Asymmetry, syntactic objects and the Mirror Generalization

Réjean Canac Marquis
Simon Fraser University

Introduction

Since its early days, X-bar theory represents a descriptive typology of phrase markers. In its minimalist approach, Chomsky (1994 BPS, 1995) proposes to reduce fundamental aspects of X-bar theory to bare essentials and in the process, seeks to provide a more explanatory typology of syntactic objects, i.e. phrase markers resulting from the projection of lexical items through the Merger and Move operations in the computational system (CS). In this paper, we agree with the value of deriving a typology of syntactic objects from minimalist assumptions, but argue that Chomsky’s specific proposals fall short in several important respects that we discuss in details. Chomsky maintains that Xmax and Xmin projections are non-primitive, relational categories which he defines in informal terms, i.e. «...a projection that doesn’t project any further is an Xmax, and one that is not a projection at all is an Xmin; any other is an X’, invisible at the interface for computation. » (ibid: 242). However these informal definitions do not stem from any fundamental notions or conceptual necessity, but merely from minimal assumptions and do not play any further significant role in defining the whole set of possible syntactic objects.

The alternative proposal developed in this paper derives the basic distinction in syntactic projections from the fundamental role played by asymmetry in grammar, in the sense of Di Sciullo’s Asymmetry Hypothesis (1999), a proposal pushing the role of asymmetry beyond the Linear Correspondance Axiom of Kayne (1994). According to Di Sciullo’s hypothesis, all grammatical and structural relations in grammar must be asymmetrical, i.e. asymmetry plays a fundamental role in defining the architecture of grammars. Our main claim is that
the entire typology of syntactic objects stems from a distinction between \( \text{Xmax} \) and \( \text{Xnon-max} \) projections (not equivalent to the \( \text{Xmax}/\text{Xmin} \) distinction in BPS) which itself derives from systematically computing all the primitive asymmetrical structural relations of dominance and immediate dominance between projections in a given phrase marker. In other words, the \( \text{Xmax}/\text{Xnon-max} \) distinction is not a mere assumption, but a necessary consequence of the hypothesis that asymmetrical structural relations play a fundamental role in the CS. The scope of the proposal extends beyond deriving the mere \( \text{Xmax}/\text{Xnon-max} \) distinction, to predict fundamental aspects of the typology of syntactic objects.

The proposal is advantageous in several respects. Empirically, it is exhaustive in covering all possible case scenarios of \( \text{Xmax} \) and \( \text{Xnon-max} \) adjunction and substitution, contrary to BPS. It also advantageously subsumes stipulative aspects of Chomsky's system, e.g. it derives from a single source the fundamental generalization that the target of Move always projects (cf. unrelated conditions in BPS) except in exactly one case which gives rise to VP shells. It further subsumes the Chain Uniformity Condition and does away with a blatant exception to it in BPS, namely that head-adjunction and Incorporation should be excluded in principle, but are permitted in practice. We maintain that as predicted by the typology, head-adjunction is excluded in syntax, which leaves head substitution as the only available head movement, as is required for e.g. V-raising. We propose an implementation of head substitution based on Grimshaw's (1991) notion of Extended Projections and maintain, contra Chomsky (1995), that head substitution does satisfy the extension condition. The last section of the paper explores the consequence of this proposal for the Mirror effects (Baker 1988, 1998) and argues contra Baker that head-adjunction is therefore not the fundamental explanation behind Mirror effects, but head substitution is.

1. The limitations of BPS

In Bare Phrase Structure (1994) and the Minimalist program (1995), Chomskyan proposes to eliminate stipulative aspects of X-bar theory in order to derive core properties of phrase structure from bare essentials of grammar. In particular, Chomskyan seeks to subsume the exact application of Merger and Move operations from primitives of grammar or conceptual necessity, hence obtaining a more explanatory typology of syntactic objects resulting from those operations. The objective is quite stimulating from an explanatory standpoint in that it provides new perspectives for evaluating the overall economy, efficiency, and predictive power of the architecture of the computational system under consideration.

The basic operations involved in forming syntactic objects are Merger and Move. Merger is uncontroversial, it is an asymmetric operation where one of two selected projects items and defines a new constituent. The operation Move, on the other hand, is much more involving and implicates a number of conditions that chains must comply with, as shown in (1).

(1) a. C-command must hold between each link of a chain
b. Move (chain formation) must obey Last Resort
c. Chain Uniformity: A chain is uniform with respect to Phrase structure status

While (1a) is uncontroversial, (1b) is a working hypothesis and (1c) a stipulation. Chain Uniformity Condition (1c) in particular plays a very important role. For instance, it excludes the derivation in (2), that is, movement of a maximal head to a specifier, or adjunction to a maximal projection. In both instances, the problem is that the trace of X, shown in curly brackets, is minimal at the tail of the Chain since it projects, but X is maximal at the head of the chain where it does not project. Hence, phrasal Chain Uniformity is violated.

What (1) properly allows however is movement of an XP targeting some YP by substitution or adjunction and where the target projects. For instance, if the trace of X in (2) were an XP instead of an Xmin, the entire chain would contain XPs and be uniform, provided that YP projects.

Yet, other derivations such as (3) are not directly excluded in BPS.

(3) a. Movement of Xmax to a head Y by adjunction or substitution.

b. Movement of a non-maximal head Y to a target Xmax and projection of Y.

Consider first the case of an Xmax adjoining to a head, as shown in (4). Here a maximal projection ZP adjoins to a head X, an operation generally held as
excluded. ZP originates from a specifier in this particular configuration, but it could also be a direct object of X with the same result. This type of operation is not excluded by any condition in (1a–c). In particular, the Chain formed by ZP is perfectly uniform as ZP does not project at the target.

\[
\text{(4)} \quad X_{\text{max}}
\]

\[
\text{ZP} \quad X \quad (ZP) \quad Y \quad Y_{\text{max}}
\]

\[
Y_{\text{max}} \quad X_{\text{min}} \quad Y_{\text{min}} \quad W_{\text{max}}
\]

\[
\text{X}_{\text{max}} \quad Y_{\text{max}}
\]

Again, nothing prevents such operation, which is unattested. As for case (3b), shown in (5) below, it is only questionably excluded. In fact, (5) along with example (8) below, represents one of the fundamental generalizations that must be derived about phrase structure and syntactic objects: Only the target of Move can project. In the case of (5), an Xmin targets a Ymax projection, and X projects instead of Ymax. The resulting chain is uniform since X is minimal at both ends of the chain, so the syntactic object is well formed. To prevent such case from occurring, Chomsky resorts to condition (1b) Last Resort, stating that movement of Xmin cannot be triggered to check or saturate a property of Y. However, notice that an Xmin could plausibly be moving to assign or verify Case for instance, or to be predicated of Ymax, in which case satisfying Last Resort and yet, these options are clearly not attested. Something more fundamental than Last Resort must prevent a structure like (5) from emerging.

\[
\text{(5)} \quad X_{\text{max}}
\]

\[
X_{\text{min}} \quad Y_{\text{max}}
\]

\[
Y_{\text{min}} \quad X_{\text{max}}
\]

\[
(WP) \quad WP
\]

Another important case is head-to-head adjacency, or Incorporation, as shown in (6).

