A Local Encoding of Syntactic Dependencies and its Consequences for the Theory of Movement*

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Abstract

In this paper we consider the impact of the theory of phrase structure for the encoding of syntactic dependencies and in particular for the way movement is represented. We show that the conception of movement as copying plus deletion (the so-called 'copy theory of movement') is incompatible with well-motivated conditions on phrase structure. The alternative we develop is a local encoding mediated by percolation of selectional requirements comparable to the slash features of HPSG, although it is different in its underlying principles and analytical detail. The proposed local encoding of movement is superior to the copy theory in at least three respects. (i) It explains why movement must target a c-commanding position, (ii) it can account for surprising restrictions on scope reconstruction, and (iii) it can capture patterns of interaction between different types of movement. In the first two cases, the copy theory falls short of the mark; in the third, the theory proposed here seems more parsimonious. We begin by considering the theory of phrase structure.

Keywords: Movement, reconstruction, c-command, Barss's Generalization, UCOOL

1 Introduction

Prior to the introduction of trace theory, syntax had to interface with semantics at both deep structure and surface structure (Jackendoff 1972). The reason for this was that movement could not be encoded in a single syntactic representation, given that the launching site of a moved category ceased to exist after application of a transformational rule.

The introduction of trace theory had two objectives (Chomsky 1973, 1981, 1986a; Van Riemsdijk and Williams 1986). First, it allowed a partial unification of movement with other syntactic dependencies: all of these could be encoded in a single phrase marker through indexation of positions. Second, it allowed a simplification of the interface between syntax and semantics. The output of the syntax was a single tree that contained all the information relevant to the interpretive system, now located exclusively at LF. The reduced role of pre-movement structures for interpretation paved the way for a multitude of theories that did away with deep structure.

Trace theory was abandoned in early minimalism in favor of the so-called 'copy theory of movement'. Indices were deemed incompatible with the principle of Inclusiveness, which restricts the content of tree structures to information originating in the lexicon. Since indices of phrases cannot be traced back to any lexical entry, they are illegitimate syntactic objects. At first sight, the copy theory appears to provide a solution to this problem: the identity of copies takes over the role of coindexation, while copies themselves only contain information taken from the lexicon.

The solution just sketched is only apparent, however. In order for identity of copies to replace coindexation, it should be possible to distinguish between identical constituents that stand in a movement relation and identical constituents that are merged separately. However, the copy theory provides no way of doing so. In other words, while trace theory identified the launching site of movement and related it to the landing site through indexation, the copy theory merely does the former.

The difficulty of distinguishing accidental copies from traces has been generally acknowledged (see for example Chomsky 1995: 227). Two solutions have been considered. The first is to make the derivational history of a phrase marker available at the LF interface, so that the interface can 'see' which copies are created by internal merge. This solution appears to have very wide currency (although its adoption is not always made explicit). For example, Chomsky, during a keynote address in 2004, suggested that the computational system 'knows' which copies have been created by movement.[1] One implication of adopting this position is that the input to the interface with semantics is not a tree, but an ordered set of trees. If taken seriously, this will require an additional – nontrivial – mechanism that extracts the relevant information from this set.[2] The literature has little to offer as regards the nature of this mechanism, but a tentative proposal can be found in Nunes 2004: 165, fn. 15.

The second approach is to deny that movement is a relation that involves two categories. Starke 2001 argues that internal merge creates structures of multi-dominance, in which a single category simultaneously occupies two positions (this is comparable to structure-sharing in unification-based frameworks). The advantage of Starke's proposal is that it circumvents the question of how copies are related in a principled way, namely by doing away with the copy theory while retaining the idea that traces are identical to moved categories. It does, however, require a nontrivial revision of phrase-structure theory (as is apparent from the fact that multi-dominance cannot be expressed by conventional rewrite rules).

Thus, the copy theory by itself does not resolve the tension between Inclusiveness and the displacement property of natural language. It requires additional assumptions, either to associate the launching site and the landing site of movement, or to allow multi-dominance. (Except where it is important to distinguish them, we will use the term 'copy theory' to include both the original proposal and Starke's reinterpretation of it.)

In this paper, we develop an alternative encoding of movement and other syntactic dependencies. Like the copy theory, it obeys Inclusiveness, but unlike the copy theory, it denies that traces have internal structure. We argue that a trace is a lexical item that introduces a selectional requirement satisfied by its antecedent after having been copied up the tree in a strictly local, stepwise fashion. The resulting structures satisfy Inclusiveness because the fact that a trace needs an antecedent is a property laid down in its lexical specification and inherited by categories containing the trace. Moreover, as is the case in GB theory and in Starke's multi-dominance proposal, the input to the interface with semantics can be a single tree; there is no need to assume access to derivational history.

It will be obvious that this proposal has much in common with the encoding of movement in HPSG, where a slash feature plays the same role as our selectional requirement (Pollard and Sag 1994; see also Gazdar 1981, Maling and Zaenen 1982, and Gazdar et al. 1985). However, the concerns that motivate our proposal are novel, while its technical implementation differs substantially from that found in its predecessors.

In section 2, we introduce a general theory of syntactic dependencies that is compatible with conditions on phrase structure, such as Inclusiveness. We extend this theory to movement relations in section 3, where we also explain in what respects it differs from the copy theory of movement. In sections 4, 5 and 6 we develop three arguments that favor the theory developed here over the copy theory. The proposed encoding of movement is superior

[1] The conference in question was Tools in Linguistic Theory 2004, held at the Academy of Sciences in Budapest.

[2] Indeed, if the interface is presented with an ordered set of trees, it is not obvious why any of these would need to contain copies left behind by movement at all (for pertinent discussion, see Leung 2007: 481).

in that (i) it explains why movement must target a c-commanding position, (ii) it can account for surprising restrictions on scope reconstruction, and (iii) it can capture patterns of interaction between different types of movement (improper movement, freezing effects, and remnant movement). In the first two cases, the copy theory falls short of the mark; in the third, the theory proposed here seems more parsimonious.

Because the main aim of this paper is to compare our proposal with the copy theory of movement, we limit our discussion of HPSG to a series of footnotes that clarify where our proposals differ from what can be found in the HPSG literature.

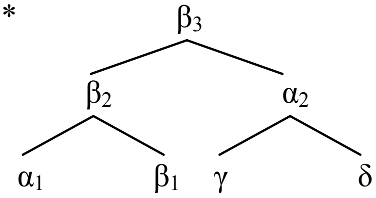
2 Inclusiveness and the encoding of dependencies

We hypothesize that phrase structure is conditioned by Inclusiveness. As Chomsky (1995: 228) suggests, "any structure formed by the computation […] is constituted of elements already present in the lexical items selected for [that structure]." In other words, the elements that make up a structure must come from inside that structure; nothing can be added from outside it. Chomsky's formulation makes clear that Inclusiveness is intended to be uniform. It does not only hold of the root node of a sentence, but of any subtree contained in it. The formulation in (1) highlights this.

(1) *Inclusiveness*
The syntactic properties of a nonterminal node are fully recoverable from its daughters; the syntactic properties of a terminal node are fully recoverable through a pointer.[3]

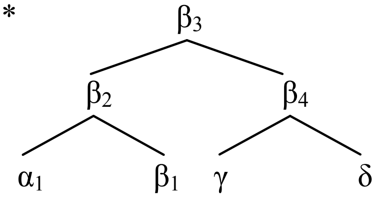
The effects of Inclusiveness for categorial projection are undisputed. First, projection of categorial features cannot be 'sideward' (it requires domination). Thus, the sequence β_1-β_2-β_3 in (2) is a well-formed projection, but the sequence α_1-α_2 is not. This follows from (1), because α_2 inherits its categorial features from α_1, but α_1 is not a daughter of α_2.

(2) *



Second, projection of categorial features cannot be 'downward'. If β_4 in (3) below is an extension of the projection line consisting of β_1, β_2 and β_3, Inclusiveness is violated because β_3 is not a daughter of β_4.

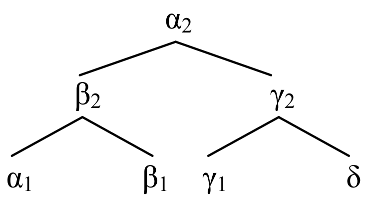
(3) *



[3] A pointer is a link to information contained in a different representation. In the standard case, a terminal contains a pointer to a lexical entry. See section 3 for further discussion.

Third, projection cannot be discontinuous. The structure in (4) is ungrammatical because α_2 inherits its label from α_1, a node it dominates, but which is not its daughter.

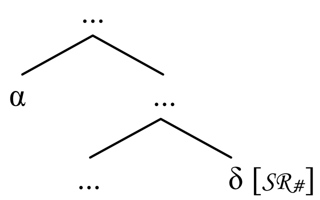
(4)



Although there is agreement that categorial features are inherited under immediate domination, Inclusiveness is more ambitious: it applies to all syntactic properties of nodes. An important question in this context is what counts as a syntactic property of a node. Of course, we should be ambitious in our interpretation of this notion, so as to maximize the empirical effects of (1). In line with this, we assume that all non-categorial features are subject to Inclusiveness, as well as a node's selectional requirements. However, nodes also have what one might call 'circumstantial characteristics', such as being a strong island or occupying the second position of a clause. These characteristics are not represented in a node but inferred from the structural environment it appears in. Therefore, they cannot plausibly be conditioned by Inclusiveness. Establishing the boundary between syntactic properties and circumstantial characteristics of nodes is a matter for future research. In what follows, we will be concerned with the properties of nodes implicated in the formation of syntactic dependencies, on the assumption that these at the very least must meet Inclusiveness.

As noted by Chomsky, a GB-style encoding of dependencies violates Inclusiveness because it relies on indices and these are not lexical properties. In Neeleman and Van de Koot 2002, we argue that the problem is not just a matter of the notation used to represent dependencies, but also of the configuration in which dependencies are thought to be established. In order to see why, consider the tree in (5), where δ is a syntactic dependent (such as an anaphor or a predicate), and α the antecedent with which it is associated. For explicitness' sake, let us assume that the fact that δ must be linked to an antecedent is encoded by a selectional requirement $\mathcal{SR}$. In (5), $\mathcal{SR}$ is satisfied by α (we use '#' to indicate this).

(5)

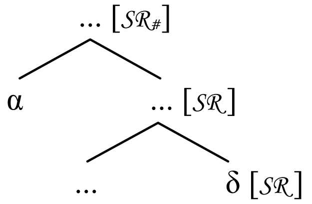


The relation established between α and δ determines properties of δ, simply because $\mathcal{SR}$ in δ cannot be satisfied again. Suppose, for example, that δ is a predicate, and $\mathcal{SR}$ a θ-role. Once $\mathcal{SR}$ is satisfied by α, δ no longer qualifies as a θ-role assigner. Therefore, '#' represents a syntactic property of the node in which it occurs. Given that δ does not dominate α, the fact that $\mathcal{SR}$ in (5) carries '#' cannot be recovered from the internal structure of δ. Hence, δ violates Inclusiveness.

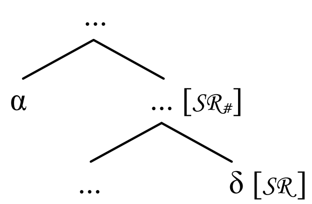
This problem is not restricted to thematic relations. For example, we may characterize the dependent nature of anaphors as a selectional requirement satisfied by its antecedent in a configuration like (5). Thus, the standard, chain-like, encoding of binding violates Inclusiveness. Mutatis mutandis, the same is true of other syntactic dependencies.

The logic of the problem dictates what alternative encoding of syntactic dependencies we must adopt. Only if $\mathcal{SR}$ is copied upward recursively to the node that immediately dominates α, as in (6a), can it be satisfied without violation of Inclusiveness. As long as no node in the path from δ to α is skipped, upward copying satisfies this condition, because each new copy on a node can be recovered from its daughters. Downward satisfaction of $\mathcal{SR}$ also obeys Inclusiveness, because the element that determines the status of $\mathcal{SR}$ is a daughter of the node that contains $\mathcal{SR}$.

(6) a.



b.

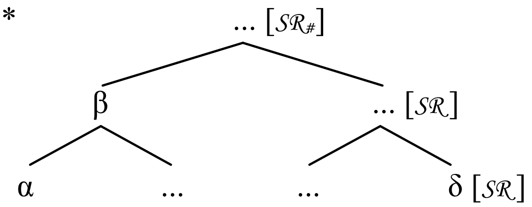


By contrast, satisfaction under sisterhood, as in (6b), violates Inclusiveness: the fact that $\mathcal{SR}$ is satisfied cannot be recovered from the daughters of the node that hosts it.[4]

Note that α in (6a) does not acquire any syntactic properties in virtue of it satisfying $\mathcal{SR}$. If it did, this property on α would violate Inclusiveness. For example, if $\mathcal{SR}$ is a θ-role, there is no sense in which δ 'assigns' a θ-role to α, or α is the 'recipient' of a θ-role. Thus, the theory we propose implies that the argumenthood of α is expressed through its relation to δ rather than as a syntactic property of α itself.[5]

As discussed, Inclusiveness forces a decomposition of syntactic dependencies into two primitive operations: the upward copying and downward satisfaction of a selectional requirement. Two key properties of syntactic dependencies follow from this. The first is that such dependencies may span fairly large distances. This is because the copy relation can be established recursively: a copied selectional requirement can itself be copied. As a result, the path along which a selectional requirement travels up the tree can in principle be indefinitely long (as long as independent locality conditions are satisfied). On the other hand, Inclusiveness requires the relation between the antecedent and the highest node that contains $\mathcal{SR}$ to be extremely local: the structure in (7), where β intervenes between α and the node containing $\mathcal{SR}$, is ruled out.

(7) *



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[4] For ease of presentation, we will often talk about features being 'copied up' and so on. This language is suggestive of a derivational view of grammar, but in fact everything we say is fully compatible with a representational view of grammar.

[5] This logic carries over to other syntactic dependencies. In some cases this is trivial. For example, few would argue that being a controller is represented as a feature of the controller. In other cases, this consequence is more controversial. Agreement, for example, is often analyzed as the assignment of values to φ-features in a functional head. This conceptualization is incompatible with the theory developed here. However, it is compatible with alternative views of agreement, for instance in terms of feature identification (see Brody 1997). Neeleman 2008 provides some empirical arguments supporting identification over valuation.

