

Structure Preservingness, internal Merge, and the strict locality of triads

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1. Introductory remarks

The generative revolution in linguistics, started in the 1950s, culminated around 1980, when it was demonstrated that “rules of grammar” were not construction-specific, as had been believed since Antiquity, but following from the interactions of various construction-independent principles. Perhaps most important among those principles were the locality principles, with such well-known highlights as Chomsky’s 1964 A-over-A Principle, Ross’s *Constraints on Variables* (1967) and Chomsky’s 1973 ideas about Subjacency and successive cyclicity.¹

At least as important, but relatively underexposed, was the idea of structure-preservingness. The idea of structure-preservingness has two related but different forms, which were developed in roughly the same period. The form of structure-preservingness that comes always to mind immediately, is the version proposed by Joseph Emonds in his classical dissertation of 1970. According to this form of structure-preservingness, transformational rules do not add anything new beyond what is already given in deep structure (via the phrase structure rules).²

The other form of structure-preservingness is trace theory. Trace theory further developed a trend existing since pre-generative structuralism, i.e., the enrichment of linguistic representations with abstract elements like zero elements and scope markers. Katz and Postal (1964) made important contributions to this effect but the development leading more directly to trace theory was the decision in *Aspects* (Chomsky 1965) to separate the recursive phrase structure component from the lexicon. This made it possible to conceive of phrase structure as something entirely or partially unlexicalized.

Trace theory added another element of structure-preservingness because it meant that deep structure information was preserved instead of being lost as the result of movement transformations. It has been my conclusion ever since that the two aspects of structure-preservingness, Emonds’s version and trace theory, have completely undermined the original idea of transformational grammar. If, with movement rules, nothing structural is gained (Emonds’s version) or nothing is lost (trace theory), it is hard to see any useful function for movement transformations at all. This judgment extends to the successors of movement transformations, such as “move alpha”, Move, and more recently, internal Merge. All these residues of transformationalism are equally superfluous, blocking the formulation of syntax in a strictly local, variable-free manner and, most important of all, obscuring the perspective on the underlying unity of grammar.

By this underlying unity I mean the following. All dependencies of core grammar are local, but not all these local connections can be stated in terms of movement. In spite of occasional attempts in that direction, the antecedent-reflexive anaphor relation, for instance, cannot naturally be reformulated in terms of movement rules. For other local dependencies,

like subject-verb agreement, reformulation in terms of movement does not make sense at all. What all these dependencies have in common, however, is certain very simple configurations that can be stated in terms of tree geometry. One could say that all grammatical dependencies realize the same (or very similar) underlying, abstract locality properties, and that trace theory greatly facilitated the exploration of the common denominator, namely in terms of tree configurations.

This move towards a more abstract view of grammar has sometimes misleadingly been interpreted as the development of a representational view of grammar in opposition to a derivational view. This dichotomy is a false one because all derivational theories also involve representations as their outputs (I will briefly return to this issue below). What really is at stake, then and now, is something different and at a meta-level, namely the more abstract collection of properties determining the nature of *both* derivations and representations. In spite of the recent minimalist overemphasis of derivational notions, nobody has ever succeeded in making a convincing empirically-based case for the superiority of either a derivational or a representational perspective. The two aspects are closely related, both are legitimate and heuristically useful ways of looking at syntactic structure.

The way minimalist theories are currently developed seems to suggest the same issues and, I assume, pseudo-dichotomies, this time between the old, top-down and “cartographic” approaches, and the new, bottom-up, dynamic approaches, based not on tree geometry but on the set notation of Merge. Much is made of this new dichotomy (see, for instance, Zwart 2004), but the alarming paucity of empirical issues that could give initial plausibility to the existence of a dichotomy suggests otherwise. Today, as before, a more abstract perspective seems possible that emphasizes what the old cartographic and the new bottom-up approaches have in common. As I see it, syntactic theory is about these underlying, more abstract collections of properties and not about particular modes of realizing these properties, cartographic-representational, set-oriented derivational, or otherwise. It is theoretically conceivable that the various existing modes of execution correspond to real differences, but as long as this has not been convincingly demonstrated, I will continue to agnostically use both tree-geometrical and --occasionally-- set-oriented Merge terminology.

A very different, and in my opinion more important, issue is whether movement rules (and their successors) exist or are some superfluous residue of theories of the past. Theories with chains formed without movement are sometimes seen as notational variants of theories *with* movement rules (see, for instance, Broekhuis 1992, 8). This error is, to my experience, based on the further view that giving up movement rules (in whatever form) leads to extensions elsewhere in the theory, extensions that are otherwise unnecessary. If the abandonment of movement rules would indeed lead to otherwise unnecessary *ad hoc* extensions, there would be a case. But this obvious burden of proof has never been met in any satisfactory way. On the contrary, I would like to show in this article that the continuing efforts to single out movement (now as internal Merge) as something real are mistaken and, in fact, block the perspective on a unifying, strictly local theory of syntax.

In other words, I hope to show in this paper that the insight that led to Emonds’s Structure Preserving Hypothesis and to trace theory around 1970 is just as valid as ever and more than survives under minimalist assumptions. In 2005, just as much as around 1970, it leads to the conclusion that movement, in whatever form, is an ill-conceived and superfluous concept.

