Right-Node Raising and Delayed Spellout[*][†]

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1   Introduction

Across the Board (ATB) movement is generally subject to the same islands that constrain regular *wh*-movement:[1]

(1)   * **Who**$_i$ did [a man who loves t_i dance], and [a woman who hates t_i go home]?

In (1) a *wh*-element is extracted from subjects within both conjuncts. Not surprisingly, the result is ungrammatical. We observe a systematic exception to this pattern: if the gaps corresponding to the extracted element are rightmost within both conjuncts, extraction is possible even across islands:

(2)   **Which book**$_i$ did [John meet the man who wrote t_i], and [Mary meet the woman who published t_i]?

There is another construction involving coordination, Right-Node Raising (RNR; Ross, 1967), that has long been known to be insensitive to conjunct-internal islands:

(3)   [John met the man who wrote ＿] and [Mary met the woman who published ＿] **the recent bestseller about bats**.

[1]For expository convenience we mark conjuncts with brackets, and material that is shared between conjuncts with boldface. We indicate leftward movement with indexed traces, and rightward movement with underscores. None of this should be taken to have any theoretical import.

In addition to island insensitivity, RNR shares with (2) the property that rightmost within each conjunct is a gap associated with the shared material. We will argue that these similarities are not accidental, an that (2) is an instance of RNR that has fed a subsequent operation of *wh*-movement. We will further argue that the interaction of RNR and *wh*-movement allows us to settle certain open questions about the structure of RNR. The remainder of this section reviews some of the known empirical puzzles of RNR and their implications on possible syntactic analyses. In section (2) we present our new observations about the interaction of RNR and *wh*-movement. Combined with the facts discussed earlier, we show that the *wh*-movement facts argue for a multiple-dominance structure, an idea originally proposed by McCawley (1982) and defended more recently by Wilder (1999).

While multiple-dominance is required in order to account for the empirical facts, it cannot do so without a clear theory of locality. We develop our proposal, presented in section 3, within the framework of the Minimalist Program, where locality, in the form of cyclic spellout, is a central notion, and where multiple-dominance, in the form of re-merge, has been recently used as an account of movement. We observe, however, that current re-merge accounts of movement can be considerably simplified by taking complete dominance, rather than dominance, as the relevant notion for spellout. Significantly, this simplification also makes the correct predictions about the interaction of RNR, *wh*-movement, and islands.

After describing how multiple-dominance structures are formed and spelled out, we turn to the question of how such structures should be linearized. In addition to general problems regarding the linearization of multiple-dominance structures, RNR exhibits a puzzling mix of strict linear-order requirements and extreme freedom. We show that as long as each node keeps track of the linearization of all the terminals that it dominates, we can use a weak linearization procedure that makes possible the required freedom, while the strict linearization requirements are taken care of by the independently needed spellout mechanism. The full pattern of RNR, with and without *wh*-movement, is now predicted, including a surprising and previously unnoticed fact about potentially ungrammatical RNR rescued by *wh*-movement.

1.1 RNR puzzles: a short survey

Two questions have been central to the discussion about the structure of RNR, and will be the focus of the current section and of section 2. The first question is whether RNR depends on movement, or whether the shared material[2] remains *in situ*. The second question is whether there are separate instances of the RN for each attachment site, or whether the same instance is attached multiple times.

1.1.1 Islands

RNR is insensitive to islands for leftward movement such as relative clause islands:

(4)   [John met a man who wrote __], and [Mary met a man who published __] **a recent book about bats**.

Significantly, as mentioned above, ATB *wh*-movement does not share this property. Consider again (1) above, repeated here as (5):

(5)   * **Who**$_i$ did [a man who loves t_i dance], and [a woman who hates t_i go home]?

The contrast between (4) and (5) suggests that RNR is not simply a mirror image of ATB. We return to this point when we discuss *wh*-extraction from RNR in section 2.

1.1.2 The Right-Roof Constraint

Ross (1967) noticed that movement to the right is bounded by a highly restrictive locality condition. Heavy NP Shift (HNPS) demonstrates this restriction, often referred to as the Right-Roof Constraint (RRC).[3] A heavy NP may be dislocated to the right (6), but it can only cross local material on its way. In this example, the intervening *yesterday* originates within the same clause, and perhaps even the same verb phrase, as the heavy NP *the new headmaster*. When the intervening material is less local (7), HNPS is blocked.

(6)   Sam saw __ yesterday **the new headmaster**.

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[2]Also known as Target, Pivot, and Right Node. We will usually refer to it as RN.

[3]Ross first used the term *upward boundedness*, introducing the term *Right-Roof Constraint* in subsequent lectures. (Háj Ross and Alex Grosu, p.c.)

(7)   * John claimed that Sam loves __ yesterday **the new headmaster**.

As with the islands discussed above, RNR is not subject to the RRC:

(8)   [John claims that Sam loves __], and [Mary claims that Sam hates __] **the new headmaster**.

In (8), each conjunct contains two clauses, and the shared material is related to the most embedded position in each conjunct. A movement analysis for RNR has to explain how it is possible for rightward movement to escape two CPs (and at least as many cyclic nodes) in such cases.

1.1.3   Non-constituents and RNR below the word level

The insensitivity of RNR to islands and bounding conditions has been taken to suggest that the movement analysis is incorrect, and that the RN remains *in situ*. Additional support for this direction comes from an observation by Abbott (1976) that RNR can affect non-constituents (9). RNR can also operate below the word level (10), further complicating the task of a movement analysis.

(9)   [John borrowed __], and [Mary stole __] **large sums of money from the Chase Manhattan Bank**.

(10)   [His theory under-__], and [her theory over-__]**generates**. (*Example from Sabbagh, 2003/2006*)

One *in situ* approach to RNR analyzes the RN as appearing in each conjunct but being pronounced only within the rightmost one. All other instances undergo some kind of ellipsis. Such an approach has been argued for by Swingle (1995), Wilder (1997), and Hartmann (2000), among others. Island insensitivity, under this approach, is no longer a challenge since no movement takes place. Example (9) is explained if we assume that non-constituents and word parts can be deleted.

1.1.4   Exceptional scope

Treating the raising of the RN as illusory obviates many of the locality problems raised by RNR. However, evidence from Quantifier Raising discussed by Sabbagh (2003/2006) suggests that the movement characterization of Ross (1967) is more accurate, at least as far as interpretation is concerned.

Sabbagh notes that a quantifier in the RN can scope over elements that are too high for it if no RNR takes place.

(11) a. [John knows a man who speaks __], and [Mary knows a woman who wants to learn __] **every Germanic language**. ($\exists \succ \forall, \forall \succ \exists$)

b. [John knows a man who speaks every Germanic language], and [Mary knows a woman who wants to learn every Germanic language]. ($\exists \succ \forall, *\forall \succ \exists$)

c. John knows a man who speaks every Germanic language. ($\exists \succ \forall, *\forall \succ \exists$)

In (11a) the universal quantifier in the RN can scope over the indefinites *a man* and *a woman* inside the conjuncts. Pronouncing 'every Germanic language' within each of the conjuncts (11b) does not allow the universal to scope over the indefinites. The tensed clauses inside each conjunct prevent QR, just as they would in a single conjunct version (11c).

Other interpretive effects that seem to favor a movement analysis over an *in situ* approach are the ability of distributive and cumulative elements to take both conjuncts within their scope. The prominent reading of (12a) is that where the tunes that John hummed were different from the tunes that Mary whistled. Repeating 'different tunes' within each of the conjuncts blocks this reading, as in (12b), which can only mean that the tunes that John hummed were different from each other and that the tunes that Mary whistled were different from each other. Similarly, the prominent reading of (13a) is that where the total of what John borrowed and of what Mary stole amounts to 3000 dollars. This would be true, for example, if each took 1500 dollars. Overt substitution blocks this reading, and (13b) can only mean that each of them took 3000 dollars.

(12) a. [John hummed __], and [Mary whistled __] **different tunes**.

b. [John hummed different tunes], and [Mary whistled different tunes].

(13) a. [John borrowed __], and [Mary stole __] **a total of 3000 dollars from the Chase Manhattan Bank**.

b. [John borrowed a total of 3000 dollars from the Chase Manhattan Bank], and [Mary stole a total of 3000 dollars from the Chase Manhattan Bank].

1.1.5   Lebeaux effects

HNPS has been known to bleed Condition C violations inside adjuncts to the shifted NP:

(14)   Sue promised him$_i$ _ yesterday **a book that John$_i$ liked**.

Fox and Nissenbaum (1999) use similar effects with respect to adjunct extraposition to argue for a late merger of the relative clause to the NP, after the NP has moved outside the scope of the pronoun. If the pronoun is above the clause containing the base position of the NP, HNPS cannot move the NP higher than the pronoun without violating the RRC. Consequently, late merge of the relative clause cannot rescue the sentence from a violation of Condition C, and the result is ungrammatical:

(15)   ?? He$_i$ remembered that some museum wanted to borrow **a picture that Todd$_i$ painted last year**.

If RNR involves movement of the RN to a position outside the coordinate structure, we would expect that late merger of the relative clause would allow the bleeding of Condition C violations with respect to conjunct-internal pronouns. In fact, however, such violations are ungrammatical:

(16)   ?? [She remembered that some gallery wanted to buy _], and [he$_i$ remembered that some museum wanted to borrow] **a picture that Todd$_i$ painted last year**.

1.1.6   The Right Edge

While RNR appears to be insensitive to many of the locality constraints that affect other dislocation phenomena, it is subject to a separate, highly stringent locality constraint. We model our characterization after Sabbagh (2003/2006):

(17)   RIGHT-EDGE RESTRICTION (RER)
       The RN or a gap associated with it must be rightmost within each conjunct.

The RER covers the following judgments:

(18)   a.   * [Joss will donate _ to the library today _], and [Maria will donate **several old novels** to the library tomorrow].
       b.   [Joss will donate _ to the library today _], and [Maria will donate _ to the library tomorrow _] **several old novels**.

In (18a), the RN *several old novels* appears before *to the library tomorrow*, which can only be interpreted inside the second conjunct. The RER is violated, and the result is ungrammatical. When *several old novels* is made rightmost within the second conjunct (18b), the result is grammatical.[4]

As it stands, capturing the RER poses a problem for both movement and *in situ* analyses of RNR. Leftward movement, including ATB extraction, has no constraint that parallels the RER. In fact, reordering of overt phonological material is the hallmark of leftward movement. Rightward movement, too, reorders phonological material, insofar as this does not cause a violation of the RRC. Incorporating a constraint in terms of string vacuousness would make RNR rather different from other movement operations. For the *in situ* analysis of RNR as phonological deletion the RER is likewise foreign. VP ellipsis, for example, has been analyzed using both semantic and syntactic mechanisms, but string adjacency does not seem to play a role in the explanation.

1.2   Two recent proposals

Two recent proposals, the *in situ* analysis of Wilder (1999) and the movement analysis of Sabbagh (2003/2006), take the RER as a central phenomenon that should be accounted for. While differing in many respects, both proposals share the insight that the source of the RER is also the source of the island insensitivity of RNR. As will be evident in section (3), we adopt this idea without change. We now present a short summary of the two proposals. A more detailed discussion is provided in Appendix (B).

