in one recent study of feature percolation it is stipulated that there is no percolation from complements of lexical categories (Cole, Hermon and Sung 1993). This is exactly the situation that extended projection predicts.

Acknowledgments

This is a slightly revised version of the first part of Grimshaw (1991). The research reported here was supported by the National Science Foundation under grants to Brandeis University and New York University. Thanks to Mark Baltin, Bob Frank, Ray Jackendoff, Alan Prince, Geoff Pullum, Magui Suñer, Sten Vikner, Edwin Williams, and members of the Brandeis syntax seminar, Spring 1991. Earlier versions of this work were presented between 1989 and 1991 at Dusseldorf, Leiden, MIT, USC, Stuttgart, Austin Texas, Toronto, Utrecht, and the West Coast Conference on Formal Linguistics.

References


LEXICAL SPECIFICATION AND INSERTION

Edited by

PETER COOPMANS
Utrecht University

MARTIN EVERAERT
Utrecht University

JANE GRIMSHAW
Rutgers University

JOHN BENJAMINS PUBLISHING COMPANY
AMSTERDAM/PHILADELPHIA

Volume 197

Peter Coopmans, Martin Everaert and Jane Grimshaw (eds.)

Lexical Specification and Insertion