2. The problematic nature of internal Merge

In its latest reformulation, the operation Move is referred to as “internal Merge” (Chomsky 2001). According to the definition of Merge of Chomsky (1995, 243), Merge affects linguistic objects, which are defined as follows:

- (1)
 - a. lexical items
 - b. $K = \{\gamma, \{\alpha, \beta\}\}$, where α, β are objects and γ is the label of K

Since lexical items and each K are objects, this formulation guarantees recursivity. According to Chomsky (*loc. cit.*), “[a]ppplied to two objects α and β , Merge forms the new object K , *eliminating* α and β [italics added –JK].” For actual derivations, this means that objects merged in each step are either lexical items or K s that have not undergone Merge themselves yet. K s that have undergone Merge earlier in the derivation are no longer available, since they are, according to Chomsky eliminated by Merge. I think this is a reasonable and by far the simplest interpretation of Merge and it generally suffices for empirical purposes.

It therefore comes as a surprise that, according to Chomsky (2001), Merge may also affect earlier outputs of Merge. Thus, not only the latest result of Merge (unmerged itself so far) but also earlier results of Merge (that have already been Merged themselves) can be recycled by merging them again.³ This re-merging is called “internal Merge” and it is claimed that thanks to this possibility, one gets the (minimalist counterparts of the) classical operation Move (or “move α ”) for free. The ubiquitous displacement phenomena in natural languages (movements) are in this view no longer surprising but something following from the simplest possible definition of Merge: internal Merge comes for free and can only be excluded by further, unnecessary and undesirable stipulations.

This kind of reasoning is far from convincing. To begin with, the interpretation seems to be at variance with the earlier conception of Merge, which, as we saw, was said to *eliminate* the elements merged. In order to re-merge eliminated elements, one would have to re-animate them first. But supposing that this conceptual problem could be solved, there remain at least four more serious problems:

- (2) *Internal Merge*
 - a. expands the class of possible grammars
 - b. involves back-tracking
 - c. is completely redundant

Internal Merge, once more, is praised because it is claimed to derive the effects of movement (“displacement”) without stipulation, as an automatic result of the simplest possible definition of Merge. Theories excluding internal Merge (“movement”) are thought to be inferior because this exclusion would come down to an extra stipulation.

Counting stipulations, however, is practically never a decisive kind of argument in theory evaluation. Stipulations are not something inherently bad because theories without any stipulations whatsoever are empty and have nothing to justify. It is furthermore impossible to precisely count the number of stipulations in a theory because, as can be learned from the history of science, many stipulations are hidden among the tacit assumptions under which theories are formulated and interpreted. Therefore, in the practice of theory choice, intuitive

ideas about elegance, simplicity and beauty are more important than the exact count of stipulations at a certain moment.

In the case of internal Merge, the assumed advantage of one stipulation less is offset by an overwhelming number of disadvantages. It is immediately clear, for instance, that adopting internal Merge is in conflict with one of the traditional goals of linguistic theory, i.e., limiting the hypothesis space for the language learner. Part of this hypothesis space must be possible theories as to what to select as candidates for Merge. Limiting Merge to lexical items and unmerged products of earlier applications of Merge entails a more constrained theory than a theory that also allows *subproducts* of unmerged linguistic objects. So, the choice is between one stipulation less (a consideration of negligible significance) and a theory that narrows the hypothesis space for the language learner:

(3) Merge applies to *unmerged* linguistic objects (in the sense of (1))

What is crucial here is the addition of the adjective *unmerged*. This is what the incriminated extra stipulation comes down to. It excludes internal Merge (as being about elements already merged), while dropping this adjective would rule in internal Merge. If we adopt Merge as the standard structure-building mechanism, (3) can be seen as entailing (4):⁴

(4) Only external Merge exists

The next problem with internal Merge is that it is a form of back-tracking, i.e., a return to stages in a derivation already passed. This is generally seen as something undesirable, which, as I have always understood it, was a major motivation for ideas about strict cyclicity since Chomsky (1973). I share Chomsky's intuitions about the desirability of some form of strict locality and have argued elsewhere (to be expanded below) that, seen in terms of old-fashioned tree geometry, the strictest form of locality limits syntactic relations exclusively to sisters and their immediately dominating category. Translated into the terminology of Merge, this means that only external Merge exists, while internal Merge would be a form of back-tracking and therefore a violation of the strict locality that seems to be empirically sufficient. Of course, in theory, a theory with back-tracking (as entailed by internal Merge) could adopt extra stipulations to limit the effects of unlimited back-tracking, but, once more, the cost of such extra stipulations has to be weighed and evaluated against the cost of limiting Merge exclusively to linguistic objects not merged before.

The third and most decisive objection against internal Merge is that it is completely redundant. This argument carries over from discussions in earlier versions of generative theory, which were based on the consequences of Emonds's Structure Preserving Hypothesis (SPH). As discussed in section 1, with the SPH, movement transformations became superfluous and the redundancy argument carries over to theories with residual successor versions of movement transformations, like "move α " or Move. It should be clear that the redundancy (which is total) just remains under the latest incarnation of movement, internal Merge.

Chomsky (1995, 318) briefly discusses the SPH but suggests that the redundancy is gone under minimalist assumptions and that the SPH is "unformulable" because D-structure (defining the targets of structure-preserving rules) is eliminated from his minimalist theories. I fully agree, but somehow, this discussion does not address the issue that was raised by the SPH. The conclusion drawn by Koster (1978) (and several others at the time) was that, if the

SPH is correct for all movement rules, these movement rules must be eliminated altogether (hence, trivially, making the SPH unformulable). The point is very simple: the SPH entails that for each output of movement rules, the same output is available on the basis of phrase structure rules only; hence the complete redundancy of movement rules. This conclusion holds independently of the issue (possibly a non-issue) whether one has to adopt a derivational or a representational framework.