1.2.1   Wilder (1999)

Wilder (1999) proposes an *in situ* analysis that makes use of multiple dominance and a modified version of the Linear Correspondence Axiom (LCA) of Kayne (1994). Multiple dominance involves an element α that is dominated by two nodes, X and Y, such that neither dominates the other. Kayne's LCA cannot linearize such structures. Wilder consequently redefines the LCA and the notion of c-command to correct that by allowing X and Y to c-command α, and by preventing either of them from containing α within

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[4]The RN is made rightmost through Heavy-NP Shift, a topic we have nothing to say about here.

its image. The resulting system allows certain multiply-dominated structures to be linearized. In particular, RNR that obeys the RER is correctly predicted to be grammatical. On the other hand, as discussed by Sabbagh (2003/2006), the system wrongly predicts that RNR may violate the RER as long as the RN does not c-command any element in any non-rightmost conjunct:

(19)   * [A man who loves _ danced], and [a woman who hates **the new headmaster** went home].

1.2.2   Sabbagh (2003/2006)

Sabbagh (2003/2006) proposes an ATB account based on the linearization procedure of Fox and Pesetsky (2005). He proposes to replace the RRC and the RER with the following:

(20)   LINEARIZATION PRINCIPLE

    a. At the end of each cycle linear order is fixed.

    b. Within conjunction, material inside one conjunct does not count for the purpose of linearizing material within another conjunct.

    c. The only two positions available for the right attachment of an element α are the original cyclic node in which α was merged and the root of the sentence.

    d. Other than that, movement (to the right) is free.

Since linear order is fixed after each cycle, an element α moving from the left of element β to its right must do so during the first cycle in which β is introduced. But since α can only right-attach to its own immediate cyclic node or to the root, it can only cross β if β belongs to the immediate cyclic node of α or to the cycle of the root.

(21)   a. $[_1[_2[_3\alpha\ \beta]]] \rightarrow [_1[_2[_3\underline{\alpha}\ \beta\ \alpha]]]$

    b. $[_1[_2[_3\alpha]\ \beta]] \nrightarrow [_1[_2[_3\underline{\alpha}]\ \beta\ \alpha]]$

    c. $[_1[_2[_3\alpha]\ \beta]] \nrightarrow [_1[_2[_3\underline{\alpha}]\ \beta]\alpha]$

    d. $[_1[_2[_3\alpha]]] \rightarrow [_1[_2[_3\underline{\alpha}]]\ \alpha]$

HNPS is the case in which an NP α crosses overt material β within the same phase (21a). Shifting α across overt phonological material β that is in a higher phase, but not the root phase, is ruled out: attaching α inside the

phase of β (21b) violates the condition on possible attachment sites, while attaching α at the root (21c) violates the linearization of α to the left of β at a previous phase. Finally, in the absence of overt phonological material to its right (21d), α is allowed to re-attach at the root, regardless of how many phases it needs to cross. Since other conjuncts in RNR assumed not to count as overt phonological material, this final scenario makes possible movement of the rightmost material from within a conjunct. Significantly, under the linearization principle (20) RNR always involves adjunction at the root level, and the linear ordering of the RN on the right is fixed. These properties lead to several incorrect predictions to which we return below.

2 New observations: RNR and leftward dislocation

2.1 RNR can feed *wh*-movement

Consider again (4), repeated below:

(22)   [John met a man who wrote _], and [Mary met a man who published _] **a recent book about bats**.

We observe (23) that a *wh*-phrase corresponding to the RN in (22) can appear on the left , even though each of the conjuncts contains a relative clause island (24).

(23)   **Which book**$_i$ did [John meet the man who wrote _], and [Mary meet the man who published _] t_i?

(24)   * Which book$_i$ did John meet the man who wrote t_i?

We describe (23) as *wh*-movement of the RN in (22). One may wonder whether an alternative description that does not involve RNR is possible. The only principled way to do this that we can think of is rethinking the locality conditions on ATB. Recall from the introduction that ATB movement, as opposed to RNR, is in general sensitive to islands:

(25)   * Who$_i$ did [a man who loves t_i dance], and [a woman who hates t_i go home]?

Using (23) we can state the following condition on ATB movement:

(26)   CONDITION ON ATB
        Wh-movement is possible across-the-board only if no island occurs in either conjunct, or if a corresponding RNR configuration is available.

Condition (26) is hard to account for under most proposals. It is particularly puzzling under any of the *in situ* family of analyses for RNR, since for them the island insensitivity of RNR is only illusory. By analyzing RNR as not involving movement of the RN they manage to avoid a modification of the general island and locality conditions of the grammar. But if RNR does not move the RN above the conjunct-internal islands, it is hard to understand why *wh*-movement is exempt from such islands precisely in those configurations that correspond to an RNR configuration.

2.2   Extraction from within the RN is possible

In addition to extracting the whole RN, it is also possible to extract only part of it, leaving overt material on the right:

(27)   **Which animal**$_i$ did John say that Mary knew [a man who wrote __],
and [a woman who published __] **an encyclopedia article about**
t_i?

(27) contains both RNR and *wh*-extraction from within the RN. Here, too, the conjuncts contain relative clause islands, making it unlikely that the *wh*-phrase was extracted before RNR applied to the remnant. As in our discussion of (23), we conclude that RNR exempts the RN from the relative clause islands in (27), after which *wh*-movement applies to the *wh*-phrase. This further emphasizes the point that RNR may feed *wh*-movement, and that its island insensitivity is real. But (27) also provides a straightforward argument against a linearization-based account of locality, where RNR is analyzed as rightward movement of a rightmost element, avoiding islands by virtue of being string vacuous. Recall, for example, the analysis of Sabbagh (2003/2006). As mentioned above, Sabbagh uses the linearization mechanism of Fox and Pesetsky (2005) together with a constraint on available landing sites on the right to derive the bounding conditions on RNR. The RN is linearized on the right edge of its immediate cyclic node, and then waits for the root to be merged. In the absence of intervening material, the RN can then right-adjoin to the root, ignoring all islands along the way. Crucially, in order to capture the RER, the linearization of the RN to the right of the rest of all other conjunct-internal material is fixed. Nothing, after the first cycle is over, can move the RN to the left. But this is exactly what happens to the *wh*-phrase in (27).

2.3 Islands reappear

We saw above that RNR is insensitive to islands, and that this insensitivity is inherited by subsequent overt movement (23) and covert movement (11a). Those examples, repeated here as (28) and (29) respectively, involve only islands within the conjuncts.

(28) **Which book**$_i$ did [John meet the man who wrote __], and [Mary meet the man who published __] t_i?

(29) [John knows a man who speaks __], and [Mary knows a woman who wants to learn __] **every Germanic language**. ($\exists \succ \forall, \forall \succ \exists$)

As soon as we add an island above the coordination, it will restrict the movement of the RN just as it would restrict any other element.

(30) * **Which animal**$_i$ does John know a reporter who made famous [a man who published __] and [a woman who illustrated __] **a book about** t_i?

(31) Some student made the claim that [John can speak __], and [Mary can write __] **every Germanic language**. ($\exists \succ \forall, *\forall \succ \exists$)

The relative clause modifying *a reporter* in (30) blocks the overt *wh*-extraction of the RN. The embedded tensed clause in (31) and the complex NP island containing it prevent the RN from taking scope over the existential quantifier. Even if we extend the linearization analysis of Sabbagh (2003/2006) to incorporate a mechanism that allows it to *wh*-move to the left material that has been linearized on the right, it would be left to explain why islands should become active again once conjunction is passed.[5]

2.4 Interim conclusion

In the introduction we presented two main structural questions that we wanted to answer:

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[5]The contrast between the insensitivity of RNR to islands below coordination and its sensitivity to islands above coordination is a problem not only for ATB and *in situ* analyses of RNR, but also for analyses in other frameworks. Categorial Grammars, for example, have offered accounts of RNR (Steedman, 1987; Oehrle, 1990; Morrill, 2002) that are interestingly different from those discussed here. But there, too, a global choice must be made: either islands interfere with composition, in which case no type will be created for the conjuncts and conjunct-internal islands will not allow RNR, or they do not interfere, in which case islands outside coordination will also cause no problem. Either way, the contrast cannot be accounted for.

(32) a. Does RNR depend on an additional attachment site for the RN
above conjunction (as in movement accounts)?

b. Are there separate instances of the RN for each attachment site
(as in PF-deletion accounts; the alternative is to attach the same
instance multiple times into separate positions)?

The new data presented in this section allow us to answer both questions
to the negative, thus narrowing down the range of possible analyses. Recall
that one of the main obstacles facing movement accounts was the insensi-
tivity of RNR to islands and other bounding conditions. To our knowledge,
the only movement account to offer a solution to this problem is that of
Sabbagh (2003/2006), where the RN avoids islands by never having to cross
overt phonological material after being linearized on the right. The obser-
vation the RNR can feed *wh*-movement is a counter-example to the most
direct prediction of this approach. The further observation that RNR does
not give rise to Lebeaux effects makes a movement account even more dif-
ficult to maintain. These observations add to the familiar facts from the
introduction regarding possibility to use non-constituents and word parts as
the RN. We conclude that there is, in general, no higher attachment site
above conjunction.

As for the implications of the *wh*-movement facts on the second question,
notice that if there are separate instances of the RN, then an unpronounced
copy in one conjunct allows a pronounced copy in a second conjunct to
move across islands in a way that is unavailable for conjunction with two
pronounced copies. It is not clear what kind of syntactic mechanism could
account for this behavior. One of the main attractions of the PF-deletion
approach was that it avoided the problem of island insensitivity by deny-
ing that movement takes place. The evidence from *wh*-movement lessens
the appeal of this approach. This evidence adds to the other problems for
the multiple-instance approach mentioned in the introduction, such as the
exceptional scopal effects and the linearization-sensitive deletion conditions.
We conclude that RNR does not involve multiple instances of the RN.

Combining our answers to the two structural questions in (32) we arrive at a
structure in which the RN occurs once and is attached multiple times. How-
ever, while multiple-dominance is the only approach that is compatible with
the empirical facts, it does not, on its own, derive those facts. Moreover,
multiple-dominance requires the rethinking of several architectural notions
concerning the construction of syntactic representations, the encoding of lo-

cality, and the mapping of structures onto linear strings. We now turn to present a system in which these issues are addressed.

3 Proposal

We propose to derive RNR from the interaction of three processes: a)structure formation, b) cyclic spellout, and c) linearization. We develop our analysis within the Minimalist framework, which already contains the means for the construction of multiple-dominance structures, discussed in section 3.1, and which incorporates cyclicity in the form of phases, discussed in section 3.2. While our empirical concern remains RNR, much of the discussion will focus on general architectural issues, and in particular on *wh*-movement and locality within a multiple-dominance system. We show that current Minimalist treatments of long-distance movement can be simplified by making spellout sensitive to a properly defined notion of complete dominance, and that the pattern of interaction between RNR and *wh*-movement described in section 2 can be derived without making any further assumptions. Our third component! , linearization, which we present in section 3.3, is a highly local process that applies independently of spellout. Each node in the structure must satisfy certain linearization well-formedness constraints with respect to the nodes that it dominates.