Condition (1c) directly excludes such operation which is abundantly used in the literature. Adjunction of Ymin to Xmin actually makes Ymin maximal at the head of the chain, as Xmin projects. To prevent (1c) from excluding head-to-head adjunction, Chomsky adopts the following ad hoc exception that prevents word internal structure from being subject to conditions of the computational system at LF, (Chomsky 1995:322).

\[
\text{(6)} \quad X_{\text{max}} \quad Y_{\text{max}}
\]

\[
\text{Y}_{\max} \quad \text{X}_{\min} \quad \text{Y}_{\min} \quad \text{W}_{\max}
\]

\[
\text{W}_{\text{max}} \quad \text{X}_{\text{min}} \quad \text{Y}_{\text{min}} \quad \text{W}_{\text{max}}
\]

\[
\text{X}_{\text{max}} \quad \text{Y}_{\text{max}}
\]

\[
\text{X}_{\text{max}} \quad \text{Y}_{\text{max}}
\]

\[
\text{Y}_{\text{max}} \quad \text{X}_{\text{min}} \quad \text{Y}_{\text{min}} \quad \text{W}_{\text{max}}
\]

(7) At LF, X-zero is submitted to word-independent process WI where WI ignores principles of the computational system within X-zero.

This exception is non minimal in spirit, as it runs against the assumption that the computational system is constant throughout interfaces and for all objects (including heads). As for head adjunction in syntax, Chomsky's assumption that verbs are inserted fully inflected seems to alleviate the problem, though head adjunction is still, in fact, required for Feature Checking Theory, as we discuss in Section 3. Furthermore, Chomsky's (ibid: 334–340) discussion of linear order and Kayne's (1994) LCA suggests that head-to-head adjunction applies in the computational system as well. In sum, head adjunction, or Incorporation, should be excluded in syntax by (1c), but Chomsky proposes (7) to allow it at least at LF, and the issue remains somewhat open in syntax.

A final operation, not excluded by any condition in (1), is shown in (8). The case illustrates an intermediate projection movement where the intermediate projection projects, not the target.

\[
\text{(8)} \quad X_{\text{max}}
\]

\[
\text{X} \quad (\text{ZP}) \quad Y \quad X_{\text{max}}
\]

\[
\text{W}_{\text{max}} \quad \text{X}_{\text{min}} \quad \text{Y}_{\text{min}} \quad \text{W}_{\text{max}}
\]

\[
\text{X}_{\text{max}} \quad \text{Y}_{\text{max}}
\]
This derivation respects Chain Uniformity and c-command, and arguably Last Resort (similarly to example (5)). What excludes (8) in BPS is the stipulation that intermediate projections are not visible to the computational system. However, there is no conceptual necessity behind this assumption, and it crucially depends on what is defined as an Xmin or Xmax. Chomsky (1995:245) defines an Xmin as "...a terminal element (selected from the lexicon), with no categorial parts". According to this definition however, the assumption that there is no intermediate projection movement must be ignored when, e.g. V-raising is involved. For instance, if a terminal node Xmin targets and Moves to some terminal Ymin in syntax or LF, it will create a new non-terminal head constituent Y. Yet, this newly created intermediate Y is what is being moved (copied) when multiple head movement applies (see Section 3 for further discussion of the technical details of V-raising under Feature Checking Theory). Thus under Chomsky's own definition of Xmin, there is intermediate head projection movement, which implies that somehow the CS must be able to recognize a form of intermediate projection. But again, this significant exception is ignored by the CS under special statement (7). This casts serious doubts on excluding intermediate projection visibility as a general, fundamental property of the CS, hence leaving the exclusion of (8) on questionable grounds. Notice finally that (8) is similar to (5) above insofar as both would involve the projection of the moved element, not the target. That the target always projects is unquestionably a fundamental property of the Move operation and it would be desirable to derive it from a unique source in the CS.

In sum, the typology of syntactic objects in BPS is non-exhaustive in that, on one hand, it doesn't exclude certain unattested objects such as (4), (5) and (8) and, on the other hand, allows for certain syntactic objects such as (6) (head-adjunction) that should be excluded under general assumptions, but are permitted as exceptions under the special condition (7). In fact (7) suspends the application of Chain Uniformity to X° altogether in the CS, which in turn either questions the status of Chain Uniformity, or the accuracy of an analysis that includes X° and XP movement under the same Move operation, but treats them differently when it comes to the application of fundamental assumptions such as Chain Uniformity. The typology also relies on the unrelated notions of Chain Uniformity and Last resort to derive the fundamental property that targets always project for both X° and Xmax movement. The Chain Uniformity Condition itself is basically stipulated.

A further and final remark is that the primitive notions of Xmin and Xmax are not a crucial part of the typology itself, though they play a crucial role w.r.t. Chain Uniformity Condition. Why are there only Xmax and Xmin and how does this distinction bear on the typology of syntactic objects as a whole? will propose in Section 2 that the very way in which the CS is able to draw a distinction between Xmin and Xmax projections, that is from computing asymmetrical dominance relations between all projections, plays a determinin role in defining the entire typology of syntactic objects.

2. Asymmetry and Xmax and Xnon-max

Following Di Sciullo (1999), we adopt the view that all structural relations are asymmetric in nature, the Asymmetry Hypothesis.

(9) Asymmetry Hypothesis.