This is an important result. Inclusiveness is a restriction on phrase structure, but on the proposed encoding of syntactic dependencies, it also explains why a dependent must be c-commanded by its antecedent.

One important clarification is in order. The feature that satisfies a selectional requirement can itself have been copied. Given that this is possible, can it really be guaranteed that the antecedent occupies a c-commanding position? For example, could the feature of α that satisfies $\mathcal{SR}$ in (7) be copied to β and satisfy $\mathcal{SR}$ there? Contrary to what one might think, this problem is only apparent. The grammar does not permit gratuitous percolation of features. Copied features become properties of the node they are copied to. Therefore, the relevant feature can only be copied to β if it is taken to characterize this node, in which case $\mathcal{SR}$ is in fact satisfied by β.

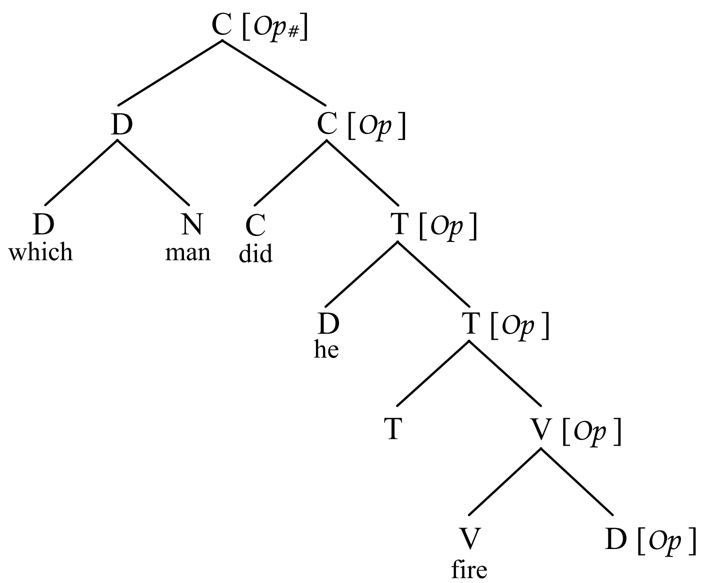
Of course, copied selectional requirements also become properties of the node they are copied to. However, whereas features indicate what a node *is*, selectional requirements indicate what a node *asks for*. In many cases, a node cannot be two things at the same time (say a verb and a preposition). But it can be one thing (say a verb) and ask for another (say a prepositional complement). Thus, copying of selectional requirements is less restricted than copying of features.

3 Movement and reconstruction

3.1 $\bar{A}$-movement

The conception of syntactic dependencies argued for in the previous section implies that movement, too, must be mediated by a selectional requirement, which must be introduced by a trace, copied up the tree, and satisfied by the trace's antecedent. For example, we propose to encode WH-movement using the selectional requirement *Op* (for operator):

(8)



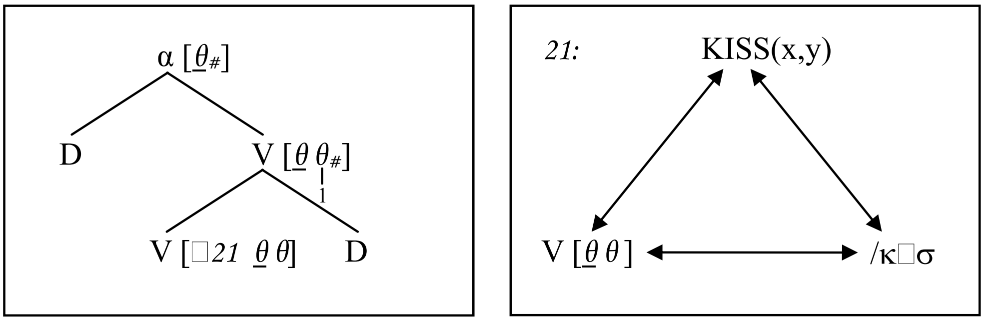
The way the WH-expression and its trace are associated in this structure satisfies Inclusiveness, provided (i) the selectional requirement in the trace (D [*Op*]) is recoverable from the lexicon and (ii) the properties that satisfy it are located in the root of the subtree that acts as the antecedent. The second requirement seems unproblematic; if we assume, for example, that *Op* is satisfied by the WH-feature of *which*, a simple operation of copying internally to the antecedent will suffice.

The *first* requirement can only be met if traces are lexical items. This is, of course, a highly controversial proposal. Ā-movement is known to reconstruct for syntactic properties of the moved category and at first sight this seems to rule out an analysis of the trace of Ā-movement as a simplex item stored in the lexicon. After all, one would not want to assume separate lexical entries for Ā-traces of different categories. We will deal with the problem of reconstruction in two stages. In section 3.3 we turn to reconstruction for scope and related interpretive notion. In this subsection we address reconstruction for syntactic properties.

In order to do so, we need to consider the way in which terminal nodes acquire their content. Obviously, the requirement that the syntactic properties of a node must be inherited from the structure it dominates cannot be extended to terminals. The standard assumption is that terminals instead acquire their content through lexical insertion. However, lexical insertion on a literal interpretation cannot exist: it does not make sense to say that a syntactic terminal contains a lexical entry. Similarly, a lexical item cannot be ‘taken’ from the lexicon when inserted, since that would lead to the absurd conclusion that insertion depletes the lexicon. At best, a syntactic terminal is a copy of a lexical item or, more precisely, it contains information licensed through matching against information in a lexical entry (Jackendoff 1996).

On this view, lexical insertion must be a relation between two representations: an independently generated syntactic terminal and a lexical entry. We take this relation to be mediated by a pointer contained in the syntactic terminal that identifies the lexical entry. For example, ‘insertion’ of the verb *kiss* into a syntactic representation consists of the matching of information generated in that terminal with syntactic information in the verb’s lexical entry. In (9), the pointer that licenses this matching is represented as □*21* in the terminal node; *21* is supposed to be the ‘lexical address’ of the verb.

(9)



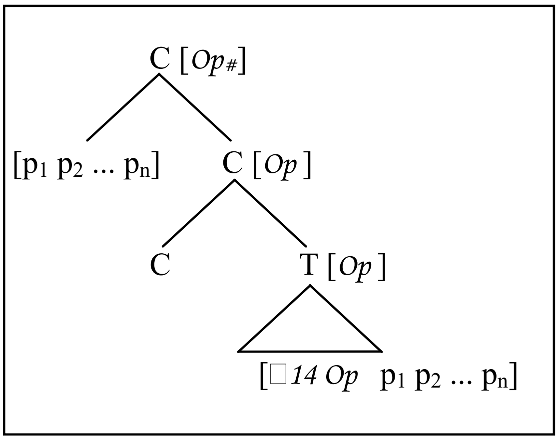
Syntax **Lexicon**

Thus, the syntactic properties of a terminal node are freely generated, subject to recoverability from a lexical entry (compare Starke’s 2006 view on the relation between syntax and the lexicon). The situation is – we suspect – not very different in the case of nonterminal nodes. The content of such a node may also be freely generated, but subject to recoverability from information in its daughters.

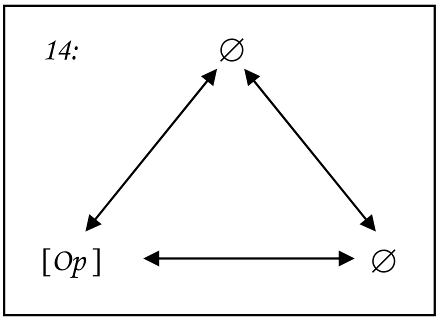
Given that matching can relate information contained in different representations, there can be no structural requirements on the nodes it relates (see Ackema and Neeleman 2004 for related discussion). Therefore, as a matter of logic, nothing stands in the way of a terminal containing a pointer that relates it to another node in the same representation. Adapting the terminology in Chomsky 2008, we may call matching within a representation ‘internal matching’, reserving the term ‘external matching’ for lexical insertion. We propose that internal matching is responsible for syntactic reconstruction effects.

Consider the representation in (10), a version of (8) that represents some details relevant to reconstruction.

(10)



Syntax



Lexicon

One of the attributes of the trace, the selectional requirement *Op*, is licensed by an external matching relation with lexical entry *14*, that of Ā-trace. *Op* is copied and satisfied in the usual way. Its function, we submit, is to identify the source for internal matching of the remaining properties of the terminal: it acts as a syntactic pointer and in this way ensures that the properties p_1, p_2, ..., p_n in the trace satisfy Inclusiveness.

This account does not require the postulation of more than one lexical entry for Ā-trace. Lexical entry *14* contains a selectional requirement that functions as a syntactic pointer. A syntactic terminal associated with this lexical entry may therefore contain independently generated properties licensed through internal matching.[6] It is the presence of these properties in the syntactic terminal that give rise to syntactic reconstruction effects. The phenomenon thus falls out from independently motivated mechanisms required for lexical insertion and the encoding of syntactic dependencies.

Note that we cannot allow internal matching between a terminal and any arbitrary syntactic node, because this would render Inclusiveness empirically vacuous. Such arbitrary associations are ruled out if there are lexical, but no syntactic, addresses: in that case, there is nothing inherent in a constituent that could identify it as a target for a pointer. Consequently, the only way for a trace to be associated with its antecedent is through a selectional requirement, as proposed here.[7]

To illustrate the theory, consider an example of anaphoric binding licensed under reconstruction, such as the Dutch verb-second structure in (11).[8]

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[6] As already pointed out, the encoding of Ā-movement using percolation and satisfaction of *Op* has much in common with the slash-feature notation in HPSG. Nevertheless, HPSG faces a question that parallels the one at the heart of this paper, namely whether traces are copies or terminals. In HPSG this question involves the amount of structure-sharing licensed by satisfaction of a slash-feature. Indeed, if structure-sharing were complete, the HPSG encoding of movement would come very close to the copy theory and in particular to the implementation advocated by Starke (2001) in terms of multi-dominance. Of course, in the mainstream HPSG literature structure-sharing does not extend to features in the DTRS category. However, the amount of structure shared is a matter of debate (see, for example, Pollard and Yoo 1998 and the references mentioned there).

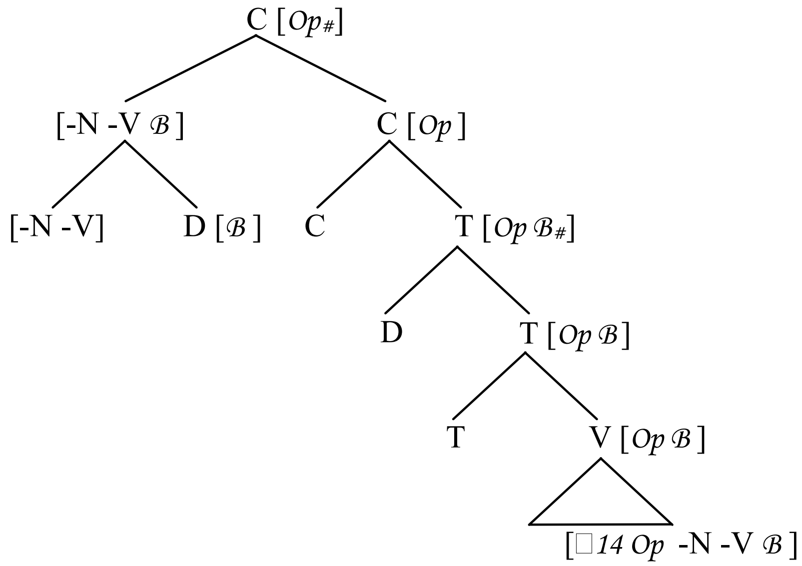
[7] Possibly, the assumption that there are lexical but no syntactic addresses can be understood as a reflection of the difference between information permanently stored (and hence associated with a fixed memory location) and information active in working memory (which may be allocated to different memory registers during computation).

[8] Throughout this paper we use Dutch, rather than English, when considering binding, because this language clearly distinguishes anaphoric and logophoric expressions. In Dutch the third person

(11) [$_{PP}$ Aan zichzelf] had Jan nooit t_{PP} gedacht.
on self had John never thought
'Of himself John had never thought.'

A partial structure corresponding to (11) is given below. The reflexive contained in the fronted PP introduces the selectional requirement *ℬ* responsible for anaphoric binding. The root of the moved category is formed by copying of *ℬ* from the reflexive and a set of categorial features from the preposition. The resulting node satisfies the selectional requirement *Op*, introduced by the VP-internal trace in virtue of its pointer to lexical address *14*. This syntactic dependency licenses matching of the trace's remaining attributes against those of the fronted category. This implies that the trace will be a prepositional category carrying *ℬ*. The latter instance of *ℬ* undergoes copying in the usual way until it is satisfied by the subject in Spec-IP, with the result that the anaphor is interpreted as bound by *Jan*.

(12)



We assume that syntactic reconstruction is obligatory: properties that undergo reconstruction are no longer 'active' in the antecedent. Therefore, if an anaphor undergoes Ā-movement, it is bound in the foot of the chain; it cannot be bound anywhere else. We can illustrate this using Dutch Ā-scrambling. This type of movement is licensed by focus and differs from A-scrambling in that it can reorder arguments (Neeleman 1994, Neeleman and Van de Koot 2008). As shown in (13), Ā-scrambling of a PP containing an anaphor across a local subject does not create a configuration that allows binding by the matrix subject:

(13) Piet$_1$ zei [$_{CP}$ dat [$_{PP}$ aan ZICHZELF$_{*1/✓2}$] Jan$_2$ nooit t_{PP} gedacht heeft.
Peter said that on self John never thought has

There are various ways in which the obligatoriness of syntactic reconstruction could be captured. Here we simply stipulate a ban on the presence of a copy of an attribute (a feature

anaphor has the form given in (11), while the logophor is realized as *hemzelf/haarzelf* 'himself/herself'. In English, the anaphoric and logophoric forms are indistinguishable.

or a selectional requirement) in the node containing a selectional requirement that licenses its reconstruction:[9]

(14) *Copy Condition*
Let n_1 be a node containing a selectional requirement $\mathcal{M}$ satisfied by its daughter node n_2. If $\mathcal{M}$ licenses reconstruction of an attribute α of n_2, then n_1 cannot contain a copy of α.