3.1 Merge

The basic structure-building operation within the Minimalist Program (Chomsky, 1995) is MERGE, by which two syntactic objects, X and Y, are combined to form a new syntactic object, Z. For the simple case in which X and Y are disjoint, this is nothing more than a tree-forming operation. We follow Chomsky (2004) in referring to this case as EXTERNAL MERGE:

(33)

$$X, Y \quad \Rightarrow$$

$$
\begin{array}{c}
Z \\
\diagup \quad \diagdown \\
X \qquad Y
\end{array}
$$

If MERGE is not restricted to disjoint syntactic objects, we may re-merge an object with a containing object. This operation, named INTERNAL MERGE in (Chomsky, 2004), has been used to capture movement-like phenomena:

(34)
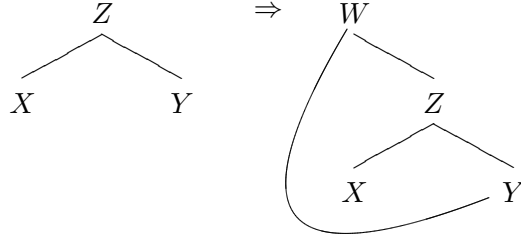
Applying INTERNAL MERGE results in structures where some nodes have more than one mother, a structural representation of movement that has already been noted by **?**. Other multiple-dominance structures have been used by McCawley (1982) to account for various discontinuous phenomena, including RNR. Within current Minimalism, it has been noticed by Citko (2005) that if MERGE is a general structure-forming operation, it should apply not only between disjoint objects (EXTERNAL MERGE) or between an object and a containing object (INTERNAL MERGE), but also across structures. We follow Citko in referring to this form of MERGE as PARALLEL MERGE:

(35)

PARALLEL MERGE makes possible a Minimalist version of the multiple-dominance of RNR proposed by McCawley (1982, 1988), and argued for more recently by Wilder (1999):

(36)　John bought and Mary read a recent book about bats
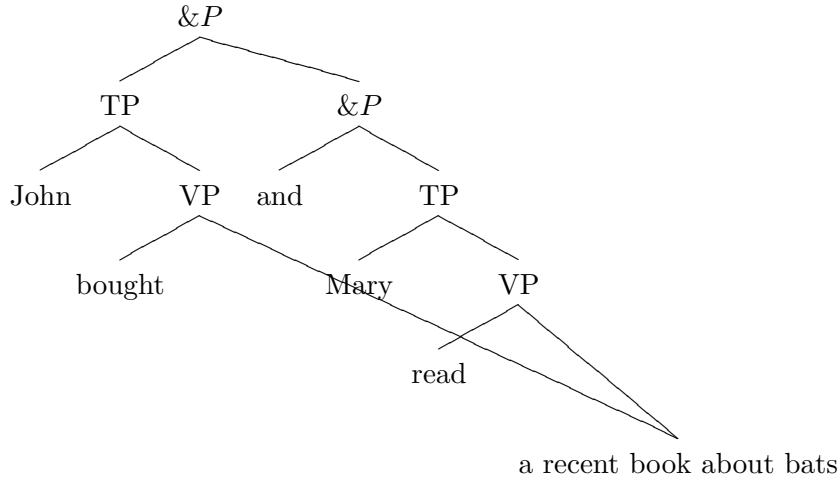
3.2　Phases and Spellout
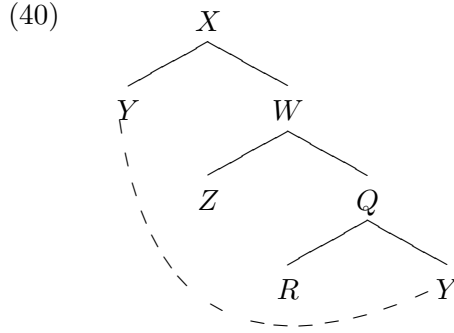
3.2.1　Spellout and External Merge

Current Minimalism (Chomsky, 2001, 2004) posits a cyclic architecture (Bresnan, 1971), in which the construction of syntactic structure is interspersed with non-syntactic operations, such as phonological or semantic interpretation. In Minimalist terms, syntactic derivations are broken down into *phases*. At the end of each phase, an operation called *spellout* sends the current syntactic structure to the phonological and semantic interfaces. Phases are mediated by *phase heads*, syntactic categories that trigger the spellout of their sisters. Structure that has been spelled out cannot be modified by subsequent operations. The relevant definitions are summarized below:

(37)　**Spellout Domain (First Version):** The spellout domain of a node X is the set of all nodes dominated by the sister of X.

(38)　**Phase Head (First Version):** A designated syntactic object that triggers spellout of its spellout domain after all of its specifiers have been merged. The phase head itself and all of its specifiers (the *edge* of the phase) are not spelled out until the next phase.

(39)　**Spellout:** A syntactic structure transferred to the interfaces is mapped onto an object that cannot be modified by further operations. In the case of the phonological interface, the resulting immutable object is

a string.[6]

3.2.2 Some concerns

Spellout as just described is relatively straightforward to implement as long as structure is limited to trees, the output of EXTERNAL MERGE. The tree is traversed in some order, usually the order in which it is constructed, and each terminal node is spelled out when its mother is spelled out. For copy theories of movement some additional machinery is required in order to ensure that only one copy will be pronounced within a chain. The re-merge theory of movement obviates the need for such mechanisms, since a chain consists of only one object. However, as has been observed (Frampton, 2004; Fitzpatrick and Groat, 2005), re-merge makes it difficult to define the relevant notion of spellout in the first place. Since under re-merge there are no indexed copies or traces, the information required to distinguish the different occurrences of a node is no longer contained within the node itself:

(40)

$$
\begin{array}{c}
X \\
\diagup \quad \diagdown \\
Y \qquad W \\
\quad \diagup \quad \diagdown \\
\quad Z \qquad Q \\
\qquad \diagup \quad \diagdown \\
\qquad R \qquad Y
\end{array}
$$

In (40), a schematized version of *wh*-movement, we would like to say that the higher occurrence of Y, standing for the *wh*-element, is pronounced while the lower occurrence is not. This is not possible by talking about Y alone. If Z is a phase head, it will trigger the spellout of the set of terrminals dominated by its sister, Q, including Y. Under a copy theory of movement we could mark the lower copy of Y as phonologically null (cf. Chomsky, 2004). Re-merge makes this impossible. There is only one occurrence of Y in the structure, and if it is marked as phonologically null it will not be pronounced anywhere at all. The fact that multiple dominance complicates the notion of occurrence is not necessarily a serious problem, and proposals such as (Frampton, 2004) have offered ways to address the issue. Our only point

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[6]It is less clear what the result of spellout is on the semantic side. We do not deal with semantic interpretation in this paper, and so we will ignore the semantic results of spellout here.

here is that such proposals provide additions to the theory. The Minimalist framework on its own does not offer a solution.

A second concern regarding cyclic spellout is that it involves a counter-cyclic operation, at least as formulated by Chomsky (2001, 2004). In (40), for example, the phase head Z merges Y as its specifier and spells out its sister Q. In order to avoid spelling out Y in its lower position, the order of operations must not be changed: Q can be spelled out only after the tree has been extended by re-merging Y. As with the notion of occurrence, the counter-cyclic behavior of spellout is not necessarily a particularly serious issue, which can be addressed in any of a variety of ways. All things being equal, however, it would be reassuring to have a system where the issue does not arise in the first place.

3.2.3   Redefining Spellout Domains

As a first step towards integrating re-merge and cyclic spellout we propose the following definitions for complete dominance and for spellout domains:[7]

(41) **Complete Dominance:** A node X completely dominates a node Y iff (a) X is the only mother of Y, or (b) X completely dominates every mother of Y. The set of nodes completely dominated by X will be called the *Complete Dominance Domain* of X, written $CDD(X)$.

(42) **Spellout Domain (Revised):** The spellout domain of a node X is $CDD(X)$.

(43) **Phase Node (replaces Phase Head):** A designated syntactic object that triggers spellout of its spellout domain.[8]

(44) **Spellout (Repeated from (39)):** A syntactic structure transferred to the interfaces is mapped onto an object that cannot be modified by further operations. In the case of the phonological interface, the resulting immutable object is a string.

The new definitions have the immediate result of making spellout a cyclic operation. Going back to the schematized *wh*-movement example in (40), notice first that we now have X as a phase node instead of Z as a phase head. This is a minor modification. The significant change is that under the new

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[7]A different definition for complete dominance is offered by Wilder (1999). See Appendix B.1 for discussion.

[8]We assume here that vP and CP are the only relevant phases.

definition, Y is not completely dominated by X: X is not the only mother of Y, since Q is also a mother of Y; furthermore, X does not dominate every mother of Y, since X does not dominate itself. Consequently, Y is not in $CDD(X)$, and when X is spelled out, Y will not be affected. More generally, our new definition exempts re-merged specifiers, but not uniquely merged specifiers, from spellout by their mothers. Notice that as soon as we merge a new object as a sister of X in (40), Y becomes completely dominated by the new root:

(45)
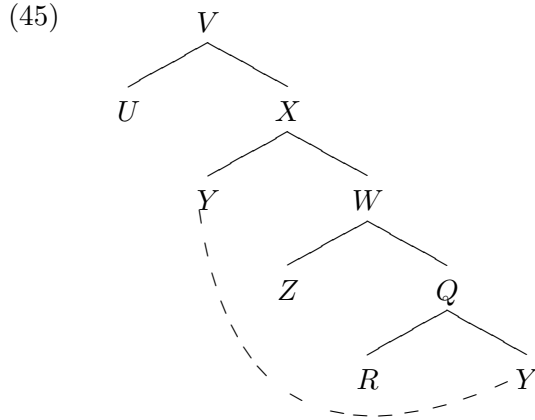
If V is a phase node, Y will now be subject to spellout.

3.2.4 Successive cyclic movement

Consider the following case of long-distance *wh*-movement:

(46) $[_{CP_2}\text{What}_i \text{ did Mary}[_{vP_2} t_i \text{ say}[_{CP_1} t_i \text{ that John }[_{vP_1} t_i [_{VP} \text{ ate } t_i?]]]]]$

What is initially merged as the object of the embedded verb *ate*. At this point it is completely dominated by the verb phrase, but since VP is not a phase, this has no spellout effect. The first phase is the embedded vP_1, and *what* is re-merged at its daughter, triggering spellout. As described above, a re-merged daughter is not completely dominated by its mother and is therefore not part of its spellout domain. Consequently, the *what* is not spelled out by vP_1. We will discuss the results of spellout in more detail below. For our immediate purposes we only need the part of (44) that says that spellout creates a string that cannot be altered later on. In the current case, the string will consist of 'ate' alone. At the next few merges, *what* is again completely dominated, but since the next phase has not yet been reached, no spellout takes place. The next phase is the embedded CP_1. Here again *what*

is merged as a specifier, allowing it to escape spellout, which now results in the string 'that John ate'. Similar application of re-merge and spellout happens in the matrix vP_2 and CP_2.