"Any structural relation, be it primitive or derived, is asymmetrical"

Asymmetrical relations are in turn defined as follows:

(10) \( R \) is Asymmetrical = (Vx) (Vy) (rxy ⇒ ¬ryx)

Two types of asymmetrical relations can be distinguished, primitive or intrinsically relations, which are typically structural, and derived relations, which are typically grammatical. Hence structural relations of dominance, immediate dominance, sister-contain (but not c-command) and precedence are intrinsically asymmetrical. Other relations, e.g. head-complement and spec-head agreement are asymmetrical by the role that one element plays with respect to the other, e.g. a head selects its complement, a specifier checks features of the head.

Assuming that asymmetry is fundamental in grammar, we explore the nature of the role it might play in defining syntactic objects. Our contention that primitive asymmetric relations of dominance and immediate dominance are central not only in determining the nature of possible projections, i.e. the basic Xmax and Xnon-max distinction that we propose, but also in restricting the entire set of syntactic objects resulting from the Move operation. The driving idea behind the present proposal is that syntactic objects can only be interpreted by the CS and the LF interface through primitive asymmetrical relation i.e. asymmetry defines and limits the nature of syntactic objects.

Let us first assess which primitive structural relations would be relevant in distinguishing possible types of projections. To answer this, consider fir what is a projection. Under minimalist assumptions, projections are sets of formal features which do not have a primitive but only a relational categorial status. Further, projections are endocentric, expanding from lexical items to more complex constructs, in bottom-up fashion. The latter property of projection
readily excludes relations of *sister-contain* and *precedence* as relevant in defining categorial distinctions in relational terms. Indeed, given that projections are endocentric and defined in relational terms, only dominating and dominated projections are relevant. That leaves *dominance* and *immediate dominance* as the remaining and relevant primitive asymmetric relations. The question whether both definitions are distinguished by the CS is of interest, but as it turns out, the result of our proposal is the same whether only dominance is considered, or also immediate dominance. Indeed, immediate dominance is but a subcase of dominance and our proposal below only requires dominance. Now, given that projections are essentially bundles of features defined in relational terms, it further follows that two given projections can be either identical or non-identical, feature-wise. We thus obtain the following logical possibilities of distinguishing projections in asymmetric relational terms based on strict feature identity:

11. a. If \( Y \) (immed.) dominates \( X \), and the features of \( X \neq Y \), then \( X \) is maximal
   b. If \( Y \) (immed.) dominates \( X \), and the features of \( X = Y \), then \( X \) is non-maximal

The relative notions of *maximal* and *non-maximal* result from computing the identity of a projection w.r.t. dominating and immediately dominating projections. In other words, the Xmax vs Xnon-max (henceforth XNmax) distinction logically derives from the fact that a given projection is defined in relational terms of (immediate) dominance and feature identity.³

This proposal is distinct from BPS in several respects. Firstly, notice an XNmax is not equivalent to an Xmin. The notion XNmax does not make a distinction between a terminal Xmin, a non-terminal Xmin and intermediate projections (see example (8) and related discussion on those distinctions). Section 3 develops an analysis of the Mirror effects which supports this conclusion.

Secondly, this proposal is also distinct as it does not determine per se whether a given projection is *overall* an Xmax or an XNmax. This can only be assessed once each and all dominating projections are considered. Then two scenarios can occur. Under one scenario, the X projection will have an unequivocal Xmax/XNmax status as determined by each and all dominating projections. Under the other scenario, the X projection would have an ambiguous status, being simultaneously defined as Xmax w.r.t one or more projections, but as an XNmax w.r.t one or more projections. We come back to examples of such cases directly, but notice first that Chomsky (1995) also considers the possibility that a projection may have a double status, w.r.t. Xmax and Xmin.

Chomsky maintains that nothing prevents such a scenario and speculates the clitics may be an instantiation of such projection, as they seem to have both properties of Xmax and XNmax. We differ fundamentally from Chomsky on that view. We refer to Sportiche (1998) who argues that the alleged double categorial status of clitics is misleading and proposes a unified analysis under which clitics are heads and that the Xmax properties of clitics follow from the operator movement.

More specifically, I assume that the computational system and in particular, the LF interface, cannot tolerate ambiguity, be it semantic or relation. That assumption seems motivated on interpretative grounds. Given that phrase structure is still available at the Conceptual/Intentional interface, and given that ambiguities are resolved at that level, each phrasal projection must therefore be unequivocally interpretable as Xmax or XNmax. For the strict purpose of discussion, I will refer to this assumption as the Non Equivocal Requirement bearing in mind that it arguably needs not be stipulated and follows from the non-equivocal nature of the Conceptual/Intentional interface and the CS.

12. Non-Equivocal Requirement (NER)

A syntactic object must be unequivocally determined as Xmax or XNmax

Let us now consider direct consequences of our proposal for the type of syntactic objects.

A first consequence, shown in (13) is that the generalization that the target of Move always projects follows directly and from a unique, primitive property of projections, i.e. the fact that they are defined in relational terms.

13. The derivation in (13) shows the earlier problematic case of an XNmax projecting at the target, hence being well formed w.r.t. Chain Uniformity. Under (12) this derivation is ruled out as one projection is both defined as an XNmax and an Xmax. The culprit in (13) is the projection of X immediately dominating WP: it is an Xmax by virtue of being immediately dominated by Yn
but it is also an XNmax by virtue of being dominated by a projection of itself, namely the new Xmax created by projecting XNmax at the target of Move. The phrasal status of that projection is therefore equivocal and uninterpretable, according to (12).

A second consequence of our proposal is that the basic effects of the Uniformity Condition on Chains are also subsumed under (11) and (12). Basically, a Chain is a syntactic object, though a discontinuous one. Following Chomsky (1995) for instance, a Chain is a series of copies in c-commanding relations. All and each link is a subpart of a single syntactic object, a Chain. It follows from (12) that a Chain and all of its links must unequivocally be interpretable as either Xmax or XNmax. In other words, chains are subject to the same conditions as Xmax and XNmax. Consequently, the derivation in (14) repeated hereunder for convenience, where XNmax targets Y, Moves and Y projects, will crash as the links of the chain are not of the same type, i.e. the chain is equivocal and uninterpretable. Whereas in BPS, the CUC is stipulated, its basic effects now follow from the general definitions of projections, i.e. Xmax and XNmax, through asymmetrical relations.