Thus, copying of $\mathcal{B}$ from a constituent that has undergone Ā-movement is impossible, because *Op* licenses reconstruction of $\mathcal{B}$. (Notice that the effects of this condition for features are different than for selectional requirements. Although a feature cannot be copied out of a moved category, it may of course be interpreted in that category. Therefore, it is possible to interpret the operator feature in moved WH-phrases in the head of the chain.)

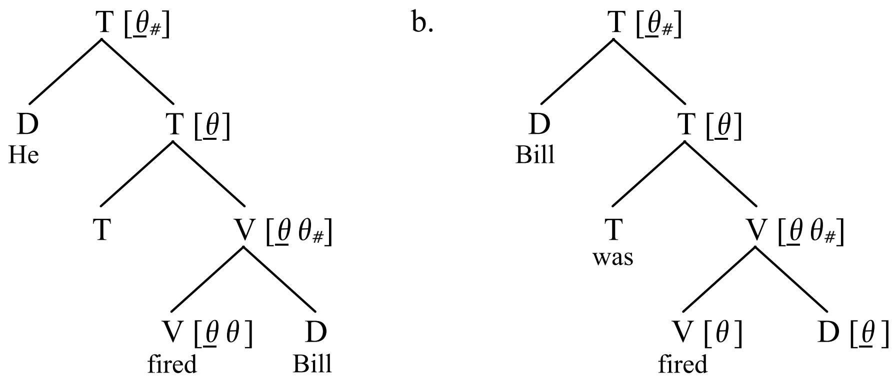
3.2 A-movement
Our proposal requires the existence of a family of selectional requirements encoding different types of movement. Limiting ourselves to displacement of phrases, we must at least be able to distinguish between Ā- and A-movement, so that we must assume at least one further selectional requirement that can encode movement. We can make an educated guess about the nature of the selectional requirement introduced by NP-trace if we take as our starting point the desideratum that one should be able to generalize over subjects of different classes of verb. How to achieve this is not entirely trivial. Subjects of transitive and unergative verbs receive external θ-roles, while subjects of passive and unaccusative verbs do not (their subjects are moved from a lower thematic position). There are two ways in which one might develop a unified view of subjects.

The first relies on a positional definition of subjects. For example, one could assume that subjects of unaccusative and passive verbs move to the position in which subjects of transitive and unergative verbs are base-generated (the standard view in early GB theory). One could also assume that all subjects move from a thematic position to a designated position externally to VP (see Kuroda 1988, Koopman and Sportiche 1991). In either case, a DP qualifies as a subject if and only if it occupies a particular structural position.

The alternative is to define subjects relationally: the subject of VP is the category that satisfies VP's external θ-role. Normally, this θ-role is introduced by the verb, but in passive and raising constructions it is introduced by NP-trace (a proposal in this spirit can be found in Williams 1986, 1994). If the relevant θ-role is satisfied VP-externally, subjects of passive and unaccusative verbs are indeed relationally equivalent to subjects of transitive and unergative verbs, as illustrated in (15). In (15b) the trace receives the verb's internal θ-role and simultaneously introduces a θ-role that is copied into the verbal projection. This role is satisfied by the VP-external argument, just like the external θ-role in (15a). If the trace is a variable, equated with *Bill* through assignment of its external θ-role, then – by transitivity – *Bill* will be interpreted as an argument of the verb.

[9] The two instances of α that the Copy Condition mentions are meant to be token-identical, not type-identical. That is, n_2 can contain an instance of α, as long as that does not originate in n_1 and therefore is not a copy of the instance of α that reconstructs. See note 20 for further discussion.

(15) a. b.



Given the general outlook of this paper, it will be clear that we should opt for an analysis of NP-trace as introducing a selectional requirement θ. We have emphasized the importance of syntactic dependencies and it would therefore be awkward to make additional assumptions that allow categories to acquire properties in virtue of their *position*. In fact there are several empirical arguments supporting the claim that NP-trace introduces θ; space does not permit us to discuss these here (but see Neeleman and Van de Koot 2002).

We can contrast the reconstructive behavior of θ with that of *Op*. Where θ is used to associate a predicate with its argument, there is no possibility of syntactic reconstruction (for example, one would not want to reconstruct the category of the argument into the verb). The simplest assumption is therefore that θ never licenses internal matching. This implies that syntactic reconstruction should be unavailable in A-chains, a conclusion in line with Chomsky 1993, 1995, Lasnik 1999, and Boeckx 2001.

Lack of syntactic reconstruction predicts that an A-moved anaphor must be bound in the head of its chain. This can be illustrated using nominative-dative inversion in Dutch (see Den Besten 1989, Broekhuis 1992, and references mentioned there): in passivized double-object constructions raising of the direct object to subject position is optional, giving rise to variation in surface order. The direct object in the examples at hand is an anaphor. In (16a) it fails to undergo raising and can therefore only be bound by the indirect object *Marie* 'Mary' (due to the locality of anaphoric binding). In (16b), the anaphor raises to the subject position of the embedded clause, where it can only be interpreted as bound by the matrix subject *Jan* 'John'.

(16) a. Jan_1 ziet [__ Marie_2 $\text{zichzelf}_{*1/\checkmark 2}$ getoond worden]
John sees Mary self shown be
'John sees Mary being shown to herself.'
b. Jan_1 ziet [$\text{zichzelf}_{\checkmark 1/*2}$ Marie_2 t_{DP} getoond worden]
John sees self Mary shown be
'John sees himself being shown to Mary.'

The fact that (16b) is unambiguous could potentially be attributed to a Principle C violation rather than a failure of the anaphor's selectional requirement to undergo reconstruction to the foot of the A-chain. However, as shown in (17b), Principle C cannot fully account for the data. Embedding of the anaphor in a larger constituent circumvents the Principle C violation, but (17b) is still unambiguous.

(17) a. Jan_1 ziet [__ Marie_2 een foto van $\text{zichzelf}_{\checkmark 1/\checkmark 2}$ getoond worden]
John sees Mary a photo of self shown be
'John sees Mary being shown a photo of himself/herself.'

b. Jan$_1$ ziet [[$_{DP}$ een foto van zichzelf$_{✓1/*2}$] Marie$_2$ t_{DP} getoond worden]
John sees a photo of self Mary shown be
'John sees a photo of himself being shown to Mary.'

We are aware of the fact that anaphors in DPs headed by a picture noun may display logophoric behavior. Presumably, this is because they can be bound by a silent possessor, which itself is interpreted through non-obligatory control.[10] This factor that may explain the contrast between (16a), which requires anaphoric binding, and (17a), which allows either anaphoric binding or control. However that may be, the lack of ambiguity in (17b) can only be understood if A-movement fails to reconstruct syntactically.

3.3 Interface reconstruction

So far, we have limited the discussion to reconstruction for syntactic properties. We believe there is compelling evidence for treating this type of reconstruction as essentially different from reconstruction for scope and so on, which we will refer to as 'interface reconstruction'. Syntactic reconstruction has to do with the syntactic properties of traces, while interface reconstruction involves the mapping between syntax and semantics. The distinction is hardly new: it has been argued for explicitly by Lechner 1998, who himself refers to earlier work by Cresti (1995) and Rullmann (1995). Related discussion can be found in Lebeaux 1998 and Boeckx 2001. While the proposal we sketch below differs in many details from Lechner's, we agree with his main motivation for distinguishing the two types of reconstruction, namely their contrastive behavior in a number of contexts, some of which we discuss below.

Of course, scope is the interface phenomenon par excellence. On just about anyone's approach, scope is a matter of interpreting LF representations. For many other phenomena we must rely on independent evidence to decide whether they involve syntactic encoding and hence syntactic reconstruction, or interpretive rules and hence interface reconstruction. In the realm of binding theory, there is general agreement that anaphoric dependencies are encoded syntactically. Consequently, anaphors in $\bar{A}$-chains undergo reconstruction, as demonstrated in section 3.1. By contrast, it has been argued that coreference (Reinhart 1983, Grodzinsky and Reinhart 1993) and variable binding (Reuland 2001) are not encoded syntactically.[11] If this argument stands, reconstruction for Principles B and C must be a matter of the interface.

It is beyond the scope of this paper to develop a full-fledged theory of interface reconstruction. However, we think the following rule provides a good approximation of the conditions under which reconstruction for scope and so on is permitted.[12] Needless to say, interface reconstruction displays additional complexities that cannot be dealt with here.

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[10] As expected, when there is an overt possessor, an anaphor contained in the picture noun phrase must be bound by it:

(i) Marie$_1$ bewondert Jan$_2$'s foto van zichzelf$_{*1/✓2}$
Mary admires John's photo of self
'Mary admires John's photo of himself.'

As pointed out by an anonymous reviewer, whether the logophoric nature of anaphors in picture nouns is indeed due to the presence of null possessor depends on the analysis of other structures in which anaphors are bound non-locally. It would take us too far afield to discuss this matter here.

[11] Anaphoric binding display the properties that Koster (1987) argues are systematically associated with syntactic dependencies, his 'configurational matrix' (see also Neeleman and Van de Koot 2002). Coreference and variable binding do not.

[12] Note that narrowing of the scopal domain of α in (18) can apply recursively.

(18) *Interface Reconstruction*
Let $\mathcal{M}$ be a member of the set of selectional requirements that encode movement and let α be the category that satisfies it.

i. The initial scopal domain of α is the node in which $\mathcal{M}$ is satisfied.
ii. The scopal domain of α can be narrowed from n_1 to n_2 if n_1 and n_2 contain $\mathcal{M}$ and n_1 immediately dominates n_2.

The clearest argument in favor of the possibility of interface reconstruction comes from A-movement, which does not reconstruct for syntactic properties of the antecedent, but does display quantifier lowering effects (see May 1979, Lebeaux 1998, and Fox 1999). In (19a), *some young lady* may be interpreted in the scope of *every senator*. By contrast, (19b) and (19c) are unambiguous. In (19b), the binding relation with the reciprocal forces *some young lady* to take surface scope. In (19c), the universal fails to take scope over an argument of the matrix verb. In view of these data, the ambiguity in (19a) must be due to reconstruction of the existential rather than raising of the universal.

(19) a. [$_{IP}$ Some young lady$_1$ seems [$_{XP}$ t_1 to be likely [t_1 to dance with every senator]]]
(i) some > every; (ii) every > some
b. [$_{IP}$ Some young lady$_1$ seems to herself$_1$ [$_{XP}$ t_1 to be likely [t_1 to dance with every senator]]]
(i) some > every; (ii) *every > some
c. [$_{IP}$ Mary$_1$ seems to some young lady [$_{XP}$ t_1 to be likely [t_1 to dance with every senator]]]
(i) some > every; (ii) *every > some

If we are correct in assuming that A-movement is subject to interface reconstruction, but not syntactic reconstruction, then the following data from Fox 1999 show that Principle C effects indeed fall under the former. If the existential is to be interpreted in the scope of *seem*, it cannot contain an R-expression coreferential with the pronominal complement of *seem*:

(20) a. [Someone from David$_1$'s city] seems to him$_1$ t to be likely to win the lottery.
(i) some > seem; (ii) *seem > some
b. [Someone from his$_1$ city] seems to David$_1$ t to be likely to win the lottery.
(i) some > seem; (ii) seem > some

The contrast between the two types of reconstruction can also be observed in Ā-chains. To begin with, reconstruction for syntactic properties of the antecedent always targets the foot of the chain. We can use a variant of (13) to demonstrate this. No matter how far we move the PP containing the anaphor, the only admissible binder remains the subject of the clause in which the PP originates. (See footnote 8 for discussion of the languages in which one can reliably check this.)

(21) [$_{PP}$ Aan ZICHZELF$_{*1/✓2}$] zei Piet$_1$ [$_{CP}$ t_{PP} dat Jan$_2$ nooit t_{PP} gedacht heeft]
on self said Peter that John never thought has
'Of himself Peter said that John has never thought.'

By contrast, interface reconstruction to an intermediate position in an Ā-chain is generally possible. We will illustrate with English examples, but the data can be replicated in Dutch. The evidence is based on the observation that weak-island inducing operators, such as *no one* block reconstruction of the restrictor of a WH-phrase (see Szabolcsi and Den Dikken 1999 for discussion and references). This explains the lack of ambiguity in (22a). However, (22b) *is* ambiguous, which indicates the existence of a reconstruction site below *every student* but above *no one*. This is exactly the kind of position that does not permit syntactic reconstruction.

(22) a. Which paper did no one believe [_*_] that every student is able to read [_*_]
b. Which paper did every student claim [_✓_] that no one is able to read [_*_]

Our proposal predicts a further divergence between syntactic reconstruction and interface reconstruction. Syntactic reconstruction must target a trace, while interface reconstruction can target positions that are not (intermediate) landing sites for $\bar{A}$-movement. This is because, by the rule in (18), a category that satisfies *Op* may be assigned as its scopal domain any node that contains *Op* and is dominated by $Op_{\#}$.

There is in fact general agreement that the phenomenon we refer to as 'interface reconstruction' can target a large number of positions. Proponents of the standard view that reconstruction sites must be traces deal with the data by arguing that more maximal projections than usually assumed have escape hatches through which movement must proceed. In fact, Fox has suggested "that one can construct an argument for the existence of intermediate landing sites in every maximal projection" (Fox 1999: 175, fn.32).

For example, in (23a), the restriction of the WH-expression cannot reconstruct to the foot of the chain, as that would lead to a principle C violation. Instead, it is assigned as its scope the sister of the subject, which could be attributed to the presence of an escape hatch in vP. (The facts in (23) are taken from Fox 1999; the examples in (23b) and (23c) are control sentences showing that interface reconstruction is sensitive to principle C.)

(23) a. [Which (of the) paper(s) that he_1 wrote for Ms. $Brown_2$] did every $student_1$ [_✓_] get her_2 [_*_] to grade?
b. *[Which (of the) paper(s) that he_1 wrote for Ms. $Brown_2$] did she_2 [_*_] get every $student_1$ [_*_] to revise?
c. [Which (of the) paper(s) that he_1 wrote for her_2] did Ms. $Brown_2$ [_*_] get every $student_1$ to revise [_✓_]?