Under minimalist assumptions, the redundancy objection against movement rules simply continues to stand. Replace phrase structure rules by external Merge and replace movement rules by internal Merge and the insight underlying the SPH can simply be rephrased in minimalist terms:

- (5) There are no known outputs of internal Merge that cannot be independently derived by external Merge

Since external Merge (or some equivalent of it) cannot be missed, internal Merge can and must be eliminated as something completely redundant. Of course, one can decide that each output derived by internal Merge can be derived twice, namely once by internal Merge and once by external Merge, but again the cost of this *prima facie* absurdity has to be weighed and evaluated against the alleged stipulative cost of limiting Merge to elements not merged before. To further illustrate the point, consider a typical passive construction:

- (6) *John* [was arrested *t*]

According to traditional standard approaches to passivization, *John* landed in the subject position by movement (or now by its successor operation internal Merge plus some form of linearization at the phonological interface). The insight that was derived from the SPH is that there is no way to prevent *John* from appearing in the subject position in question on the basis of phrase structure rules (and lexicalization) only (the same is true about fronted Wh-phrases, etc.). Translated into minimalist Merge terminology, we can say that there is no way (and no need) to prevent *John* from getting in place by external Merge only. *John* can be taken from the lexicon and therefore is a mergeable object according to all known conceptions of Merge. Similarly, there is no reason to assume that [was arrested *t*] cannot be the result of earlier applications of external Merge only.

There are two independent issues that have perhaps obscured the whole discussion. What I mean is the nature of the empty object in (6), indicated by the trace. Another problem is the connection between *John* and this position, which not only involves an interpretive relation but also has to guarantee that the trace position is empty, with *John* as the exclusive “filler” of the gap. This connection is probably responsible for the intuitive appeal that the concept of movement has for many, but it is completely irrelevant for the question whether one needs movement (internal Merge) or not. The nature of the connection is only an argument for internal Merge if there are no other, independently necessary, mechanisms that can account for the nature of the connection. A critique of internal Merge would be futile perhaps if its abandonment would lead to the slightest stipulation elsewhere. However, here is some news for those who maintain internal Merge for the reasons just mentioned: on the basis of external Merge alone, the filler-gap relation and its properties are completely derivable from independent factors, without any new stipulations whatsoever. Consider the fact that

“movement” constructions must contain a gap. Suppose we would have another lexical item in the object position of (6) instead of a gap:

(7) **John* [was arrested *Bill*]

The ungrammaticality of this output has nothing to do with the nature of Merge (any style), but obviously with interpretability (let us say at the semantic interface). DPs are usually only interpretable if related to a theta-position. The only available theta-slot in (7) is occupied by *Bill*. Names like *Bill* do not have the capacity to mediate theta role assignment, which makes (7) (particularly *John*) uninterpretable.

Note that the problem posed by (7) has to be solved no matter whether we adopt internal Merge or not. Theories with internal Merge also have external Merge, so, even if internal Merge is accepted, (7) can still be derived by external Merge, just as in theories that *exclusively* rely on external Merge. This makes facts like (7) completely useless for an evaluative comparison of theories with or without internal Merge.

Another argument against the external Merge-only approach could be that the trace in (6) is not really a lexical element and therefore not a mergeable object in the sense of (1). That, however, would be an arbitrary decision and a dubious one as well in the light of several empirical facts. First of all, calling empty positions (like the object position of (6)) “traces”, at least terminologically, suggests the existence of movement rules. If there is no movement, there cannot be traces of movement and it is therefore better to see empty positions as incompletely specified lexical elements. It is generally assumed that lexical items not only involve the phonological features of words or morphemes but also categorial information, indicating that something is an N, a V or some other category.

In accordance with this assumption, I assume that a lexical element minimally involves categorial features such as $\pm N$, $\pm V$, etc., while more elaborate lexical elements also involve information to make lexical elements interpretable at the phonetic and semantic interfaces. One of the essential functions of grammar is to contextually complete incomplete elements, by providing the missing features for interpretation. Historical examples of that are the contextual features that make deletion retrievable, the interpretation of PRO (by rules of control), and the interpretation of subjects in certain pro-drop languages (as often derived from the contextually available agreement morphology). Most variants of generative grammar assume a host of incomplete, “empty”, elements to be completed by the linguistic context.

Some languages, like Chinese, go even further by leaving lots of positions empty and by heavily relying on the non-linguistic discourse and situation (see for example Huang 1982). In short, for obvious and almost generally accepted empirical reasons, grammars have to allow for “empty” elements, which I take as incomplete lexical elements, with categorial features, but without the full range of identifying semantic and phonetic features. In other words, I assume there are compelling reasons to accept phonologically and semantically incomplete categories as normal, and therefore mergeable, lexical elements.

A filler and a gap, then, as in movement constructions, could be seen as a pair in which the features necessary for interpretation are divided over two positions. This is not an *ad hoc* statement about “movement” constructions but following from the very essence of local grammatical processes: they usually involve two elements, one incomplete and the other providing the missing information. Consider the following cases, for example:

- (8) a. Mary **reads** *a book*
 b. **Bill** saw *himself*

As mentioned, DPs are only interpretable in sentences if they have a theta-role. Straight from the lexicon, nouns (as heads of DPs) do not have a theta-role, and in that sense they are incomplete. As always in core grammatical processes, the local context comes to the rescue. Thus, *a book* in (8a) lacks an inherent theta-role, but it is provided by the verb **read**. Similarly, reflexives like *himself* in (8b) are incomplete in some sense, in that they cannot fulfill an independent referential role. In this case, the necessary completion is provided once again by the local environment, namely by the antecedent *Bill*.