(14)
\[
\text{Xmax} \quad Y\text{max} \\
\text{Ymax} \\
\text{XNmax} \\
\text{YNmax} \\
\text{Xmax} \quad \text{YNmax} \\
\text{Xmax} \\
\{\text{XNmax}\} \quad \text{Wmax}
\]

Since our proposal subsumes the effect of Chain Uniformity, it still also excludes head adjunction in the computational system, as shown in (15). The head chain created by adjunction is ambiguous w.r.t. its XNmax or Xmax status.

(15)
\[
\text{Xmax} \\
\text{XNmax} \\
\text{Ymax} \\
\text{Xmax} \\
\text{YNmax} \\
\text{Xmax} \quad \{\text{YNmax}\} \quad \text{Wmax}
\]

Head adjunction also poses a problem for c-command. Chomsky (1995:334–339) discusses alternative ways of defining c-command so that it holds for head adjunction. Even Chomsky’s (1999) notion of sister-contain which has the advantage of being a primitive asymmetric relation, still makes adjunction to head violate locality between chain links.

In sum, head adjunction should be excluded by Chain Uniformity, or NEI under our proposal, and also by c-command or the sister-contain relation. Keeping with the strongest possible hypothesis, I will henceforth assume the adjunction to a head is excluded in the CS and LF. Of course, this raises a crucial question: How are V-raising and feature checking performed, at least in the CS before spelling out where bare output conditions force pied-piping of lexical material along with features?

The only other option left for V-raising at this point is substitution. But Chomsky (1995) excludes substitution under the extension condition, which requires the result of Move or Merge to extend a phrase marker. Chomsky maintains that the extension condition is supported on empirical grounds, i.e. provides a version of the strict cycle and prevents raising to object (ibid:190). These empirical arguments involve XP movement however, and head substitution is discarded on general assumptions. Incidentally, Chomsky points out that head adjunction does not extend the target and violates the extension condition, but maintains it on the basis that it does not involve cycle effects or raising to object. Notice incidently that head substitution is not subject to raising to object either, and whichever cycle argument is applied to head substitution could just as well involve head adjunction to an empty head through Merge. This really leaves the question open whether there is real motivation in allowing head adjunction, but excluding head substitution on the basis of the extension condition.

Notwithstanding the latter remarks, a further examination of how head substitution could apply suggests in fact that the extension condition is satisfied. Since head substitution is not formally discussed in BPS, let us explore an implementation of it.

Notice first that head substitution, in contrast to head adjunction, obeys the sister-contain or strict c-command relation between the head of the chain and all its links. Secondly, suppose that it can be maintained that under substitution the head actually projects at the target, then all links of the result structure would be of the same projection level, i.e. the chain would respect NE (Chain Uniformity). And in fact, the idea that a verbal head projects at its target after raising is in essence a logical consequence of Grimshaw’s (1999) Extended Projections theory. Grimshaw distinguishes between lexical features N and V and functional features of level F1, F2, and so on. All categories are specified for lexical and functional category. For instance in (15), V and INI
are both lexically specified as \([-N, +V]\) according to Grimshaw, but \(V\) is an F0 functional category while INFL is F1. Hence, apart from the functional feature contribution of a given functional projection, all the functional projections in the extension of a lexical category share the same lexical features.

(16)  
\[
\begin{array}{c}
\text{Imax \([-N, +V]\ F1)} \\
\text{INmax \([-N, +V]\ F1)} \\
\text{\text{Spec \ VNmax \([-N, +V]\ F0)}} \\
\text{VNmax \([-N, +V]\ F0)} \\
\text{Ymax}
\end{array}
\]

If the terminal VNmax were to substitute under INFL in (16), the result shown in (17) could be conceived as the combination of all features, a merger of the features of \(V\) and then of INFL. The newly created category is different from \(V\) alone, as it now contains an additional functional feature F1, but it nonetheless remains an extended projection of \(V\) by virtue of sharing the same lexical features as \(V\). Such features merger under substitution is arguably possible because both \(V\) and INFL share the same lexical features. Yet \(V\) and INFL are different projections as they do not share all features, i.e. they differ on at least F1. Hence \(V\) does project after raising, as its features combine with the features of INFL to define the new projection.

(17)  
\[
\begin{array}{c}
\text{\text{V-Imax \([-N, +V]\ F0, F1)}} \\
\text{\text{V-I \([-N, +V]\ F0, F1)}} \\
\text{\text{\text{Spec \ VNmax \([-N, +V]\ F0)}}} \\
\text{\text{{\text{V \([-N, +V]\ F0)}} Ymax}}
\end{array}
\]

The consequence is that NER (Chain Uniformity) is preserved by head substitution, as the head of the chain projects at the target and is therefore non-maximal, as all other links of the chain. In Section 3 and directly below, I modify parts of this analysis so that head substitution obeys the extension condition and provides an account for the Mirror effects. But the core idea remains that the head projects at the target. In sum, head substitution, contrary to head

adjunction, meets two fundamental properties of Move: C-command between chain links and the NER (Chain Uniformity).

Let us now return to the issue of the extension condition. Strictly speaking, head substitution still does not comply with the extension condition, even though it projects at the target. And the reason for that is that (16) presumes the projection of INFL prior to V-raising. But if we consider (16) in strict derivational terms, it turns out that head substitution is effectively extending the target. In fact, head substitution can be construed as a standard applicative of Move. Suppose, following Chomsky in that respect, that verbs are inserted in the CS fully inflected, thus as bundles of lexical and functional features. Suppose further that each functional feature on a verbal stem must project its own projection in order to be interpretable and/or checked through spec head agreement. Then, given that flexional features are extended features of we can reanalyze (17) as a case of self-attachment, i.e. VNmax targets its own maximal projection, Move applies and the lexical features of VNmax, also with the functional feature F1, project at the target. This is shown in (18).

(18)  
\[
\begin{array}{c}
\text{\text{\text{Vmax \([-N, +V]\ F1)}}} \\
\text{\text{VNmax \([-N, +V]\ F1)}} \\
\text{\text{\text{Spec \ VNmax \([-N, +V]\ F0)}}} \\
\text{\text{{\text{Ymax}}}}
\end{array}
\]

The application of Move now satisfies the extension condition. In fact, there is no substitution in derivational terms (but there is in the representation ones), as there is no head existing prior to Move. But for the mere purpose of differentiating this application of Move from head adjunction, we will refer to it as head substitution for the remainder of the paper. Notice further that the V head projects a different category at the target. VmaxF1 is a different projection than Vmax, i.e. these two projections differ in at least feature F1 and are therefore distinct according to (11) above.