Similar examples showing reconstruction to more unorthodox escape hatches are not hard to come by. The data in (24) parallel those in (23) and establish that the restriction of the fronted WH-expression in the first example must be assigned as its scope domain the verbal category immediately dominating *to her* (depending on one's analysis, this might be VP).

(24) a. In which class (that) he_1 is taking with Ms. $Brown_2$ will Bill introduce every $student_1$ [_✓_] to her_2 [_*_].
b. *In which class (that) he_1 is taking with Ms $Brown_2$ will Bill introduce her_2 [_*_] to every $student_1$ [_*_].
c. In which class (that) he_1 is taking with her_2 will Bill introduce Ms $Brown_2$ [_*_] to every $student_1$ [_✓_].

If reconstruction is indeed taken to exclusively target launching sites of movement, further exploration of the data will quickly establish the necessity of Fox's suggestion that every maximal projection contains an escape hatch. By contrast, the rule in (18) allows interface reconstruction to operate with the required degree of flexibility without sacrificing the idea that there is a limited set of categories that classify as phases and hence have an escape hatch.

The choice between the two theories is not a matter of taste. Let us assume that the additional escape hatches suggested by Fox must be classified as either A- or Ā-positions. If they are A-positions, long-distance Ā-movement will necessarily create configurations that are indistinguishable from improper movement, since movement from Spec-CP to Spec-CP must pass through an A-position. If they are Ā-positions, passive and raising will necessarily create configurations that are indistinguishable from improper movement, since movement from, say, the complement of V to Spec-IP will have to pass through an Ā-position. Thus, the proposal that every phrase is a phase needs to be worked out such that it avoids this dilemma.[13] These complications do not arise under the proposal developed here, which does not require intermediate traces for interface reconstruction. (We will see in section 7 that the inventory of movement types extends beyond the A-/Ā-distinction, but this does not affect the argument.)

To sum up, we have developed a theory according to which movement is mediated by selectional requirements, thus making it compatible with Inclusiveness, the central principle regulating phrase structure. An immediate pay-off of this proposal is that it follows that movement, like other syntactic dependencies, obeys c-command. Since Inclusiveness also implies that traces are terminals, a new theory of reconstruction is required. We propose that reconstruction for syntactic properties is accounted for by a process of internal matching, mediated by the selectional requirement *Op*. Matching forces the properties of the trace to be identical to those of the root of the antecedent. In this respect, the proposal is more restrictive than the copy theory, which requires full identity of traces and their antecedents. We have captured reconstruction for scope and related properties by assuming a syntax-semantics mapping rule that allows a category satisfying $\mathcal{M}$, a selectional requirement encoding movement, to be assigned as its scope any node that contains $\mathcal{M}$ and is dominated by $\mathcal{M}_{\#}$. In this respect, the proposal is less restrictive than the copy theory, which limits reconstruction for scope to positions in a movement chain (although increasing the number of escape hatches brings the theories closer).[14]

4 C-command

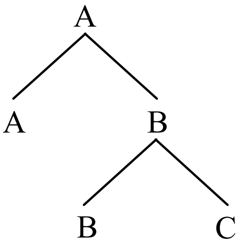
Chomsky's argument for the existence of internal merge is that it is unavoidable given that there can be no structural conditions on the input of merge. This is so because in the case of external merge the two elements to be merged are not part of the same tree prior to application of the merge operation. Therefore, any condition that requires that the subtrees to be merged are in some structural configuration prior to merger will rule out external merge. (Note that we have used a parallel argument above to support internal matching.)

[13] One might, for example, explore the possibility that the relevant escape hatches are not specified as A- or Ā-positions. However, for the notion of escape hatch to have any empirical content it must be selective; that is, it should tolerate only certain moved categories. This is apparent from early work on the issue (Chomsky 1973; Van Riemsdijk 1978; Szabolsci 1983).

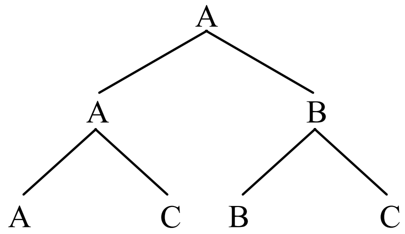
[14] The line of argumentation developed here is not available in HPSG. Since HPSG is monostratal, it can embody only one mechanism for reconstruction. Interface reconstruction, as described in this section, cannot exist as a phenomenon distinct from syntactic reconstruction. This implies that the properties relevant to interface reconstruction (quantifiers, bound variables, R-expression, and so on) must be structure-shared in a movement chain. This has been recognized explicitly in the case of quantifiers (see Pollard and Yoo 1998). Of course, increased structure-sharing brings the theory closer to the copy theory of movement. For example, it faces comparable problems in dealing with the reconstructive properties of A-chains and with reconstruction to intermediate positions in the path of the slash-feature.

The only structural conditions that can be imposed on merge must therefore be stated over its output. For example, Chomsky (1993) adopts the Extension Condition, according to which merger must create a new root. (In later work within the minimalist program this condition is replaced by more permissive variants; see Svenonius 2004 for an overview. This does not affect our argumentation.) The Extension Condition has a number of purported consequences, one of which is a ban on movement to a non-c-commanding position (so-called sideward movement). Thus, the step of internal merge that relates (25a) to (25b) is ruled out, because it fails to create a new root.

(25) a.

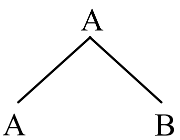


b. *



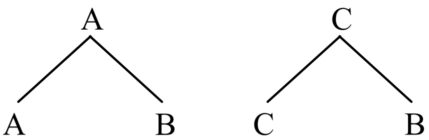
However, in all theories of merger that adopt the Extension Condition or something like it, intermediate stages of the derivation may consist of more than one (internally complex) tree. For example, in order to derive a sentence like *The man bought something*, it is necessary to assemble the subtree for *the man* and that for *bought something* before the final merge operation can take place. The unfortunate consequence of the necessity of intermediate stages with more than one tree in the 'workspace' is that it voids the Extension Condition of any empirical consequences. Internal merge – by definition – applies to a subtree that is a nonroot. In line with the Extension Condition this subtree is merged with the root of another tree. It is normally assumed that this second tree contains the first, but if we allow the 'workspace' to contain multiple trees, there is no reason why this should be so. As a consequence, the theory of internal merge incorrectly allows derivations like the one in (26), where B moves to a non-c-commanding position.

(26) a.



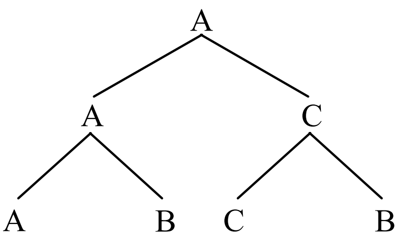
- A and B are selected from the numeration and merged.
- A projects.

b.



- C is selected from the numeration and merged with B.
- C projects.

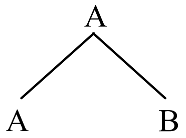
c.



- The two trees rooted in A and C are merged.
- A projects.

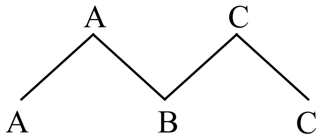
This problem does not just arise in Chomsky's implementation of internal merge. As shown in (27), there is an analogous derivation in the movement theory based on multi-dominance: like the tree in (26c), the graph in (27c) encodes sideward movement of B.

(27) a.



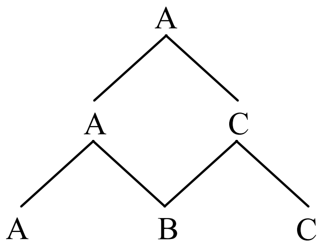
- A and B are selected from the numeration and merged.
- A projects.

b.



- C is selected from the numeration and merged with B.
- C projects.

c.



- The two trees rooted in A and C are merged.
- A projects.

That the type of derivation illustrated here is available on minimalist assumptions is corroborated by several publications that employ it to solve problems with certain types of movement. The most prominent of these are Nunes 1995, 2004, where it is argued that parasitic gaps and across-the-board movement involve one or more steps of sideward movement. Similarly, Bobaljik and Brown (1997) tackle the problem that head movement does not meet the Extension Condition by adopting a sequence of operations parallel to that in (26). The analysis of V-to-I that they advocate is as follows. Once the VP has been built, I is selected from the numeration and merged with a copy of the verb. Subsequently, the V/I-complex is merged with the VP. Finally, Citko (2005) addresses the problem that across-the-board movement leaves multiple traces associated with a single antecedent by arguing for what she calls 'parallel merge'. This is an operation that creates a representation of the type in (27b), which is later expanded into a rooted cyclic graph like (27c). Movement of B out of this structure creates the appearance of movement from multiple positions, even though only one constituent actually undergoes internal merge.

It would take us too far afield to evaluate the literature cited above, but there are alternative accounts of head movement and forking chains that are compatible with the approach to dependencies developed here (see Koeneman 2000, Bury 2003, and references given there, on head movement; see Neeleman and Van de Koot 2002 on forking chains.) What is crucial for the current discussion is that the theory of internal merge, even if it is combined with the Extension Condition, does not explain why the landing site of movement must c-command the launching site. So, where our proposal derives this condition from Inclusiveness, the copy theory must resort to a separate statement. This conclusion is tacitly accepted in Nunes 2004, where c-command is stipulated as a property of chain formation, an operation that applies to copies after internal merge has taken place.[15]

[15] One might think that the c-command condition on chain formation can be captured along the lines of Epstein 1999, who argues that syntactic dependencies must be established at the time of merger. However, Brody's (2002) comprehensive critique of Epstein's proposal establishes that the asymmetric properties of c-command cannot be derived from the symmetrical operation of merger.

5 A reconstruction paradox

The theory of reconstruction advocated in this paper imposes an important stricture on the information represented in a trace. Only properties that are part of the top node of the antecedent can be matched against properties of the trace. This implies that reconstruction is predicted to be selective in ways that would be unexpected on the copy theory of movement, which potentially makes all properties of the antecedent available in the trace.

In this section we show that the selective nature of reconstruction inherent in our proposal is key to solving a paradox involving reconstruction in remnant movement configurations. An explanation of the grammaticality of examples like (28) requires that the A-moved category, *this picture*, can be linked to its trace. This necessitates reconstruction in the $\bar{\text{A}}$-chain created by topicalization of *painted by Picasso*: the raised DP must have access to t_1 'through' t_2.

(28) [Painted t_1 by Picasso]$_2$ [[this picture]$_1$ does not appear to be t_2]

On the other hand, there is evidence from interface reconstruction phenomena that in remnant movement configurations the raised DP does *not* have access to its trace through the trace of the remnant. In the examples that demonstrate this, the category undergoing A-movement is an existential quantifier, while the category undergoing $\bar{\text{A}}$-movement contains a universal quantifier that can take scope over the base position, but not the surface position, of the raised existential. If the raised existential had access to its trace though the trace of the remnant, the ambiguity of the base structure would be preserved. In fact, however, the $\bar{\text{A}}$-trace behaves as if it is opaque for reconstruction of the existential. Thus, the following pattern of scopal interaction obtains:

(29) a. $[_{CP} \ldots [_{IP} \ldots [_{XP}\ \exists \ldots \forall \ldots]]]$ $(\exists > \forall; \forall > \exists)$
b. $[_{CP} \ldots [_{IP}\ \exists_1 \ldots [_{XP}\ t_1 \ldots \forall \ldots]]]$ $(\exists > \forall; \forall > \exists)$
c. $[_{CP}\ [_{XP}\ t_1 \ldots \forall \ldots]_2 \ldots [_{IP}\ \exists_1 \ldots t_2]]$ $(\exists > \forall; {*}\forall > \exists)$

We have already considered part of the data that instantiate the abstract structures in (29). In (30a) – which parallels (29b) – *some young lady* may be interpreted in the scope of *every senator* as a result of interface reconstruction in A-chains (see the discussion surrounding (19)). The key observation for present purposes is that scope reconstruction of the existential becomes unavailable once the constituent containing its trace undergoes WH-movement, as shown in (30b) – which parallels (29c).

(30) a. [$_{IP}$ Some young lady$_1$ seems [$_{XP}$ t_1 to be likely [t_1 to dance with every senator]]]
(i) some > every; (ii) every > some
b. [$_{CP}$ [$_{XP}$ How likely t_1 to dance with every senator]$_2$ does [$_{IP}$ [some young lady]$_1$ seem to be t_2]]
(i) some > likely/every; (ii) *likely/every > some

The observation that structures like (30b) are unambiguous goes back to Barss 1986. Sauerland and Elbourne (2002) refer to it as Barss's Generalization and formulate it as in (31), where 'total reconstruction' means reconstruction of all the material contained in a QP.

(31) *Barss's Generalization*
Total reconstruction of an A-moved QP to a position X is blocked when the QP does not c-command X in the overt form.

Sauerland and Elbourne (2002) give further examples that display the same pattern. One involves the licensing of the negative polarity item *any* through reconstruction to a position in the scope of negation. The example in (32a) shows that A-movement allows such reconstruction. However, reconstruction is no longer possible if a constituent containing the trace of A-movement is fronted, as in (32a’). The pair in (32b,b’) show that such fronting is fine if the stranded A-moved constituent is not dependent on any material in the fronted constituent.