Notice that by our definitions *what* is not completely dominated at the root level. A potential concern at this point is that *what* will never be spelled out. A possible explanation is that the whole sentence is the daughter of a higher root node, which triggers one final spellout. In that case, since *what* is now completely dominated, it will be spelled out. An alternative is to say that while not being completely dominated allows an element to escape spellout, it does not force it to do so. We do not have data that would suggest which option is correct.[9]

We can also now block successive cyclic movement when an intermediate position is occupied. Consider the following ill-formed sentence:

(47)   * $[_{CP_2}$ What$_i$ did John $[_{vP_2} t_i$ know a man $[_{CP_1}$ who $[_{vP_1} t_i$ ate t_i?]]]]

As before, *what* is initially merged as the sister of *ate*, and escapes the first spellout, at the embedded vP_1, by being re-merged at its specifier. At the second phase, however, *who* is merged as the first specifier of CP_1, triggering spellout. The phase node CP_1 completely dominates all the mothers of *what*, and so by our definitions it completely dominates *what*. This, in turn, means that *what* is part of the spellout domain of CP_1. Spellout of CP_1 results in the string 'who what ate'. Since strings are immutable (39), no subsequent operation will be able to extract *what* from its current position and cause it to appear in the position required for (47). Notice that we do not need any constraint on the number of possible specifiers in order to derive the blocking of *what* by *who*. All we require is the general restriction to binary branching, which makes it impossible for the two *wh*-words to be daughters of the same phase node. This ensures that the phase node that is the mother of *who* will completely dominate *what*.

### 3.2.5   Application to RNR

Our derivation of long-distance *wh*-movement in the examples above involved successive cyclic movement. In a way, though, this was an accident. All that was needed for long-distance dislocation to work was that the *wh*-element remain only partially dominated during each of the intermediate

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[9]Similar considerations arise in the framework of Chomsky (2001, 2004).

phases. Successive re-merge into phase specifiers was one way to do that, but our analysis predicts that any other operation that prevents the *wh*-element from being completely dominated at spellout would license the same kind of long-distance result. RNR allows us to test this prediction. Recall our multiple-dominance structure for RNR:

(48)
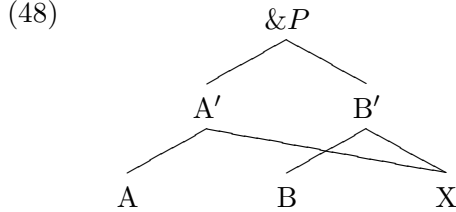
The first step in generating the structure in (48) is an application of PAR-ALLEL MERGE that combines X with A to form A' and with B to form B'. At this point, X is not completely dominated by anything in the structure. This means that even if A' or B' are phases, X will not be spelled out. The first occasion on which X becomes completely dominated is when A' and B' combine to form $\&P$. If $\&P$ is not a phase, and if it has a specifier position, X can be re-merged above both conjuncts:

(49)
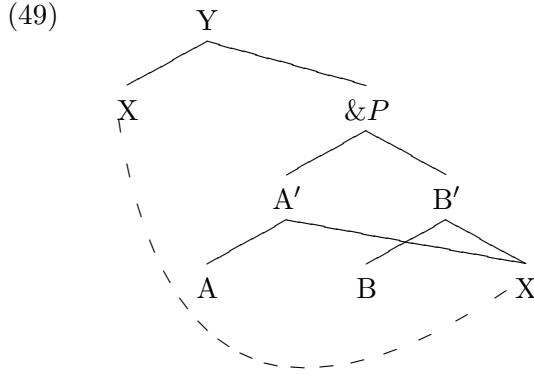
Crucially, no spellout inside the conjuncts could affect the re-merging of X. We therefore expect islands below the conjunction to be transparent for extraction from RNR. As we have seen above, this is indeed the case:

(50)   **Which book**$_i$ did [John meet the man who wrote __], and [Mary meet the man who published __] t_i?

Consider now the effect of islands above conjunction. X in (48) is completely dominated by $\&P$. At the next phase, X will be spelled out unless it is re-merged as a daughter of that phase node. The same will apply for every

subsequent phase. If X cannot be re-merged to one of these phase nodes, it cannot be extracted further. Above conjunction, then, we expect island effects to reappear. Again, this prediction is confirmed:

(51) a. **Which book**$_i$ did John say that he met [the man who wrote ＿], and [the woman who published ＿] t_i?

  b. * **Which book**$_i$ does John know a reporter who made famous [a man who published ＿], and [a woman who published ＿] t_i?

3.2.6 Interim summary

We have seen that the combination of cyclic spellout and re-merge, under their current formulations in the literature, give rise to certain difficulties. Re-merge allows multiple occurrences for a single object, requiring special care in the discussion of what gets pronounced where. Successive cyclic movement requires a counter-cyclic spellout operation. We solved these problems by making cyclic spellout sensitive to the notion of complete dominance we have defined. A multiply-merged object is now not completely dominated by any of its mothers, which makes re-merged specifiers available for subsequent operations. Instead of talking about occurrences in the structure, we relegated this task to an interface condition: strings can be concatenated but not internally changed, so once two objects are spelled out next to each other, they cannot be re-ordered or separated by future spellout operations. The choice of occurrence is a by-product of this interface condition, the definition of multiple dominance, and the timing of spellout. Finally, we saw how our definitions predict that multiply-dominated elements will be available for re-merge even in the absence of movement-like operations. We noticed that this is exactly the pattern of interaction between RNR and *wh*-movement observed in (2). Missing at this point is the specification of ordering within any particular phase. This will require a more detailed discussion of the linearization of syntactic structures, to which we now turn.

3.3 Linearization

Linearizing two objects, A and B, with respect to each other is often implemented by requiring every element in A to be ordered in a certain way with respect to each element in B. The ordering of choice is usually strict precedence (Kayne, 1994; Chomsky, 2004), written here as $<$:

(52) STRICT LINEARIZATION

If A is linearized before B then $\forall a \in A.\forall b \in B.a < b$

Multidominance poses an immediate problem for this definition. If A and B share an element X, ordering A before B will result in X being ordered strictly before itself. This predicts, for example, that any instance of RNR will give rise to a linearization contradiction:

(53) a. [John bought ＿] and [Mary sold ＿] **books about bats**.
      b. **books about bats** $\not<$ **books about bats**

This conflict can be solved in any of several ways. One solution is to ban multiple dominance altogether, as done by Kayne (1984). As argued in section 2.4, RNR makes this option difficult to maintain. A different solution is to allow multiple dominance, but require an additional ATB movement (or re-merge) to a position c-commanding both A and B. If only the highest occurrence is taken into account for linearization, as assumed by Nunes (2004); Citko (2005), no contradiction arises. For RNR, however, we have seen that there are many reasons to reject an ATB-movement analysis.

A way to reconcile (52) with multiple dominance while maintaining an *in situ* approach has been developed by Wilder (1999), who proposes to exempt from the linearization of A any element not completely dominated by A.[10] The proposal, which we present in more detail in Appendix B.1, predicts correctly many of the properties of RNR. However, as noticed by Sabbagh (2003/2006), this proposal fails to capture the Right-Edge Restriction, and predicts incorrectly that shared material can escape the RER as long as it does not c-command any element that follows it. In particular, the following is predicted to be grammatical:

(54) * [A man who loves ＿ sang a song], and [a woman who hates ＿ read a book] **the new headmaster**.

The ungrammaticality of (54) suggests that excluding elements from linearization is incorrect, and that the well-formedness of the ordering of A and B depends on all the elements within them, including elements that are not completely dominated.

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[10]Wilder's definitions are different from ours, but the difference does not affect the current point.

3.3.1 Reflexive linearization

We believe that the incompatibility of multiple-dominance and (52) is fundamental. Rather than trying to find a better method to exempt elements from linearization, we propose to weaken the linearization principle itself. Informally speaking, we replace the total ordering requirement in (52) with a condition on the edges of the linearized objects only, and we avoid the ordering violation in (53) by replacing the irreflexive $<$ in (52) with its reflexive version $\leq$:

(55)   a. [John bought __] and [Mary sold __] **books about bats**.
       b. **books about bats** $\leq$ **books about bats**

More formally, we separate linearization into two well-formedness conditions. The first condition concerns the well-formedness of linearization within each node. We represent the information about linearizing a node X by associating X with a list of nodes, $<x_1,\ldots,x_n>$, which we refer to as the *D-list* of X. The list contains all the terminal nodes that X dominates and nothing more. Multiple occurrences of a single terminal node are allowed, but only for nodes that are not completely dominated by X, using the same notion of complete dominance as before (41). We define the condition as follows:

(56)   LINEARIZATION WELL-FORMEDNESS CONDITION
       a. The D-list for a node X has all the terminals dominated by X as members, and only them.
   b. If $y \in CDD(X)$ then y appears on the D-list of X exactly once.[11]

The second condition concerns the mapping between a mother node and its daughters, and involves the reflexive $\leq$:

(57)   LINEARIZATION MAPPING CONDITION
       In ordering $A =< a_1,\ldots,a_m >$ to the left of $B =< b_1,\ldots,b_n >$, written $A \bullet B$, the following must hold:
       a. EDGE ALIGNMENT: $a_1 \leq b_1$ and $a_m \leq b_n$.
       b. CONSERVATIVITY: $a_1 \leq a_2 \leq \ldots \leq a_m$ and $b_1 \leq b_2 \leq \ldots \leq b_n$

Before discussing the predictions of these linearization conditions for RNR, it will be helpful to observe their consequences for structures that do not involve multiple dominance. First, notice that linearization is unambiguous for atomic objects. If A consists of a single element a, and if B consists of a single element b, the only way to order A before B is by mapping them to an object where a precedes b:

---

[11]We use (56b) to ensure that the D-list for X induces a linear ordering on $CDD(X)$.