This analysis has further interesting consequences. First, notice that target does not project in (18), but the moved head does. This derivation therefore seems to run against the generalization that the target of Move doesn’t project. But notice that this generalization does not follow from conceptual necessity; what really matters is to properly exclude the cases where the mo
element should not project. As we discussed earlier, (11) properly excludes such cases from a unique source, but we now identify one instance allowed by (11) where the target does not project, and the derivation converges. And coincidentally, this option seems to be crucially required by the CS as the only way to perform head movement in accordance with fundamental assumptions about Move.

In fact, there is one more way in which the CS presumably makes use of that option. For instance, suppose once more that self-attachment applies as in (17), but that F1 does not project at the target in this instance. Indeed, nothing forces F1 to project immediately, as long as it does prior to LF interface for interpretability or before spell-out for feature checking. The result would be (19) where either of the target or the moved element could project, as the features involved are exactly the same.

\[ \text{VNmax}[-N,+v] \rightarrow \text{Vmax}[-N,+v] \]

This scenario allows the option of projecting either the target or the moved head, and the resulting chain is well formed w.r.t. the extension condition, c-command and the NER. Then the question is: Is such a syntactic object attested? Interestingly, this object has all the proprieties of a Larsonian VP shell: a verbal head moves to an empty (light) verb position, which under our analysis is actually created by Move. This new head projection could project further and provide a new specifier position. In sum, the option of self-attachment within our proposal leads to an analysis of head substitution which obeys the extension condition as well as predicts the existence of VP shells as well-formed syntactic objects.4,5

Summarizing the discussion on head movement, we adopted the firm position that the CS is uniform throughout the CS and interfaces and applies equally to all Move operations. This led us to exclude head adjunction which violates the C-command requirement between chain links, the NER (Chain Uniformity) as well as the extension condition. We developed an analysis of head substitution, based on insights in Grimshaw’s theory of Extended Projections, which satisfies all these requirements and is therefore the logical choice for the CS. Section 3 refines this proposal further in developing an analysis of the Mirror effects and features projection.

Summarizing this section, a typology of syntactic objects was developed on the basis of the Asymmetry Hypothesis (Di Sciullo 1999), according which all relations must be asymmetrical. Syntactic projections being endo-centric and defined in relational terms following minimalist assumptions, l primitive asymmetrical relation of (immediate) dominance defined the base distinction between XNmax and Xmax. The resulting typology has the following properties: It subsumes the effects of the Chain Uniformity Condition it is exhaustive in that, contrary to BPS, all combinations of adjunction are substitution of Xmax and XNmax are covered; It is exceptionless, in that a operation that would violate a fundamental property of Move or the extensic condition is allowed under special conditions. In particular, it excludes head adjunction in the CS and it subsumes the generalization that the target of Mo project, except in one instance predicted by the analysis which corresponds the only strategy available for V-raising (namely a derivational variant of head substitution) and also provides the source for VP-shells.

Two predictions of this typology are particularly striking: the absence any head adjunction through Move, and a consequence that we have not touched on yet, namely that intermediate XNmaxs are in principle visible the computational system. The next section explores one particularly releva phenomenon linked to these assumptions, the Mirror effects. It will be argued that the Mirror effects are not a result of head-to-head adjunction, as proposed in Baker (1988, 1998), but rather, the result of head substitution involving intermediate XNmax projections.

3. Head movement and the Mirror Generalization

The cross-linguistic work of Cinque (1999) on the functional structure the clause reveals a particularly rich make-up and, very importantly, one that doesn’t vary very much cross-linguistically. Cinque’s work also supports the Mirror Generalization which refers to the fact that inflectional morphemes expressing e.g. tense, mood, and aspect on verbal heads stand in a mirror image their corresponding functional projections. This Mirror Generalization is commonly held to follow from Baker’s (1988) theory of Incorporation, in particular through multiple left adjunction. However, as Cinque points out, and Bro (2000) strongly argues, left-head adjunction does not provide an explana-
account of the generalization. This section of the paper reviews some of Brody and Cinque's arguments and propose an alternative account of the Mirror Generalization that doesn't rely on head adjunction. Our claim is that the Mirror Generalization reflects one of two grammatical strategies to project functional heads into functional projections within the allowed typology of syntactic objects, which, under our assumptions, excludes head-adjunction but allows head substitution.

3.1 The Mirror Generalization and head adjunction

The Mirror Generalization refers to the fact that flectional morphemes (tense, aspect, modality, voice, and agreement principally) are in opposite order, or mirror order, with respect to the hierarchy and precedence of their corresponding functional projections in the clause. The following example from Turkish is discussed in Brody (2000), citing Cinque (1999), and shows a typical case of the Mirror Generalization.

(20) Morphological order of Tense, modality and V: olvas-hat-om
read-permissive-1sg present

TP

T

ModP

Mod VP V

-om -hat olvas

The Mirror Generalization is often held to follow from Baker's Incorporation theory (1988, 1998), which relies on three fundamental assumptions.

(21) a. Adjunction is always to the left of the targeted head (Baker 1998:29);
"If X and Y are X° and X is adjointed to Y in the syntax, then X precedes Y in the linear order."
b. Head-movement is subject to the Head movement Constraint.
c. Head adjunction excludes Excorporation.

According to these assumptions, the mirror order follows from successive head adjunction, where the verb raises and left-joins to the next head up, and then this new verb compound raises and left-joins to the next head up.

However, author such as Di Sciullo and Williams (1987a, b Section 3.6), Spf (1991), Cinque (1999), and Brody (2000) among others, discuss compelling arguments showing that this account is incorrect. In particular, two of the basic conceptual assumptions in (20) are questionable. Firstly, Brody points out that the exclusion of excorporation for head movement, which is crucial to account for the strict reverse order and to prevent the form *olvas-om-hat is in direct contrast with adjunction to XPs, which crucially allows excorporation. There is indeed no independent evidence that supports such spec status for head movement, and Koopman (1994) argues that excorporation possible. Secondly, notice that restricting adjunction to the left is also dubious. Even Baker’s (1998:33) claim about Sora, a Mundu language of the Ind showing inverted mirror effects, suggests that left adjunction is not universal. "These facts are elegantly explained if the direction of adjunction perform by head movement is simply reversed in Sora". So according to Baker, left head adjunction is not a constant assumption either.