(32) a. $[_{IP}$ [A doctor with any reputation]$_1$ was certain *(not) t_1 to be available]

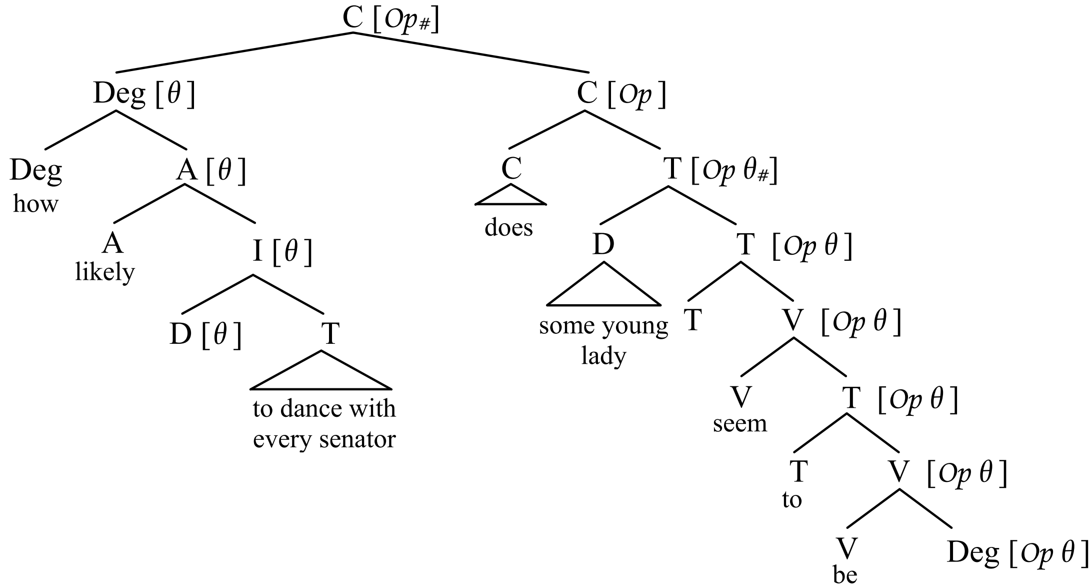
a’. *... and $[_{CP}$ $[_{XP}$ certain not to be t_1 available]$_2$ $[_{IP}$ [a doctor with any reputation]$_1$ was t_2]]

b. $[_{IP}$ [A doctor from cardiology]$_1$ was certain (not) t_1 to be available]

b’. ... and $[_{CP}$ $[_{XP}$ certain not to be t_1 available]$_2$ $[_{IP}$ [a doctor from cardiology]$_1$ was t_2]]

On our account, the paradox that the trace of A-movement is accessible through the trace of the remnant for syntactic purposes, but not for the purposes of scope reconstruction, dissolves as a result of the selective nature of reconstruction. Consider the representation of (30b) in (33).

(33)



In this structure, the selectional requirement θ that links *some young lady* to its thematic position is represented in the root node of the $\bar{A}$-moved remnant and reconstructs into the trace as a result of the application of *Op*. Hence, syntactic reconstruction obtains even though the trace is a terminal. This is of course what we have already seen for anaphoric binding in (12), where copying of $\mathcal{B}$ to the root node of the antecedent was sufficient to guarantee its presence in the trace.

Our rule for interface reconstruction in (18) states that the scope of a moved category may be successively narrowed along the path of movement. The fact that the $\bar{A}$-movement in (33) removes part of the path of θ from the structure dominated by $\theta_\#$ therefore implies that the number of reconstruction sites is reduced as well. The rule in (18) is conditioned by immediate domination, which makes it possible to narrow the scope of *some young lady* along the spine of the tree down to the terminal node labeled Deg. However, given that Deg does not dominate the fronted category, reconstruction into that category is not possible. But this means that the existential cannot interact with the universal. Ultimately, then, Barss's generalization falls out from the assumption that traces do not have internal structure.

It is important to point out that our account does not predict that either the raised subject or the remnant category must take surface scope. For the phenomena that we have associated with interface reconstruction, raising is raising and remnant Ā-movement is just another Ā-movement. Indeed, the raised subject can contain a variable bound under reconstruction (see (34a)), and so can the remnant (see (34b)).[16]

(34) a. [How likely t_1 to pass the exam]$_2$ does [his$_3$ weakest student]$_1$ appear to be t_2 to [every professor]$_3$?
b. [How likely t_1 to kiss his$_3$ best friend]$_2$ does Mary$_1$ appear to be t_2 to [every student]$_3$?

The paradox that the remnant is transparent for syntactic reconstruction but opaque for interface reconstruction is particularly recalcitrant when considered from the perspective of the copy theory of movement. The assumption that traces are copies explains why the raised DP can access its trace through the trace of Ā-movement: the A-trace is in fact part of the trace of Ā-movement. Similarly, it captures the scope reconstruction effects in (34). However, if the trace of Ā-movement has internal structure, then fronting of the remnant will *not* remove reconstruction sites for scope from the c-command domain of the moved quantifier. This is true no matter whether internal merge is conceptualized along the lines of Chomsky or Starke. Therefore, the fact that the raised DP cannot reconstruct for scope into the trace of the remnant remains mysterious.[17]

We are aware of two theories that attempt to reconcile the idea that traces have internal structure with Barss's Generalization. The first, proposed by Boeckx (2001), denies that the Ā-movement in (29c) plays any role in the explanation of the lost reading in remnant movement configurations. Boeckx claims instead that in the relevant examples the constituent labeled XP is introduced by a degree expression (namely *how*) and that A-movement cannot reconstruct across such an operator. In other words, the trace of Ā-movement does have internal structure, but reconstruction of the A-moved element is blocked by other factors.

This theory seems incorrect. First, even if no overt degree operator is present, preposing of a constituent that contains a trace of A-movement blocks reconstruction in the A-chain. This is shown by the lack of ambiguity found with (35), where *likely to dance with every senator* has been fronted.

(35) And [likely t_1 to dance with every senator]$_2$ [some young lady]$_1$ seems to be t_2.
(i) some > likely/every; (ii) *likely/every > some

[16] Some speakers favour extraposition of the PP in the examples in (34). This appears to be independent of variable binding. The same speakers also prefer extraposition in examples like *How likely to pass the exam does John appear to be to Mary*. Speakers who accept the variants of (34) without extraposition still allow variable binding.

[17] It is of course possible to express the observed restrictions on scope reconstruction in the copy theory by (i) distinguishing syntactic reconstruction and reconstruction for scope, and (ii) stipulating that syntactic reconstruction is possible whenever an antecedent c-commands a trace, while reconstruction for scope requires that an antecedent c-command *all* its traces. Assumption (i) goes against the spirit of the copy theory and the way interface reconstruction phenomena have been used to support it. Assumption (ii) is in effect an ad hoc statement about reconstruction in remnant movement configurations.

Second, as demonstrated by the example in (36a), the presence of an overt degree expression in a structure without Ā-movement does not block scope reconstruction. (*More* is not the only degree expression that fails to block reconstruction; in fact, we do not know of any degree expression that does.) For completeness, we add (36b), which is unambiguous, as expected.

(36) a. Some young lady is more likely [t_1 to dance with every senator] than some octogenarian.
(i) some > every; (ii) every > some
b. And more likely to dance with every senator than some octogenarian some young lady definitely is.
(i) some > likely/every; (ii) *likely/every > some

An alternative account of Barss's Generalization has been advanced by Sauerland and Elbourne (2002). These authors suggest that scope ambiguity with A-movement does not result from reconstruction. Rather, A-movement can take place either in the syntax or in the PF component of the grammar. Syntactic movement gives rise to a wide-scope interpretation of moved quantifiers, while PF movement is associated with narrow scope, as PF-movement does not feed the semantic interface:

(37) a. Some politician is likely to address every rally.
Syntactic movement:
PF: [some politician] is likely [~~some politician~~] to address every rally.
LF: [some politician] is likely [~~some politician~~] to address every rally.
some > likely/every
b. *PF-movement:*
PF: [some politician] is likely [~~some politician~~] to address every rally.
LF: is likely [some politician] to address every rally.
likely/every > some

This proposal captures Barss's Generalization on the further assumptions that Ā-movement cannot be delayed until PF and that lowering is ruled out in all components of the grammar. Consider why. The remnant in the crucial example undergoes Ā-movement, a syntactic operation. As a result the remnant-creating A-movement must take place in syntax as well, as in (38b). The derivation in (38c), which involves PF lowering, is blocked. Since syntactic A-movement give rise to wide scope only, the lack of ambiguity of (38a) follows.

(38) a. [How likely t_1 to address every rally]$_2$ is [some politician]$_1$ t_2?
b. *Syntactic movement:*
[some politician] is [how likely [~~some politician~~] to address every rally]
Syntactic movement:
[how likely [~~some politician~~] to address every rally] is
[some politician] ~~is~~ [~~how likely~~ [~~some politician~~] ~~to address every rally~~]
c. *Syntactic movement:*
[how likely [some politician] to address every rally] is
~~is~~ [~~how likely~~ [~~some politician~~] ~~to address every rally~~]
PF-movement (lowering of some politician*):*
*[how likely [~~some politician~~] to address every rally] is
[some politician] ~~is~~ [~~how likely~~ [~~*some politician*~~] ~~to address every rally~~]

The main problem with Sauerland and Elbourne's proposal is that the case for PF movement is weakened by the fact that it has all the properties of syntactic movement. As already noted, it must target a c-commanding position. In addition, it is subject to the cycle (so that an alternative derivation in which *some politician* undergoes raising out of the lower copy rather than lowering from the higher one is ruled out). This is suspicious, as the newly introduced operation duplicates properties of syntactic movement (note that other proposals involving PF movement, for example Bobaljik's 1995 account of affix hopping, argue that it has different properties).

Moreover, in order for the theory to be empirically adequate, PF-movement must obey conditions that mention the LF notion of scope. First, in order to keep the theory from overgenerating, Sauerland and Elbourne are forced to stipulate that PF movement of a constituent X is licensed only if (i) there is a scope-taking element Y such that X takes scope over Y if moved in the syntax, but below Y if moved at PF, and (ii) the two scopal construals are semantically distinct.

Second, reconstruction in A-chains is blocked by certain intervening quantifiers, such as negation. This means that PF-movement must be blocked by these quantifiers. Of course, there is no reason inherent to the PF component why this should be so. The problem is brought into focus by the observation that the same operators block reconstruction in $\bar{A}$-chains (see Szabolcsi and Den Dikken 1999 for discussion and references), a phenomenon that Sauerland and Elbourne locate at LF, along with most other researchers. It seems unlikely to us that a movement that shares all relevant properties with syntactic movement and is sensitive to scope could take place in the PF branch of the grammar.

Our overall conclusion is that Barss's Generalization is captured much more straightforwardly on an analysis of traces as terminals. This is especially remarkable in view of the general permissiveness of the scope rule we have proposed.[18]

6 Interactions between A- and $\bar{A}$-movement

There is an important asymmetry between the selectional requirements encoding A- and $\bar{A}$-movement. As we have seen, *Op* licenses reconstruction of θ, but θ does not allow reconstruction of *any* attribute, and hence not of *Op* either. This captures several well-known interactions between A- and $\bar{A}$-movement that were already captured by the theory developed in Van Riemsdijk and Williams 1981: (i) A-movement chains can be extended through $\bar{A}$-movement, but $\bar{A}$-chains cannot be extended through A-movement; (ii) $\bar{A}$-movement out of an A-moved category is possible, but A-movement out of an $\bar{A}$-moved category is not; (iii) a remnant created by A-movement can undergo $\bar{A}$-movement, but a remnant created by $\bar{A}$-movement cannot undergo A-movement. Van Riemsdijk and Williams' account is based on an assumption about level-ordering, according to which all A-movement must precede all $\bar{A}$-movement. Here we show that the same generalizations can be derived from our characterization of the selectional requirements that encode A- and $\bar{A}$-movement, without recourse to ordering statements.

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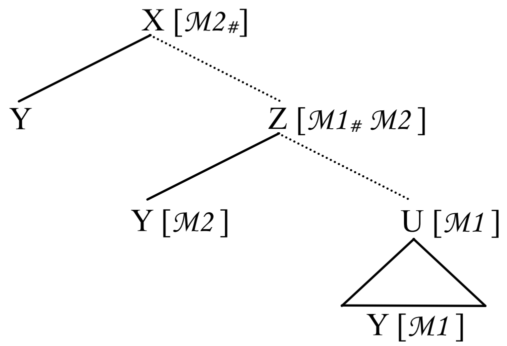
[18] We observed in footnote 14 that, in order to deal with interface reconstruction, HPSG must assume structure-sharing for more properties than originally assumed. Indeed, Pollard and Yoo (1998) argue that the QSTORE feature is part of the LOCAL feature, so that it is structure-shared in an $\bar{A}$-chain. The QSTORE-feature of a category contains information about all the quantifiers contained in it. This implies that structure-sharing in an $\bar{A}$-chain will make available in the trace all information about quantifiers contained in the antecedent. As a result, HPSG is unable to capture the data that motivated Barss's Generalization. The problem can ultimately be traced back to the fact that the theory makes available only one mechanism for reconstruction, just like the copy theory of movement.

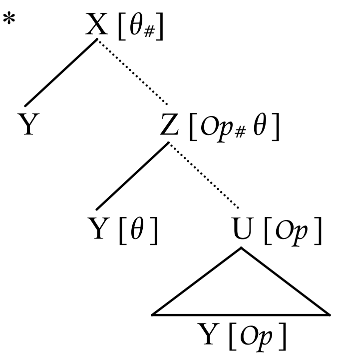
The general representation associated with examples involving stepwise movement of the same category is given in (39).

(39)

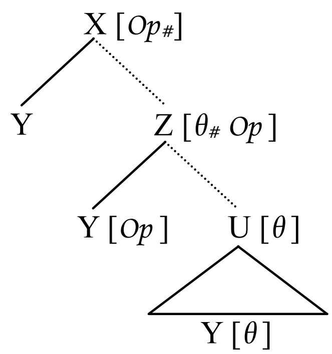


In this tree, *ℳ2* must be copied to Z from the trace that introduces it and then onwards to X, where it is satisfied. As we have just argued, this will only be possible if *ℳ1* is a selectional requirement that does not trigger syntactic reconstruction of *ℳ2*. If it did, Z would not be able to host a copy of *ℳ2*, as a consequence of the Copy Condition in (14). Therefore, an instantiation of (39) as (40a) is ruled out, as satisfaction of *Op* triggers reconstruction of θ. By contrast, an instantiation of (39) as (40b) is grammatical, because θ does not give rise to syntactic reconstruction of *Op*. Therefore, A-chains can be extended with $\bar{\text{A}}$-movement, but not vice versa.

(40) a. *



b.