On the basis of these and numerous other examples, it can be concluded that the essence of grammar is combining elements in such a way that incompleteness is remedied in an, as I will argue, strictly local context. Local contextual completion makes the sentences in (8) interpretable and also the structures with incomplete elements traditionally referred to as traces, like (6) (repeated here for convenience):

- (9) *John* [was arrested *t*]

The object position is incomplete (as indicated by *t*), but the necessary completion is provided by *John* in the local context. Since the local completion mechanism is the same for all local dependencies (like in (8) or in (9)), nothing new, beyond *external Merge* and the local completion mechanism, is necessary to interpret so-called movement constructions (like the ones traditionally derived by Wh- or NP-movement).

One could argue that Move (or internal Merge) is the very completion mechanism mentioned here, but that will not do. The completions shown in (8), for instance, cannot be reduced to internal Merge. Treating movement as a completion mechanism separate from the other completion mechanism comes down to entirely missing the grand generalization underlying all local completions in grammar. In the next section, I will further sketch the nature of the completion mechanism.

3. The strict locality of triads

Syntax combines linguistic objects to more complex linguistic objects. Quite apart from what is known about grammar, it can be said that, as a matter of necessity, the simplest possible combination involves exactly two elements. Seen in terms of conventional tree geometry, this means that syntactic representations minimally involve two sister nodes and their mother node (binary branching). Surprisingly, it has become clear in recent years that this --from a conceptual point of view-- absolute combinatorial minimum is empirically sufficient as a structural basis for practically all known local dependencies. Assuming that local dependencies involve completion (in the sense of the previous section), we can say that incomplete categories can only be completed by their sister.⁵ More specifically, I assume that syntactic representations are built up from triads of the following form:

- (10) [_β α δ]

In this format, δ stands for “dependent element” (incomplete element) while α stands for “antecedent” (completing element) and β for the complex object into which α and β are combined. The elements α and δ are either taken from the lexicon or are a β in the sense of (10), which accounts for recursivity.

Although (10) seems to show some (non-accidental) similarity with Chomsky’s formulation of Merge (as in (1)), the nature and scope of (10) are different. Like Merge, it covers facts previously characterized by phrase structure rules and X-bar schemata. Unlike Merge, however, it also characterizes --as a meta-statement-- the format of all other local dependencies, like subject-verb agreement, antecedent-reflexive relations, the filler-gap relations involved in movement and the conditions determining these relations (like Principle A of the binding theory and Subjacency). Since (10) is a unification of former base rules (or X-bar schemata) and the Bounding Condition (of Koster 1987), its scope is enormous. In fact, it is a definition of the format of all possible grammatical core relations. This means that (10) makes the very strong claim that all syntactic relations can only be defined in terms of triads, i.e., sisters and/or their immediately dominating node. Needless to say, (10) also differs from Merge in that it states matters in terms of tree geometry (something non-essential to which I will return).

Standard phrase structure configurations, like the verb-complement relation, are straightforwardly characterized by (10):

(11) [$_{VP}$ V NP]

The NP is a dependent element δ , because it needs a theta-role. This theta-role is provided by the V, which figures at the antecedent α in this case. The VP immediately dominating the sisters V and NP is the domain β in this case. So, phrase structure, particularly the head-complement relation, is the most straightforward application of (10).

How (10) also characterizes the filler-gap relations of “movements” is less straightforward, but nevertheless surprisingly simple, as I will show in a moment. As an illustration of the problem, consider passive structures:

(12) [$_{\beta}$ [$_{\alpha}$ *John*] [$_{\delta}$ was arrested *t*]]

A direct relation between *John* and its trace *t* is impossible according to (10) because these two elements are not sisters. However, as I will argue below, (12) does not involve a direct relation between *John* and the trace, but a relation between *John* and the domain *containing* the trace, namely δ . The relation of *John* with the trace *t* is mediated by the relation between the trace and this domain δ , a form of vertical “information flow” to which I will return.

Note also that, according to (10), “movement” (which could be translated as internal Merge) is also excluded in the derivation of (12) and for the same reason, namely that *John* and its trace are not sisters (or elements directly combined under Merge). According to (10), grammar only involves the strict locality of sisterhood (and immediate dominance) and therefore (10) entails a complete ban of the kind of back-tracking that was shown to come with Move (and as preserved under internal Merge).

Before discussing mediated completion, I would like to make a few further comments as to the question how (10) relates to standard Merge. As mentioned before, I see no issue between representational approaches and the derivational approaches entirely based on Merge. Derivations create representations and there is no reason, under a derivational

approach, to ban the study of the representations resulting from derivations. Thus, (10) is about representations, no matter whether they are created by derivational means or not. Since (10) is formulated in terms of tree geometry, it does not correspond literally to an output of Merge, but for Merge to be adequate, it must preserve the empirical content of (10). In that sense, (10) can be seen as a meta-theoretical statement at a higher level of abstraction than Merge. There are very few relevant properties, if any, that follow from the fact that Merge is a set-theoretical, derivational operation rather than an operation creating traditional (sub)trees. There is nothing in the concept of Merge itself, for instance, that blocks the direct combination of three instead of two elements. According to (10), syntactic representations (conceived in terms of trees) exclusively involve binary branching. This excludes n -ary branching for $n > 2$ and, accordingly, also excludes Merge combining more than 2 elements at a time.