(58)   Linearizing atomic objects: $< a > \;\bullet\; < b > \Rightarrow < a, b >$

```
            C
          /   \
        A       B
        |       |
        a       b
```
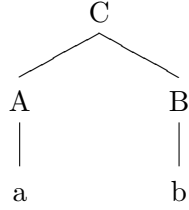
The ordering of a before b satisfies EDGE ALIGNMENT: the left edge of A is a, and it is linearized to the left of b, the left edge of B; similarly, the right edge of A is a, and it is linearized to the left of b, the right edge of B. Ordering a to the right of b would have violated EDGE ALIGNMENT. CONSERVATIVITY is trivially satisfied in our example: A and B are atomic, and so nothing can change in their internal ordering. The two conditions of (56) are similarly satisfied: the D-list for each node contains exactly the terminals dominated by it – A linearizes a, B linearizes b, and C linearizes a and b – and every element that appears in a D-list appears there exactly once. Consequently, every D-list induces a linear order over its elements. Condition (56) would rule out a configuration where A and B above are mapped onto C with anything other than one occurrence of a and of b. For example, the D-list $< a, b, c >$ is excluded since it includes terminals not dominated by C, and the D-list $< a, a, b >$ is excluded since it has two occurrences of $a \in CDD(C)$

If A and B are not atomic, more mappings are possible. Consider, for example, the following linearization configuration:

(59)   Linearizing complex objects:

```
          A                 B
        /   \             /   \
      a1      a2        b1      b2
```
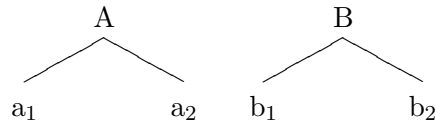
As in the case of atomic objects, concatenating the contents of A to the left of the contents of B is possible. The edges of the two daughters are aligned correctly, the internal ordering within each daughter is preserved, and all the relevant linearization relations are linear orderings:

(60) √ Concatenation: $< a_1, a_2, b_1, b_2 >$

```
                C
              /   \
            A       B
          /  \     /  \
        a₁    a₂  b₁    b₂
```

$$
\begin{array}{c}
C \\
\diagdown \\
A \qquad B \\
a_1 \quad a_2 \quad b_1 \quad b_2
\end{array}
$$
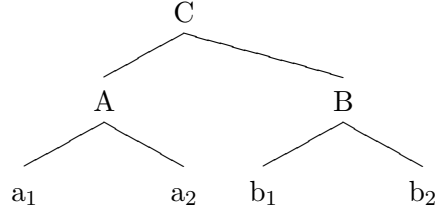
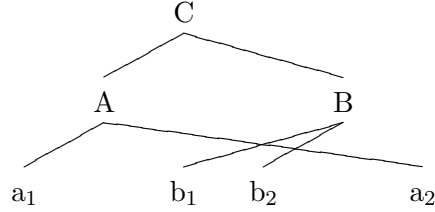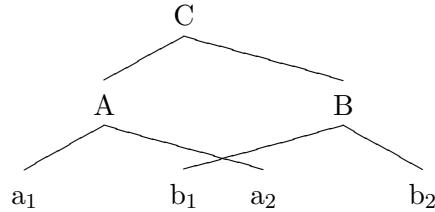Next, notice that the linearization conditions rule out wrapping of the elements of one daughter around the elements of its sister. Such a configuration would violate EDGE ALIGNMENT:

(61) * Wrapping: $< a_1, b_1, b_2, a_2 >$

$$
\begin{array}{c}
C \\
A \qquad B \\
a_1 \quad b_1 \quad b_2 \quad a_2
\end{array}
$$

Finally, our conditions make possible the interleaving of the elements of A with those of B as long as the edges are aligned correctly:

(62) √ Interleaving: $< a_1, b_1, a_2, b_2 >$

$$
\begin{array}{c}
C \\
A \qquad B \\
a_1 \quad b_1 \quad a_2 \quad b_2
\end{array}
$$

This last point might be seen as a cause for concern. After all, interleaving is not normally considered a possible outcome of combining two syntactic objects. Notice, however, that we use our linearization conditions in a system that includes a cyclic spellout mechanism. Under normal conditions, by the time two complex objects are merged together, at least one of them has already undergone spellout. Assume, for example, that A in (62) above has been spelled out before the merger of A with B. Recall that the output of spellout is a string, in this case '$a_1 a_2$', which is an immutable object. While interleaving in the syntax is licensed, the output of the next spellout will contain the substring '$a_1 b_1 a_2 b_2$'. This result cannot be obtained without modifying the previous output, '$a_1 a_2$', and the attempt to modify an

25

immutable object will crash the derivation.

3.3.2 Linearizing multidominance structures

We have seen how our linearization conditions (57) and (56) account for the possible linear orderings of disjoint objects. The motivation behind our change from $<$ to $\leq$, however, came from multiple-dominance structures, of both the INTERNAL MERGE and the PARALLEL MERGE kinds. We are now in a position to test the predictions of the new definitions for these cases. We start with simple RNR, marking with parentheses any element on the D-list of X that is not in $CDD(X)$:

(63) $< a, (x) >$ • $< b, (x) > \Rightarrow < a, b, x >$
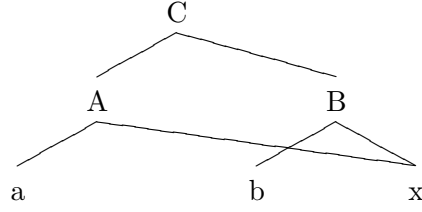
The correct linearization of the mother node, $< a, b, x >$ is the only one licensed by the linearization conditions. The left edge of A is a, and it is linearized to the left of b, the left edge of B. Similarly, the right edge of A is x, which is linearized to the (reflexive) left of x, the right edge of B. Notice that here, for the first time, reflexivity makes a difference. CONSERVATIVITY is satisfied by the ordering $< a, b, x >$ since each of the internal orderings $< a, x >$ and $< b, x >$ is maintained. CONSERVATIVITY would have ruled out the ordering $< a, x, b >$ since the original ordering of x to the right of b is not preserved. Finally, condition (56) rules out the potential ordering $< a, x, b, x >$, which includes two occurrences of $x \in CDD(C)$.

Turning to more complex RNR configurations, we can see why RER violations are ungrammatical. The examples in (64) show an attempt to linearize $A =< a, x, a' >$ to the left of $B =< b, x >$:

(64) a.

$$C$$
$$A$$
$$D \qquad a' \qquad B$$
$$a \qquad\qquad b$$
$$x$$
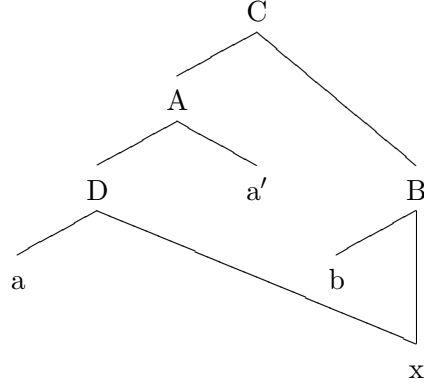
b. $< a, (x), a' > \bullet < b, (x) > \nRightarrow < a, x, a', b, x >$

c. $< a, (x), a' > \bullet < b, (x) > \nRightarrow < a, a', b, x >$

d. $< a, (x), a' > \bullet < b, (x) > \nRightarrow < a, x, a', b >$

By (56), x may only appear once in the result, as in the case of simple RNR, ruling out (64b). In the D-list for A, x occurs to the left of a'. Consequently, using CONSERVATIVITY, the occurrence of x in the D-list for C must be to the left of a', ruling out (64c). At the same time, EDGE ALIGNMENT requires that x be linearized to the right of a', ruling out (64d). No other ordering can rescue this structure, and so we correctly predict it to be bad.

The same reasoning does not apply to RER violations within the right conjunct:

(65) $< a, x > \bullet < b, x, b' > \nRightarrow < a, b, x, b' >$

$$C$$
$$A \qquad B$$
$$D$$
$$a \qquad\qquad b \quad x \qquad b'$$
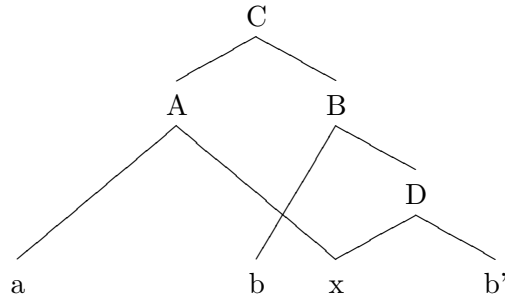
EDGE ALIGNMENT is satisfied by (65): a is linearized before b, and x is linearized before b'. Similarly, CONSERVATIVITY is satisfied, since no internal ordering is changed. Finally, all three D-lists, $< a, x >$, $< b, x, b' >$, and $< a, b, x, b' >$, are linear orderings. But in fact orderings like (65) are bad:

(66)   * [John congratulated ___] and [Mary gave **the winner** the prize].

Our explanation for the ungrammaticality of (66) is based on spellout, and follows the explanation for the ungrammaticality of most interleaving configurations. Each conjunct within (66) is a clause, which under standard assumptions means it will undergo spellout before conjunction takes place. At that point, the shared material is not completely dominated within either conjunct. Consequently, it is not spelled out: the left conjunct maps onto the string 'John congratulated', and the right conjunct maps onto 'Mary gave the prize'. While the ordering of (66) according to the schema in (65) is licensed by the syntax, the next spellout will attempt to modify the string of the right conjunct to insert 'the winner' between 'gave' and 'the prize'. Since strings cannot be modified, the derivation crashes. The fact that (65) crashed at spellout and not because of linearization means that if we prevented the shared material from being spelled out in its conjunct-internal position, the structure could be rescued. We return to this point below after we discuss *wh*-movement.

3.3.3   Linearization and *wh*-movement

Our use of CONSERVATIVITY allowed us to block reorderings of overt material. This was useful for RNR, the licensing conditions of which are descriptively captured in terms of non-reordering conditions (cf. Sabbagh, 2003/2006). However, reordering of overt phonological material is quite useful for various dislocation phenomena, and one may wonder whether we have not created a grammar that rules out RER violations at the expense of *wh*-movement. Fortunately, this is not the case. To see why, recall from our discussion of spellout domains that when an element is re-merged at the root it is no longer completely dominated. Simple *wh*-movement will have the following schematic form, where multiply dominated material is written within parentheses:

(67) $< wh > \quad \bullet \quad < a, wh > \Rightarrow < (wh), a, (wh) >$
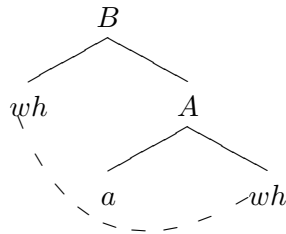
The D-list of B is $< wh, a, wh >$, which contains two occurrences of wh. However, $CDD(B) = \{a\}$, and a has only one occurrence in the D-list, satisfying (56). Described differently, re-merging an element in a c-commanding position allows reorganization of linear order by making the re-merged element only partially dominated.

Consider now the next step in the derivation of long-distance wh-movement from (67). An element, c, is merged to B in (67) to form C:

(68)

```
            C
          /   \
        c       B
              /   \
           wh       A
              \    /  \
               `a      wh
```
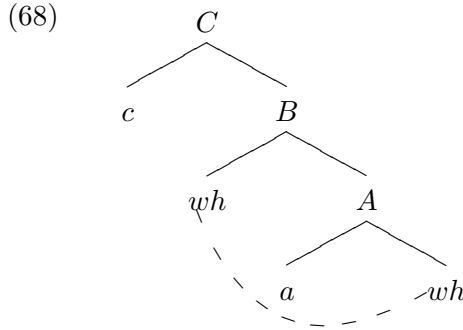
Since C completely dominates wh, the D-list $< c, wh, a, wh >$, in which wh occurs twice, is ruled out by (56b). Two other D-list are possible based on (57) and (56): $< c, wh, a >$ and $< c, a, wh >$. The former corresponds to overt wh-movement, while the latter corresponds to wh-in-situ. We have nothing here to say about how languages choose which option to use.

