Universal 20 without the LCA*

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1 Introduction

There is general agreement that linguistic theory should account for linear asymmetries found in language. This paper presents a case study of one such asymmetry: the facts that go by the name of universal 20. We confront the known facts with a particular theory of linear asymmetry, Kayne's (1994) Linear Correspondence Axiom (LCA). We distinguish two claims made by the LCA, one concerning base generation and one concerning movement. Regarding base generation, the LCA claims that specifiers universally precede heads and that heads universally precede their complements; regarding movement, the LCA claims that all movement is to the left. Given the LCA, the second claim follows from the first. We will argue however that a weaker theory, one that embraces only the restriction to leftward movement and jettisons the idea that base-generation is universally ordered, is to be preferred.

How can this be shown? Our argument proceeds as follows. First we show that, as far as universal 20 is concerned, the restriction to a universal underlying specifier before head before complement order does not add restrictiveness. In the extended projection of the noun the same range of orders and associated structures can be generated as long as movement is uniformly leftward. The empirical burden of explanation thus rests entirely on restrictions on movement, including the ban against rightward movement. We then show that this result generalizes to other linear asymmetries. They cannot be explained without a restrictive theory of movement.

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However, the base generation claim made by the LCA makes a restrictive theory of movement impossible since all variation in ordering has to be derived through movement. We then provide a rationale from parsing for the assumption that movement must (at least in the cases at hand) be leftward while allowing symmetrical base generation. The overall outlook of the paper is thus similar to that in Ackema and Neeleman (2002), although there are substantial differences in the empirical material we discuss and in the details of our analysis. Finally, we consider some poorly-understood properties of heavy NP shift and show how they find an account in our theory which is not easily available under the LCA, because the relevant restrictions on movement cannot be enforced.

2 Cinque's Theory

Extending earlier work of his on the order of elements in the noun phrase (Cinque (1996, 2000)), Cinque (2005) argues that the typology of word order in the extended nominal projection can be derived if four assumptions are made, among which Kayne's (1994) Linear Correspondence Axiom. Concretely, Cinque discusses the orders in which demonstratives, numerals, adjectives and nouns appear in the extended nominal projection. On the basis of careful typological work, he argues that on the twenty-four logically possible orders of these elements, only fourteen are attested as base word orders in natural language. The typological pattern is illustrated below:

(1)	a.	(i)	DEM NUM A N these five young lads	*attested*
		(ii)	DEM NUM N A	*attested*
		(iii)	DEM N NUM A	*attested*
		(iv)	N DEM NUM A	*attested*
	b.	(i)	DEM A NUM N	*unattested*
		(ii)	DEM A N NUM	*attested*
		(iii)	DEM N A NUM	*attested*
		(iv)	N DEM A NUM	*attested*
	c.	(i)	NUM DEM A N	*unattested*
		(ii)	NUM DEM N A	*unattested*
		(iii)	NUM N DEM A	*unattested*
		(iv)	N NUM DEM A	*unattested*
	d.	(i)	NUM A DEM N	*unattested*
		(ii)	NUM A N DEM	*attested*
		(iii)	NUM N A DEM	*attested*
		(iv)	N NUM A DEM	*attested*
	e.	(i)	A DEM NUM N	*unattested*
		(ii)	A DEM N NUM	*unattested*

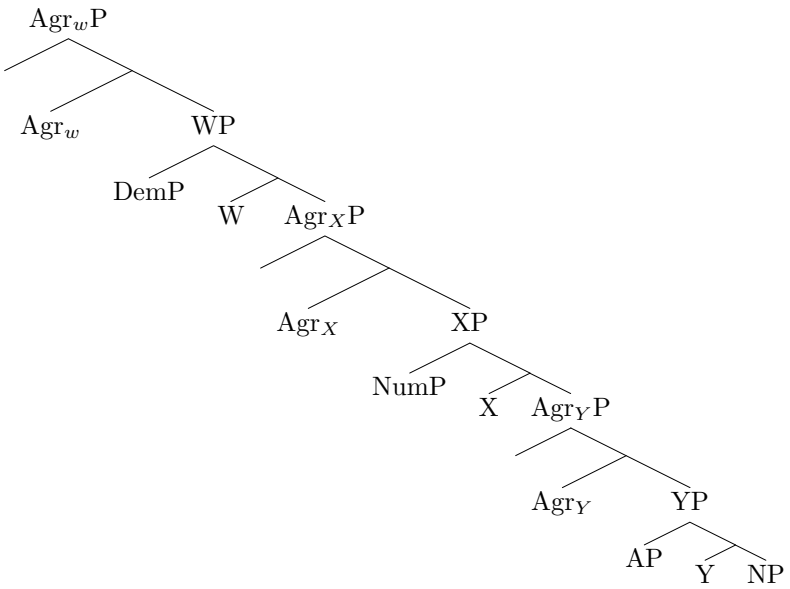
	(iii)	A N DEM NUM	*attested*
	(iv)	N A DEM NUM	*attested*
f.	(i)	A NUM DEM N	*unattested*
	(ii)	A NUM N DEM	*unattested*
	(iii)	A N NUM DEM	*attested*
	(iv)	N A NUM DEM	*attested*

The main theoretical contribution of Cinque's paper consists in a demonstration that the assumptions given below generate the fourteen existing orders, while excluding the ten nonexisting ones:

(2) a. The underlying hierarchical order in the extended projection of the noun is $\text{Agr}_w \succ$WP-$\succ\text{Agr}_X \succ$X$\succ\text{Agr}_Y \succ$Y$\succ$N where Y hosts AP in its specifier, X hosts NumP in its specifier and W hosts DemP in its specifier;
b. all (relevant) movements move a subtree containing N;
c. all movements target a c-commanding position;
d. All projections are modelled on the template (Kayne (1994)):
$[_{\text{XP}}$ Spec $[_{\text{XP}}$ X^0 Compl]]

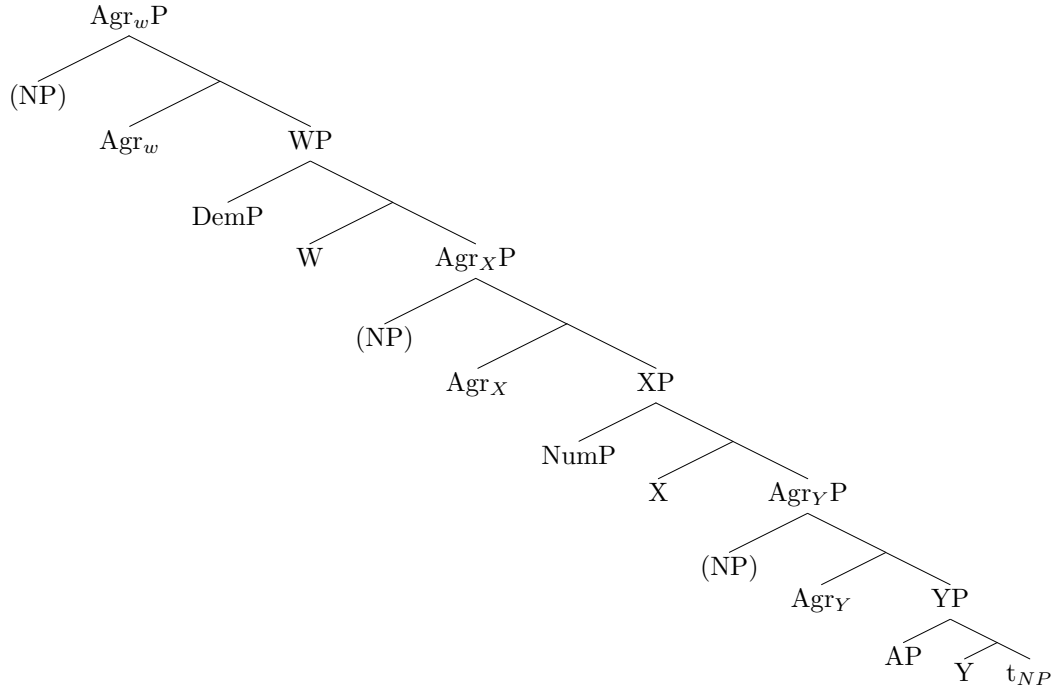
Let us consider how this result obtains. When the noun is final within DP, the prenominal material can occur in only one order. This order is base-generated in line with assumptions (2a) and (2d). No movement can have taken place, because assumption (2c), (2b), and (2d) imply that movement results in an order where the noun is not final. This rules out the orders in ((1ei), (1fi), (1bi), (1di), and (1ci)).

(3)



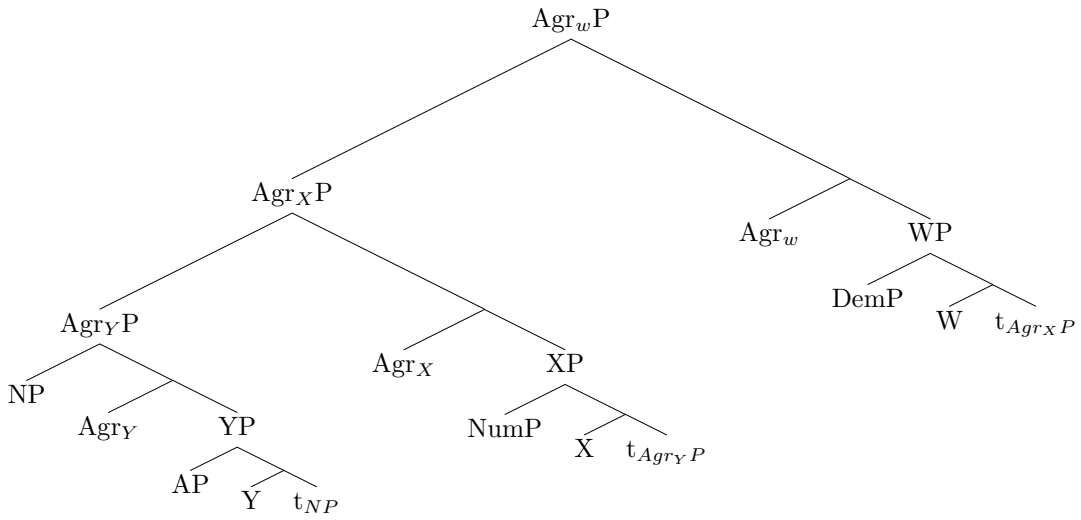
A second class of structures is generated by moving NP to [Spec, Agr$_Y$P], [Spec, Agr$_X$P], or [Spec, Agr$_W$P]. This will generate all orders in which the underlying sequence Dem$\prec$Num$\prec$A surfaces, while the position of the noun varies ((1aii), (1aiii), and (1aiv)).

(4)



A third class of structures is generated by extending the set of movable projections to include Agr$_Y$P and Agr$_X$P. If these additional movements take place in a 'roll-up' fashion, i.e., movement of NP to [Spec, Agr$_Y$P] followed by movement of Agr$_Y$P to [Spec, Agr$_X$P], followed by movement of Agr$_X$P to [Spec, Agr$_W$P], this will derive the mirror image of the base order ((1fiv)), as shown in (5).

(5)



Partial roll-up movement derives the order (1biii) as above without the final step of Agr$_X$P to [Spec, Agr$_W$P] movement.

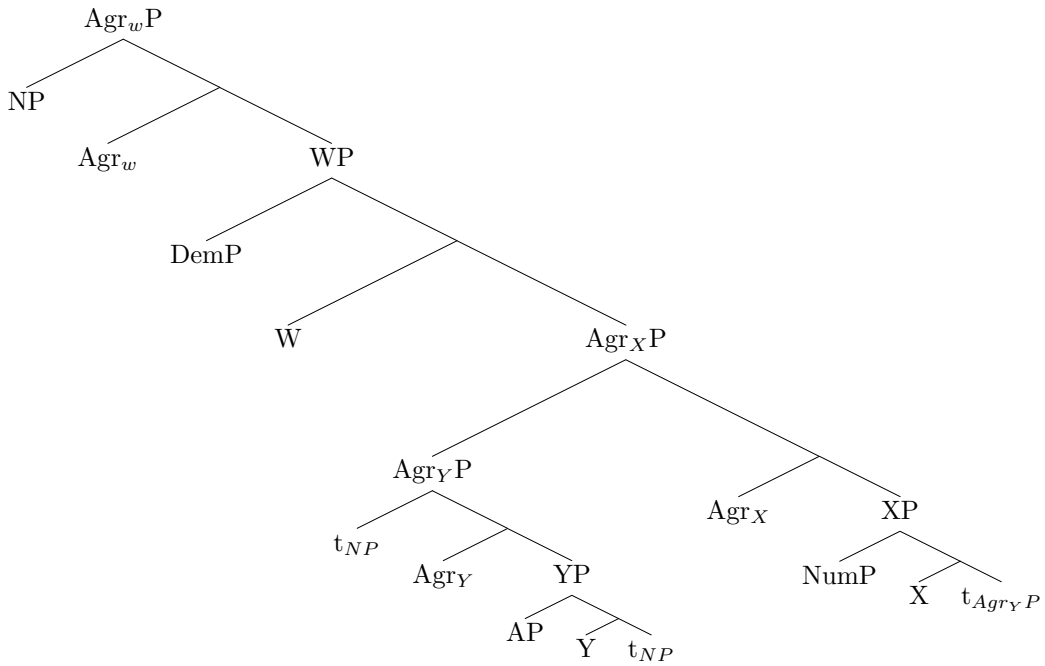
Four more orders are derived by moving agreement phrases but leaving the NP in situ; thus, Agr$_Y$P can move to [Spec, Agr$_X$P] and from there to [Spec, Agr$_W$]P giving rise to (1bii) and (1eiii) respectively. Agr$_X$P can move to [Spec, Agr$_W$P] which gives rise to (1dii) or to (1fiii) if combined with movement of Agr$_Y$P to [Spec, Agr$_X$P].