Furthermore, unlike what we find in standard Merge, (10) assumes a fundamental asymmetry between the two elements combined (α and δ): δ is the dependent, incomplete, receiving element, while α is the independent, completing, feature-providing element. As far as I can see, syntactic relations always involve this basic asymmetry (see also Zwart 2004).⁶

A related issue is that, according to (10), α and δ are linearly ordered (α precedes δ). This ordering incorporates the very strong claim of Kayne (1994) that all “movement” is to the left and that all languages have head-initial phrase structure at the deepest level (see also Zwart 1993 and 1994). This is an empirical claim with all kinds of interesting consequences. Standard Merge leaves the relative order of the combined elements free, with the further suggestion that linear order is a matter of phonology, particularly of those procedures that map basic linguistic structures on the linearly ordered stream of speech. It is easy to reformulate (10) without the stipulated linear order, but maintaining the fundamental asymmetry between α and δ . This calls for a formulation of Merge in terms of ordered pairs rather than unordered sets (see note 6). There are perhaps good reasons for the (partial) separation of hierarchical and linear information and I will leave this matter open here (see Fox and Pesetsky (2003) for some suggestive results about linearization). However, the fundamental asymmetry between α and δ (making them an ordered pair) is a different matter and linear order only is the (perhaps externally motivated) expression of this asymmetry. The asymmetry itself, however, has nothing to do with phonology and stands in urgent need of further elucidation.

I will now turn to the main topic of this section, namely mediated completion. One of the best ideas ever in generative grammar was the insight that seemingly unbounded Wh-movement can be seen as a chained iteration of local steps (Chomsky 1973). With the idea of successive cyclicity, it became possible to tame variables in linguistic rules and to see all processes as local. The problem of “constraints on variables” (Ross 1967), however, was not entirely gone because variables, be it in more limited form, remained implicit in the operation of rules like “move alpha.”

Since the late 1990s, it has been argued that the notion of strict cyclicity can be radicalized by eliminating variables altogether from grammar (Koster 2000, 2003). This radicalization is implicit in the assumption that all syntactic relations conform to one, exclusive format, the triad (10), repeated here for convenience ($\langle \beta, \langle \alpha, \delta \rangle \rangle$ in the Merge format of note 6):

$$(13) \quad [\beta \ \alpha \ \delta]$$

This formulation is entirely variable-free because α and δ are adjacent and the only daughters of β . The triad is assumed to exhaustively define syntactic relations, meaning that α and δ can only have a relation with each other or with β , but not with an element γ outside of β . If the relations in question involve the spreading of features, features can only flow from α to δ (and, perhaps, vice versa), or from each of them to the immediately dominating β (percolation).⁷ However, this does not mean that the features of α and δ cannot “escape” the confinement of β . Thanks to the fact that β can be an α or δ itself (the recursive property), there is exactly one escape route for the features of α and δ , namely via β :

$$(14) \quad [\beta \ \gamma \ \beta]$$

Thanks to recursion, the features of α and δ can, via β , reach the next cycle up, namely the triad β' , and so on. I will call β' the successor triad of β . Features can only “move” up a tree via an uninterrupted chain of successor triads (equivalently, by successive Merge, from label to label). Unlike what we saw under “movement” (or internal Merge), features can bridge certain distances this way without variables or ugly back-tracking.

Upward flow of features is not unlimited, as will be clear from some examples. Vertical feature travelling or percolation is not something new but has, implicitly or explicitly, been part of practically all variants of generative grammar. In comparison to Merge and Move, feature percolation has always remained somewhat in the margin of mainstream syntactic research, unlike what we find in morphology and the variant of generative grammar known as HPSG. In morphology, feature percolation conventions have been standard at least since Lieber (1981) (see also Di Sciullo and Williams (1987), for discussion and reference to earlier work). The best known syntactic example is the projection of lexical features known from X-bar theory, for an account of what was traditionally called “endocentricity.” Thus, in the following example, the N features vertically flow from N to N' to N'':

$$(15) \quad [N'' \text{ Spec } [N' \text{ N Complement}]]$$

As soon as a projection of N meets another lexical category, like V, the upward flow of N-features stops, while in turn the V-features are further projected:

$$(16) \quad [V'' \text{ Spec } [V' \text{ V } [N'' \text{ Spec } [N' \text{ N Complement}]]]]$$

In other words, upwardly projected features have a *vertical range*, corresponding with the usual locality domains (maximal projections, bounding nodes, blocking categories, phases, etc.). Only in exceptional cases, the vertical range of a feature goes beyond the commonly assumed phase CP. I will briefly return to the vertical range of features (bounding) at the end of this section.

In the bare phrase structures of Chomsky (1995, ch. 4), the upward flow of features is partially translated into the concept of labelling. Starting from

$$(17) \quad K = \{\gamma, \{\alpha, \beta\}\}, \text{ where } \alpha, \beta \text{ are objects and } \gamma \text{ is the label of } K$$

the idea of projection is now preserved in the assumption that the label γ equals one of the subparts, namely α , which leads to the following result of Merge:

(18) $\{\alpha, \{\alpha, \beta\}\}$

Another well-known example of vertical feature flow is Pied Piping as found in the formation of Wh-phrases.⁸ As is generally assumed, under the process known as Wh-movement, what is often moved is not a minimal Wh-phrase, but a more inclusive phrase containing the minimal Wh-phrase:

- (19) a. [With **whom**]_i did you talk t_i ?
 b. [[[[[**Whose** father's] brother's]mother's] sister]_j did you see t_j ?