The timing of the change between complete and partial dominance is an important difference between wh-movement and RNR. In wh-movement the re-merged material is not completely dominated at the relevant point in the derivation, allowing re-organization of overt material. In RNR, the re-merged material was not completely dominated within each conjunct, but it becomes completely dominated once the two conjuncts are merged together. Consequently, the shared material must satisfy (56) and appear only once:

(69) $< a, (x) > \bullet < b, (x) > \Rightarrow < a, b, x >$

```
            C
          /    \
        A        B
       / \      / \
      a      b      x
```
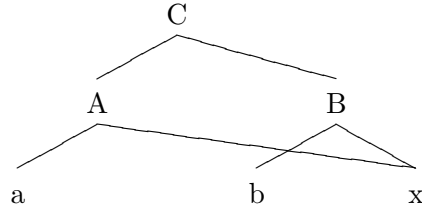
Since the shared material may have only one occurrence in the linearization of conjunction, CONSERVATIVITY has a restrictive effect, ruling out reorderings:

(70) $< a, (x), a' > \bullet < b, (x) > \not\Rightarrow < a, a', b, x >$

```
                    C
                   /  \
               A' /    \
               /\       \
           A  /  \        \
          /\ /    \        B
         /  X      \      /\
        /  / \      \    /  \
       a  a'  b      x  
```
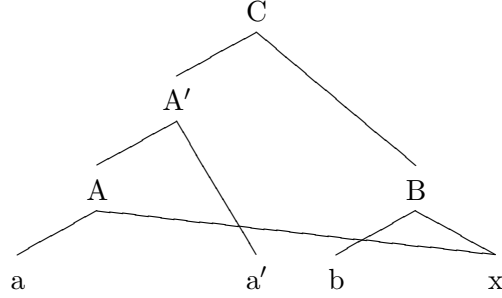
3.3.4 Putting it all together

We conclude this section by showing the linearization steps involved in *wh-*movement from within RNR:

(71) **Which book$_i$** did [John meet the man who wrote _], and [Mary meet the man who published _] t_i?

We start at the point in the derivation where both conjuncts have been formed but before conjunction has taken place. The shared material *which book* is linearized at the right within each conjunct. It is not yet completely dominated at this point, hence the parentheses:

(72) TP_1 <John, meet, the man who wrote, (which book)> ,
      TP_2 <Mary, meet, the man who published,(which book)>

At the next step, the conjuncts are merged together. The shared material is now completely dominated by the highest TP. As discussed above, the D-list of TP may only include one occurrence of *which book*. CONSERVATIVITY requires that this instance be on the right:

(73) $TP_1 \bullet TP_2 \Rightarrow$
      TP <John,meet, the man who wrote, Mary, meet, the man who published, which book>

```
                              TP
                   ┌──────────┴──────────┐
                 TP₁                     TP₂
            ┌─────┴─────┐          ┌──────┴──────┐
          John         VP        Mary           VP
                    ┌───┴───┐             ┌──────┴──────┐
                  meet     DP           meet           DP
                        ┌──┴──┐                    ┌────┴────┐
                      the    NP                  the        NP
                          ┌───┴───┐                      ┌────┴────┐
                        man      CP                    man        CP
                              ┌───┴───┐                      ┌─────┴─────┐
                            who      VP                    who         VP
                                  ┌───┴───┐                       ┌─────┴─────┐
                               wrote     Wh            published          Wh
                                        ╱──╲                              ╱──╲
                                  Which book                       Which book
```

TP is not a phase, and so *which book* is not yet spelled out. The next phase is the root CP, the result of re-merging *which book* with TP. Spellout takes place, but since *which book* is not completely dominated by CP, it is not spelled out, and can feed subsequent operations:

(74) $Wh \bullet TP \Rightarrow$
     CP <(which book), John,meet, the man who wrote, Mary, meet, the man who published, (which book)>

```
                          CP
                        /    \
                     (Wh)     \
                     /  \       \
              (Which book)      TP
                             /      \
                         TP₁          TP₂
                        /   \        /    \
                    John    VP    Mary    VP
                           /  \          /   \
                        meet   DP     meet    DP
                              /  \           /   \
                           the   NP        the    NP
                                /  \             /   \
                             man   CP          man    CP
                                  /  \               /   \
                               who   VP           who    VP
                                    /  \                 /    \
                                wrote  (Wh)        published   (Wh)
                                       /  \                    /  \
                                (Which book)           (Which book)
```
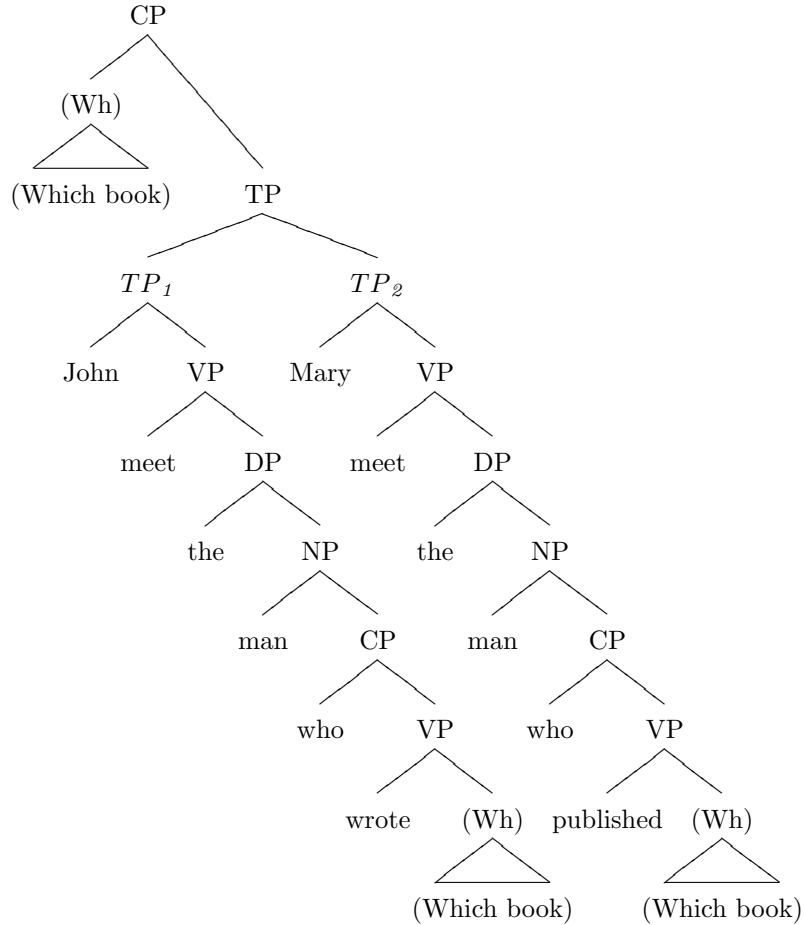
3.4   Rescuing RER violations in the rightmost conjunct

Recall from our discussion of (65) above that RER violations in the rightmost conjunct, are linearly well-formed and only crash at spellout. Between the formation of the structure and the spellout in which it will crash there is an interval during which we predict that the derivation can still be rescued if the shared material is removed from the relevant D-lists. We are now in a position to test this prediction, using *wh*-movement, which, as shown above, can change the position in which an element is linearized. Consider (75), an example of RER violation in the rightmost conjunct:

(75)   * [John met the man who trained __], and [Mary met the woman who claimed __ **the black new thoroughbred** won the race].

By *wh*-extracting the RN we prevent it from being completely dominated at the first phase above the conjunction, allowing it to be linearized elsewhere. The string created by the previous spellout of the rightmost conjunct will not be modified, and the result is predicted to be grammatical. This prediction is borne out:

(76)   **Which horse**$_i$ did [John meet the man who trained ＿] and [Mary meet the woman who claimed ＿ t_i won the race]?

As with previous sentences, the conjunct-internal islands prevent a potential alternative derivation of (76) as ATB movement. We can also rule out a second alternative derivation, in which HNPS within the second conjunct first creates a grammatical RNR, which then feeds *wh*-movement. As (77) shows, no such HNPS is possible:

(77)   * [John met the man who trained ＿], and [Mary met the woman who claimed ＿ won the race ＿] **the black new thoroughbred**.

We conclude that (76) is indeed derived from *wh*-movement from a structure in which the RER is violated in the rightmost conjunct, confirming our distinction between linearization and spellout.

A   Fragment

- *AtomicType := D | N | V | T | W*
  Type := AtomicType | Type/Type | Type\Type

- $\leq \subseteq$ *AtomicType* $\times$ *AtomicType* – a partial order

- *TreeNode := < Address, Type, Daughters >*, where *Address* expands to the natural numbers and *Daughters* expands to a list of *Address*.
  TN := $\mathbb{N} \times Type \times \mathbb{N}^*$ the set of possible tree nodes

- Workspace: *WS* =< *Items, Phases* >, where *Items* $\subseteq$ *TN, Phases* $\subseteq$ *Items*. *WS* will be said to be *well-formed* if the following hold:

  1. If $\alpha, \beta \in items(WS)$ and $address(\alpha) = address(\beta)$ then $\alpha = \beta$

  2. If $\alpha \in Items(WS)$ and $daughters(\alpha) \neq \emptyset$ then α is licensed by MERGE.

  3. There exists a linearly well-formed mapping $\mathbb{F}$ on *WS*.

- $<k, X, <i, j>> \in Items(WS)$ is licensed by Merge if there are $\alpha, \beta \in Items(WS)$ and $i, j < k$ such that either of the two holds:

  1. $\alpha = <i, X/Y, z_1>$, $\beta = <j, V, z_2>$ $(V \leq Y)$
  2. $\alpha = <j, X\backslash Y, z_1>$, $\beta = <i, V, z_2>$ $(V \leq Y)$

- For any $z \in Items(WS)$, the *reachable nodes* from z are $Reach(z) := \{z\} \cup \{x : \exists y \in Reach(z).x \in daughters(y)\}$

- For $z \in WS$, the *Complete Dominance Domain* of z with respect to a set S is $CDD_S(z) := \{x \in S : \forall y \in S.x \in daughters(y) \rightarrow y = z \ \vee \ \forall y \in S.x \in daughters(y) \rightarrow y \in CDD_S(z)\}$

- Let L be a linear order over a finite set D. A function $\sigma : D \rightarrow S$ will be called an *L-list over S*.

- Let $\mathbb{F}$ be a function that maps WS into lists over WS. For any $\alpha \in Items(WS)$ define $R_{\mathbb{F}}(\alpha) = \mathbb{F}(\alpha)|_{\mathbb{F}^{-1}(CDD_\alpha(\alpha))}$. $\mathbb{F}$ is *locally linearly well-formed* if the following hold:

  1. For any $\alpha \in WS, Range(\mathbb{F}(\alpha)) = Reach(\alpha)$
  2. For any $\alpha \in WS$, $R_{\mathbb{F}}(\alpha)$ is injective.