Three further orders are derived by a combination of movement of agreement phrases and NP movement internal to those agreement phrases. If NP moves to [Spec, Agr$_Y$P], Agr$_Y$P can surface either in [Spec, Agr$_X$P] or [Spec, Agr$_W$P]. The first of these is a partial roll-up structure discussed above, but the latter gives rise to the new order (1eiv). If Agr$_X$P moves to [Spec, Agr$_W$P], then NP can surface in either [Spec, Agr$_X$P] or [Spec, Agr$_Y$P]; both derivations are new and give rise to the orders (1div) and (1diii) respectively.

The final admissible derivation in Cinque's system is one in which Agr$_Y$P moves to [Spec, Agr$_X$P] and is subsequently stranded by NP movement to [Spec, Agr$_W$P]. This derives (1biv).[1]

[1]Although this order is attested only in Pitjantjatjara (see Bowe (1990, p. 29-54, 111, 146-150)) as a base order according to Cinque (2005), similar derivations are possibly required for Greek N DEM A$_{color}$ A$_{size}$ orders if size>>color is the base hierarchy (though see Alexiadou and Wilder (1998)).

(6)



This exhausts the orders that can be derived under Cinque's theory. Consider why. It follows from the assumptions made that all material preceding the noun must come in the base order, essentially because all other orders violate the condition that moved constituents must contain the noun ((2b)). This subsumes the case of N-finality discussed above, but also includes (1cii), (1eii), (1fii). Finally, the orders (1ciii) and (1civ) are excluded because their derivation either requires movement of a non-constituent or, again, violates (2b). This is because any constituent that contains N and Num also contains A. Therefore there is no way of placing Num and N in a position preceding Dem without also placing A in a position preceding Dem.

Further assumptions allow Cinque to derive the relative typological frequencies of the various orders, something to which we return in section 4.

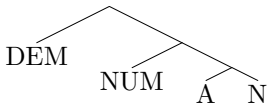
3 The Alternative

The results described in the previous section are certainly important, in that they make an important contribution to our understanding of the syntax of the extended nominal projection. However, we do not think that they provide evidence for Kayne's antisymmetry hypothesis. As we will show in this section, the typological pattern can equally well be derived from the assumptions in (7). The first three of these are identical or equivalent to the first three assumptions made by Cinque. The fourth assumption replaces the LCA. It is weaker than Kayne's hypothesis, because it limits the asymmetry of syntax to movement.

(7) a. The underlying hierarchical order of Dem, Num, A, and N in the extended nominal projection is Dem$\succ$Num$\succ$A$\succ$N, where $\succ$ indicates c-command;
b. all (relevant) movements move a subtree containing N;
c. all movements target a c-commanding position;
d. all (relevant) movements are to the left.

If the LCA is abandoned in favour of (7d), we can base-generate eight of the fourteen attested linear strings, simply by allowing cross-linguistic variation in the linearization of sister nodes in the hierarchical structure described by (7a). Seven of these orders are derived through movement in Cinque's system. In our trees the non-terminals in the extended projection of the noun are unlabeled and the demonstrative, numeral and adjective are not introduced by dedicated functional heads. This is because nothing in our argument hinges on the label of the nodes in the extended projection of the noun or the existence of dedicated functional heads hosting DEM, NUM, and A as specifiers. The reader is thus invited to resolve these issues in his or her favorite way.

(8) a.



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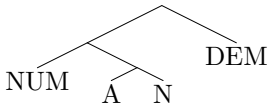

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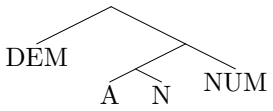

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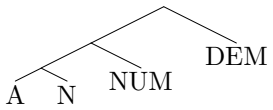

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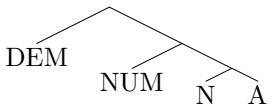

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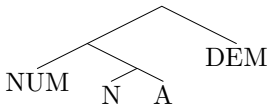

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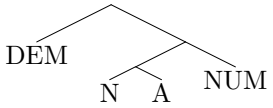
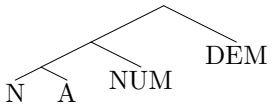
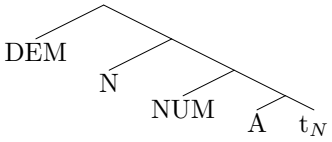


h.



The remaining six orders are derived by leftward movement of a constituent containing the noun:

(9) a.



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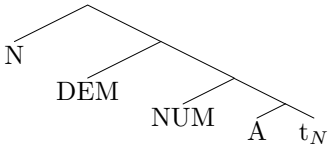

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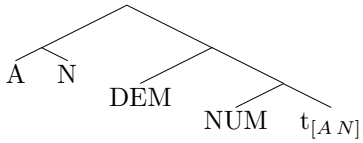

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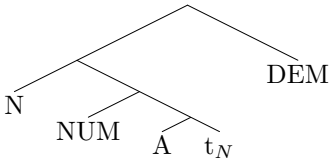

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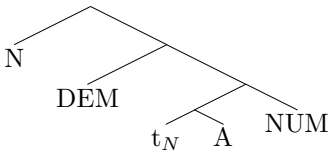

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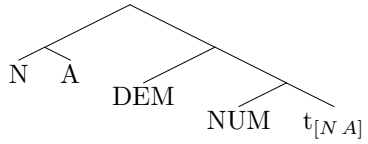


There are other derivations involving movement, but these do not extend the set of derivable linear strings. For example (1biii) can be base-generated as above or derived on the basis of, for example, (1bii) by short movement of N as in (10).

(10)

The impossibility of the ten unattested orders can be derived here in essentially the same way as in Cinque's system. This is very clear in the case of noun-final structures. Since movement is uniformly leftward and must affect constituents containing the noun, noun-final orders must be base-generated. But among the base-generated structures, all of which are given in (8), only (8a) is noun-final. Therefore, every other permutation of Dem, Num, and A is ruled out prenominally.

In fact, this argumentation carries over to prenominal material generally. All material preceding the noun must be base-generated there, and its linear order must consequently reflect the hierarchy in (7a).

Finally, the orders (1ciii) and (1civ) are excluded because their derivation either requires movement of a non-constituent or, again, violates (7b). This is because any constituent that contains N and Num also contains A. Therefore there is no way of placing Num and N in a position preceding Dem without also placing A in a position preceding Dem.

We have demonstrated that, in order to derive Cinque's result, it is sufficient to assume that movement is uniformly leftward. The stronger assumption that projections are uniformly right-branching, the LCA, need not be made and does not add restrictions on the derivable typology.

Another set of assumptions that play no role in restricting the typology, involve the number and the nature of landing sites for movement.[2] Suppose that any node in a base-generated tree admits free (possibly multiple) adjunction. Then conditions on movement ((7c), (7b), (7d)), still guarantee that the set of derivable orders is limited to those that are attested. Similarly, Cinque could either allow multiple specifiers in each functional projection[3] or multiple Agr projections or both to freely host moved constituents.

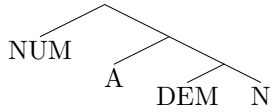
The remaining assumptions, however, are crucial. Dropping any of them rules in unattested word orders. Thus, relaxing (7a) would incorrectly allow prenominal material to appear in

[2]Formally, given the base hierarchy in (2a) or (7a) or (3), the set of fourteen strings representing attested orders in (1) is closed under permutation by movement according to (2c), (2b), and (2d) or (7c), (7b), and (7d).

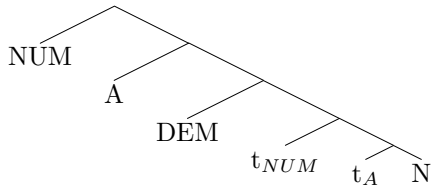
[3]For the question of the LCA compatiblity of multiple specifiers and adjuncts see Chomsky (1995b), Cinque (1996)

permuted orders as illustrated very simply in (11a).[4] The same problem arises if movement of constituents that do not contain N were allowed; the order ((1di)) can be derived either by separate movements of Num and A or by movement of N followed by remnant movement of the phrase containing Num, A, and the trace of the noun. This is illustrated in ((11b)). The c-command requirement on movement is well motivated on independent grounds. In the domain we are considering, revoking it would allow the two orders in which N and Num precede Dem but A follows it, as illustrated in (11c). Most importantly for our present purposes, lifting the ban against movement to the right has undesirable consequences; for example we could derive scrambled noun final orders, as illustrated in (11d) for (1di).

(11) a. unattested: Num≪A≪Dem≪N



b. unattested: Num≪A≪Dem≪N



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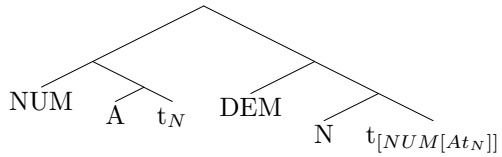
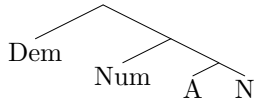


c. unattested: N Num Dem A



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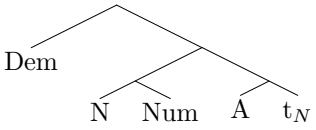

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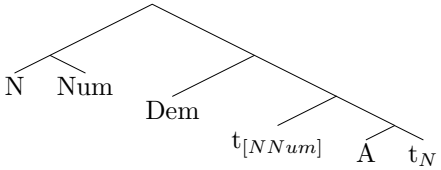
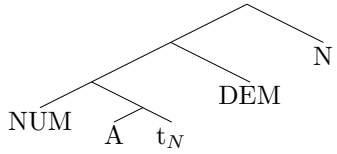


d. unattested: Num≪A≪Dem≪N



[4]Incidentally, Brugè (2002) assumes that the structure in (11a) represents the underlying universal hierarchy and that demonstratives sometimes surface in this low underlying position. The text discussion indicates that Brugé's hierarchy is incompatible with the cross-linguistic record. Her suggestion, largely motivated by Spanish facts where the article and demonstrative may co-occur on opposite sides of the noun also fails to make sense of the observation in (Rijkhoff, 2002, chapter 6) that in all languages that allow demonstratives and articles to co-occur prenominally, the demonstrative always precedes the article.

Of course, the theory we have tested has fewer restrictions than Cinque's and therefore the number of derivations that it allows are a superset of the set of derivations allowed in Cinque's approach. This is in fact the basis for the claim that Cinque's findings ought not to be construed as an empirical argument for universal Spec$\prec$Head$\prec$Complement order, since the extra derivations allowed on the assumptions in (7) do not give rise to additional orders. Consequently, the assumed universal Spec$\prec$Head$\prec$Complement order does not carry any of the empirical burden. Cinque's and our explanation rests entirely on the assumption of a universally fixed underlying hierarchy of elements in the extended projection of the noun and on restrictions on movement. The linear asymmetry in the order of elements within the extended projection of the noun does not follow from the LCA but from restrictions on movement. We will demonstrate below that this carries over to the explanation of other linear asymmetries as well. An explanation necessarily rests on a restrictive theory of movement rather than the base-generated linear order. In this context it is crucial that the current setup requires fewer movements than the LCA-based alternative. As a matter of fact, Cinque's theory requires movement in 13 of the 14 licit derivations, while our alternative does so in only six. In each of those six derivations no more than a single movement is required. In contrast Cinque's derivations require up to three movements. This suggests that we might be able to formulate a more restrictive theory of movement than is available in LCA-based views of phrase structure. Such a restrictive theory of movement could then help explain linear asymmetries found in language.

