Repairing linearization

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1 Introduction

- In this talk, I argue for the deletion of ordering statements as a repair mechanism for linearization.
- In combination with Order Preservation (Fox & Pesetsky, 2005), this proposal:
  - provides an account of the linearization of parallel structures such as right node raising (RNR).
  - provides a multidominance-compatible implementation of Bobaljik's (2002) account of the distinction between overt and covert movement.
  - provides a multidominance-compatible account of scattered/distributed deletion.

2 Formalizing linearization

- We can model the output of linearization as a binary relation, i.e., a set of ordered pairs (Kayne, 1994; Chomsky, 1995).
- I call the output of linearization the **precedence relation**.
  - Formally, a precedence relation is a binary relation over lexical items (or terminal nodes, depending on what linearization linearizes).
- I refer to the elements of the precedence relation as **ordering statements** (cf. Fox & Pesetsky, 2005).

- For a precedence relation to be interpretable by the SM interface, it must be a **linear order**[1], i.e., it must be transitive, total, and asymmetric (Kayne, 1994).[2]
  - **Transitive**: Let R be a binary relation over a set S. Then R is transitive if for all $x, y, z \in S$, if $\langle x, y\rangle \in R$ and $\langle y, z\rangle \in R$, then $\langle x, z\rangle \in R$.
  - **Total**: Let R be a binary relation over a set S. Then R is total if for all distinct $x, y \in S$, it is the case that $\langle x, y\rangle \in R$ or $\langle y, x\rangle \in R$.
  - **Asymmetric**[3]: Let R be a binary relation over a set S. Then R is asymmetric if there is no $x, y \in S$ such that both $\langle x, y\rangle \in R$ and $\langle y, x\rangle \in R$.
- Asymmetry entails irreflexivity.
  - **Irreflexive**: Let R be a binary relation over a set S. Then R is irreflexive if there is no $x \in S$ such that $\langle x, x\rangle \in R$.

3 Problems of linearization

- Treating movement as Merge leads to reflexivity and symmetry in syntax.
- Consider (1).

(1) $[_{\text{CP}}$ what$_i$ did $[_{\text{TP}}$ you $[_{\text{VP}}$ see what$_i]]]$

- In (1), *what* c-commands itself (reflexive c-command).
- In (1), *what* both c-commands and is c-commanded by *did*, *you*, and *see* (symmetric c-command).
- In general, reflexivity and symmetry in syntax lead to reflexivity and symmetry in linearization, precluding a linear order (Nunes, 2004).
- There are two types of approaches to this problem:
  - **Repair approaches**: Introduce a PF repair mechanism to eliminate violations of asymmetry.
  - **Redefinition approaches**: Define the linearization algorithm (or the primitives on which it is based) so that reflexive and symmetric ordering statements do not arise in the first place.
- Repair approaches are strongly associated with the copy theory of movement, where copies of a displaced constituent are deleted to resolve asymmetry violations (e.g., Nunes, 2004).

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[1] I use the term *linear order* exclusively in the set-theoretic sense to denote a particular type of binary relation. I do not use the term to refer to the ordering of lexical items in an utterance.

[2] For some authors (e.g., Fox & Pesetsky, 2005; Sheehan, 2013), a precedence relation does not need to be a linear order, as long as its transitive closure is.

[3] In linguistics, this property is often called *antisymmetry*. Outside of linguistics, however, *antisymmetry* refers to a different property.

- Authors who assume multidominance tend to adopt redefinition approaches, although specific proposals vary.
- Examples of different proposals include the following:

	Copy theory	Multidominance theory
Repair	Nunes 2004 and others	Belk et al. 2023
Redefinition	Sheehan 2013	Wilder 1999; Citko 2005; Fox & Pesetsky 2005; de Vries 2009; Gračanin-Yuksek 2013; Bachrach & Katzir 2017; Johnson 2020

4 Proposal

- The specific framework I adopt is **Flexible Cyclic Linearization (FCL)** (Malanoski, forthcoming).
- FCL is an extension of **Cyclic Linearization (CL)** (Fox & Pesetsky, 2005) that allows for ordering statements to be deleted *in the phase in which they arise* as necessary to linearize a structure.
  - Flexible Cyclic Linearization is motivated by the inability of Cyclic Linearization to linearize parallel structures (unless they involve subsequent movement). See Malanoski (forthcoming) for discussion.
- Like in CL, FCL assumes:
  - linearization happens in phases.
  - linearization obeys **Order Preservation**: ordering statements generated in one phase cannot be deleted in a subsequent phase.
  - there is no distinction between the phase and Spell-Out Domain—the entire phase is transferred.
  - the contents of a phase are still accessible after it is spelled out.
- Unlike in CL, under FCL every position in which a constituent appears is taken into account during linearization (rather than only its highest remerge position).
- In other words, Fox & Pesetsky (2005) adopt a redefinition approach to asymmetry violations: they define the linearization algorithm so that it only pays attention to one position in which a constituent occurs.
- FCL is a repair approach: ordering statements can be deleted if linearization would not otherwise succeed.
- Some important notes:

- Transitivity and especially totality restrict the deletion of ordering statements: if we delete too many, we may end up with a relation that is not total and/or transitive.[4]
- We can adopt the deletion of ordering statements as a repair mechanism without otherwise adopting Flexible Cyclic Linearization (although Order Preservation is also necessary to my account of the phenomena discussed below).
- Because linearization generates ordering statements regardless of whether we adopt copy theory or multidominance theory, this repair mechanism is compatible with either.