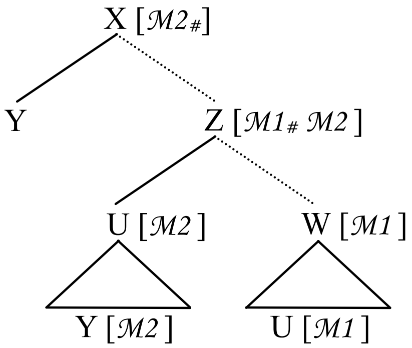
That this asymmetry in composite movement chains exists is generally accepted. We will not demonstrate the grammaticality of structures like (40b). (40a) is a configuration of improper movement; its deviance is apparent from examples like those in (41). Given the standard assumption that the specifier of CP is an $\bar{\text{A}}$-position, these examples must be generated by a derivation in which $\bar{\text{A}}$-movement to Spec-CP feeds A-movement.

(41) a. *[This book]$_1$ appears [$_{\text{CP}}$ t_1 that John has read t_1]
b. *[Which book]$_1$ was asked [$_{\text{CP}}$ t_1 John had read t_1]

Although the ban on improper movement is based on long-standing observations, there is no consensus regarding its explanation in current theorizing. Our proposal can be seen as a reconstruction of the insights in Van Riemsdijk and Williams 1981. Like Van Riemsdijk and Williams, we link the reconstructive properties of A- and $\bar{\text{A}}$-movement (for example, with respect to binding) to the patterns of interaction between these movements. However, rather than relying on level ordering, the account developed here builds on the assumption, forced by Inclusiveness, that movement is encoded through a selectional requirement introduced by a trace. After all, the extendibility of a chain depends on whether this selectional requirement, when introduced by an intermediate trace, is reconstructed alongside other syntactic properties of that node.

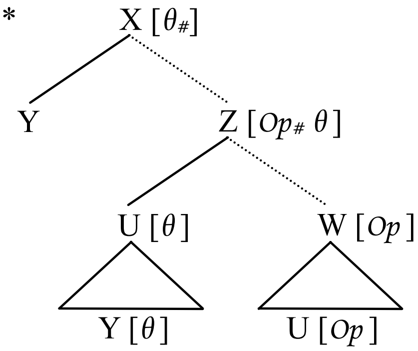
We now turn to movement out of a moved category. An abstract representation of a derivation of this type is given in (42).

(42)

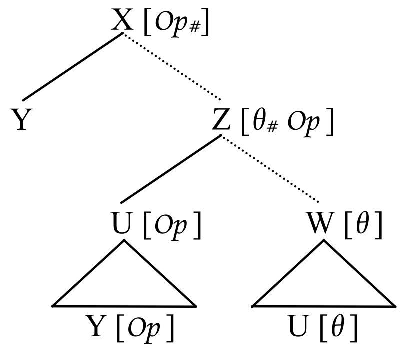


As before, this tree will be grammatical only if $\mathcal{M}1$ does not reconstruct for $\mathcal{M}2$. This is because reconstruction of $\mathcal{M}2$ is incompatible with the presence of a copy of this selectional requirement in Z (as stated in the Copy Condition). Therefore, the instantiation of (42) in (43a) is ruled out, while the instantiation in (43b) is grammatical.

(43) a. *



b.



In fact, the source of this asymmetry is identical to the one underlying the contrast between improper movement and A-chains extended by Ā-movement: the trees in (40) and (43) are identical, except for the fact that U has internal structure in the latter. Again, it is the local encoding of movement that allows this generalization to be captured. In the standard theory, it is not obvious how one could generalize over these cases, as extension of a chain and movement out of a moved category do not share obvious structural properties.

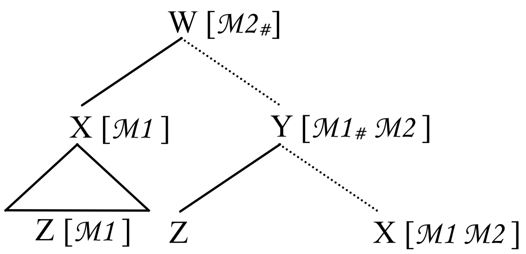
Indeed Ā-moved constituents are islands for A-movement. In (44a), for example, a prepositional phrase has been moved to Spec-CP, after which the complement of the preposition has undergone pseudo-passivization. Although both movements exist in English, combining them in this way is impossible. In (44b), topicalization feeds pseudo-passivization, again with poor results. (The latter structure might be independently ruled out as a case of improper movement, if raising must pass through Spec-CP.)

(44) a. *[Young children]$_2$ are believed [[to t_2]$_1$ that you should never give matches t_1]
b. *[Young children]$_2$ are believed [(t_2) that [[to t_2]$_1$ that you should never give matches t_1]]

While Ā-movement freezes constituents for A-movement, the reverse is not true. WH-extraction from exceptionally case-marked subjects is (somewhat) degraded for some speakers (see, for example, Kayne 1984), but fully acceptable for others (see, for example, Chomsky 1986b; see Gallego and Uriagereka 2006 and Chomsky 2008 for related discussion).[19] It does not seem to make any difference, however, whether the exceptionally case-marked subject has undergone raising internally to the infinitival complement, as in (45a), suggesting that extraction from a raised DP is possible. For those readers who find the contested status of the English example insufficiently convincing, we offer the Dutch examples in (45b) and (45c), which seem fully grammatical to us.

(45) a. %Who$_2$ do you believe [[pictures of t_2]$_1$ to have been sold t_1 on the internet]?
b. Waar$_2$ zag je [[een oude foto van t_2]$_1$ Marie t_1 getoond worden]?
where saw you a old photo of Marie shown be
'What did you see an old photo of being shown to Mary?'
c. Wat$_2$ zag je [[t_2 voor foto]$_1$ Marie t_1 getoond worden]?
what saw you for photo Marie shown be
'What kind of photo did you see being shown to Mary?'

The final interaction to consider involves remnant movement. In the abstract representation in (46), movement of Z creates a remnant category X, which is subsequently moved across Z's surface position.

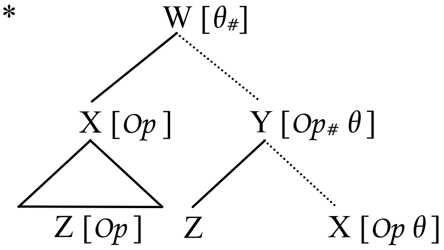
(46)


Recall that chain extension and movement out of a moved category are only possible if the initial step of movement does not reconstruct for the selectional requirement that encodes the second step of movement. The grammaticality of remnant movement, however, *requires* reconstruction. The selectional requirement encoding the remnant-creating movement must be reconstructed to the trace of the remnant, if Z is to be linked to *its* trace. In other words, in (46) *M2* must license reconstruction of *M1*.

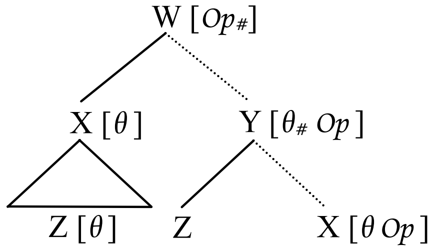
Therefore, A-movement can create a remnant that undergoes Ā-movement, but Ā-movement cannot create a remnant that undergoes A-movement. The structure in (47a) is ungrammatical, because it requires reconstruction of *Op*, something not licensed by satisfaction of *θ*. In contrast, (47b) is grammatical because *Op* reconstructs for *θ*.

[19] Of course, the traditional view is that extraction from subjects, whether moved or in situ, is impossible (see Rezac 2004 and Broekhuis 2005 and references mentioned there).

(47) a. *



b.



That A-movement can indeed create a remnant that undergoes Ā-movement has already been illustrated extensively in the discussion of Barss's generalization. The reverse pattern, Ā-movement followed by A-movement of the remnant, yields ungrammatical structures. We can demonstrate this using Dutch examples. Recall that in this language NP-raising is optional. Thus, the structure in (48a) coexists with the one in (48b), where the direct object has been raised to a VP-external position, crossing the indirect object. Dutch also has an operation of Ā-scrambling (see Neeleman and Van de Koot 2008, and references mentioned there). This operation derives (48c) from (48a). If Ā-movement could feed remnant A-movement, we would expect (48d) to be grammatical, contrary to fact. As expected, Ā-scrambling of *alleen daar* 'only that' cannot be followed by raising of the remnant *een foto van* 'a photo of'.

(48) a. dat de meisjes een foto van Piet meestal bevalt.
that the girls a photo of Pete usually pleases

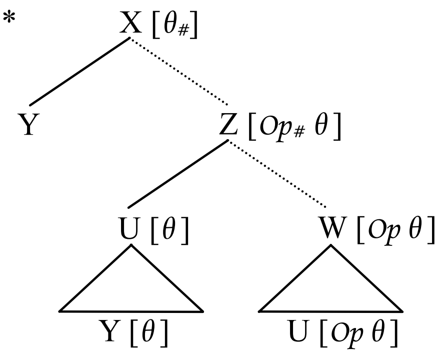
b. dat [een foto van Piet]$_1$ de meisjes t_1 meestal bevalt.
that a photo of Pete the girls usually pleases

c. dat de meisjes [alleen DAAR]$_1$ een foto van t_1 echt bevalt.
that the girls only there a photo of really pleases

d. *dat [een foto van t_1]$_2$ de meisjes [alleen DAAR]$_1$ t_2 echt bevalt.
that a photo of the girls only there really pleases

It is important to note that the remnant creating movement in (46) should not be able to cross the landing site of remnant movement. If it could, this would give rise to a configuration empirically indistinguishable from the ungrammatical case of movement from a moved constituent in (43a):

(49) *



We need not formulate any further condition to eliminate (49), because the presence of θ in Z violates the Copy Condition.[20]

[20] Note that the Copy Condition applies to token-identical rather than type-identical attributes. In other words, it is possible for a θ-role to be copied to Z in (49), as long as that θ-role is not token-identical

We can summarize the results so far as follows. Let $\mathcal{M}1$ and $\mathcal{M}2$ be selectional requirements that encode movement. If $\mathcal{M}2$ reconstructs for $\mathcal{M}1$ but not vice versa, we expect the following pattern of interaction: (i) a chain created by $\mathcal{M}1$ may be extended using $\mathcal{M}2$, but a chain created by $\mathcal{M}2$ cannot be extended using $\mathcal{M}1$; (ii) a constituent that satisfies $\mathcal{M}1$ allows subextraction using $\mathcal{M}2$, but a constituent that satisfies $\mathcal{M}2$ does not allow subextraction using $\mathcal{M}1$; (iii) $\mathcal{M}1$ may create a remnant that is moved using $\mathcal{M}2$, but $\mathcal{M}2$ cannot create a remnant that is moved using $\mathcal{M}1$.

7 UCOOL(R)

We have illustrated the predictions of our theory with a specification of $\mathcal{M}1$ and $\mathcal{M}2$ as θ and $\mathcal{O}p$. However, it is likely that there are more movement types, and hence it is expected that the patterns identified above have more than one instantiation. There are several authors who have argued that the typology of phrasal movement indeed goes beyond the A/Ā-distinction and that the interactions between these movements mirror what is found with A/Ā-interactions. Perhaps the most prominent work in this area is by Edwin Williams (1974, 2003); see also Sternefeld 1992 and Müller 1998. Williams (2003), building on his earlier work with Van Riemsdijk, develops a model of grammar that has several levels of representation, with a specific type of movement associated with each level. Because levels are strictly ordered with respect to each other, certain movements must precede certain others, giving rise to the kind of effects we have already seen for A- and Ā-movement.

There have been several attempts to reinterpret (some of) Williams' proposals in models of grammar that have fewer levels of representation (see, for example, Svenonius 2004 and Nevins 2004). The reworking most relevant here can be found in Abels 2007. Abels argues that Williams' hierarchy of levels of representation can be replaced by a hierarchy of movement operations, which he dubs the Universal Constraint on Operational Ordering in Language (UCOOL). The effects of UCOOL come about through a principle called GenPIM, which makes reference to the hierarchy of movement types (we discuss GenPIM below). Abels illustrates the effects of his theory for four types of movement found in German, namely A-movement, scrambling to a position preceding the subject, WH-movement and topicalization into the *Vorfeld* (we refer to Abels' paper for a detailed description of these movements). They are ordered as in (50).[21]

(50) UCOOL
... << A-movement << Scrambling << Wh-movement << Topicalization << ...

The prediction made by the conjunction of UCOOL and GenPIM is that the pattern we have derived for interactions between A- and Ā-movement should hold between any two movements in (50), as long as the first is subordinate to the second. For example, scrambling may extend an A-movement chain, take place out of A-moved constituents, and affect remnants created by A-movement. However, A-movement may not extend a chain created by scrambling, take place out of a scrambled constituent, or affect remnants created by scrambling.

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to the one that was reconstructed from U. Such structures exist and are well-formed, but we will not demonstrate this here.

[21] We should perhaps point out that scrambling to the pre-subject position in German has properties that differ substantially from focus scrambling in Dutch. The latter seems to be more like WH-movement/topicalization.

A large part of Abels' paper is devoted to establishing that the conjunction of UCOOL and GenPIM makes the correct predictions for German. All of the feeding relations ruled out by Abels' theory are indeed unattested, and the vast majority of feeding relations predicted to exist indeed occur. Where this is not the case, there seem to be extraneous factors at play. The data are summarized in the following table (adapted from Abels' (36)), where the feeding operations are given in the first column and the subsequent movements in the first row. These results are very similar to those reported in Williams 2003 on the basis of partly differently languages and constructions (see page 136 of that work).

(51)		A-movement	Scrambling	Wh-movement	Topicalization
A-movement	extension		✓	✓	✓
	subextraction		✓	✓	✓
	remnant mvt		?	✓	✓
Scrambling	extension	*		✓	✓
	subextraction	*		%	%
	remnant mvt	*		✓	✓
Wh-movement	extension	*	*		*
	subextraction	*	*		??
	remnant mvt	*	*		??
Topicalization	extension	*	*	*	
	subextraction	*	*	*	
	remnant mvt	*	*	*	

Within the framework developed here, the data can be understood if UCOOL is really a hierarchy of selectional requirements. We will dub this variant of UCOOL the Universal Constraint on Operational Ordering in Language Reinterpreted (UCOOLR):

(52) UCOOLR
... << *θ* << *Scr* << *Op* << *Top* << ...