4 Comparing the two Theories

The point of the previous section was to show that the typology of word order in the nominal domain can be derived without appeal to the LCA. A weaker assumption barring rightward movement suffices. This means that at this point we have two largely equivalent theories that assign very different representations to the various linear realizations of the extended nominal projection. In this section we will try to evaluate the two approaches.

We begin by showing that the equivalence of the two theories is more dramatic than may seem to be the case at first sight. They assign roughly isomorphic structures to each of the attested strings in (1). This, of course, further weakens the empirical content of the LCA considerably. It should also dissuade any attempt at arguing against our theory on the basis of constituency; the theories are too similar to be distinguishable in terms of constituency at any level.

We then go beyond the nominal domain, demonstrating that for each ungrammatical string derived by movement to the right, there is an LCA-compatible analysis. Consequently, proponents of antisymmetry will still need to make a stipulation banning apparent rightward movement (that is, structures that are the LCA-compatible equivalent of rightward movement).

Finally, we show that there are well-motivated grammatical constraints that can successfully be formulated in theories that adopt our more slender and more flexible structures, but not in antisymmetric theories, which rely on larger, rigid trees to derive word order alternations.

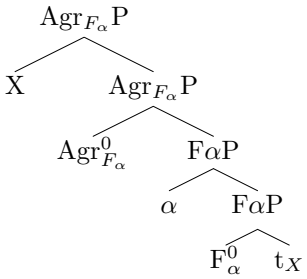
4.1 Stretching and Shrinking Trees

The main claim of this subsection is that, despite appearances, for each attested word order in the extended nominal projection the gross constituency and command relations on Cinque's analysis are identical to those in the simplest representation allowed under our alternative proposal. We demonstrate this by giving a mechanical procedure to change Cinquean trees into the trees in (8) and (9), as well as a mechanical procedure to do the reverse. We call the first of these procedures *Shrinking* and the second *Stretching*. Shrinking is defined in (12), (15), and (17). The point is the mere existence of such structure preserving algorithms, not the details of execution.

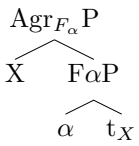
(12) Prune the Cinquean tree by deleting the functional heads (W, Agr_W, X, Agr_X, Y, and Agr_Y) and their intermediate projections maintaining dominance relations.[5]

When applied to the tree in (13) this yields (14)

(13)



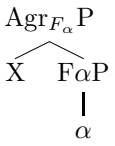
(14)



(15) Delete any trace whose antecedent is the sister of the trace's mother.

This will transform (14) into (16).

(16)



(17) Prune all non-branching non-terminals maintaining dominance.

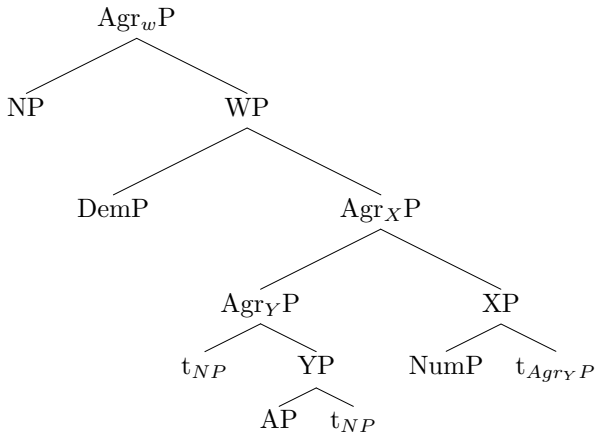
The final step produces (18).

[5] Starke (2004) argues on independent grounds that functional heads whose only purpose is to host specifiers of a particular type should be jettisoned from the the theory. Since Cinque provides no morphological motivation for any of the proposed functional heads, our algorithm treats them uniformly as empty. See also Koopman's 1996 generalized doubly filled COMP filter.

(18)

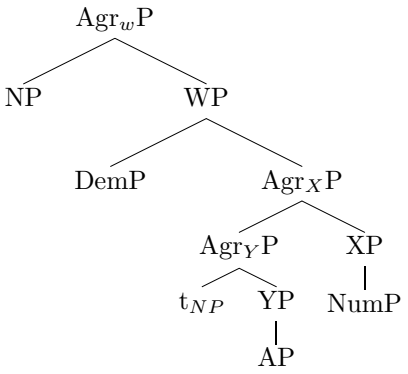
It is easy to see that this three-step procedure takes us from the representation in (3) to one that is isomorphic to (8a). It is equally obvious that Shrinking will yield a representation isomorphic to (8h) when applied to (5). We will leave it to the reader to check that this procedure works for all admissible derivations in Cinque's system. (It does.) Here we will only illustrate this result, by going through the effects of shrinking in one of the more complicated cases. When the rule in (12) is applied to (6) it yields (19).

(19)

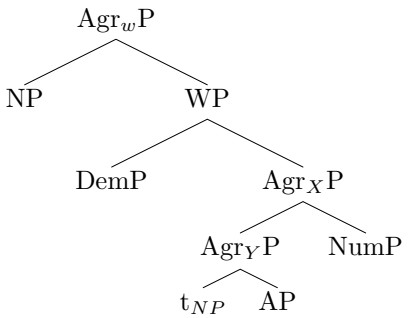


Applying (15) will delete the traces of NP and Agr$_Y$P as in (20a), which can be pruned to (20b).

(20) a.



b.



Of course, the labelling in the representations derived by shrinking does not adhere to standard requirements. This does not affect the point under discussion, however, since we are interested strictly in properties of tree geometry here. What is important, though, is that the nodes that make up the extended nominal projection bear labels revealing that. This information is indeed preserved under shrinking.

It should be clear that Shrinking preserves gross constituency. Material shared in the two types of analysis (Dem, Num, A, N and traces of 'long' movement) is grouped in the same way before and after shrinking. For example the representation in (6) and the shrunken version of it in (20b) are both characterized by the following bracketing: $[NP[DemP[[t_{NP}AP]NumP]]]$.

Shrinking also preserves c-command relations in the sense that any c-command relation that holds in at some point during the derivation in the Cinquean analysis also holds at some point in the derivation in our analysis. This is trivial for the c-command relations determined by the functional sequence, given that the functional sequence determines height of attachment in base-generated structures. The movements that remain in the shrunken trees are inherited from the Cinquean input and so the extra c-command relations they give rise to are also present in LCA-based representations. In order to guarantee full preservation of c-command relations among material shared by both analyses, however, it must also be the case that movements that do not survive shrinking do not give rise to new c-command relations either. This is indeed true, as the movements that shrinking eliminates are the roll-up ones. A look at (5) reveals that NP, AP, NumP, and DemP are properly contained in the moving constituent. The moving constituent itself of course acquires new c-command relations but its proper parts do not.

It is true, of course, that c-command relations are not entirely equivalent. Thus, in (6) NumP c-commands AP before movement of Agr$_Y$P but not after movement, whereas in our structure NUM c-commands A throughout the derivation. However, we know of no convincing analysis that crucially invokes the loss of c-command through roll-up movement (though see Kayne (1994); Cinque (2006) and footnote 11 for discussion). For movement that is not of the roll-up type, such effects do seem to exist, however (failure of reconstruction for various phenomena, the possibility to bind anaphors under successive cyclic *wh*-movement, etc.).

To complete our argument, we present a partial method for stretching trees. It is essentially the reverse of the three operations that constitute shrinking and is formulated in (21) and (23). The procedure is only partial because it is designed to stretch trees with right specifiers or adjuncts, as this is the geometry that the LCA prohibits. In order to develop a complete method of stretching trees one would have to add a procedure that enriches structures with left specifers

and adjuncts. In the interest of space, we refrain from doing so here.

(21) In a structure

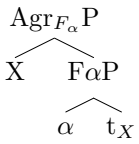
where

(i) α is a non-projecting node,
(ii) Y is projected from X, and
(iii) α belongs to a class mentioned in (7a).

a. Insert a node $F_\alpha P$ between α and its mother;
b. insert a trace of X under $F_\alpha P$ and to α's right;
c. relabel Y as $Agr_{F_\alpha} P$.

This step converts a right specifier or adjunct into a left specifier or adjunct by inserting a trace as its right sister. The result is (22).

(22)

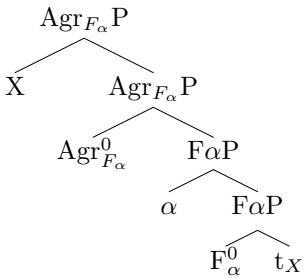


The next step simply inserts the functional heads required for LCA compatibility:

(23) For every head-less node β, insert an identically labelled node γ between β and β's right daughter and the appropriate head for γ as γ's left daughter.

This yields (24).

(24)



As before, gross constituency and c-command relations between Dem, Num, A and N are preserved under stretching.

What the procedures of stretching and shrinking demonstrate is that the LCA-based analysis of the typology of noun phrases is in fact very similar to the symmetrical analysis proposed here. Not only does it give rise to the same typological predictions qua word order (weak generative capacity), but it also generates very similar trees for those word orders (strong generative capacity). This does not mean, of course, that the theories are identical. In fact, we will show below

that stretching trees is not innocent. However, we can already conclude at this point that the original motivation for the LCA is undermined since it does not impose additional restrictions on tree geometry. For every shrunken tree that violates the LCA, there is a stretched variant that is LCA-compatible. The LCA would of course restrict tree geometry if there were fewer functional projections that could host movements and if there were fewer admissible patterns of movement (e.g., if roll-up movement were to be disallowed). The problem that this would give rise to, however, is that the typology of noun phrases captured by Cinque's system would then be beyond the reach of the theory.

Before we turn to these issues, let us briefly touch upon one point of comparison between the two theories not mentioned so far: the cross-linguistic statistical distribution of the various orders.[6] Cinque addresses this matter at some length. The data on the frequency of the various orders is relatively tentative and apparently not based on statistical analysis beyond what is available in Cinque's sources, none of which, by the way, end up with exactly the same typological patterns as Cinque.

Cinque distinguishes four different levels of frequency: very many languages, many languages, few languages, and very few languages (p. 319-320). The order Dem Num A N ((1ai)) and its mirror image N A Num Dem ((1fiv)) are the most frequent (very many languages). The orders Dem Num N A ((1aii)) and Dem N A Num ((1biii)) are the second most frequent orders according to Cinque (many languages). It is striking that all four of the most frequent orders are base-generated in our system. Out of these, the two most frequent ones are those with uniform direction of branchingness: the head of the extended projection is to the extreme right/left of its projection (see **?** on why uniform branching might be preferred over non-uniform branching). The two second most popular orders involve one change of direction and both of them start out at the top with right-headed structures. All four of the frequent cases thus fall under the generalization that all right-headed parts of the structure dominate all left-headed parts of the structure.[7]

The remaining base-generable orders are either infrequent ((1diii)) or very infrequent ((1bii), (1dii), (1fiii)) and all structures that involve movement in our system are either infrequent ((1aiv), (1eiv), (1div)) or very infrequent ((1aiii), (1eiii), (1biv)) according to Cinque. Given the lack of statistical tests for reliability and given that Cinque's own system fails to distinguish the infrequent from the very infrequent cases in a consistent manner, we will lump these two categories together. The picture that emerges thus suggests that three factors are at play:

(25) a. Movement within the extended projection of the noun is marked;

[6] Actually, there is a another point of comparison that should eventually be addressed: intralinguistic variation, that is, cases where a given language allows more than one order. Some information about such cases is scattered through Cinque's paper. None of the cases he cites pose problems for our system; we can handle them by either invoking optionally left- or right-headed structures or by invoking optional movement. A more thorough discussion would require having much more and more systematic data available than we do at the moment. Given the result above, that gross constituency is identical in both theories, it does not seem likely that such facts will be able to distinguish the theories.

[7] The empirical footprint in the area of typology is thus identical to the core generalizations concerning verb clusters in Hungarian as described in Koopman and Szabolcsi (2000): English orders can embed Mirror-English orders but not the other way around. See also Svenonius (to appear) for discussion of this pattern across categories and a different approach to its explanation.

b. Directionally uniform branching is less marked than non-uniform branching;
c. Going down in an extended projection of N, switching from junctures in which the right sister contains the lexical head to junctures in which the left sister does is less marked than switching from junctures in which the left sister contains the lexical head to junctures in which the right sister does.

The third factor allows an alternative, linear, formulation:

(26) Gaps in the functional sequence are unmarked on the left side of the lexical head but marked on the right side of the lexical head.