5 Linearizing sharing: Right node raising

- Flexible Cyclic Linearization can linearize parallel structures, i.e., structures where a constituent occurs in two (or more) positions, neither of which c-commands the other.
- Consider the right node raising (RNR) structure (2). I assume that RNR involves multidominance (at least sometimes; see Belk et al., 2023).
- Some expository notes:
  - I use co-indexation to indicate constituent identity, so that the two instances of *the book* in (2) are occurrences of the same constituent.
  - I ignore displacement other than RNR. This does not affect the points under discussion.
  - I remain agnostic on the algorithm that generates ordering statements, and take for granted that it generates usual English word order.

(2) Darius found and Jasmine took <u>the book</u>.
$[_{\text{CP}}\ [_{\&\text{P}}\ [_{\text{TP}}$ Darius $[_{\text{vP}}$ found [the book]$_i]]\ [_{\&'}$ and $[_{\text{TP}}$ Jasmine $[_{\text{vP}}$ took [the book]$_i]]]]]$

- Spell-Out of $[_{\text{vP}}$ found the book] will produce the following ordering statements: $\langle found, the \rangle$; $\langle found, book \rangle$; and $\langle the, book \rangle$.
- Spell-Out of $[_{\text{vP}}$ took the book] will produce the following ordering statements: $\langle took, the \rangle$; $\langle took, book \rangle$; and $\langle the, book \rangle$.
- No repair is necessary for either.
- Spell-Out of the CP will generate the precedence relation in (3).

[4] If we adopt the transitive closure approach to linearization (see fn. 2), then the constraints on the deletion of ordering statements are weaker: we can delete ordering statements in such a way that the resulting relation is not transitive or total, as long as its transitive closure is.

(3) Initial precedence relation for the CP in (2). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{array}{cccccc}
\langle Darius, found\rangle & \langle Darius, and\rangle & \langle Darius, Jasmine\rangle & \langle Darius, took\rangle & \langle Darius, the\rangle & \langle Darius, book\rangle \\
 & \langle found, and\rangle & \langle found, Jasmine\rangle & \langle found, took\rangle & \boldsymbol{\langle found, the\rangle} & \boldsymbol{\langle found, book\rangle} \\
 & & \langle and, Jasmine\rangle & \langle and, took\rangle & \langle and, the\rangle & \langle and, book\rangle \\
 & & & \langle Jasmine, took\rangle & \langle Jasmine, the\rangle & \langle Jasmine, book\rangle \\
 & & & & \boldsymbol{\langle took, the\rangle} & \boldsymbol{\langle took, book\rangle} \\
 & \langle the, and\rangle & \langle the, Jasmine\rangle & \langle the, took\rangle & \langle the, the\rangle & \boldsymbol{\langle the, book\rangle} \\
 & \langle book, and\rangle & \langle book, Jasmine\rangle & \langle book, took\rangle & \langle book, the\rangle & \langle book, book\rangle
\end{array}\right\}$$