In addition to these conceptual questions (see Brody 1998) for other problematic issues pertaining to head adjunction w.r.t. c-command and relativiz minimality, Brody also points out serious shortcomings for feature-checking theory. Let us briefly consider some of these problems and add some comments to them, as they are directly related to the alternative proposal developed in the next section.

A first issue resides in the fact that not all verbal forms showing a mirror order actually move in syntax, as amply argued on the basis of French and English (Emonds 1978; Pollock 1989; Chomsky 1995). Verbs would only move to IN overtly in French, yet both languages display a mirror effect with respect to flectional morphemes. If the mirror order results from successive head adjunction in syntax, English then remains a mystery. Chomsky’s (1995) feature checking theory provided a solution to this paradox. Basically, verbs in both languages are inserted fully inflected in situ and Move makes copies of the inflected ve and adjoins it in each head position of the head chain. Each copy allows feat checking, but only one copy surface at spell out (i.e. under VP in English, and under INFL in French). The final result for e.g. Turkish is the following (f.r. Brody 2000:36), where items in square brackets indicate non-spelled out head and those in curly brackets, non-spelled out copy-traces.
This derivation however, does not warrant that the Mirror Generalization follows from left adjunction. As Brody points out, new stipulations are required to explain the mirror effect, namely:

23. a. Feature checking must start with the most embedded suffix.
   b. Feature checking must follow the order of the suffix, from the most to the least embedded.

Independently of the question whether these stipulations are a satisfactory account of the Mirror Generalization, the fact is that left-adjunction has no bearing anymore on the account of the generalization itself. There are further problems as well. Brody rightly points out that the complete structure for (21) is actually more complex. General assumptions about words, phrase structure and chains require that words and chain members be constituent nodes, that nodes be labeled by one of their constituents, and that only tails of chains may be labeled (i.e. only the target of Move projects). The combination of these assumptions requires that entire copies of traces form a constituent with the head of each functional category, itself not spelled out. The end result is the following structure from Brody (ibid: 36).

To this syntactic representation, we must further factor in the word-internal structure of the word, which in essence duplicates the syntactic structure. Assuming a morphological right adjunction word formation, the final representation is the following (with the word-internal structure italicized and separated from the syntactic structure by a horizontal line, for more transparency).

Let alone the amount of structural and feature specification redundancy in the representation that Brody discusses in details, plus the fact that left adjunction still has no bearing on the mirror order, there are at least two additions worth pointing out. Firstly, notice that the uppermost label of the flected word, T, is never inserted under a node of the same type, but under node. Secondly, none of the features of the word is actually checked in a lex fashion with a functional head, e.g. under sisterhood or immediate domina or “spec-head” agreement. In the case of T for instance, its feature must checked through the V and Mod syntactic nodes before actually reaching syntactic T node. Notice that this structural distance would only increase the number of functional morphemes would, i.e. each new head would impose more structural distance between affixes and functional heads.

A similar remark can be made about the morpheme V and the synt head V, however in this case, a solution along the lines of the notion of Lativized Head (Di Sciullo & Williams 1987) is available. Hence the category features of V and M percolate to T and are thus available from T. This percolation is possible since V, M, and T specify distinct types of features, according to Di Sciullo & Williams. After percolation a stronger locality between featur
and functional heads would be warranted, but ad hoc assumptions along the lines of (23) would still be required to explain the mirror order of morphemes.

In sum, a closer look at feature checking indicates that left-adjunction has no bearing in explaining the mirror order of suffixes. The notion of Relativized Head says nothing about the internal order of morphemes and features, so the Mirror Generalization can then only follow from other stipulative assumptions such as (22). Further, the notion of Relativized Head, which is of the domain of word-internal features, says nothing about the non locality that persists for feature checking between $T$ and $M$ and their corresponding syntactic, functional heads $M$ and $T$.

Summarizing this section, several arguments were presented, in particular from Brody (2000), showing that an explanatory account of the Mirror Generalization cannot be held to follow from successive left head adjunctions, even considering the framework of feature checking theory (Chomsky 1995). The next section develops an alternative account of the Mirror Generalization within the typology of syntactic objects developed in Section 2.

3.2 The Mirror Generalization and head substitution

The typology of syntactic objects developed in Section 2 excludes head adjunction in syntax through Move. That considerably restricts the CS in performing Verb-raising under head movement, basically leaving head substitution as the only alternative. In the remainder of this section, an analysis of Mirror effects based on head substitution is explored. In the process, some aspects of head substitution as proposed in Section 2 will be refined, while coming to the following conclusion: Mirror effects reflect the only alternative available to the CS to ensure that each relevant featural feature associated to a bound morpheme projects its own syntactic projection.

Before developing an analysis, let us review some assumptions about functional features projection. As mentioned at the outset of Section 3, one of Cinque's important conclusion about the hierarchy of clausal structure, in particular for tense, mood, voice, and aspect features, is that there seems to be no cross-linguistic variation. In the Principles and Parameters approach of the Minimalist program, this suggests that the relative order of those features is not ultimately determined in the lexicon, which is the source of parametric variation, but follows from invariant interpretive principles related to bare output conditions of the conceptual/intentional (C/I) interface. For instance, hierarchical structure determines the relative scope of functional heads and the fixed cross-linguistic order could result from a universal relative scope inter-

pretation required of those specific morphemes. It is beyond the scope of this paper to substantiate that specific hypothesis, but the fact that there is no cross-linguistic variation is consistent with the assumption that the sentential order of those functional features is not subject to lexical variation but is rather determined by bare output conditions of the C/I interface. Of course, whether a given feature is realized as a bound or free morpheme, or as a suffix or prefix still is a matter of morphological variation and must be specified in the lexicon. But assuming that Cinque's generalization is right, let us suppose that the relative sentential order of the projections corresponding to those functional features, contrary to perhaps other features such as negation or agreement, is no determined in the lexicon, which would lead us to expect parametric variation but by bare output conditions at the C/I interface.