For example, Dem N and Num N both skip parts of the sequence (Num A and A,respectively); yet both occur in frequent orders. N Num, N Dem, and N ... A Dem skip A, A N, and Num, respectively, and occur in infrequent orders only. [8]

This shows that the three frequency classes reliably distinguished in Cinque's system can be distinguished as natural classes in the present system as well. Moreover, the two most frequent word orders form a natural class here while such a unified treatment is not available in Cinque's system. To see this, observe that Cinque introduces a separate markedness statement to capture the fact that the order in (1ai) is unmarked (Cinque (2005, p. 321, (7bi)): "No movement (unmarked)"). Since no other orders are derived without movement, this statement's sole purpose is to make sure that (1ai) is unmarked. On the extreme opposite is the order in (1fiv). To make sure that it comes out as unmarked, Cinque makes two separate assumptions. He says that movement of NP plus pied-piping of the *whose-picture* type is unmarked while the lack of pied-piping and pied-piping of the *brother-of-who* type are increasingly more marked (Cinque, 2005, p. 321 (7bii-iv)). By itself these statements ensure that (1aii), (1biii), and (1fiv) are less marked than all other orders with the exception of the base generated one.

To distinguish the three orders (1aii), (1biii), and (1fiv) from each other Cinque invokes a separate "parameter of movement" (Cinque, 2005, p. 321):

(27) "*Total* (unmarked) versus *partial* (marked) movement of NP with or without pied-piping (in other words, NP raises all the way up, as in [(1aiv), (1eiv), (1biv), (1div), (1fiv)], or just partially, as in [(1aii), (1aiii), (1eiii), (1bii), (1biii), (1dii), (1diii), (1fiii)], around its modifiers)" (Cinque, 2005, p. 321, (7bv)).[9]

This condition succeeds in distinguishing the three cases above in the desired way since only (1fiv) involves total movement. Thus, while in the present system the two most frequent orders represent a unified case, they are captured by vastly different assumptions under Cinque's system.

[8] The linear formulation of the third factor can be made to follow from the parser's preference for low attachment. Low-attachment preferences have been motivated on independent grounds in the parsing literature.

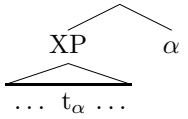
[9] It is not clear that this condition is formulable as a structural condition. Cinque's explication in the text suggests that total movement is meant as a structural condition ("all the way up"), which could be rendered as *filling [Spec, Agr_{Dem} P] with a constituent containing N is less marked than not filling it.* However, this structural notion of total movement would subsume (1eiii), (1diii), and (1fiii) under the unmarked case of total movement. However a glance at the list of cases Cinque gives shows that this is not the intended interpretation. The cases of total movement are all and only N-initial orders while the cases of partial movement are all orders where N is not initial. If the linear formulation of the condition is indeed necessary in Cinque's system, then it is hard to see how it could be a structural rather than a linear parameter.

What we have shown so far is that, at the very least, Cinque's theory of the word order typology in the extended projection of the noun phrase is not empirically superior to the more traditional approach advocated here. The considerations in the last paragraph in fact suggest the opposite.

4.2 Rightward Movement and the LCA

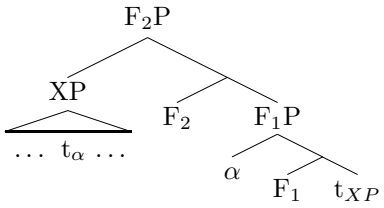
We have claimed above that the LCA does not restrict the class of possible tree shapes. This entails, in particular, that it does not rule out rightward movement, either local or unbounded. To see this consider the following structure:

(28)



We can make this representation LCA-compatible by applying exactly the same stretching procedure defined above (modulo labels of inserted functional projections):

(29)



The possibility of unbounded rightward movement arises, because nothing in the theory restricts the depth to which t_α is embedded in XP. For example, α could have undergone a number of steps of successive-cyclic movement within XP.

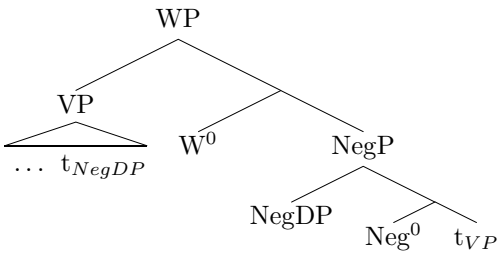
The fact that this type of movement is not available within the NP on Cinque's analysis has nothing to do with LCA. Rather it follows from a restriction on movement, the assumption that movement must always target a constituent containing the lexical head. This rules out the occurrence of structure (29) in the realm of the NP, since the two moving elements, XP and α, cannot both contain N. If α contains N, then XP doesn't, and vice versa.

The requirement that every movement pied-pipe the lexical head does not seem to have a counterpart in the extended projections of other lexical categories.[10] In fact, the structure in (29) is not just a hypothetical possibility, it is a widely used analytical tool known as remnant movement (den Besten and Webelhuth (1987); Müller (1998); Koopman and Szabolcsi (2000); Nilsen (2003) and references cited there). A particularly striking example comes from Kayne (1998), who argues that negative quantifiers in English raise to [Spec, NegP], a movement that is followed by remnant movement of VP to the specifier of an as yet unidentified functional

[10]Indeed, even in the NP the restriction holds only if we abstract away from optional movements, movements of arguments of the noun, etc. Given these simplifications, the restriction might actually carry over to other lexical categories.

projection WP. This derivation instantiates the possibility raised above.[11]

(30)



In sum, every tree-geometric shape, including rightward-movement structures, have an LCA-compatible counterpart, not just hypothetically but also in analytical practice. Therefore, a number of cross-linguistic generalizations that have been used to motivate the LCA do not follow from the theory, unless a way can be found to block remnant movement in the relevant cases.[12] For example, it has been observed that *wh*-movement and long NP raising are universally leftward (Bresnan (1970), **?**).[13] These generalizations have been used to motivate the LCA (e.g., Cinque (1996)) but do not in fact follow from it, as we have just shown. Similarly, Kayne (1994, p. 50) observes that while there are languages with verb-second, languages with the verb systematically in penultimate position do not seem to exist. This generalization extends to other second-position phenomena such as second-position cliticization Kayne argues that this asymmetry is a result of the LCA, as it implies that heads precede their complement and specifiers are unique and precede heads; therefore, both head movement and phrasal movement must be leftward. Verb-second results if the highest functional projection is targeted by both. But in fact there is an LCA-compatible derivation that results in the offensive pattern, as shown in (31). The derivation requires a sequence of two functional heads both of which attract the head of their respective complement. In addition, the lower functional head (F^0_1) attracts some maximal projection (YP) out of its complement, as is independently required for verb-second. Finally, the higher head attracts the complement of F^0_1, as required for roll-up structures.[14] Although we have not provided a procedure for shrinking trees like (31), where the functional head positions contain

[11] Movement of NegDP to [Spec, NegP] is intended to overtly mark scope. This implies that the subsequent movement of VP should not erase c-command relations. Recall that this assumption was part of the argument we made for saying that c-command relations are preserved under shrinking. See Cinque (2006) for a suggestion where underlying c-command relations are, in effect, destroyed by movement just to be recreated later–but binding principle A is computed somewhere along the way.

[12] Remnant movement cannot be ruled out across the board, as it is required for the analysis of structures like the following.

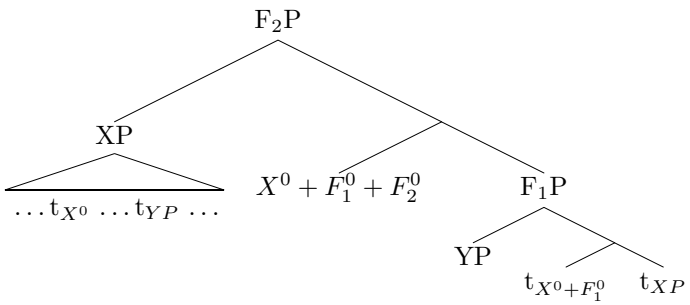
(i) a. Painted by Picasso, this painting doesn't seem to be.
b. How likely is there to be a riot?

[13] Signed languages are sometimes cited as counterexamples to the claim that *wh*-movement is universally leftward.???add references to Kegl et al, Petronio and Lillo-Martin, Glow 05...

[14] Remnant movement of headless phrases has been motivated for German by Müller (1998) and for Japanese by Koizumi (1995), Vermeulen (2005), contra Takano (2000). Should it turn out to be the case that head movement bleeds remnant movement, then the argument can be reconstructed by simulating head movement through remnant movement *à* la Koopman and Szabolcsi (2000) or Nilsen (2003).

moved material, we suspect that removal of structure required only for LCA compatibility yields a structure with head movement and phrasal movement to the right.

(31)



What these observations show is that developments in the field subsequent to the introduction of the LCA in Kayne (1994) have led to a situation in which LCA-based theories fail to capture the data that motivated the LCA in the first place. In other words, the LCA provides no insights into the type of generalizations quoted above.[15]

4.3 Is Stretching Harmless?

So far we have shown that there is no particular advantage in adopting the LCA over the more traditional alternative advocated here. There is an important disadvantage, however, that convinces us that the LCA should be abandoned. This disadvantage is that the movements required to reconcile the LCA with the attested word-order patterns stand in the way of arriving at a restrictive theory of movement. The general problem manifests itself in at least two ways, each one associated with a type of movement required by Cinque's analysis. The two movements in question are the very local movement that derives roll-up structures and the movement of NP in (6), where pied-piped material is stranded in an intermediate position.

Very local movement is problematic in the light of Saito and Murasugi (1993); Bošković (1997) and Abels (2003b,a). In those works an anti-locality condition on movement is proposed according to which no complement can recombine through movement with a projection of its selecting head.[16] Abels (2003b) argues that this condition has the following rationale: A head and its complement are in a local relation in the base structure (they mutually c-command each other) and no different relation is established by recombining the complement with a projection of the head. For any category that only permits extraction through an escape hatch, the prediction is that the complement of that category cannot be extracted. There is good evidence that extraction from CP must proceed through just such an escape hatch. It is therefore predicted, correctly, that IP will resist movement when generated as the complement of C^0 (den Dikken 1995 calls this the IP Immobility Principle). This pattern is striking, since extraction out of IP

[15] (Kayne, 1994, p. 140 fn. 8) acknowledges that even with the more restrictive theory of movement assumed at the time, the LCA doesn't by itself rule out the analogue of rightward V-to-C. "It is also essential to rule out derivations involving leftward movement of the finite verb to C^0 followed by leftward movement only in root contexts of IP to Spec,CP."

[16] Grohmann (2000) suggests an even more radical anti-locality constraint.

is possible. Both facts are illustrated in (32).

(32) a. ✓What do you think that Mary has read?
b. ✓Nobody thought that anything would happen.
c. ✓That anything would happen, nobody thought.
d. *Anything would happen, nobody thought that.

The general pattern extends to a number of other categories; thus, preposition stranding is blocked in languages where movement out of PP needs to proceed through an escape hatch while movement out of the complement of PP is unproblematic. Similarly, VP can never strand v, although extraction out of VP is, of course, allowed. Beyond these cases, which are discussed at length in Abels (2003b), patterns of extraction that parallel the data in (32) are found with several other categories. This would follow if these other categories also require extraction through an escape hatch. Two of these can be found in English. Extraction of NP stranding the determiner is ungrammatical but extraction from NP is unproblematic. Furthermore, it can be shown that English has two types of degree expression, one of which is a functional head selecting AP and the other a modifier that adjoins to AP as well as to other categories (see Neeleman et al. (2004)). Extraction of AP stranding modifying degree expression is possible, but similar movement stranding degree expressions that are functional heads is ruled out. As before, extraction out of AP is fine in both cases. The structures to be ruled out, then, are given in (33a-e).

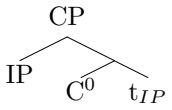
(33) a. *$[_{\text{CP}}$ IP [C^0 t_{IP}]]
b. *$[_{\text{PP}}$ DP [P^0 t_{DP}]]
c. *$[_{\text{vP}}$ VP [v^0 t_{VP}]]
d. *$[_{\text{DP}}$ NP [D^0 t_{NP}]]
e. *$[_{\text{DegP}}$ AP [Deg^0 t_{AP}]]
f. ✓[XP α [X^0 $[_{\text{YP}} \ldots t_\alpha \ldots]$]]
where X ranges over C, P, v, D, and Deg.

The structures discussed so far are all head-initial, but the same patterns are found with complements that precede the head. Thus the IP Immobility Principle applies to Japanese, Korean, and Turkish as well as to English, and the ban on preposition stranding is as common with postpositions as it is with prepositions. Needless to say, extraction from IP and from the complement of postpositions is unproblematic (see e.g. Sener (2006) for illustration based on Turkish postpositions). The set of structures to be ruled out should therefore be extended to (34a-e).