In (52), *Scr* encodes German scrambling and *Top* topicalization to the *Vorfeld*. The effects of UCOOLR come about through its interaction with a principle stating that a superordinate selectional requirement triggers reconstruction of all subordinate selectional requirements, while a subordinate selectional requirement does not reconstruct for any superordinate selectional requirements:

(53) *Principle of Syntactic Reconstruction* (PSR)
Satisfaction of a selectional requirement *SR1* gives rise to syntactic reconstruction of *SR2* if and only if *SR2* << *SR1* under UCOOLR.

It should be obvious that the combination of UCOOLR and PSR predicts that the pattern of interaction found with A- and $\bar{\text{A}}$-movement extends to any other pair of distinct movement types encoded by the selectional requirements mentioned in (52).

As far as we can tell, Abels' proposal and ours are empirically indistinguishable. There is, however, an important conceptual difference: where we rely on PSR to reap the benefits of the hierarchy of movement operations, Abels relies on a principle called GenPIM, which we give in (54).

(54) *Generalized Prohibition on Improper Movement* (GenPIM)
No constituent may undergo movement of type τ if it has been affected by movement of type σ, where $\tau \ll \sigma$ under UCOOL.

GenPIM itself is formulated in terms of a notion of 'affectedness', defined as in (55).

(55) *Affectedness*
A constituent α is affected by a movement operation if and only if
i. α is reflexively contained in the constituent created by movement, and
ii. α is in a (reflexive) domination relation with the moved constituent.

What this definition expresses is that movement affects (i) the moved constituent, (ii) any node contained in the moved constituent, and (iii) any node on the path from the moved constituent to its trace. We will not demonstrate this here, but these three cases cover extension of chains, extraction from moved categories and remnant movement, as required.

While the notion of affectedness fits the empirical bill, it must – by its very nature – remain arbitrary. There is no reason inherent in the theory of movement why the nodes affected by movement should be those covered by the definition in (55) rather than, for example, only the moved category or all nodes dominated by the mother of the moved category. We believe that our proposal has advantages over Abels' in this respect.

Specifically, it is inherent in the way reconstruction works that the nodes affected by movement are precisely those identified by Abels. Consider the three cases identified above. A moved constituent is a category that satisfies a selectional requirement that encodes movement. It will be affected by this in that the satisfied selectional requirement will reconstruct selectional requirements lower on the hierarchy in (52). This implies that certain chain extensions will be excluded (see the discussion surrounding (39)). It also implies that any node contained in the antecedent is affected. If such a node is to move, a selectional requirement must pass through the root of the moved category, where it may or may not be subject to reconstruction (see the discussion surrounding (42)). Any node on the path from the moved category to its trace is affected because movement of those nodes will take away the source for the selectional requirement that licenses the moved category to begin with. Therefore, movement of a node in the path is only possible if it is of a type that reconstructs for the relevant selectional requirement (see the discussion surrounding (46)).

Notice that this explanation of Abels' notion of affectedness crucially involves the local encoding of movement dependencies: all affected nodes are either the source of a selectional requirement or nodes to which a selectional requirement is copied.

8 Intermediate traces?

In the above discussion we have not considered interactions between movements of the same type (the cells that form the diagonal in (51) were left blank). The reason for this is that we believe that such interactions are not regulated by the theory of reconstruction, but rather banned altogether by a principle governing the content of nodes. This principle, discussed in some detail in Neeleman and Van de Koot 2002, is given below:

(56) *Distinctness*
The syntax interprets attributes of a node that cannot be distinguished as one and the same.

The upshot of this principle is that a feature or selectional requirement cannot be present more than once in the same node. For example, no node is specified as a verb twice and no anaphor requires multiple antecedents (encoded as *[$\mathcal{B}$ $\mathcal{B}$]).[22]

Distinctness has immediate consequences for the theory of movement interactions. In each of the trees representing movement out of a moved category, remnant movement and successive cyclic movement, there is at least one node that contains two selectional requirements. If these cannot be identical, this rules out any interaction between movements of the same type.

Let us first consider movement out of moved categories. In (42), the node labeled Z is specified as [$\mathcal{M}1_{\#}$ $\mathcal{M}2$]. It follows from Distinctness that in this representation $\mathcal{M}1$ and $\mathcal{M}2$ cannot be instantiations of the same selectional requirement. Hence, a category that has undergone movement of a particular type is an island for movements of that type. It has long been known that this is indeed the case. Some representative data involving $\bar{A}$-movement are given below. The examples in (57) show that, in cases of long-distance movement, it is not possible to strand pied-piped material in intermediate positions in either WH-chains or chains created by topicalization.

(57) a. *Whom$_1$ did John say [[to t_2]$_1$ that one should never give matches t_1]?
b. *[Young children]$_2$ John said [(t_2) that [to t_2]$_1$ one should never give matches t_1].

In example (58a), taken from Lasnik and Saito 1992, each of the WH-movements has an independent trigger, showing that the relevant freezing effect is unrelated to conditions on pied-piping. Similarly, topicalization out of a constituent that has undergone topicalization is impossible, as shown by (58b).[23]

(58) a. ??Who$_1$ do you wonder [[which picture of t_2]$_1$ Mary bought t_1]?
b. *[Young children]$_2$ John said [(t_2) that [too many friends of t_2]$_1$ one should not invite t_1].

The second interaction to be considered is that of remnant movement. In the configuration in (46), the node labeled X is specified as [$\mathcal{M}1$ $\mathcal{M}2$]. By Distinctness, these selectional requirements cannot be identical, and therefore remnants created by a particular type of movement cannot undergo movement of that type. This generalization has in fact been established in the literature on remnant movement (see Fukui 1997, Kitahara 1997, Müller 1998, Takano 2000, and Williams 2003). We give one representative example from German, where remnants created by scrambling cannot be scrambled.

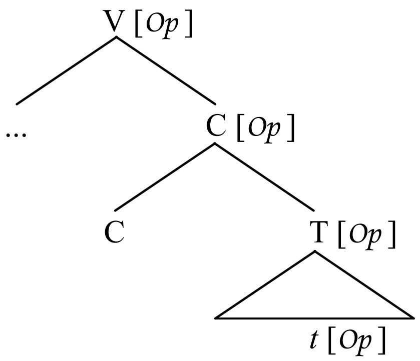
[22] In Neeleman and Van de Koot 2002, Distinctness is combined with the idea that nodes can be structured so as to allow multiple θ-roles, among other things. However, the theory of nodes developed there implies that such structure is only available in very limited circumstances, which do not obtain in the structures to be discussed below.

[23] Lasnik and Saito (1992) note that examples like (58a) improve somewhat if the subextracted phrase is D-linked (see also Gallego and Uriagereka 2007 and references cited there). In addition to this, we may note that subextraction of adjuncts in similar configurations gives rise to severely degraded results. These data suggest that there may be two types of WH-movement, one of which is exclusive to D-linked arguments (see Rizzi 1990 and Cinque 1990). If this latter type is more prominent on UCOOL(R), then we may expect that subextraction of D-linked arguments from an expression that has undergone WH-movement is acceptable, assuming other conditions on movement are met. It would take us too far afield to explore this possibility here.

(59) *daß [t_1 zu lesen]$_2$ es$_1$ keiner t_2 versucht hat.
that to read it no one tried has
'that no one has tried to read it.'

The final interaction concerns movement of a category that has already been moved. Our proposal makes the controversial prediction that chain extension is impossible if the lower part and the upper part of the chain are created by the same type of movement. In the structure in (39), the node labeled Z is specified as [$\mathcal{M}1_{\#}$ $\mathcal{M}2$]. If no node can contain the same attribute twice, it follows that $\mathcal{M}1$ cannot be identical to $\mathcal{M}2$. Therefore, a trace cannot introduce the same selectional requirement it satisfies. This does not imply that our proposal rules out long-distance movement, but rather that such movement will not involve intermediate traces. Instead, it is the selectional requirement introduced in the foot of the chain that continues to be copied upward past any cyclic nodes:

(60)



This raises the question whether there is any empirical evidence that distinguishes the proposal outlined above from theories that assume intermediate landing sites. We do not think that restrictions on movement normally considered sensitive to intermediate traces can provide such evidence. Such restrictions can easily be reformulated in terms of sensitivity to the percolation of selectional requirements that encode movement. For example, the fact that only $\bar{A}$-movement can cross a CP boundary can be captured by a feature cooccurrence restriction of the form *C [θ] (that is, nodes with a C label cannot contain θ-roles). This is equivalent to the statement that the specifier of CP is an $\bar{A}$-position.

Similarly, intermediate traces have been used to capture anti-locality effects (see Abels 2003 and references mentioned there). The basic idea is that no complement can recombine through movement with a projection of its selecting head. As a consequence, complements of heads that project a cyclic domain are frozen in place, as they cannot reach the escape hatch without violating anti-locality. Indeed, it has been observed that IP, for example, cannot move when generated as the complement of C (Den Dikken 1995 calls this the IP Immobility Principle). Again, Abels' proposal can be reformulated as a condition on the percolation of selectional requirements. As far as we can tell, the empirical effects of (61) are identical to an anti-locality condition whose formulation presupposes the existence of intermediate traces.

(61) *Anti-Locality*
Within a cyclic domain the path of any selectional requirement encoding movement must span more than one maximal projection.

A third domain in which intermediate traces have been claimed to have empirical effects is that of reconstruction. However, we have shown in section 3 that syntactic reconstruction never targets intermediate traces and that interface reconstruction can target any maximal projection in the path of movement, and not just escape hatches of cyclic domains.

A final argument for intermediate traces comes from the observation that in some languages long-distance movement triggers a different form of the declarative complementizer in every intermediate CP. In Irish, for example, the regular declarative complementizer *go* is replaced by *aL* (see Chung and McCloskey 1987 and McCloskey 2002). This is not only true of relative clauses like (62), but also of clefts and of WH-extraction.

(62) An rud Op_1 aL shil me aL duirt tu aL dheanfa t_1
The thing ***aL*** *thought I that said you* ***aL*** *you-would-do*

The standard analysis of data of this type is that the special form of the complementizer results from specifier-head agreement with an intermediate trace (see, for instance, Rizzi 1990). Although this is possible, there is an obvious alternative: the shape of the complementizer could simply reflect the presence in its projection of *Op*, the selectional requirement encoding $\bar{\text{A}}$-movement. For example, one could argue that Irish has two declarative complementizers, one of which is specified as hosting *Op* in its projection. In the case of long-distance movement, the Elsewhere Condition dictates that this complementizer be used, rather than the less specified default form.

The standard analysis and our alternative make divergent prediction regarding morphological reflexes of long-distance movement.

First, we expect that such reflexes are not limited to heads of cyclic domains, but can in principle be found anywhere along the path of movement. Müller's (2008) reading of the literature is that this is indeed the case. For instance, focus movement in Ewe licenses a different form of subject pronouns in Spec-TP (see Collins 1993, 1994), while tonal downstep in Kikuyu is a reflex of long-distance movement that does not exclusively identify CP or vP edges (see Clements et al. 1983).

Second, if intermediate traces are responsible for morphological reflexes of long-distance movement, it is predicted that heads of cyclic domains can agree for any of the features contained in the moving phrase. One would not expect 'operator agreement' to be qualitatively different from, say, subject-verb agreement. If the relevant morphological reflexes are instead triggered by the presence of a selectional requirement encoding movement, it is predicted that alternations in C will *not* be sensitive to features of the moving phrase. At best, C can reflect that a chain is formed across it. The Irish data mentioned earlier fit well with the latter view: agreement is not for any features of the moved constituent, but simply reflects that movement has taken place. This is, in fact, the characterization of the phenomenon in McCloskey 2002. To the best of our knowledge, the Irish pattern is the typical one: agreement for φ-features, for example, is rare and perhaps non-existent in the kind of alternations under discussion.[24]

[24] There are two languages that are potential counterexamples to this generalization. In Malay, $\bar{\text{A}}$-movement of NP arguments triggers the omission of a verbal prefix in every verb spanned by the chain (see Cole and Hermon 1998). In Kinande, there is agreement on C that reflects the nominal class of the moving phrase (see Schneider-Zioga 2000). The Malay data yield to a simple analysis if there is more than one selectional requirement that encodes $\bar{\text{A}}$-movement (one of which is available only for NP arguments). This possibility fits well with the distinction between *Op* and *Top* in (52).The Kinande data are complex, because agreement in C is accompanied by suppression of regular verbal agreement. This suggest that agreement in C might be displaced verbal agreement. The data given in Schneider-Zioga 2000 do not suffice to explore this hypothesis.

In short, the evidence does not support the existence of intermediate traces in designated positions.

We conclude this section with a brief motivation for why we have relied on a separate principle to regulate interaction between movements of the same type, rather than extend the account based on UCOOL(R). The motivation for this is empirical. Consider the pattern found with two different types of movement, MT1 and MT2, where MT2 reconstructs for MT1, but not vice versa. The table below lists the full set of predictions for interactions between MT1 and MT2, based on three alternative hypotheses. All of them regulate interaction between movements of different types through UCOOL(R). Hence the three rising diagonals are identical. However, the falling diagonals differ. If UCOOL(R) is combined with Distinctness, we arrive at the first sub-table, where the cells in the falling diagonal contain only stars: as explained above, movements of the same type do not interact. There are two potential alternatives that extend UCOOL(R).

One option would be that no movement reconstructs for itself (UCOOL(R) ext. A). In that case, (i) a movement chain formed by MT1 can be extended by MT1, (ii) subextraction by MT1 from a category that has undergone MT1 should be grammatical, and (iii) movement through MT1 of a remnant formed by MT1 should be ungrammatical. (The same predictions hold for interactions between instances of MT2.)

The other option is that every movement reconstructs for itself (UCOOL(R) ext. B). In that case, (i) a movement chain formed by MT1 cannot be extended by MT1, (ii) subextraction by MT1 from a category that has undergone MT1 should be ungrammatical, and (iii) movement through MT1 of a remnant formed by MT1 would be allowed. (The same predictions hold for interactions between instances of MT2.)