The next logical question to ask is what are the options available to the CS to instantiate that relative functional feature order. Again there are few options. Assuming that functional features must reach a relative order for scopal interpretation, this implies that the CS must ensure that every relevant functional feature projects its own scope at the C/I interface. Since scope is determined under c-command, each functional feature must head its own syntactic projection to establish its scope. A straightforward way to instantiate this would simply consist into selecting from the lexicon a morpheme corresponding to a feature and project it directly, through Merger, as a syntactic head. Depending on whether the morpheme is phonologically bound or free, it could either create a phonological word with adjacent morphemes without changining their relative order, e.g. through phonological cliticization. This is exactly what Cinque suggests is happening in languages of the Bantu family, where said sentences appear to directly reflect the order of functional morphemes, with agreement to the left of tense, which is itself to the left of Aspect. (Cinque 1999:68)

Cinque presents evidence to the effect that those prefixes are actually free morphemes and points out that these languages are a challenge to the Mirror Principle which doesn't seem to apply. But in our view, there is no reason for the Mirror Generalization to manifest itself in this circumstance if the mirror order is a reflection of a movement strategy to instantiate feature projection. The morphemes in the Bantu family are inserted directly as syntactic projection-hence directly establishing their scope, and there is no need to resort to any further strategy that would result e.g. in a mirror order.

Let us now consider a different strategy from direct projection of feature into syntactic projections. Another option that the CS must deal with consists into forming complex, fully inflected verbs in the lexicon, created by word formation (presumably head adjunction) and insert them as such in syntax. Th
is Chomsky's (1995) position. The CS must ensure that each feature of that inflected verb is projected for interpretability. The analysis of V-raising proposed in Section 2 provides a proper way of executing this. Consider a first attempt at a derivation, where specifiers positions have been omitted as we focus on head movement.

\begin{equation}
\text{TP} \\
\text{ModP} \\
\text{Mod} \quad \text{VP} \\
T \quad \text{M} \quad \text{V} \\
\text{M} \quad \text{M} \quad \text{M} \quad \text{M} \quad \text{M} \\
V \quad \text{M} \quad \text{T} \quad V \quad T \quad V \quad M \quad T
\end{equation}

\begin{equation}
\text{olvas-hat-om} \quad [\text{olvas-hat-om}] \quad [\text{olvas-hat-om}]
\end{equation}

Head-substitution of the inflected verb was performed through copying. Assuming percolation of features through relative headedness, each feature of the verbal complex is available at the topmost node of the word and can project directly from there into its own syntactic projection. Though a positive result is achieved, nothing however warrants that the order of suffixes should be in a mirror order. This is indeed the conclusion we reached in the last section when we discussed the use of relative headedness or feature percolation.

Let us therefore explore a different option offered by the typology in Section 2, one that will not use relative headedness. Recall that the typology only makes a distinction between Xmax and XNmax, i.e. does not make a stipulated distinction between Xmins that are lexical items and Xmins created by head movement. XNmax is simply any projection visible in syntax but which is not maximal, as determined by asymmetric dominance relations. Suppose therefore that the CS can identify flectional morphemes as XNmax, which seems reasonable for those flectional morphemes that have syntactic projections. Assuming that individual flectional morphemes are XNmax, they can undergo Move (head substitution) as long as the constituent structure of the word is respected. In that perspective, consider the following derivation.

This derivation has proceeded through successive head movement (copy) of a subpart of the word flectional structure. Notice that even though only a subpart of the word structure moves, the whole phonological word is pied-piped for PF convergence. However, this derivation arguably crashes for a number of reasons. For one, the head of Tnmax is a Vnmax, i.e. the feature T is not projecting. In fact, the status of the lowest VNmax is similarly questionable. Since we are allowing access to word internal structure, relative headedness should presumably not be used and consequently, the feature of VNmax cannot percolate to the highest node Tnmax. Thirdly, notice also that the projection status of V changes in the copying process of MNmax, passing from VNmax to Vnmax. Even though VNmax is not the head of the chain, that clearly seems an undesirable consequence.

So derivation (26) is excluded on several grounds and, in any case, it still did not provide any explanation for the mirror order. However, the interest of (26) lies in suggesting another option which would provide the results we are seeking. Instead of assuming a right branching adjunction structure of the word, let us suppose an inverted structure, preserving the same morpheme order, and then perform head substitution.
This morpheme structure does not reflect the hierarchical structure of the corresponding sentential projections, and it would seem hard to justify that the verb selects Mood which in turns selects Tense. And indeed, it is not our contention to do so. Recall from the outset of this section that one logical consequence of Cinque's findings is that the sentential order of certain flexional heads—those involved in the mirror effects and which are not subject to cross-linguistic variation—is not determined in the lexicon but by bare output conditions at the C/I interface. In other words, apart from specifying that in Turkish those morphemes are suffixes and that they are extended features of verbs in the sense of Grimshaw, we can assume that the lexical component has nothing more specific to say about the relative order of the suffixes in the word. All that is required is that the way those morphemes will be adjoined to one another will ensure that the CS will be able to project them so that they meet the relative order required by bare output conditions at the C/I interface.

The analysis above extends in a direct way to cases of Athapaskan language such as Navajo. As argued in Speas (1991), Navajo and other Athapaskan languages display inflectional morphemes as prefixes. What is striking however is that those prefixal functional morphemes show the same relative order found in other languages such as Greek, Finnish, Basque, and French. The only and crucial difference is in the position of the verb stem.

(30) a. Greek, Finnish, Basque:  
   verb stem-oagr-aspt-sag  
   b. Navajo & Athapaskan:  
   oagr-aspt-sagr-verb stem

Notice first that the mirror order follows directly under our analysis, despite the morphemes being prefixes. In fact, there is no significant difference in the derivation in Navajo and Greek or Basque, the only difference being that the bundle of functional morphemes is in a different position w.r.t. the verbal stem a morphological parameter according to Speas (1991). Recall that the relative order and the hierarchical structure of inflectional morphemes among them need not have any bearing on the output of the word, but are only relevant in ensuring a converging derivation at the C/I interface. Hence, the mirror order is still necessary in Navajo, despite the fact that morphemes are prefixes. The structure of flexional morphemes for each language group will be as follows.
(31) a. Greek, Finnish and Basque family

Let us now come back to the question of why there is still a mirror image with prefixes. In other words, why doesn’t Navajo display a non-mirrored order with the following hierarchical structure?