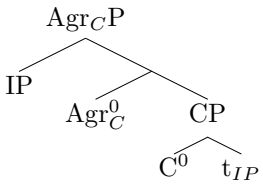
(34) a. *$[_{\text{CP}}$ IP [t_{IP} C^0]]
b. *$[_{\text{PP}}$ DP [t_{DP} P^0]]
c. *$[_{\text{vP}}$ VP [t_{VP} v^0]]
d. *$[_{\text{DP}}$ NP [t_{NP} D^0]]
e. *$[_{\text{DegP}}$ AP [t_{AP} Deg^0]]
f. ✓[XP α [$[_{\text{YP}} \ldots t_\alpha \ldots]$ X^0]]
where X ranges over C, P, v, D, and Deg.

As far as we can tell, the anti-locality constraint on movement cannot be formulated in theories that assume syntax to be antisymmetric. To account for head finality, LCA-based theories can adopt one of the following two structures. The problem with adopting (35a) (suggested in Kayne (1994)) is that it violates the anti-locality condition. However, giving up the anti-locality condition implies that the immobility of IP can only be stipulated. If, on the other hand, the anti-locality thesis holds, then (35a) must be rejected in favor of (35b). This implies that the escape hatch for extraction from the CP domain cannot be [Spec, CP] but must be [Spec, Agr_CP], which in turn has the unfortunate consequence that the account of IP's immobility is lost. Thus, either the anti-locality constraint must be abandoned, or it must be voided of its empirical content.[17]

(35) a.



b.



Essentially the same paradoxical situation presents itself in the case of unstrandable postpositions.

We now turn to a second restriction on movement that cannot be reconciled with the derivations proposed in Cinque's paper. In general the movements that derive base orders are assumed to target the noun. This explains why only movements of constituents containing the noun are admissible. Such movements can be construed as instances of pied-piping. Cinque is actually quite explicit about this; indeed, it is hard to see what else could explain the limitation to subtrees containing the noun. With this in mind, consider again the structure in (6). On the proposed analysis this must be a derivation in which material pied-piped in an initial step of movement (of Agr_YP to [Spec, Agr_XP]) is stranded by a subsequent one (movement of NP to [Spec, Agr_WP]). The problem is that such derivations seem to be systematically ruled out in other domains. Thus Postal (1972) observed that prepositions pied-piped under *wh*-movement cannot be stranded in

[17] Proponents of LCA-based theories face an additional question in this area. Kayne (1994) cites lack of obligatory *wh*-movement in complementizer-final languages as possible evidence for . However, if is adopted, there is an additional potential position following IP and preceding C^0. If that position were used for *wh*-movement, head-final languages would have rightward *wh*-movement. Thus, the question must be answered why [Spec, CP] is systematically empty.
In Kayne (1999, 2004) (see Borsley (2001) for discussion) a different account of head-finality is proposed. Under this proposal certain prepositions and complementizers are merged in a VP external position and combine with their apparent complements through movement. Along the way, a number of remnant movements occur. We leave it to proponents of such analyses to demonstrate how the IP immobility principle, the ban against P-stranding, and the word order typology in the NP can be made to follow under that set-up. The proposals are not sufficiently worked out to allow general evaluation yet.

intermediate positions, as shown in (36).[18] Movement under relative clause formation is subject to the same restriction, as (37) illustrates.

(36) a. ✓[PP With which friend] did you say t_{PP} that Mary went to the movies t_{PP}?
b. ✓[DP Which friend] did you say t_{DP} that Mary went to the movies with t_{DP}?
c. *[DP Which friend] did you say [PP with t_{DP}] that Mary went to the movies t_{PP}?

(37) a. ✓the famous rock [DP pictures of which] I think t_{DP} that Bill must have seen t_{DP} before
b. ✓the famous rock [PP of which] I think t_{PP} that Bill must have seen pictures t_{PP} before
c. *the famous rock [PP of which] I think [DP pictures t_{PP}] that Bill must have seen t_{DP} before

At the very least, the derivation Cinque assumes complicates the generalization that pied-piped material cannot be stranded. Therefore, it may well make it harder to develop an explanation of the relevant data. In contrast, the more conservative analysis of the N-Dem-A-Num word order advocated here ((1biv)) does not rely on stranding and therefore does not give rise to the same complication. This is a second example, then, where tree-stretching is potentially harmful.[19] [20]

5 Processing and Rightward Movement

So far what we have shown is that the typology of word order in the extended nominal projection can be derived from the assumptions given above as (7) and repeated here.

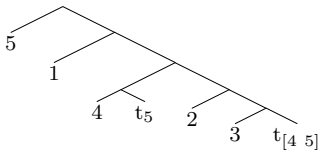
[18] Plessis (1977) claims that such derivations do exist in Afrikaans, but the analysis is dubious according to (Den Besten, p.c.) who reanalyzes the cases as involving parentheticals. den Besten shows that du Plessis' analysis cannot account for the verb placement in the examples involving putative intermediate stranding.

[19] There is one class of analyses according to which quantifier float may give rise to stranding of pied-piped material. Sportiche (1988), in particular, argues that quantifier and DP are generated as a constituent, and that the quantifier can be stranded, not only in its base position, but in any A-position through which the DP passes. However, there are several alternative accounts of quantifier float. Bošković's (2004) proposal comes very close to Sportiche's without allowing stranding of pied-piped material. Other authors have argued that floating quantifiers are base-generated as adverbs, rather than as part of the associated DP (see, for instance, Bobaljik (1995) and Janke and Neeleman (2005) .

[20] Assuming that pied pipers never strand their pied pipees, the predictions of our theory and of Cinque's theory diverge once more than four elements are taken into consideration. Suppose that there are five elements ordered by some kind of functional sequence. If pied pipers may strand their pied pipees, then the order in (i) can be derived as in (ia). A theory without such stranding cannot generate (i) from the base hierarchy 1>>2>>3>>4>>5. We are not aware of such orders, but the issue should be investigated since the fate of Cinque's theory depends on it.

(i) 5 1 4 2 3

a.



(38) a. The underlying hierarchical order of Dem, Num, A, and N in the extended nominal projection is Dem$\succ$Num$\succ$A$\succ$N, where $\succ$ indicates c-command;
b. all (relevant) movements move a subtree containing N;
c. all movements target a c-commanding position;
d. all (relevant) movements are to the left.

The first three assumptions are shared between our approach and Cinque's. The fourth comes in place of the LCA. In this section we will address the question why condition (7d) should hold.

We do not think that a syntactic explanation can be given, mainly because there is little if any evidence that linear order plays a role in syntax. We therefore feel that an explanation should be sought in a component of the language faculty for which left-right asymmetries are independently motivated. One possibility is to develop an account that relies on the linearization of syntactic structures at PF.[21] The formulation of the required rule is trivial: junctures created by movement are linearized with the moved category leftmost. The question is why such a rule should hold. Why should PF impose an ordering on a moved constituent and its sister if in general there is variation in the ordering of sister nodes in base-generated structures?

Another possibility would be to attribute asymmetries in movement to the parser. This is the line we will pursue here, following the spirit of work by Ackema and Neeleman (2002), though not the technical details of their proposal. The parser needs to recover hierarchical structures from input strings that are presented to it incrementally. As a result of this, there is an inherent asymmetry in the parsing process: bits of the input presented to the parser earlier on can be associated with a structure before substrings presented later. This is what makes it attractive to try to account for left-right asymmetries in terms of parsing.

Given that the general aim of parsing is to achieve an interpretation of the input as soon as possible, it is hardly surprising that early structure building is the hallmark of the human parser. In line with this, it is often claimed that the parser has no look-ahead capacity (see Frazier and Rayner (1982), Gorrell (1995), and references mentioned there). What this means is that at any stage of the parsing process, the parser must commit to an analysis of the input it has received. This commitment entails that the parser cannot decide to hold unstructured linguistic material in short-term memory (compare Just and Carpenter (1992)), for allowing it to do so would be tantamount to granting it access to its right context.

In order to explain the left-right asymmetry in movement, we have to make more specific assumptions about the representations the parser produces. We assume that these are trees expressing precedence and immediate dominance. This is not sufficient, however, since syntactic structures encode more information than just dominance. In particular, it is generally accepted that every category has one member with a privileged status as head. Although the number of functional projections has grown dramatically, they are still organized in so-called "extended projections" of a unique lexical head (Grimshaw (1991, 2005)). We assume therefore that the parser needs to represent headedness in addition to constituency. It does so in terms of statements that determine immediate domination between extended projections. We will use $>$ and $<$ to represent such statements in tree structures.

[21] Several authors have adopted the LCA but reinterpreted it as rule of linearization that operates at the PF interface (see Chomsky (1995a), Nunes (2004), Epstein et al. (1998), Moro (1997)). It is possible that a weaker version of these theories covering only the case of movement can be developed.

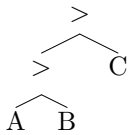
Consider the tree structures in (39). The first expresses that the extended projection of A is immediately dominated by a node belonging to the extended projection of B. The second tree expresses the reverse, i.e., the extended projection of B is immediately dominated by a node belonging to the extended projection of A.

(39) a.

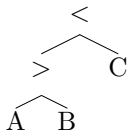
b.

As more of the input is parsed, trees will grow. An important condition on tree growth is that information represented at an earlier stage of the parse must be preserved at later stages. This strict preservation of information is the formal expression of the early commitments made by the parser. In practice this means that the relations between the extended projections of A and B in a representation like (39a) must be maintained. This will always be the case if the tree is expanded at the root, so both (40a) and (40b) are possible continuations of the parse in (39a).

(40) a.

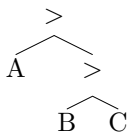


b.

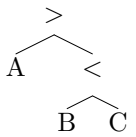


It is impossible however to insert a node between the root and either A or B which is labeled in such a way as to contradict the information contained in (39a). Thus, (41a) and (41c) are not possible continuations of the parse in (39a), because they express that A is immediately dominated by a node in the extended projection of C rather than B. In contrast, (41b) and (41d) are possible continuations of (39a) because the new node C belongs to the extended projection of either B or A, as required.

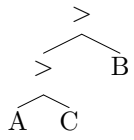
(41) a.



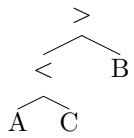
b.



c.

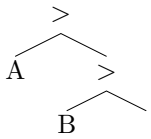


d.

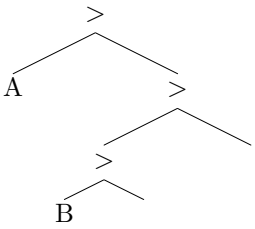


The requirement that information be preserved throughout the parse sometimes forces the parser to postulate empty branches at the right edge of the tree. Suppose for example that the extended projection of A cannot be part of the extended projection of B. Then the parser must either assume that the right context of the current parse contains an element whose extended projection hosts both A and B ((42a)) or it may pursue the hypothesis that A and B are embedded in different extended projections, in which case it needs to postulate two empty branches ((42b)).

(42) a.

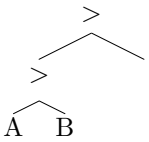


b.

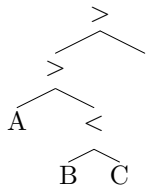


We can exploit the fact that incomplete parses may contain empty branches and define complete parses as those that lack empty branches (no commitment is made to further structure). Incomplete parses therefore always contain at least one empty branch at the right edge (there is a commitment to further structure). This implies that the trees in (39) must be altered slightly if they are to allow further growth. As given, they represent finished parses. For example, the transition from (39a) to (41b) could be corrected as in (43).

(43) a.



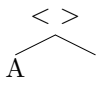
b.



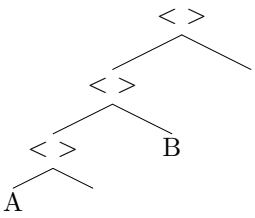
The theory of parsing that we have presented thus far is minimal in the sense that any theory of parsing must be able to express precedence, constituency, headedness, and whether a parse is complete or incomplete.

It is a property of our parser that final parses never contain empty branches. This is because an empty branch represents a commitment to further material, but if it is not part of an incomplete parse, such a commitment cannot be met. In a reasonable theory of parsing, fulfillment of commitments cannot be postponed indefinitely. This makes it attractive to further restrict the occurrence of empty branches. In particular, we propose that empty branches are tolerated only at the right edge of the current parse tree. The transition from (44a) to (44b) is therefore ruled out. (The bidirectional arrow in the tree is intended to indicate that headedness plays no role in the argument.)

(44) a.

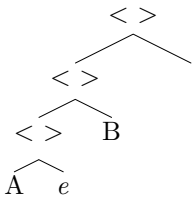


b.