- A locally linearly well-formed $\mathbb{F}$ on WS is *linearly well-formed* if:

  1. For any $\alpha \in WS$ with daughters $\beta_1, \ldots, \beta_n$, $\mathbb{F}$ is order-preserving w.r.t. $\{\mathbb{F}^*(\beta_i)\}_{i \in [1, \ldots, n]}, <$, and $\mathbb{F}(\alpha)$, where for any $\gamma \in WS$, $\mathbb{F}^*(\gamma)$ is some restriction of $\mathbb{F}(\gamma)$ such that $Range(\mathbb{F}^*(\gamma)) = Range(\mathbb{F}(\gamma))$
  2. For any $\alpha, \beta \in Phases(WS)$, if $CDD_\alpha(\alpha) \cap CDD_\alpha(\beta) \neq \emptyset$ then either $R_{\mathbb{F}}(\alpha) \subseteq R_{\mathbb{F}}(\beta)$ or $R_{\mathbb{F}}(\beta) \subseteq R_{\mathbb{F}}(\alpha)$
  3. For some $\alpha \in Phases(WS), CDD_{WS}(\alpha) = Items(WS)$

- Let I be a finite set, L a linear order on I, and S a set. Define $I' = I \cup \{\mu\}$, where $\mu \notin I$. For each $i \in I'$ let D_i be a finite set, L_i a linear order on D_i, and σ_i an L_i-list over S. Define $A := \{(i, x) : i \in I, x \in D_i\}$. A function $f : A \rightarrow D_\mu$ will be called *order preserving* w.r.t. $\{\sigma_i\}_{i \in I}, L$, and σ_μ if:

  1. Onto: $f(A) = D_\mu$
  2. Conserv: $\forall i \in I.\forall x, y \in D_i.(x, y) \in L_i \rightarrow (f(i, x), f(i, y)) \in L_\mu$
  3. Align: $\forall i, j \in I.i < j \rightarrow (f(i, min(L_i)), f(j, min(L_j))) \in L_\mu$ and $\forall i, j \in I.(i, j) \in L \rightarrow (f(i, max(L_i)), f(j, max(L_j))) \in L_\mu$

4. FAITHFULNESS: $\forall i \in I.\forall x \in D_i.\sigma_\mu(f(x)) = \sigma_i(x)$

- Sample Lexicon:

Category	Entries
D	John, Mary, we
W	who, what, $\phi_{y/n}$
D/N	the, a, some
W/N	which
$D\backslash W/T$	that
D/T	that
N	banana, headmaster
$V\backslash D$	walk
V/D	fall
$V\backslash D/D$	eat, say
$T\backslash D/D$	will, -s, -d
X/X	yesterday, new

B   Other approaches

B.1   Wilder (1999)

Wilder's main concern is to derive the generalization in (78):

(78)   If a shared constituent α surfaces inside the coordination, then (i) α surfaces in the final conjunct, and (ii) α-gaps must appear at the right edge of all non final conjuncts (adapted from Wilder's (11))

Note that (78) differs from the RER generalization in section 1 in not requiring the shared constituent to surface at the right edge of the *final conjunct*. We return to this issue below. Wilder observes that in an ellipsis account (backward deletion) of RNR as in Wilder (1997), (78) has to be stipulated.[12]

(Wilder, 1999) adopts a multidominance structure (McCawley, 1982) for RNR configurations and proposes that (78) is a cosequence of LCA type linearization of such structures.[13]

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[12]In Wilder (1997) the author argues against a movement based account of RNR. In this paper this conclusion is simply assumed as a premise.

[13]An additional (though widely acccepted) assumption is that coordination is asymmetric, with the leftmore conjunct asymmetrically c-commanding the rightmore conjunct.

The original formulation of the LCA (Linear Correspondance Axiom, Kayne 1994) is provided below:

(79) The LCA (adapted from Wilder's paper)

    a. Precedence among terminals is determined by asymmetric c-command among categories that contain them: if a category X asymmetrically c-commands a category Y, then the terminals in the *image* of X precede the terminals in the *image* of Y.

    b. The image of a category X, d(X), is the set of terminals dominated by X.

    c. There is a requirement for a *linear ordering* of terminals of a tree which determines possible forms of trees via (a).

(79) is not compatible with graphs containing instances of multidominance. Wilder identifies two critical aspects of the LCA that need to be modified in order to rule in multidominance graphs.

(80)
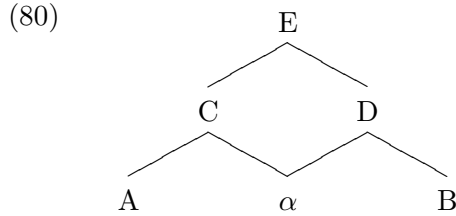
In the multidominance graph in (80) C does not (asymmetrically) c-command α given the standard definiton of c-command:

(81) X c-commands Y iff (i) X$\neq$Y, (ii) X does not dominate Y, (iii) Y does not dominate X, and (iv) all categories that dominate X dominates Y.

This is a potential problem for the LCA algorithm because the image of C (in 80) will not be ordered with respect to (the image of) α. Wilder suggests to replace dominance in (81iii) with *full dominance*:

(82) X fully dominates α iff X dominates α and X does not *share* α.

(83) α is *shared* by X and Y iff (i) neither of X and Y dominates the other, and (ii) both X and Y dominate α.

This modification of c-command has the consequence that in (80) C now asymmetrically c-commands α (as it does not fully dominate it) and so ordering can be determined.

The second problem for an LCA linearization of (80) is that since α is both a member of the image of C and asymmetrically c-commanded by C it is ordered to precede itself. As precedence is taken to be non-reflexive, the LCA as defined in (79) rules out structures such as (80). Wilder proposes to modify the definition of image in the following way:

(84)   d(X)= the set of terminals *fully dominated* by X.

Given the new definition of *image*, α in (80) is no longer in the image of C and so is not ordered before itself, avoiding the linearization paradox. Wilder claims that the revised LCA accounts for the generalization in (78). The shared constituent is asymmetrically c-commanded by all non-final conjuncts (given the modified definition of c-command). As a consequence it must surface to the right of the terminals in the image of all non-final conjuncts (generalization 78i). The structure in (85) violates the second clause in (78) :
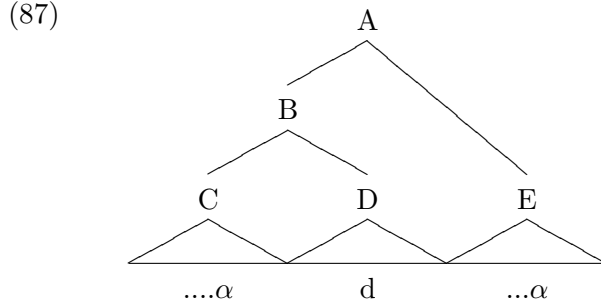
(85)
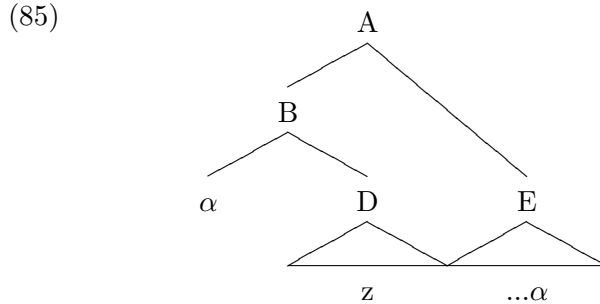
α asymmetrically c-commands z in the non final conjunct. This causes a linearization paradox. The modified LCA still requires α to precede z (full dominance does not play a role here). α is also ordered to follow z since it is asymmetrically c-commanded by B, and z belongs to the image of B. Thus, the revised LCA correctly filters out the structure in (85). This is a welcomed prediction:

(86)   * John can_ your book and Mary will **read** the paper

As has been noted by Sabbagh (2003/2006), Wilder's account does not actually derive the generalization in (78ii). Wilder's system does rule out structures where the shared constituent *asymmetrically c-commands* other

material in a non final conjunct (85,86). However, it does not rule out structures where conjunct final material is *not* asymmetrically c-commanded by the shared material (87):

(87)

```
                    A
                   / \
                  /   \
                 B     \
                / \     \
               /   \     \
              C     D     E
             /\    /\    /\
            /  \  /  \  /  \
         ....α   d     ...α
```

In (87) α does not c-command d and is thus not ordered to precede it. Linearizing α inside the rightmost conjunct should not bring about an LCA violation. Such constructions are, however, ungrammatical:

(88)   * Joss edited one review _ for Blackwell, and Maria edited two reviews **of my new book** for Oxford (from Sabbagh (2003/2006))

(89)   * A man who loved _ danced the night away and a woman who hated **the recent song by Elton John** went home.

Nothing in the system presented in Wilder (1999) explains the ungrammaticality of (88) or (89).
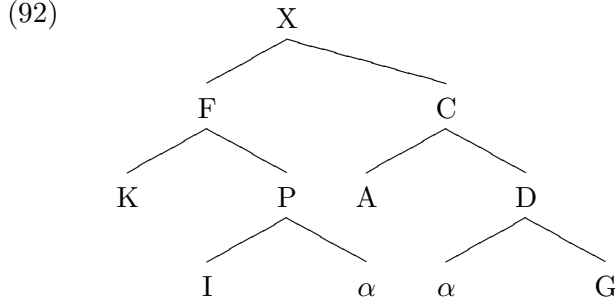
We noted earlier that the generalization in (78) does not require the shared material to be rightmost in the rightmost conjunct. Wilder presents (90) as evidence for the correctness of this generalization:

(90)   John should fetch _ and give **the book** to Mary (Judgment as reported by Wilder)

Wilder claims that his system derives this aspect of the generalization. While the shared material is not in the image of the last conjunct, it is not c-commanded by it either. As a consequence, the shared material can asymmetrically c-command material inside the last conjunct and be linearized in a non final position inside that conjunct. A closer look at Wilder's definition of c-command (91) reveals that his system actually rules out the sentence in (90).

(91)   X c-commands Y iff (i) X≠Y, (ii) X does not fully dominate Y, (iii) Y does not dominate dominate X, and (iv) all categories that dominate X dominates Y.

Consider the abstract structure in (92) corresponding to (90):

(92)

```
                        X
               ┌────────┴────────┐
               F                 C
          ┌────┴────┐       ┌────┴────┐
          K         P       A         D
               ┌────┴───┐        ┌────┴───┐
               I        α        α        G
```

α is not fully dominated by D. Additonally, all categories that dominate D dominate α. As a consequence, D asymmetrically c-commands α and so the image of D (G) must *precede* α. Wilder's system predicts that (90) could only surface as in (93):

(93) John should fetch __ and give to Mary **the book**

One could suggest to replace dominance in (91iv) with full dominance. This would prevent the last conjunct from c-commanding the shared material, but would also prevent any other constituent in non intitial conjuncts from c-commanding the shared material.[14] The fact that Wilder's system cannot generate (90) might actually be a blessing. Our informants have rejected a number of variants of (90) which his generalization predicts to be acceptable:[15]

(94) * John will wrap __ and Mary will give **the book** to Mary

(95) * John will congratulate __ and give **the winner** the prize

In section 3 we have presented new data that demonstrates that RNR feeds Wh movement. (Wilder, 1999) makes no reference to leftward movement or to the interaction of his modified LCA with loacality constraints on long distance dependencies. It is thus not possible to evaluate whether his account could be made compatible with these new facts. However, it is important to note that as we understand it, Wilder's account cannot properly handle linearization of leftward movement. Wilder assumes, as we do, that movement is a case of re-merge (rather than copy+merge):

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[14]Possibly, a different definition all together of c-command might allow Wilder to derive (78). We will not explore this possibility here.