(32)

This word structure would allow unfolding the morphemes under head-substitution and processing with feature checking under strict locality. To our knowledge, no language displays this order with the prefixes being bound morphemes, and not free morphemes as in Bantu languages. Provided that this is a true empirical generalization, we expect it to follow from some fundamental property of the computational system. One interesting possibility is to capitalize on a version of Kayne’s (1994) Linear Correspondence Axiom (LCA), for instance as proposed in Chomsky (1995:334–340). In (30), each morpheme that precedes another morpheme is containing (including) and sister-containing (asymmetrically c-commanding) that morpheme. In contrast in (30), there is no sister-contain relation that corresponds to linear precedence, i.e. the LCA is violated. This again leaves (31) as the only possible hierarchical orders of functional morphemes that will ensure a converging derivation. The LCA therefore provides an explanation for the presence of a mirror effect in languages with functional prefixes, such as Navajo. Since these functional morphemes are visible to the computational system under our analysis, it is unsurprising that the LCA should constrain their hierarchical structure.

This account in terms of LCA could extend to another potential case scenario. Let us suppose a language such as Basque or Greek, but where the functional morphemes would not show a mirror effect. To our knowledge, such language does not exist. Yet under our analysis, there is indeed one hierarchical structure that could exactly make that prediction, i.e. a language with flectional suffixes but with no mirror effects. The word structure would be as follows.

(33)

Unfolding the morphemes through head substitution would ensure projection of each morpheme without requiring a mirror order. However, notice that the flectional morpheme structure is essentially similar to (31) and violates the LCA for the same reasons. So the LCA also excludes this unattested case.

In sum, the discussion above suggests that the LCA is operative in ordering the structure of flectional morphemes, which comes as no surprise under our analysis which maintains that certain flectional morphemes are visible to the CS as XNmax. The effect of LCA is to further constrain the possible hierarchical structure of flectional morphemes, leaving basically structures such as (31) available for head-substitution, which incidentally, necessarily imply a mirror order.

Conclusion

This paper developed a typology of syntactic objects based on primitive asymmetric relations of dominance, following the Asymmetry Hypothesis of D. Sciullo (1999) according to which all structural relations are asymmetric in nature and asymmetry is a fundamental building block of Grammar. The typology is a criticism of and an alternative to Chomsky (1994) and (1995). This typology that results has the following properties. It isolates two basic syntac
tic objects, $X_{\text{max}}$ and $X_{\text{Nmax}}$, which result from assessing the status of each feature projection in relational terms through the primitive asymmetric relation of (immediate) dominance. The typology derives the fundamental generalization that the target of Move projects, except in exactly one case which we argue to give rise to VP shells as proper syntactic objects. The typology also subsumes all effects of Chomsky's stipulated Chain Uniformity Condition. One of the most important consequences of the typology is that head adjunction under Move is excluded in the computational system, which leaves head substitution as the sole head movement operation available. We developed a strict derivational approach to head substitution which makes it compatible to the extension condition. Section 3 addressed the Mirror Generalization and proposes that head-substitution, and not head-adjunction, is the source of the generalization.

The typology developed in this paper raises many empirical issues and puts into question a number of standard assumptions in the minimalist program which only further inquiry will allow to further evaluate. For instance, while the seminal work of Cinque is significant, more research is required to verify the cross-linguistic validity of the Mirror Generalization and confirm exactly what features are subject to it and why exactly there is no cross-linguistic variation in the order of a subset of functional morphemes. Also, the exclusion of head-adjunction in the CS certainly has tremendous consequences for feature checking theory, especially covert feature raising, which we have not considered. In addition, allowing the CS to have access to part of the word structure runs against the strict lexicalist hypothesis (Lapointe 1980; Williams 1981; Di Sciullo & Williams 1987, and Chomsky 1995), and opens a debate that we have not taken on here due to the limited scope of the paper. However, our goal was to lay out a typology of syntactic objects that takes root in the fundamental building block that we think asymmetry is in grammar, and explore the predictions of the typology without resorting to exceptional conditions and keeping the CS constant throughout, even if this required putting into question standard assumptions.

Notes

1. This paper has benefited at various stages of development from comments of members of the Asymmetry project, in particular Rosemarie Déchaine, Anna Maria Di Sciullo, Manuel Espanol-Echevarria, Philippe Gabrini, Mohamed Guerissel, Yves Roberge et Mireille Tremblay, from the audience at the Asymmetry Conference and CLA, also from Peggy Speas,
therefore if a language has morphologically bound functional morphemes, the latter will necessarily have to be merged in the lexicon to avoid head adjunction in syntax. The prediction is that languages with bound inflectional morphemes will insert fully inflected forms from the lexicon.

References


Synthetic/analytic asymmetries in voice and temporal patterns

Abdelkader Fassi Fehri
Mohammed V University

Among the issues that any linguistic theory has to deal with are the principle and limitations on the asymmetrical mappings between sound and meaning in terms of words and phrases, and typically how grammatical functions (or functional categories; GFs henceforth) arising in lexical or syntactic derivations are mapped into morphological segments or sequences. Lexeme-base morphology (cf. Beard (1995)) was primarily designed to account for a number of these asymmetrical mappings through the Separation Hypothesis.1 Distributed Morphology (cf. Halle & Marantz (1993)) has refined the picture to include even more complex relationships between lexico-syntactic structure morphology, and actual vocabulary.2 But many questions remain to be solved. For example, even though the traditional classification of languages into isolating, agglutinative, or fusional is presumably not directed to focalize on the existence of purely discrete types, the relevance of these classifying properties has not received notable attention.3 Thus the one-to-one mapping found in isolating or agglutinative Ls, as opposed to the many-to-one mapping found in fusional (or cumulative) Ls, is commonly treated as if it were of no empirical (or theoretical) significance. If a (relatively) isolating-agglutinating-fusional continuum is true of most (if not all) languages, then the question that arises is: which natural principles and constraints operate in the organization of the continuum?

Best studied traditional mapping relationships have been usually confined to the domain of morphological words (be they roots, stems, simple or complex words), with a one-to-many mappings (when a single function is associated with multiple discrete expressions), or "synonyms"), or with a many-to-one mapping (when multiple discrete functions share only a single expression.