(44a) makes a commitment that a sister of A will be found in the right context. That commitment can no longer be met if B is added at the root of the tree, as in (45b). This situation, where a branch remains radically empty, must be distinguished from one in which an abstract lexical item is inserted as a sister of A, as in (45).

(45)



While (44b) expresses a commitment that there will be a sister of A to its right, a promise which cannot be kept, (45) identifies the sister of A as a particular lexical item that happens to have no phonological realization, *e*. (The abstract lexical item *e* might be a silent version of English

one or *do so*, which would give rise to empty-headed noun phrases or verb phrases respectively.)

Crucially, traces, unlike *e* above, are not abstract lexical items but copies of their antecedents.[22] This implies that the parser cannot save a representation like (44b) by inserting a "trace", unless it has previously identified an antecedent for it (the category that provides the original for the copy). This implication of the copy theory of movement, in conjunction with the ban on structures containing non-final empty branches, yields what is known as the filler-driven strategy to the resolution of movement dependencies: the parsing of movement dependencies requires the identification of category as having moved prior to the insertion of a copy (see Frazier (1987, 1993); Frazier and Flores d'Arcais (1989); Gibson (1998)).

In line with this result, we propose that the parser buffers constituents which – it hypothesizes – have moved. Such buffering entails a commitment to insertion of a copy when a suitable position for the foot of the chain has been identified. It also entails that further processing of the moved constituent is postponed until the copy has been inserted. We will indicate buffering by the parser through a box drawn around moved material.[23]

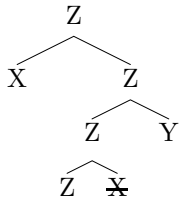
We are now ready to spell out the predictions the proposed parser makes with regard to movement. As we will show, it follows that difficulties arise if the parser is presented with a string created by (non-string vacuous) rightward movement of a constituent containing the lexical head of an extended projection stranding (parts of) that extended projection. In contrast, leftward movement of such constituents is unproblematic, as is rightward and leftward movement of full extended projections:

(46)

	complete extended projection	incomplete extended projection
Leftward movement	✓(47a)	✓(47c)
Rightward movement	✓(47b)	* (47d)

We will demonstrate this prediction by considering the tree growth required to parse the following structures.

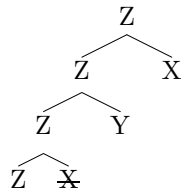
(47) a.



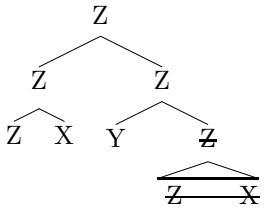
[22] Any implementation of this idea that makes traces partial or complete copies of or identical to the antecedent has this effect. We speak of copies here for simplicity only.

[23] We also assume that buffered material is exempt from the restriction against non-final empty branches. This is how our parser is able to deal with remnant movement. See footnote 25.

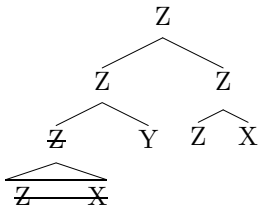
b.



c.



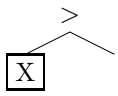
d.



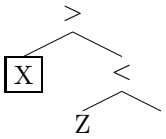
Example (47a) represents phrasal leftward movement. Of course, the string X Z Y permits many other possible parses, but we are not concerned here about how the parser decides on which parse(s) to pursue. All that matters here is that there is a successful path to the structure with which we try to associate the string.

Example (48) shows that the relevant string can be assigned the intended structure by the parser. In the first step, X is identified as a moved category in the extended projection of a lexical head that is yet to come. The second step identifies the relevant head as Z and commits to further structure in Z's extended projection. In the third step, a copy of X is inserted as Z's sister and X is removed from the buffer. The fourth step completes the parse by filling the remaining empty branch with Y. The three transitions preserve information in the sense demanded above.

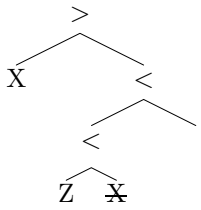
(48) a.



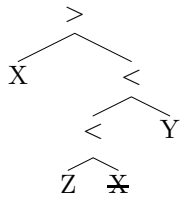
b.



c.



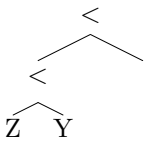
d.



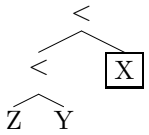
Example (49) shows the tree growth required for rightward phrasal movement. Steps (49a) and (49b) and the transition between them are trivial. For ease of exposition we have broken down the transition from (49b) to the final structure into two steps. Upon encountering X the parser assumes that it is a moved category and therefore undertakes to insert a copy. In the case at hand the copy is immediately inserted in the parser's left context as Z's sister. This expansion of the tree is admissible because commitment that Y is part of the extended projection of Z is preserved. This type of stretching of Z's extended projection was discussed above in connection to the transition from (39a) to (41b) (note that the parallel between the two cases is structural only, as linear order diverges).

(49) a.

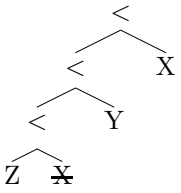
b.



c. (i)



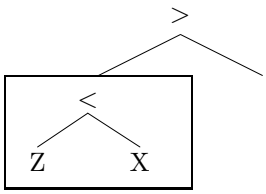
(ii)



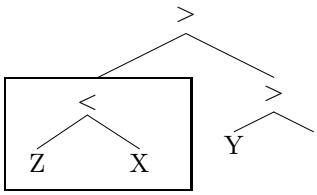
Example (50) represents the case of leftward movement of an incomplete extended projection. In step (50b) of the parse, the complex constituent containing the lexical head Z is buffered, that is, it is hypothesized to have moved. After subsequent processing of Y, a copy of the boxed constituent is inserted, providing the head of the extended projection in which Y occurs. Again, no commitments made earlier have to be overridden in the crucial transition from (50c) to (50d).

(50) a.

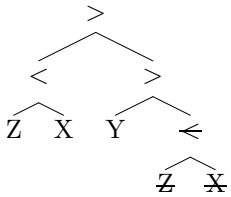
b.



c.

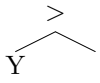


d.

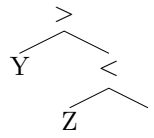


Finally, (51) presents the substantially different case of rightward movement of an incomplete extended projection. The steps in (51a) and (51b) are self-explanatory. As before, we break down the next and crucial step into two parts. In the first, the parser hypothesizes that the subtree consisting of the lexical head Z and its sister X has moved. Hence, the commitment is made to insert a copy of this subtree. Structure (51c-ii) represents an attempt at doing so in the parser's left context, preceding Y, a member of Z's extended projection. The transition to this tree is illicit. In (51a) through (51c-i), the labeling of the root node expresses that Y's extended projection is an immediate part of the category to its right. The labeling of the node inserted between Y and the root in (51c-ii) contradicts this earlier commitment, as that node does not belong to Y's extended projection.

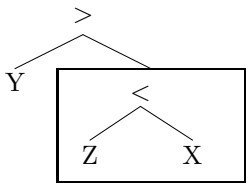
(51) a.



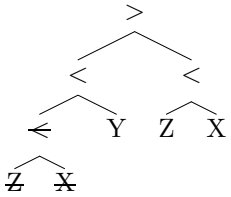
b.



c. (i)

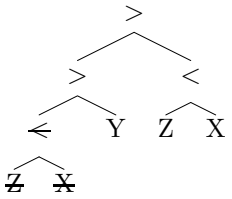


(ii)



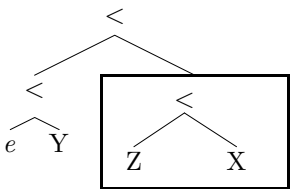
Of course the transition from (51b) to (52) *is* licit. However, this is not a structure in which an incomplete extended projection moves rightward. Rather, it represents movement of a complete extended projection out of Y's extended projection accompanied by "reprojection" of the moved category. The question whether such structures are allowed by the grammar is certainly an interesting one, but it is orthogonal to our present concerns. Example (52) simply does not match the structure we want to parse in (47d).

(52)



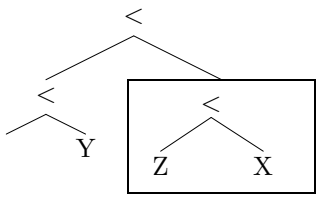
Other attempts at successfully parsing rightward movement of incomplete extended projections could be based on an early commitment in the parser to Y being contained in the extended projection of a category to its left. In effect, such attempts prefabricate a position for the insertion of a copy of a constituent containing the lexical head. One way in which such a position could be prefabricated would be by insertion of an abstract lexical item to the left of Y, as in (53).

(53)



However, the transition from (53) to (51cii) is inadmissible, as the content of the node preceding Y is changed from what we have represented as e to a copy of [$_<$ Z X]. This particular problem could be circumvented by positing an empty branch on Y's left, as in (54), but doing so would violate the condition that empty branches occur only at the right edge of the parse tree.[24]

(54)



We have demonstrated that, on fairly standard assumptions about parsing, the inherent left-right asymmetry of the process implies that rightward movement of incomplete extended projections is problematic. This is sufficient to capture the effects of the ban on rightward movement in the domain of the extended nominal projection. In other words, if our sketch of the parser is accepted, the assumption in (7d) is derived for the relevant cases. After all, movements in the nominal domain must target incomplete extended projections containing the lexical head, as stated in (7b).[25]

At the beginning of this section we pointed out that our case against the LCA relied on a stipulation about the directionality of movement which seemed out of place in a theory of syntax that has no linear asymmetries elsewhere. In order to complete the argument against the LCA, we therefore had to provide a rationale for this assumption. The fact that the processing-based account presented above does exactly this completes the argument against antisymmetric theories of syntax.

6 Exploring Consequences beyond the Noun Phrase

The proposal just sketched has positive consequences beyond the extended nominal projection. For example, it offers some hope of capturing the typological observation that the reverse of verb-second does not exist. A hypothetical language that places the verb in the penultimate

[24]The problem discussed here does not present itself if rightward movement of the incomplete extended projection is string-vacuous. This is because a reversal of the order of Y and [$_<$ Z X] in (51cii) makes it possible to maintain the hypothesis that Y is part of the extended projection of the constituent to its right. However, non-string-vacuous movement of this type is always going to lead to the problems discussed in the main text.

[25]For the sake of completeness we should point out that the semblance of rightward movement of an incomplete extended projection can be created through a two-step derivation involving leftward movement of that incomplete extended projection followed by remnant movement of a now headless constituent containing the trace of the first movement:

(i) [[$_Z$ Y ~~[$_Z$ Z X]~~] [$_Z$ [$_Z$ Z X] ~~[$_Z$ Y [$_Z$ Z X]~~]]]

Although we will not demonstrate this here, such structures can be parsed by the system we have proposed as long as we allow buffered material to contain empty branches at their right edge (a reasonable assumption). However, such derivations could never occur in the extended nominal projection because the remnant-movement operation runs afoul of the assumption in (7b).

position in main clauses would have a grammar requiring rightward head movement, but, as demonstrated, such movement is problematic from a processing perspective. In this respect the consequences of the proposal are identical to those of the LCA. Recall from the discussion in section 4.2 that the reverse of verb-second has an LCA-compatible derivation, namely through remnant movement of a constituent that has lost the verb as a result of leftward movement. This derivation is in principle available in the present system as well. However, LCA-based theories must allow rampant remnant movement to deal with other data and are thus hard-pressed to rule it out in this case. Our theory on the other hand does away with many remnant movements and thus holds the promise of a restrictive theory of movement that would rule out the problematic derivation.

Before exploring the consequences of our proposal, an important issue must be addressed regarding the status of the parsing based account of the ban on rightward movement. There are two possible interpretations of this account.

The first is that the grammar in principle allows both rightward and leftward movement and that the former is ruled out in the relevant cases because it leads to unparsable structures. On this view, the parser's commitments are absolute and retraction of such commitments is impossible. (If so, garden-path effects do not result from revision of early commitments but from abandonment of the current parse in favor of an alternative, a setup that fits in naturally with ranked parallel or serial parsing.)

The second interpretation does not hold the parser directly responsible for ruling out rightward movement, but takes the parsing difficulties described above as motivation for a grammatical principle stating that a moved constituent must be linearized at PF as preceding its sister. The idea behind this interpretation is that grammars may contain principles that increase the chance of successful parsing. Notice that the rule of linearization we have stated is in a sense over-accommodating because it rules out all types of rightward movement, even those that could be parsed. The reason for this over-accommodation may be sought in restrictions on possible grammatical principles. In particular, an alternative linearization rule that would exactly fit the parser's profile would need to look at global properties of movement structures: it would for instance need to check whether the trace of the moved category is an incomplete extended projection, that is, whether the trace projects. It is unlikely that linearization rules have such unlimited access to global properties of syntactic structure. One might think the suggested over-accommodation is rather drastic, but the parsing problems caused by rightward movement are very likely to extend beyond the cases discussed so far. In general, rightward movement differs from leftward movement in that it requires insertion of a trace in an already analyzed string. This means that the parser can deal with rightward movement only if that string is still "active", but continued activation increases parsing cost because of its demands on memory resources.