[15]We do not know why Wilder's informants accepted (90). We suspect that it is either a parsing error or possibly a reanalysis of 'fetch and give' as V-coordination. Some of our informants initially accpeted (90) but reversed their judgment upon further reflection, suggesting that mis-parsing might be the underlying cause. In any case, given that neither of our systems actually generates (90), its acceptability would be a surprise for everyone.

(96)
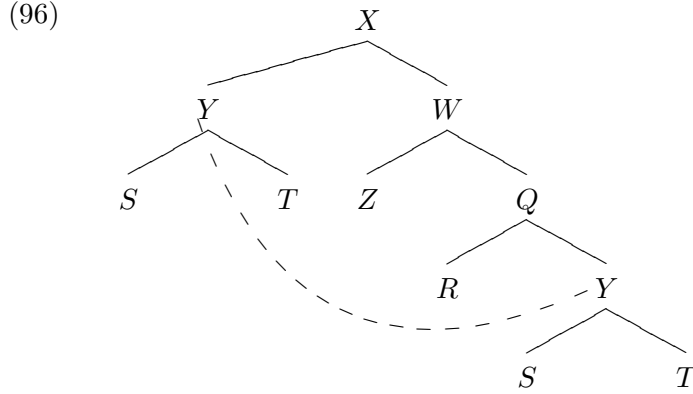
In (96) the constituent Y has been re-merged as a sister of W. Y itself is now unordered with respect to Z and R since there is mutual c-command. Z and R c-command the base position of Y while Y c-commnads Z and R from its derived position. It is not clear what is the relation established between Y and W and Q. W and Q both (fully) dominate Y in its base position but Y c-commands both from its derived position. Furthermore, S and T are still asymmetrically c-commanded by R and Z despite the movement of Y and so the images of R and Z are ordered to *follow* the images of Z and R preventing phonological movement despite the syntactic re-merge operation. It is clear that in order to make the LCA compatible with a re-merge framework further modifications will be needed. Recall that our proposal makes use of a different notion of dominance (complete dominance) which does allow a unified account of intra and inter arborial movement.

B.2 Sabbagh (2003/2006)

The starting point of Sabbagh (2003/2006) is the absence of the Right Roof Constraint (RRC) in RNR constructions on the one hand, and the Right Edge Restriction (RER) on the other (cf. section 2). While other authors (cf. Wilder 1997) have taken this difference between RNR and other cases of rightward movement to be an argument against a movement account of RNR, Sabbagh proposes to keep the movement but replace the RRC. The author proposes the following re-conceptualization of the RRC:

(97)   Rightward Crossing Constraint (RCC)
       Rightward movement of α may not cross phonologically overt material which is not contained within the cyclic node (phase) wherein α originates.[16]

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[16]Following Chomsky, vP and CP are considered phases. PP is also taken to be a phase

The RCC seems to hold for both Heavy NP shift (98) and RNR (99) (if other conjuncts do not count as phonological interveners):

(98) a. Josh will sell to the library __ on his birthday **all his old manuscripts**

b. * Joss insisted that no one would ever consider firing __ yesterday **the crazy guy from accounting.**

(99) a. Josh will sell __ to the library, and donate __ to a shelter *on the same day*, **all of his old manuscripts.**

b. * Joss said that he was going to fire __ ,and insisted that no one would ever consider rehiring __ *on the same day* ,**the crazy guy from accounting**.

Notice that in the ungrammatical sentences, the moved material is separated from the gap by material not contained within the cyclic node containing the gap. Sabbagh implements the RCC within the framework outlinded in Fox and Pesetsky (2005). In that framework, movement, which is syntactically unbounded, is constrained by order preservation:

(100) ORDER PRESERVATION
The linear ordering of syntactic units is affected by Merge and Move within a spellout domain, but is fixed once and for all at the end of each spellout domain.

This conception of locality explains why RNR is able to escape out of domains which are islands for leftward extraction. Movement to the right (or to the left) out of a spelled-out phase is possible as long as the moving element has been linearized to the right (or left) of all other elements in the phase thus not violating ordering statements fixed at spellout. Under this view, a leftward extraction island might not be a rightward extraction island. Material that has been ordered rightmost within a spellout domain (such as in relative clause or Wh island) cannot be leftward extracted but can move further to the right. The problem is that this constraint by itself is too liberal as it does not actually capture the RCC. An element can move to the first cyclic node dominating its base (vP) and then continue to move rightward within TP and CP and then end up at the right edge of CP and so on. In order to enforce the RCC, Sabbagh adds the follwoing stipulation:

(101) LANDING SITE RESTRICTION (LSR)
Rightward movement may move an element X:

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to account for the ungrammaticality of HNPS from PP.

    a. to the right edge of the first spellout domain that contains X's base position, or

    b. to the right edge of the root.

    No other edge positions are available to rightward movement.

This constraint prevents rightward moving elements from scrambling to CP from the edge of vP through intermediate positions inside TP. By the time the edge of CP is made available, TP has been spelled out and so the element at the edge of vP is not rightmost anymore, preventing further movement (cf. 98b).

In the case of RNR, the shared material moves in an ATB fashion directly to the root.[17] This movement is blocked if material is added to the right of the conjunction (cf.99b) ATB to the right is also blocked if the material is not rightmost in all of the conjuncts::

(102)   * [A man who loves _ danced], and [a woman who hates _ went home] **the new headmaster**.

Sabbagh's basic intuition seems to us insightful, however, the formal system he proposes is problematic. The LSR is too restrictive as it rules out the following sentences :

(103)   The man who met _ and the woman who kissed **the new headmaster** came late to the party.

(104)   John insisted that the man who met _ and the woman who kissed **the new headmaster** should not be invited to the party.

(105)   John wants the man who met _ and the woman who kissed **the new headmaster** to get to know each other.

(106)   John's claim that the man who met _ and the woman who kissed **the new headmaster** were late to the party is just another one of his lies.

(107)   John decided, after Mary wrote _ , but before her brother read **the note about the murder**, to quit his job and leave for Mexico.

In all the senences above, the shared material is not attached to the root node (nor to the first cyclic node above the gap). It seems that the LSR

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[17]Sabbagh assumes that the Coordinate Structure Constraint holds also on rightward movement.

needs to be relaxed and allow intermediate attachment sites. However, if intermediate sites are allowed in, we cannot block anymore (108):

(108)   * John went out of __ furiously **the dean's office**.

Sabbagh's system blocks (108) because the moving DP can attach only to the edge of PP or to the root node but not to the edge of VP. By the time the root node is made available, the adverb has been linearized to the right of the DP and so further movement is blocked. This result cannot be maintained if we relax the LSR to allow such intermediate landing sites.

There is another,conceptual, problem with the LSR. While Sabbagh is not explicit on this point, there is a difference in the ordering of movement and spellout between the two cases allowed by the LSR. Movement to the first cyclic node can precede spellout triggered by that cyclic node:

(109)   John gave __ to Mary yesterday **a book about bats**

In (109) the movement of the DP to the edge of vP must precede the spellout of the complement of vP (VP), otherwise the VP internal PP 'to Mary' would have intervened.
Movement to the root, on the other hand, must follow the spellout triggered by the root CP, otherwise it is not clear why TP material such as the subject depictive in (111) should cause a linearization contradiction:

(110)   Max [vP described __ for Sam] **a Broadway musical** drunk

(111)   * [Max [vP described __ for Sam] __ drunk] **a Broadway musical**
         (Sabbagh 68)

Sabbagh argues that (111) is underivable in his system because the moving DP, which can attach to the edge of vP, as (110) demonstrates, can only moe to the edge of the root after the matrix CP was spelled out, linearizing 'drunk' to the right of 'a broadway musical'. A difference in the ordering of movement and spellout is higly surprising from a minimalist perspective. Moreover, we are not aware of a similar case for leftward movement. This added complexity to the already stipulative LSR makes it even less plausible as the correct generalization.

The LSR does not only undergenerate, as we have seen above, but also overgenerate. Sabbagh claims that the wide scope of the universal in (113) is a consequence of the movement of the DP out of the conjunction:

(112)   Josh knows someone who speaks every Germanic language. ($\exists \succ \forall, *\forall \succ \exists$)

(113) John knows someone who speaks, and Bill knows someone who wants to learn **every Germanic language**. ($\exists \succ \forall, \forall \succ \exists$)

The problem (discussed in section 3) is that the shared material cannot outscope quantifiers *above* the conjunction:

(114) Someone knows that Bill speaks, and that John wants to learn **every Germanic language**. ($\exists \succ \forall, *\forall \succ \exists$)

The lack of the wide scope reading of the universal in (114) is surprising for Sabbagh given that the quantifier, according to him, is attached to the root, c-commanding the indefinite subject.

(112) points to another problem with Sabbagh's system. Given that rightward movement is in principle unbounded, why can't the quantified DP in (112) string-vacuously move to the edge of the root and thus outscope the indefinite object? Something has to be added to the system in order to allowe movement in (113) but not in (112).

Given the problems discussed above, one might suggest the following reformulation of the LSR:

(115) Landing Site Restriction (revised)
Rightward movement may move an element X:
  a. to the right edge of the first spellout domain that contains X's base position, or
  b. to the right edge of conjunction, as long as X moves simultaneously from all conjuncts.[18]
No other edge positions are available to rightward movement.

This new formulation of the LSR suspiciously resembles a disjoint definition of the original Right Roof Constraint rather than a unified alternative. With the revised LSR, Order Preservation plays no significant role in constraining HNPS but is still crucial in order to derive the right edge restriction on the gap position in RNR. In section 3 we have presented new data that is, as far as we see, incompatible with the Order Preservation account:

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[18]A question remains about the nature of this simultaneous move. Are we merging the very same object into each conjunct and then once again at a higher position? In that case we have a structure similar to the multiple dominance structure of Wilder (1999). Are we merging copies? In that case, does the left conjunct contain a copy of material from the right conjunct? The other way round? And whose copy is the pivot? These questions are not addressed in the paper, and we ignore them as well.

(116)   a. [John met a man who wrote __], and [Mary met a man who published __] **a recent book about bats**.

   b. **Which book**$_i$ did [John meet the man who wrote __], and [Mary meet the man who published __] t_i?

In (116a) the Order Preservation mechanism fixes the order of the material inside each cojunct, since each conjunct contains at least one spellout domain. The shared material is ordered to the right of all other conjunct internal elements. As it is rightmost in each conjunct, it can rightward move to the edge of the conjunction or the root, without violating existing linearization statements. This account of (116a) makes a clear prediction that the shared material could never move leftwards as it would then violate a number of linearization statements. (116b) falsifies this prediction.

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