The size of Wh-phrases differs somewhat from language to language. In German, for instance, a whole infinitival clause can be pied piped (Ross 1967, Van Riemsdijk 1994):

- (20) Der Hund [**den** zu fangen]_k ich t_k versucht habe
 the dog whom to catch I tried have
 "The dog whom I tried to catch"

In Dutch (like in German), it is possible to front a VP-internal AP with Wh-specifier with (21a) or without (21b) the entire VP:

- (21) a. [_{VP} [**Hoe** hard] gewerkt]_i heb jij t_i
 how hard worked have you
 "How hard did you work?"
 b. [**Hoe** hard]_j heb jij [_{VP} t_j gewerkt]?
 how hard have you worked

Obviously, an active phrase (like a Wh-phrase) cannot be generally interpreted as the minimal phrase of the required kind, but it is as least as often the case that the relevant phrase is a more inclusive phrase *containing* the minimal phrase. This is possible thanks to feature percolation, which takes place, as proposed here, from triad to triad. This successive-triadic mechanism, not only creates Wh-phrases but also --analogously-- reflexive phrases, agreement phrases and gap phrases. In each case, the result is the standard result of the percolation also necessary in morphology, namely that a smaller element determines the nature of a dominating element containing it.

It is thanks to the recursivity-based nature of vertical feature flow that all dependency relations (checking relations or whatever) of core grammar can be reduced to sisterhood relations. The same principle was applied to subject-verb agreement in recent work by Jan-Wouter Zwart (2002). Traditionally, subject-verb agreement (as indicated by the name) is seen as a relation between subject and verb. However, if Zwart is correct, the real relation is between the subject and the VP (or predicate) *containing* the agreeing verb. If we represent 3rd person agreement on a verb by a subscript /3, in other words, the agreement relation in a sentence like *John reads a book* is not like in (22a) but like in (22b):⁹

- (22) a. *traditional view:* John₃ [_{VP} reads₃ a book]
 b. *view proposed by Zwart:* John₃ [_{VP} reads a book]₃

The relevant features (represented by the incompleteness indicating subscript /3) are vertically transmitted from the V to the VP, where agreement can be seen as being satisfied in the sisterhood relation between *John* and the whole VP.¹⁰ This is exactly analogous to what we see in Wh-fronting: the relation is not direct but indirect, mediated by a more inclusive phrase that contains the visible feature somewhere down the tree.

Similarly, (most forms of) reflexivization can be seen as a relation between a subject and a reflexive predicate *containing* a reflexive pronoun, rather than as a direct relation between a subject and a reflexive pronoun (reflexive agreement indicated by the subscript /i):¹¹

- (23) a. *traditional view:* John_i [saw himself_i]
 b. *view proposed here:* John_i [saw himself]_i

The traditional account of displacement phenomena, from movement transformations to internal Merge, can in the same way be replaced by a strictly local account based on feature percolation. In this case, I adopt (and slightly modify) a proposal made by Gazdar (1981) by signalling a lexically unidentified N by a subscript /N (comparable to a trace):

- (24) a. *traditional view on displacement:* John_N [was arrested /N]
 b. *view proposed here:* John_N [was arrested /N]_{/N}

Displacement does not involve back-tracking to some earlier stage in the derivation, but can be seen exactly as the other phenomena discussed, as a completion relation between an incomplete category and its immediate sister. The work of bridging the distance between filler and gap is done by an extremely general, independently motivated mechanism, the upward transfer of features, which proceeds in strictly local steps, from triad to triad. Unlike the *ad hoc* mechanism of movement (or internal Merge), upward feature transmission has overwhelming independent motivation, because, as far as I know, nobody denies the necessity of feature percolation in morphology, in category projection (as in traditional X-bar theory) or in the definition of Wh-phrases. In Chomsky (1995, ch. 4), for instance, one instance of feature percolation (projection) is, as we have seen, done via Merge itself, particularly by its labelling component. Translating things from tree representations to Merge terminology, one could use this labelling component for upward feature transmission in general, by making the appropriate, empirically motivated subset of features of the merging elements α and β (in (1)) part of the label.

No matter how feature percolation is done technically, it is clear that it is the most general mediating mechanism available and that it, moreover, has the desirable property of making grammar uniform, variable-free and strictly local, without the *ad hoc* back-tracking properties of movement (as preserved in the format of internal Merge).

A last issue that was mentioned above and that I will briefly further discuss here is the fact that upward feature transmission is limited, roughly to the local domains known from binding and bounding theory (cf. Chomsky 1981 and for an alternative account, Koster 1987). Traditionally, bounding conditions, like Subjacency, are formulated with variables. It is my claim that the formulation of all traditional locality principles can be given in the variable-free triad format presented here, particularly as filters blocking the features of the merged elements to spread to the newly formed unit. In terms of tree geometry, and assuming that the correct formulation of Subjacency involves only one blocking category (see Koster 1978, 1987), the bounding condition for empty elements /Z looks as follows:

(25) Bounding Condition (right branches):

*[_Z Y X⁺/Z]

(where /Z indicates a gap, Y some category and X⁺ a maximal functional extension (both X and Z drawing from the features [\pm N, \pm V])

I take as the maximal functional extension of [+V] not the category VP but the category CP (see Koster 1987). The limitation to lexical projections guarantees that no blocking effect occurs when X is a functional category (like Agr, I, C etc.). Thus, the following configuration is allowed because VP, unlike the category CP, is not the maximal projection V⁺:

(26) [_{IP/NP} I VP/NP]

Altogether, then, (25) states that the projections NP, PP, AP and CP on right branches are islands in the unmarked case.¹² Most languages, for instance do not allow escape from a PP:

(27) *Which sermon_i did you fall asleep [_{PP} during t_i]

Such facts follow from (25), since it does not allow gap features to spread to the dominating category:

(28) *[_N P N⁺/N]

Similarly, gap features cannot escape from a left branch:

(29) Bounding Condition (left branches):

*[_Z X⁺/Z Y]

unless X⁺ = Z

The intended interpretation is that if X⁺ = Z, the resulting category Z/Z is in its entirety a gap and not some partially lexical category containing a gap. This makes it impossible to escape from a subject phrase, while allowing the subject features themselves to escape. The closeness of (25) and (29) suggests further unification, perhaps along the lines of the linearly unordered format of note 6, a step that would require a better understanding of the differences between left and right branches. The exact nature of conditions in question remains a matter of controversy and further research, but at this point, the only claim I want to make is that island conditions can be formulated in the variable-free triad format, as in (25) and (29).