The two interpretations differ in their consequences for grammatical analysis. The first predicts that rightward movement exists in a certain set of well-defined circumstances; the second denies the possibility of rightward movement and therefore forces alternative analyses of phenomena exhibiting apparent dislocation to the right. We will now explore some of these consequences for the analysis of one specific rule of English grammar, namely heavy (NP) shift (HNPS).

We assume that the derivation of an example like (55) involves movement of the object. This is a widely but not universally accepted assumption going back at least to Ross (1967) (for

discussion see Rochemont and Culicover (1990)).

(55) I met _ yesterday my favorite uncle from Cleveland.

The challenge to this assumption comes from work by Larson (????light predicate raising, Kayne claims that it is in Larson (1988)) and Kayne (1994). Larson analyzes heavy NP shift as movement of a verbal constituent that excludes the object, as in (56a); Kayne claims that it results from separate movement of the verb and another constituent that ends up preceding the object, as in (56b).

(56) a. $[_{\text{vP}}\ [_{\text{V}}\ \text{V XP}]_i\ [_{\text{VP}}\ \text{NP t}_i\ ]\ ]$
b. $[_{\text{F}_1\text{P}}\ \text{V}\ [_{\text{F}_2\text{P}}\ \text{XP}\ [\ \text{F}_2\ \ldots [_{F_3 P}\ \text{NP}\ [\ \text{F}_3\ [\ \ldots \text{t}_{XP}\ \ldots \text{t}_V\ \ldots]]]]]]$

The discussion of the correct derivation for heavy NP shift in Kayne (1994) hinges on the analysis of examples in which the operation appears to license a parasitic gap. As pointed out by Engdahl (1983) examples like the following are gramamtical:

(57) I offended __ 1 by not recognizing __ 2 immediately – his favorite uncle from Cleveland

If the second empty position in (57) is a parasitic gap, the conclusion is inevitable that the object, *his favorite uncle from Cleveland*, has undergone $\overline{A}$-movement and that the first empty position contains a trace. This follows because parasitic gaps require overt $\overline{A}$-movement past the containing phrase to be licensed. Various authors have argued that there is no conclusive evidence for the status of the second empty position as a parasitic gap (Postal (1993, 1994)). The basis for this statement is that examples like (57) permit of a right node raising analysis. In fact, a right node raising analysis seems forced for examples like (58), in view of the fact that heavy NP shift does not strand prepositions (Ross (1967)). This restriction, to which we will return below, is illustrated in (59).

(58) ✓John listened to __ 1 without recognizing _ 2 immediately – his favorite Beethoven sonata. (Kayne, 1994, p. 74)

(59) *John was talking to __ about linguistics – one of my very oldest friends. (Kayne, 1994, p. 73)

While we do not want to deny the fact that structures like (58) and possibly (57) are derived by right node raising, it can be demonstrated that heavy NP shift licenses empty arguments even in contexts where right node raising is not available. These gaps must therefore be parasitic in nature and heavy NP shift must involve movement of the object (see Nissenbaum (2001, chapter 2) for a related argument).

The right node raising analysis of examples like (58) relies on an instance of *his favorite Beethoven sonata* occurring rightmost in both the main and the adjunct clause (for relevant discussion of right node raising see Wilder (1999); Sabbagh (2003); Bošković (no year); Abels (in press)). This implies that internal to the adjunct the object must have undergone heavy NP shift across *immediately*. The input for right node raising is therefore the structure in (60).

(60) John [listened to his favorite Beethoven sonata] [without recognizing _ immediately his

favorite Beethoven sonata]

As we have already seen, heavy NP shift never strands prepositions. The grammaticality of (61) can therefore not be understood in terms of right node raising. The application of heavy NP shift internally to the adjunct is blocked and therefore the context for right node raising cannot be created. The conclusion thus seems to be forced that the first empty position in (61) is a trace of $\overline{A}$-movement and the second empty position, a parasitic gap (note that complements of prepositions can be parasitic gaps).

(61) ✓I managed to read __ 1 without staring at __ 2 for too long – the resignation letter that was lying on my boss's desk.

Other examples that provide prima-facia evidence for the movement approach to heavy NP shift are the following. See the references cited for discussion.

(62) John has expected to find since 1939 – the treasure said to have been buried on that island. (Postal, 1974, p. 93 fn. 8)

(63) John had wanted to find, hadn't he, [the treasure said to have been buried on that island]
Kayne (1998) attributes this example to an unpublished manuscript by den Dikken, which we have not seen.)

(64) ?She has been requesting that he return ever since last Tuesday – the book that John borrowed from her just last year. (Kayne, 1998, p. 166 ex. 171)

6.1 The imposing parser: Heavy NP shift as rightward movement

If we accept the conclusion that heavy NP shift involves movement, we may adopt the traditional analysis, according to which examples like (55) are derived by rightward displacement of the object. Such an analysis presupposes that the grammar allows both leftward and rightward movement, and is compatible with the idea that infelicitous instances of the latter are filtered out by constraints on parsing.

As is well-known, apparent phrasal movement to the right is much more local than phrasal movement to the left. The exact definition of the bounding domain is a matter of debate. Rochemont and Culicover (1990) argue that, whereas heavy NP shift is rightward movement, extraposition of PPs and CPs should be analysed in terms of base generation and an interpretational rule. If we accept this conclusion, we can maintain that rightward phrasal movement can never escape from the extended projection in which the moving category is base-generated.

For example, heavy NP shift is not possible out of clauses, as shown by ((65a-b)) (based on Ackema and Neeleman (2002)). It is not possible either for heavy NP shift to strand a preposition, as shown by (51) (from Rochemont (1992, p. 387) this observation formed the basis of the discussion at the outset of this section).

(65) a. John wanted [$_S$ Frank [$_{VP}$ to study t$_i$ carefully [the entire book of Revelation]$_i$]]
b. *John wanted [$_S$ Frank [$_{VP}$ to study t$_i$]] dearly [the entire book of Revelation]$_i$

(66) a. *Mary put the money [on t_i] yesterday [a table that was standing at the entrance to the hall]$_i$
b. *John threw a look [at t_i] as he was walking by [a man who was standing outside his office]

A number of authors have argued that the locality of heavy NP shift can be derived from the design of the human parser (see Fodor (1978), Rochemont (1992), **?** Davis & Alphonce 1992 and Ackema and Neeleman (2002)). Although the parser can deal with rightward phrasal movement (as explained in section 5), it cannot handle such movement if sufficiently non-local. The reason for this lies in the operation of closure'.

It is widely assumed that in analysing an input string, the parser closes off certain units of already parsed structure and removes them from short term memory (see Kimball 1973). In other words, once the internal structure of a unit of the relevant type has been determined, and its semantics has been calculated, the parser treats it as an atom. It removes all statements that describe the internal structure of the unit in question from its storage component, and replaces this information with a single symbol. The reason for doing so is to easy the pressure on short-term memory during the parsing process.

After closure of a syntactic unit, it is no longer possible to insert a trace in that unit. In conjuncion with the filler-driven strategy to the parsing of movement dependencies, this implies that rightward phrasal movement can never escape from the unit of closure. In earlier work on the topic, the unit of closure was taken to be the phrase (see Kimball (1973) and Rochemont (1992)), but in view of recent developments in syntactic theory, as well as the considerations of section 5, a definition as the (maximal) extended projection would seem more appropriate. We leave unresolved the question of how exactly to deal with restructuring. It is clear, however, that HNPS never escapes finite clauses, which are clearly full extended projections. On this definition, the locality of heavy NP shift follows straightforwardly.

It should be clear that closure discriminates sharply between rightward and leftward movement. In the case of leftward movement, the trace follows its antecedent. Hence, the trace can be inserted in any extended projection, since insertion will coincide with the construction of that particular extended projection. In the case of rightward movement, the antecedent and its trace must be in part of the same extended projection, or else closure will block insertion of the trace after the moved phrase has been identified.

Thus, the structure in (67a), which corresponds to (67b) cannot be parsed, because the presence of a matrix adjunct forces closure of the embedded clause, thus preventing subsequent integration of the trace of the sentence-final DP. In contrast, (67b) is parsable, because the embedded clause has not undergone closure at the moment sentence-final DP is identified as having moved. Long-distance leftward movement is parsable as well, as the trace of the fronted DP in (67c) can be integrated in the embedded clause when this clause is being parsed.

(67) a. *[$_{CP}$ DP V [DP [VP V t_i]] AdvP DP$_i$]
b. [$_{CP}$ DP V [DP [VP V t_i AdvP DP$_i$]]]
c. [$_{CP}$ DP$_i$ [TP DP V [$_{CP}$ PRO [VP V t_i]] AdvP]]

If we assume that PPs are full extended projections, the same line of reasoning allows preposition

stranding under leftward movement, but not under heavy NP shift.

On the view of the relation between parser and grammar explored in this subsection, the parsing difficulties encountered in the case on long-distance rightward movement must be differentiated from the phenomenon of garden paths. The latter involve constructions that are hard but not impossible to parse. They occur when the parses can postulate two possible analyses for the input string (as the result of a local ambiguity), and prioritizes the wrong one. But in the case of non-local rightward movement, there is no local ambiguity, and therefore no alternative analysis to which the parser could resort.

One might think the existence of local ambiguities affects the explanation of the boundedness of rightward XP-movement just given. Heavy NP shift may cross material that induces a local ambiguity, for example an adverbial that can either be attached in the matrix or in the embedded clause:

(68) a. John expected Bill to meet his favourite uncle from Cleveland yesterday
(i) expect yesterday; (ii) meet yesterday
b. John expected Bill to meet yesterday his favourite uncle from Cleveland
(i) *expect yesterday; (ii) meet yesterday

As (b) shows, heavy NP shift is only compatible with a reading of the adverbial as belonging to the embedded clause. But why should the fact that the adverbial's scope is in principle ambiguous not prevent closure of the embedded clause, thus ruling in (68b) on a matrix reading of *yesterday*?

This question is misguided. Garden paths result from early commitment to an incorrect choice, rather than to lack of commitment. The local ambiguity induced by *yesterday* gives rise to two possible parses, neither of which can accommodate heavy NP shift into the matrix clause. The first parse takes *yesterday* to be a matrix adverbial, which will trigger closure of the embedded clause. Consequently, the trace of the clause-final DP must be inserted in the matrix clause (which is impossible since this DP is not selected by the matrix verb). The second parse takes yesterday to be attached in the embedded clause. This means that when the parser hypothesizes that the clause-final DP has moved, the embedded clause need not have been closed yet, and hence a trace can be inserted in it. But on this parse heavy NP shift is taken to be local.

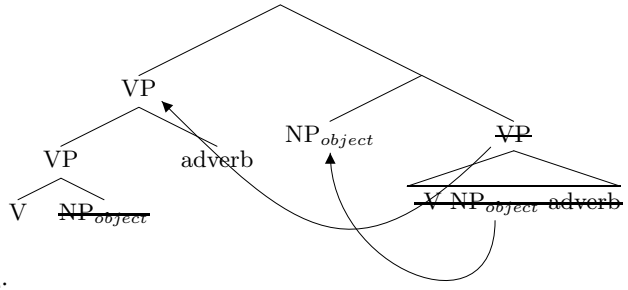
6.2 The accommodating grammar: Heavy NP shift as remnant movement

Above we claimed that our parsing result has two potential interpretations. The first one was that the grammar in principle allows both rightward and leftward movement and that the former is ruled out in the relevant cases because it leads to unparsable structures. The second was to assume that the grammar over-accommodates the parser and to rule out rightward movement generally in the grammar. We have just shown how the first option would interact with cases of phrasal movement to the right. We now turn to the question how heavy NP might be treated under the second approach.

We have presented a novel argument that heavy NP shift must involve movement. If rightward

movement is ruled out by the grammar, apparent rightward movement must be reanalyzed as remnant movement, as schematized in (69). The fact that heavy NP shift is clause-bounded must now be made to follow from some condition on remnant movement. In particular, long movement within the remnant must be ruled out (see discussion in the paragraph following example (29)). On a first pass such a condition can be formulated as our condition *Shallow Trace* in (70).

(69)



(70) Shallow Trace:
All intermediate traces of successive cyclic movement must be bound within remnants.