(63)		Distinctness		UCOOL(R) ext. A		UCOOL(R) ext. B	
		MT1	MT2	MT1	MT2	MT1	MT2
MT1	extension	*	✓	✓	✓	*	✓
	subextraction	*	✓	✓	✓	*	✓
	remnant mvt	*	✓	*	✓	✓	✓
MT2	extension	*	*	*	✓	*	*
	subextraction	*	*	*	✓	*	*
	remnant mvt	*	*	*	*	*	✓

As discussed earlier, the literature suggests that subextraction and remnant movement are ungrammatical if they involve the same movement type. If this is true, the only subtable that reflects the known data is the one based on Distinctness.

9 Conclusion

Our point of departure in this paper was an exploration of the consequences of Inclusiveness for the encoding of syntactic dependencies. We argued that these must be established through copying of a selectional requirement that is introduced by the dependent category and satisfied by its antecedent. One of the advantages of this proposal is that it explains – on the basis of a principle central to phrase structure theory – why syntactic dependencies are conditioned by c-command.

An important consequence of this extension of the reach of Inclusiveness is that it forces a revision of movement theory. Rather than being a copy, a trace must be a terminal that introduces a selectional requirement satisfied by the moved category (this selectional requirement is comparable to the slash feature of HPSG). This conclusion in turn necessitates a revision of the theory of reconstruction. We argued that syntactic reconstruction involves a matching process also employed in lexical insertion and that scope reconstruction and related phenomena are to be regulated by mapping principles that apply at the LF interface. These mapping rules identify nodes in the path of movement as potential reconstructions sites.

In short, several adjustments of the standard theory are necessary if Inclusiveness is to be taken seriously. What is exciting about the ensuing proposal is that it explains a number of properties of movement that remain mysterious under the copy theory. These include the following:

1. *The c-command condition*: The landing site of movement must c-command its launching site.
2. *Barss's generalization*: Remnant movement allows scope reconstruction of both the remnant and the category extracted from the remnant to lower positions, but it does not allow scope reconstruction of the extracted category into the remnant. However, the extracted category does reconstruct into the remnant for syntactic purposes.
3. *The Van Riemsdijk/Williams generalizations*: An $\bar{A}$-moved category cannot undergo A-movement, but the opposite is possible. An $\bar{A}$-moved category is an island for extraction by A-movement, but an A-moved category is not an island for extraction by $\bar{A}$-movement. A remnant created by A-movement can undergo $\bar{A}$-movement, but a remnant created by $\bar{A}$-movement cannot undergo A-movement. This pattern of interaction extends to other movement types.
4. *The lack of interaction between movements of the same type*: A category that has undergone movement of type T is an island for movements of type T. A remnant created by movement of type T cannot undergo movement of type T. A category that has undergone movement of type T cannot undergo subsequent movement of type T.

Needless to say, there are alternative accounts for some of these properties of movement, while some others are disputed (in particular the claim that there are no intermediate traces in homogeneous movement chains). However, it seems to us that the above results are a good illustration of the fruitfulness of the research program pursued here, which aims to unify conditions on phrase structure and conditions on movement.

References

Abels, K. 2003. *Successive cyclicity, anti-locality, and adposition stranding.* PhD dissertation. University of Connecticut.

Abels, K. 2007. *Towards a restrictive theory of (remnant) movement.* Ms. University of Tromsø and UCL.

Ackema, P., & Neeleman, A. 2004. *Beyond morphology: Interface conditions on word formation.* Oxford: OUP.

Barss, A. 1986. *Chains and anaphoric dependence.* PhD dissertation. MIT.

Bobaljik, J. 1995. *Morphosyntax: The syntax of verbal inflection.* PhD dissertation. MIT.

Bobaljik, J., & Brown, S. 1997. Interarboreal operations: Head movement and the extension requirement. *Linguistic Inquiry* 28: 345-356.

Boeckx, C. 2001. Scope reconstruction and A-movement. *Natural Language and Linguistic Theory* 19: 503-548.

Brody, M. 1997. Perfect Chains. In *Elements of grammar*, ed. L. Haegeman, 139-167. Dordrecht: Kluwer.

Brody, M. 2002. On the status of derivations and representations. In *Derivation and explanation in the minimalist program*, eds. S. Epstein, & D. Seely, 19-42. Oxford: Blackwell.

Broekhuis, H. 1992. *Chain-government: Issues in Dutch syntax.* PhD dissertation. University of Amsterdam.

Broekhuis, H. 2005. Extraction from subjects: Some remarks on Chomsky's 'On phases'. In *Organizing grammar. Linguistic studies in honour of Henk van Riemsdijk*, eds. H. Broekhuis, N. et al. ,59-68. Berlin: Mouton de Gruyter.

Bury, D. 2003. *Phrase structure and derived heads.* PhD dissertation. UCL.

Chomsky, N. 1973. Conditions on transformations. In *A festschrift for Morris Halle*, eds. S. Anderson, & P. Kiparsky. New York: Holt, Reinhart and Winston.

Chomsky, N. 1981. *Lectures on government and binding.* Dordrecht: Foris Publications.

Chomsky, N. 1986a. *Barriers.* Cambridge, MA: MIT Press.

Chomsky, N. 1986b. *Knowledge of language: Its nature, origin and use.* New York: Praeger.

Chomsky, N. 1993. A minimalist program for linguistic theory. In *The view from building 20: Essays in honor of Sylvain Bromberger*, eds. K. Hale & S. J. Keyser, 1-52. Cambridge, MA: MIT Press.

Chomsky, N. 1995. *The minimalist program.* Cambridge, MA: MIT Press.

Chomsky, N. 2008. On phases. In *Foundational issues in linguistic theory: Essays in honor of Jean-Roger Vergnaud*, eds. R. Freidin, C. P. Otero, & M. L. Zubizarreta, 133-166. Cambridge, MA: MIT Press.

Chung, S., & McCloskey, J. 1987. Government, barriers and small clauses in Modern Irish. *Linguistic Inquiry* 18: 173-237.

Cinque, G. 1990. *Types of $\bar{A}$-dependencies.* Cambridge, MA: MIT Press.

Citko, B. 2005. On the nature of merge: External merge, internal merge, and parallel merge. *Linguistic Inquiry* 36: 475-496.

Clements, G., McCloskey, J., Maling, J., & Zaenen, A. 1983. String-vacuous rule application. *Linguistic Inquiry* 14: 1-17.

Cole, P., & Hermon, G. 1998. The typology of wh-movement. Wh-questions in Malay. *Syntax* 1: 221-258.

Collins, C. 1993. *Topics in Ewe syntax.* PhD dissertation. MIT.

Collins, C. 1994. Economy of derivation and the Generalized Proper Binding Condition. *Linguistic Inquiry* 25: 45-61.

Cresti, D. 1995. Extraction and reconstruction. *Natural Language Semantics* 3: 79-122.

Den Besten, H. 1989. *Studies in West Germanic syntax.* Amsterdam: Rodopi.
Den Dikken, M. 1995. *Particles.* Oxford: OUP.
Epstein, S. 1999. Un-principled syntax: The derivation of syntactic relations. In *Working minimalism*, eds. S. Epstein, & N. Hornstein, 317-345. Cambridge, MA: MIT Press.
Fox, D. 1999. Reconstruction, binding theory, and the interpretation of chains. *Linguistic Inquiry* 30: 157-196.
Fukui, N. 1997. Attract and the A-over-A Principle. In *UCI working papers in linguistics* Vol. 3, 51-67). Irvine: University of California.
Gallego, A., & Uriagereka, J. 2006. *Subextraction from subjects: A phase theory account.* Ms. Universitat Autònoma de Barcelona and University of Maryland.
Gallego, A., & Uriagereka, J. 2007. Conditions on subextraction. In *Studies on the syntax-semantics interface*, eds. L. Eguren, & O. Fernández Soriano, 45-70. Amsterdam: John Benjamins.
Gazdar, G. 1981. Unbounded dependencies and coordinate structure. *Linguistic Inquiry* 12: 155-184.
Gazdar, G., Klein, E., Pullum, G., & Sag, I. 1985. *Generalized phrase structure grammar.* Cambridge, MA: Harvard University Press.
Grodzinsky, Y., & Reinhart, T. 1993. The Innateness of binding and coreference. *Linguistic Inquiry* 24: 69-101.
Jackendoff, R. 1972. *Semantic interpretation in generative grammar.* Cambridge, MA: MIT Press.
Jackendoff, R. 1996. *The architecture of the language faculty.* Cambridge, MA: MIT Press.
Kayne, R. 1984. *Connectedness and binary branching.* Dordrecht: Foris Publications.
Kitahara, H. 1997. *Elementary operations and optimal derivations.* Cambridge, MA: MIT Press.
Koeneman, O. 2000. *The flexible nature of verb movement.* PhD dissertation, Utrecht University.
Koopman, H., & Sportiche, D. 1991. The position of subjects. *Lingua* 85: 211-258.
Koster, J. 1987. *Domains and dynasties.* Dordrecht: Foris Publications.
Kuroda, S.-Y. 1988. Whether we agree or not: A comparative syntax of English and Japanese. In *Papers from the second international workshop on Japanese syntax*, ed. W. Poser, 103-143. Stanford: CSLI.
Lasnik, H. 1999. Chains of arguments. In *Working minimalism*, eds. S. Epstein, & N. Hornstein, 189-215. Cambridge, MA: MIT Press.
Lasnik, H., & Saito, M. 1992. *Move α: Conditions on its application and output.* Cambridge, MA: MIT Press.
Lebeaux, D. 1998. *Where does the binding theory apply (II)?* Ms. NEC Research Institute.
Lechner, W. 1998. Two kinds of reconstructions. *Studia Linguistica* 52: 276-310.
Leung, T. 2007. *Syntactic derivation and the theory of matching contextual features.* PhD dissertation. University of Southern California.
Maling, J., & Zaenen, A. 1982. A phrase-structure account of Scandinavian extraction phenomena. In *The Nature of Syntactic Representation*, eds. P. Jacobson, & G. Pullum, 229-282. Dordrecht: Reidel.
May, R. 1979. *The grammar of quantification.* PhD dissertation. MIT.
McCloskey, J. 2002. Resumption, successive cyclicity, and the locality of operations. In *Derivations and explanations in the minimalist program*, eds. S. Epstein, & D. Seely, 184-226. Oxford: Blackwell.
Müller, G. 1998. *Incomplete category fronting.* Dordrecht: Kluwer.
Müller, G. 2008. *On deriving CED effects from the PIC.* Ms. University of Leipzig.
Neeleman, A. 1994. *Complex predicates.* PhD dissertation. Utrecht University.

Neeleman, A. 2008. *Subset controllers.* Ms. UCL.
Neeleman, A., & Van de Koot, H. 2002. The configurational matrix. *Linguistic Inquiry* 33: 529-574.
Neeleman, A., & Van de Koot, H. 2008. Dutch scrambling and the nature of discourse templates. *Journal of Comparative Germanic Linguistics* 11: 137-189.
Nevins, A. 2004. Derivations without the activity condition. *MIT Working Papers in Linguistics* 49: 287-310.
Nunes, J. 1995. *The copy theory of movement and linearization of chains in the minimalist program.* PhD dissertation. University of Maryland.
Nunes, J. 2004. *Linearization of chains and sideward movement.* Cambridge, MA: MIT Press.
Pollard, C., & Sag, I. 1994. *Head-driven phrase structure grammar.* Cambridge, MA: MIT Press.
Pollard, C., & Yoo, E. J. 1998. A unified theory of scope for quantifiers and wh-phrases. *Journal of Linguistics* 34: 415-445.
Reinhart, T. 1983. *Anaphora and semantic interpretation.* London: Croom Helm.
Reuland, E. 2001. Primitives of binding. *Linguistic Inquiry* 32: 439-492.
Rezac, M. 2004. *Elements of cyclic syntax: Agree and merge.* PhD dissertation. University of Toronto.
Rizzi, L. 1990. *Relativized minimality.* Cambridge, MA: MIT Press.
Rullmann, H. 1995. *Maximality in the semantics of wh-constructions.* PhD dissertation. University of Massachusetts at Amherst.
Sauerland, U., & Elbourne, P. 2002. Total reconstruction, PF movement, and derivational order. *Linguistic Inquiry* 33: 283-319.
Schneider-Zioga, P. 2000. Anti-agreement and the fine structure of the left periphery. *University of California Irvine Working Papers in Linguistics* 6.
Starke, M. 2001. *Move dissolves into merge: A theory of locality.* PhD dissertation. University of Geneva.
Starke, M. 2006. *The nanosyntax of particles.* Course given at the EGG Summer School, Olomouc.
Sternefeld, W. 1992. *Transformationstypologie und strukturelle Hierarchie.* Ms. University of Tübingen.
Svenonius, P. 2004. On the edge. In *Peripheries: Syntactic edges and their effects*, eds. D. Adger, C. De Cat, & G. Tsoulas, 259-287. Dordrecht: Kluwer.
Szabolsci, A. 1983. The possessor that ran away from home. *The Linguistic Review* 3: 89-102.
Szabolsci, A., & Den Dikken, M. 1999. Islands. 'State of the article'. *GLOT International* 4: 3-8.
Takano, Y. 2000. Illicit remnant movement: An argument for feature-driven movement. *Linguistic Inquiry* 31: 141-156.
Van Riemsdijk, H. 1978. *A case study in syntactic markedness: The binding nature of prepositional phrases.* Lisse: Peter de Ridder.
Van Riemsdijk, H., & Williams, E. 1981. NP structure. *The Linguistic Review* 1: 171-217.
Van Riemsdijk, H., & Williams, E. 1986. *Introduction to the theory of grammar.* Cambridge, MA: MIT Press.
Williams, E. 1974. *Rule ordering in syntax.* PhD dissertation. MIT.
Williams, E. 1986. NP trace in theta theory. *Linguistics and Philosophy* 4: 433-447.
Williams, E. 1994. *Thematic structure in syntax.* Cambridge, MA: MIT Press.
Williams, E. 2003. *Representation theory.* Cambridge, MA: MIT Press.