4. Concluding remarks

In conclusion, I would like to say that the insight underlying Emonds's Structure Preserving Hypothesis (SPH) has survived the reformulation of syntactic theory in minimalist terms. The SPH itself cannot be formulated in the minimalist framework, but that observation misses the point. What matters is that in older frameworks, the SPH seemed to decisively undermine the notion "movement transformation" by making it superfluous. In almost exactly the same way, the notion "internal Merge", with its back-tracking and other undesirable properties, was shown to be superfluous. As in older theories all core syntactic structures could be specified in terms of X-bar schemata, it is possible under Minimalism to derive all permissible syntactic structures on the basis of *external* Merge only. To compensate for the ban on internal Merge, nothing extra or new is necessary since we can exclusively rely on the independently motivated mechanism of successive-triadic feature percolation. This mechanism is not only independently motivated, it also makes syntactic theory strictly local, by formulating it in accordance with the variable-free format of triads.

NOTES

¹ For my own version of locality conditions, see Koster (1978) and (1987).

² Next to structure-preserving rules, Emonds also distinguished minor movements and root transformations. Minor movements are beyond the scope of this article. Many root transformations could be reformulated as structure-preserving rules (substitutions). See, for instance, Den Besten (1977). For an earlier study of the consequences of structure-preservingness, see Koster (1993).

³ There are several implementations of the idea of "re-merge" in the literature, the so-called copying theory being the most popular somehow. This copying theory creates further complications and I will ignore it here. My frequent use of the word "trace" should not be seen as a commitment to some outdated trace theory. Throughout the text, I use the word "trace" for unlexicalized syntactic positions that only differ from PRO and *pro* on the basis of functional context.

⁴ An anonymous reviewer of this paper has misunderstood the text as offering an unspecified alternative to Merge, inviting me to minimally give an idea how structures are built. However, as is clear from the text, I find Merge (in Chomsky's sense) perfectly acceptable as a standard mechanism to build structure. It is not at all my intention to provide an alternative to Merge. I just take it for granted but want to limit it to *external* Merge. My discussion of triads is at the meta-level that determines the nature of the derivational notion Merge and its outputs (representations).

⁵ The oldest expression of the idea that grammatical relations are limited to sisterhood is, as far as I know, Zwart (1993) (not in the text itself but as number 1 of the separately added theses, as required for the Dutch doctorate).

⁶ According to Zwart (2004, 59) Merge creates ordered pairs $\langle \gamma, \langle \alpha, \beta \rangle \rangle$, followed by a linearization at the phonetic interface that creates the linear order $/\alpha \beta/$.

⁷ Although, thanks to the fundamental asymmetry, the dominant feature flow is from α to δ , nothing excludes feature flow from δ to α . This is why the relation between α and δ was characterized as "share property" in Koster (1987, 8).

⁸ Since the early discussion in Ross (1967), Pied Piping has never received the systematic attention that it deserves. Nevertheless, the literature is substantial. See for instance, Cowper (1987), Webelhuth (1992) and Murphy (1995) for discussion and further references. Apart from the HPSG literature since Gazdar (1981) (for instance, Bouma *et al.*, 2001), the g-projections of Kayne (1983) deserve mentioning.

⁹ The slash notation is adopted, with slight modifications, from Gazdar (1981). In general, I take a subscript $/\varphi$ as meaning that the category with this subscript is incomplete with respect to the features of φ . Zwart (2002) sees the agreement morphology on the verb as a matter of *spelling out* the VP (Predicate) features. A related idea with respect to theta-roles was discussed by Williams (1989, 431, with references to earlier work). According to Williams, the external argument of a verb "is represented not only on the predicate itself but also on every projection of the predicate [...]." This is another example of vertical feature transfer (percolation) in the sense of the present article.

¹⁰ An anonymous reviewer criticizes my use of indices, suggesting that I am formulating some kind of “neo-HPSG” alternative to Chomsky’s theories in which, due to the use of indices, it cannot be determined if the *ceteris paribus* condition of theory comparison is met. However, far from developing some alternative to Chomsky’s theories (with a tribal name like HPSG), I only seek to formulate an improved version of the standard minimalist theories. I do not see indices as something real but as a convenient expression of the common idea that Merge preserves properties of the elements merged, minimally within a “phase” (or some other local domain).

¹¹ See Reinhart and Reuland (1993) for a similar idea.

¹² There is quite a bit of evidence that extraction from CP, as is possible in English or Dutch, is in fact a marked phenomenon, as has been assumed since Chomsky (1977). See also Koster (1978, 62ff.), and Stepanov (2001) for recent discussion of “single cycle” languages. For the bounding nature of the PP, see Van Riemsdijk 1978.