A condition along these lines is well-motivated on independent grounds from the properties of remnant VP-topicalization in German (see den Besten and Webelhuth (1990); Grewendorf (1994); Fanselow (1993); Bayer (1996); Müller (1998, 1999) for relevant observations, discussion and attempts at deriving something like Shallow Trace from independent grammatical considerations). Consider the following examples, all taken from Müller (1999). Examples (71) and (72) are simple illustrations of CP- and VP-topicalization. Examples (73) and (74) show that topicalization of VP and CP out of a weak island leads to mild degradation only. As (75) and (76) show, remnant movement can even cross a *wh*-element that originates within the remnant. This is possible only if the *wh*-trace within the remnant is shallow, as (77) and (78) show. The crucial difference between (75) and (76) on the one hand and (77) and (78) on the other hand is that in the former cases there is only an original trace of *wh*-movement within the remnant whereas in the latter cases there is an intermediate trace of *wh*-movement within the remnant as well. In other words, the traces in the former cases are shallow in the sense of (70) but in the latter they are not.

(71) Dass Fritz Claudia liebt hat er gesagt.
that Fritz Claudia loves has he said
He said that Fritz loves Claudia.

(72) Gesagt, dass er sie liebt, hat er gestern.
Said that he her loves has he yesterday
He said yesterday that he loves her.

(73) ?Dass Fritz Claudia liebt weiss ich nicht ob er gesagt hat.
that Fritz Claudia loves know I not if he said has
I don't know if he has said that Fritz loves Claudia.

(74) ?Gesagt dass er sie liebt weiss ich nicht ob er hat.
said that he her loves know I not if he has.

I don't know if he has said that he loves her.

(75) ?Gelesen weiss ich nicht was er hat.
read know I not what he has
I don't know what he has read.

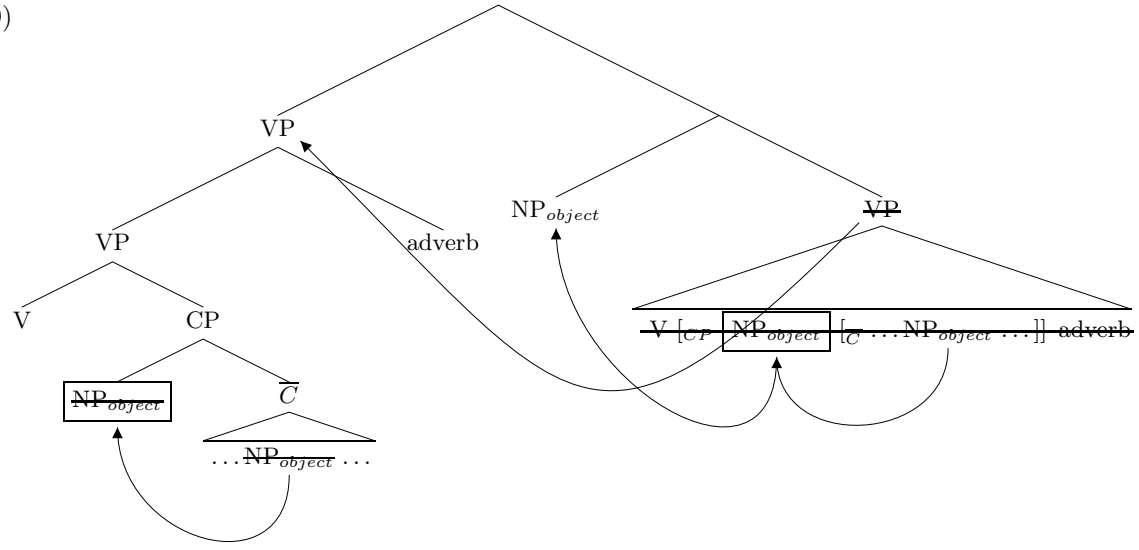
(76) ?Zu lesen weiss ich nicht was er versucht hat.
to read know I not what he tried has.
I don't know what he tried to read.

(77) *Gesagt dass Fritz liebt, weiss ich nicht wen er hat.
Said that Fritz loves know I not who he has.

(78) *Dass Fritz liebt weiss ich nicht wen er gesagt hat.
that Fritz loves know I now who he said has

On the standard assumption that movement across a clausal boundary is possible only successive cyclically, Shallow Trace has the effect of ruling out heavy NP shift across a clause boundary, (79). Successive cyclic movement will leave an intermediate trace in [Spec, CP]. This trace is framed in (79). Since this trace remains unbound within the remnant, Shallow Trace rules out this representation.

(79)



Crucially, this restrictive treatment of remnant movement is not available under the LCA. To see why, consider (80). *Yesterday* must be construed as modifying the matrix clause, but it appears at its right edge. Standard constituency diagnostics (VP-topicalization, VP-ellipsis) show that *yesterday* is generally outside of the VP (pace Larson (1988); Pesetsky (1995)). Since a strict LCA-based analysis cannot base-generate *yesterday* as a right adjunct or specifier, the entire remnant-VP, *say that she will buy* t_{what}, must have moved in violation of Shallow Trace.

Cases like this abound since any instance of successive cyclic movement out of a domain with a right adjunct, right head, or right specifier will lead to this problem. Shallow Trace or anything remotely like it does not seem to be a possible constraint on remnant movement in LCA-based syntax.

(80) What did Mary [say that she will buy t_{what}] yesterday.

If the generalization that heavy NP shift never strands prepositions is true, then Shallow Trace can easily capture this by simply assuming that PPs are phases and thus involve the creation of an intermediate trace in their highest specifier to capture the fact, mentioned above, that heavy NP shift out of PPs is ill-formed (see Sabbagh (2003) for a similar idea).[26] In fact, the effects of Shallow Trace discussed so far will be identical to those of closure (as discussed in the previous subsection), if all extended projections are phases.

Before considering the consequences of Shallow Trace further, consider example (81). (81a-b) are sometimes taken to show that heavy-shifted material becomes an island to extraction. This is not true, however, as (81d) clearly shows. The generalization seems to be that extraction from the heavy shifted phrase is possible, just in case the remainder itself is heavy and informative enough. Our theory straightforwardly captures this effect. The distinction between the examples in (81b-d) seems to rest on the trigger of heavy-shift. This trigger, if present at all in (81b) is removed by *wh*-movement but it remains in the heavy-shifted phrase in (81d). (81b) can then be ruled as a violation of the condition that the pied-piper can never strand the pied-pipee in an intermediate position. As argued above, Cinque's LCA-based analysis cannot maintain this generalization.

(81) a. ✓the problem which I explained part of to John.
b. ?*the problem which I explained to John part of.
c. ?the problem which I explained to John only part of (Kayne, 1994, p. 74)
d. ✓the problem which I explained to John only the first part of

Of course, (81d) involves intermediate traces of successive cyclic movement within the heavy-shifted NP that are not bound within it; that is, (81d) potentially violates Shallow Trace. A derivational construal of Shallow Trace (see Müller (1999) for a similar idea) together with the assumption that VP-movement freezes the VP heavy NP shift does not freeze the NP allows us to solve this problem (see Müller (1995)). Admittedly, the idea that some instances of movement do and some instances of movement do not freeze the moved item weakens the case against LCA-based analyses from examples like (80) somewhat.

Now, Shallow Trace in conjunction with the ban against pied-pipers stranding pied-pipees achieves more than just this. Idealizing somewhat, Wexler and Culicover (1980) observe that heavy NP shift freezes any material crossed over by heavy shift. The facts are illustrated in (82),

[26] Above we appealed to Abels' 2003b account of the ban against P-stranding in most languages in terms of anti-locality. As discussed by Abels, the parameter that allows PPs in English to be stranded can be given either in terms of a parametrization of the notion of a phase or by assuming that there is a piece of abstract structure present between prepositions and DPs in P-stranding languages but not in non-P-stranding languages. If the speculations here are on the right track, the P-stranding parameter must involve the presence of abstract structure.

where the PP becomes an island to extraction when crossed by heavy NP shift ((82c)). Notice that the PP itself remains extractable even when crossed by heavy NP shift ((82d)). This effect follows immediately from the assumptions that we have made.

(82) a. ✓the person who(m) John gave all his old linguistics books to $t_{who(m)}$ last week.
b. ✓the person to who(m) John gave all his old linguistics books $t_{to\ who(m)}$ last week.
c. * the person who(m) John gave __ to t_{who} last week – all his old linguistics books.
d. ✓the person to who(m) John gave __ $t_{to\ who(m)}$ last week – all his old linguistics books.

Consider the derivation of (82d) first. On the assumption made above, moving the VP leftward freezes it for extraction. Thus, direct extraction of *to whom* from the leftward moved VP is impossible. Evidently, if VP freezes through movement, the PP, *to whom*, must be extracted from VP prior to movement of VP. Since PPs unlike DPs are not subject to Case adjacency and reorder quite easily, this is unproblematic. There is then, necessarily an intermediate step in the derivation along the lines of (83). As can be easily seen, *to whom* can undergo movement to the specifier of CP from its shifted position. This explains why (82d) is acceptable.

(83) [[$_{VP}$ V t_{DP} t_{PP}] [last week] [[$_{DP}$ all his old linguistics books] [[$_{PP}$ to whom] t_{VP}]]]

Now consider the possible derivations of (82c). If the relative pronoun or the PP remain within VP when the VP moves and freezes, they will be trapped. Thus, either the relative pronoun or the PP have to shift out of the VP before it freezes. In other words, there has to be an intermediate stage of the derivation with the structure in (84a) or (84b). While (84a) is presumably licit intermediate step on a par with (83), the derivation cannot proceed from there to (82c) without violating the generalization that pied pipers cannot strand their pied pipees. This rules out the derivation of (82c) by way of (84a). The only remaining derivation of (82c) must therefore proceed via (84b). However, (84b) violates the generalization that heavy NP shift does not strand prepositions. In our system, the ban against P-stranding under heavy NP shift follows from Shallow Trace ((70)), which therefore rules out (84b).

(84) a. [[$_{VP}$ V t_{DP} t_{PP}] [[$_{PP}$ to whom] [$_{DP}$ all his old linguistics books] t_{VP}]
b. [[$_{VP}$ V t_{DP_1} [$_{PP}$ t_{DP_2} [to t_{DP_2}]] [[$_{DP_1}$ all his old linguistics books] [[$_{DP_2}$ whom] t_{VP}]]]

This account of (82c) makes an interesting prediction. The only condition that ruled out the derivation of (82c) via (84b) was the condition that pied pipers do not strand their pied pipees. Clearly then the freezing effect should be avoidable if the PP contained material that warranted shifting independently. This expectation is borne out as (85c) illustrates.[27]

[27]The exact limits of the freezing effect are unknown and require further investigation. There are interesting triplets of examples like the following, where P-stranding seems to be disfavored. A thorough discussion of such cases would go beyond the bounds of this section.

(i) a. I consider excessively angry at Robin a whole gang of maniacal Tolstoy scholars.
b. ?Robin is a person at whom I consider excessively angry a whole gang of maniacal Tolstoy scholars. (Rochemont and Culicover (1997, p. 299 fn. 9 ex. # 1) attributed to Johnson (1986))

(85) a. *the person who(m) John gave to all his old linguistics books
b. ✓the person to whom John gave all his old linguistics books
c. ?the recently deceased man who I gave to the widow of all my old linguistics books.

Our account of HNPS is successful in capturing the main properties of the construction. To the best of our knowledge, no existing account of HNPS manages to capture all the effects that our account captures. Given that the account relies crucially on the Shallow Trace constraint and the constraing against pied pipers stranding their pied pipees, both of which are unavailable in a strictly LCA-based syntax, we conclude that the success of the present remnant movement account of HNPS provides an important, if intricate, argument against the LCA.

7 Concluding Remarks

In this paper we have argued that the LCA should be given up. It should be replaced by the weaker condition that all movement is leftward. The argument is based on the observation that the hypothesis that specifiers universally precede heads and that heads universally precede their complements carries no empirical burden in the arena of universal 20, or indeed anywhere. Restrictiveness must come from a restrictive theory of movement. Such a restrictive theory of movement is unavailable under the LCA, as we have shown in several places of this paper. As the last section on HNPS shows, the result extend beyond the extended projection of the noun. We have suggested a parsing rationale for the restriction against rightward movement to replace the LCA.

c. *Robin is a person whom I consider excessively angry at a whole gang of maniacal Tolstoy scholars.

(ii) a. I would like removed from this property the squatters whose rights were terminated by that last ruling of the court.
b. ?From which properties would you like removed, the squatters whose rights were terminated by that last ruling of the courts?
c. *Which properties would you like removed from the squatters whose rights were terminated by that last ruling of the courts?

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