Bibliography

- Besten, Hans den. 1977 [1983]. On the Interaction of Root Transformations and Lexical Deletive Rules. In: Werner Abraham, ed., *On the Formal Syntax of the Westgermania*. Amsterdam: John Benjamins.
- Bouma, Gosse, Robert Malouf & Ivan Sag .2001. Satisfying Constraints on Extraction and Adjunction. *Natural Language and Linguistic Theory* 19: 1-65.
- Broekhuis, Hans. 1992. Chain Government: Issues in Dutch Syntax. PhD Dissertation, University of Amsterdam: Amsterdam.
- Chomsky, Noam. 1964. *Current Issues in Linguistic Theory*. Mouton: The Hague.
- Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. MIT Press: Cambridge, Mass.
- Chomsky, Noam. 1973. Conditions on Transformations. In: S. Anderson and P. Kiparsky, eds., *A Festschrift for Morris Halle*. Holt, Rinehart and Winston: New York.
- Chomsky, Noam. 1977. On Wh-movement. In: P. Culicover, T. Wasow and A. Akmajian, eds., *Formal Syntax*. Academic Press: New York.
- Chomsky, Noam. 1981. *Lectures on Government and Binding*. Foris: Dordrecht.
- Chomsky, Noam. 1995. *The Minimalist Program*. MIT Press: Cambridge, Mass.
- Chomsky, Noam. 2001. Beyond Explanatory Adequacy. *MIT Occasional Papers in Linguistics* 20: 1-28.
- Cowper, Elizabeth. 1987. Pied Piping, Feature Percolation, and the Structure of the Noun Phrase. *Canadian Journal of Linguistics* 32: 321-338.
- Di Sciullo, Anna-Maria and Edwin Williams. 1987. *On the Definition of Word*. MIT Press: Cambridge, Mass.
- Emonds, Josph. 1970. *Root and Structure Preserving Transformations*. PhD Dissertation. MIT: Cambridge, Mass.
- Fox, Danny and David Pesetsky. 2003. Cyclic Linearization and the Typology of Movement. Ms. MIT, to appear in *Theoretical Linguistics*.
- Gazdar, Gerald. 1981. Unbounded Dependencies and Coordinate Structure. *Linguistic Inquiry* 12: 155-184.
- Huang, James. 1982. *Logical Relations in Chinese and the Theory of Grammar*. PhD Dissertation MIT: Cambridge, Mass.
- Katz., Jerrold and Paul Postal. 1964. *An Integrated Theory of Linguistic Descriptions*. MIT Press: Cambridge, Mass.
- Kayne, Richard. 1983. Connectedness. *Linguistic Inquiry* 14: 223-249.

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- Kayne, Richard. 1994. *The Antisymmetry of Syntax*. MIT Press: Cambridge, Mass.
- Koster, Jan. 1978. *Locality Principles in Syntax*. Foris: Dordrecht.
- Koster, Jan. 1987. *Domains and Dynasties*. Foris: Dordrecht.
- Koster, Jan. 1993. Structure-Preservingness and the End of Transformationalism. In: A. de Boer, J.T. de Jong and R.J. Landeweerd, eds., *Language and Cognition 3*. Yearbook 1993 of the Research Group for Theoretical and Experimental Linguistics of the University of Groningen, Groningen: 139-148.
- Koster, Jan. 2000. *Variable-free Grammar*. Groningen: Unpublished Paper, University of Groningen: Groningen. (see: <http://odur.let.rug.nl/~koster/papers/v-free.pdf>).
- Koster, Jan. 2003. Move, Merge and Percolate are One! On the Elimination of Variables in Grammar. In: L.-O. Delsing, C. Falk, G. Josefsson and Halldór Á Sigurðsson, eds., *Grammatik i Fokus*. Grammar in Focus: A Festschrift for Christer Platzack, November 18 2003. Department of Scandinavian Languages, University of Lund, Lund.
- Lieber, Rochelle. 1981. *On the Organization of the Lexicon*. PhD Dissertation, MIT: Cambridge, Mass.
- Murphy, Patrick Michael. 1995. *Pied Piping, Proper Government, and the Grammars of English*. MA Thesis, University of North Carolina: Chapel Hill.
- Reinhart, Tanya and Eric Reuland. 1993. Reflexivity. *Linguistics Inquiry* 24: 657-720.
- Riemsdijk, Henk van. 1978. *A Case Study in Syntactic Markedness: The Binding Nature of Prepositional Phrases*. Foris: Dordrecht.
- Riemsdijk, Henk van. 1994. Another Note on Clausal Pied-Piping. In: Guglielmo Cinque, Jan Koster, Jean-Yves Pollock, Luigi Rizzi and Raffaella Zanuttini, eds., *Paths Towards Universal Grammar: Studies in Honor of Richard S. Kayne*. Georgetown University Press: Washington DC.
- Ross, John Robert. 1967. *Constraints on Variables in Syntax*. PhD Dissertation MIT: Cambridge, Mass.
- Stepanov, Arthur. 2001. *Cyclic Domains in Syntactic Theory*. PhD Dissertation, University of Connecticut: Storrs.
- Webelhuth, Gert. 1992. *Principles and Parameters of Syntactic Saturation*. Oxford University Press: Oxford.
- Williams, Edwin. 1989. The Anaphoric Nature of θ -roles. *Linguistic Inquiry* 20: 425-456.
- Zwart, Jan-Wouter. 1993. *Dutch Syntax: A Minimalist Approach*. PhD Dissertation, University of Groningen: Groningen.
- Zwart, Jan-Wouter. 1994. Dutch is Head Initial. *The Linguistics Review* 11: 377-406.
- Zwart, Jan-Wouter. 2002. *Local Agreement*. Unpublished lecture. University of Groningen: Groningen.
- Zwart, Jan-Wouter. 2004. Een Dynamische Structuur van de Nederlandse Zin. Deel 1: *Dynamische Syntaxis*. *TABU* 33: 55-71.

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