- (3) is not asymmetric, and thus requires repair.
- First, the reflexive ordering statements must be deleted: ⟨*the*, *the*⟩ and ⟨*book*, *book*⟩.
- Second, to satisfy Order Preservation, the ordering statements that contradict previously established ordering statements must be deleted: ⟨*the*, *took*⟩, ⟨*book*, *took*⟩ and ⟨*book*, *the*⟩.[5]
- Resolving the remaining symmetry—⟨*the*, *and*⟩, ⟨*the*, *Jasmine*⟩, ⟨*book*, *and*⟩ and ⟨*book*, *Jasmine*⟩ vs. ⟨*and*, *the*⟩, ⟨*Jasmine*, *the*⟩, ⟨*and*, *book*⟩ and ⟨*Jasmine*, *book*⟩—is a more complicated task. However, there is a unique solution.
    - The precedence relation contains ⟨*the*, *and*⟩ and ⟨*and*, *took*⟩ but not ⟨*the*, *took*⟩ (which was deleted to satisfy Order Preservation), violating transitivity. We can resolve this violation of transitivity by deleting ⟨*the*, *and*⟩ or ⟨*and*, *took*⟩. However, if we delete ⟨*and*, *took*⟩, then *and* will not be ordered with respect to *took*, violating totality. Thus, to respect transitivity, we must delete ⟨*the*, *and*⟩. To respect totality, we must keep ⟨*and*, *the*⟩ instead.
    - The precedence relation contains ⟨*the*, *Jasmine*⟩ and ⟨*Jasmine*, *took*⟩ but not ⟨*the*, *took*⟩ (which was deleted to satisfy Order Preservation), violating transitivity. We can resolve this violation of transitivity by deleting ⟨*the*, *Jasmine*⟩ or ⟨*Jasmine*, *took*⟩. However, if we delete ⟨*Jasmine*, *took*⟩, then *Jasmine* will not be ordered with respect to *took*, violating totality. Thus, to respect transitivity, we must delete ⟨*the*, *Jasmine*⟩. To respect totality, we must keep ⟨*Jasmine*, *the*⟩ instead.
    - The precedence relation contains ⟨*book*, *and*⟩ and ⟨*and*, *took*⟩ but not ⟨*book*, *took*⟩ (which was deleted to satisfy Order Preservation), violating transitivity. We can resolve this violation of transitivity by deleting ⟨*book*, *and*⟩ or ⟨*and*, *took*⟩. However, if we delete ⟨*and*, *took*⟩, then *and* will not be ordered with respect to *took*, violating totality. Thus, to respect transitivity, we must delete ⟨*book*, *and*⟩. To respect totality, we must keep ⟨*and*, *book*⟩ instead.
    - The precedence relation contains ⟨*book*, *Jasmine*⟩ and ⟨*Jasmine*, *took*⟩ but not ⟨*book*, *took*⟩ (which was deleted to satisfy Order Preservation), violating transitivity. We can resolve this violation of transitivity by deleting ⟨*book*, *Jasmine*⟩

[5] Strictly speaking, the problem here is symmetry: (3) contains ⟨*the*, *took*⟩, ⟨*book*, *took*⟩ and ⟨*book*, *the*⟩, but also ⟨*took*, *the*⟩, ⟨*took*, *book*⟩ and ⟨*the*, *book*⟩. The latter three ordering statements were established in an earlier phase, so deleting them would violate Order Preservation. Thus, there is no choice but to delete the three ordering statements indicated above.

or ⟨*Jasmine*, *took*⟩. However, if we delete ⟨*Jasmine*, *took*⟩, then *Jasmine* will not be ordered with respect to *took*, violating totality. Thus, to respect transitivity, we must delete ⟨*book*, *Jasmine*⟩. To respect totality, we must keep ⟨*Jasmine*, *book*⟩ instead.

  - To summarize, there is only one way to resolve the remaining symmetry, namely by deleting ⟨*the*, *and*⟩, ⟨*the*, *Jasmine*⟩, ⟨*book*, *and*⟩ and ⟨*book*, *Jasmine*⟩.

- Deleting the indicated ordering statements produces the precedence relation in (4). This corresponds to the surface order in (2) (one can see this more clearly by looking at ordering statements along the diagonal).

(4) Repaired precedence relation for the CP in (2). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{array}{cccccc}
\langle \mathit{Darius}, \mathit{found}\rangle & \langle \mathit{Darius}, \mathit{and}\rangle & \langle \mathit{Darius}, \mathit{Jasmine}\rangle & \langle \mathit{Darius}, \mathit{took}\rangle & \langle \mathit{Darius}, \mathit{the}\rangle & \langle \mathit{Darius}, \mathit{book}\rangle \\
 & \langle \mathit{found}, \mathit{and}\rangle & \langle \mathit{found}, \mathit{Jasmine}\rangle & \langle \mathit{found}, \mathit{took}\rangle & \boldsymbol{\langle \mathit{found}, \mathit{the}\rangle} & \boldsymbol{\langle \mathit{found}, \mathit{book}\rangle} \\
 & & \langle \mathit{and}, \mathit{Jasmine}\rangle & \langle \mathit{and}, \mathit{took}\rangle & \langle \mathit{and}, \mathit{the}\rangle & \langle \mathit{and}, \mathit{book}\rangle \\
 & & & \langle \mathit{Jasmine}, \mathit{took}\rangle & \langle \mathit{Jasmine}, \mathit{the}\rangle & \langle \mathit{Jasmine}, \mathit{book}\rangle \\
 & & & & \boldsymbol{\langle \mathit{took}, \mathit{the}\rangle} & \boldsymbol{\langle \mathit{took}, \mathit{book}\rangle} \\
 & & & & & \boldsymbol{\langle \mathit{the}, \mathit{book}\rangle}
\end{array}\right\}$$

- This proposal can also account for the **Edge Restriction** on RNR: in RNR, the gap corresponding to the shared material must be final in non-final conjuncts (Bachrach & Katzir, 2017).[6]

- Consider (5).

(5) * Darius found at home and Jasmine took the book.

[$_{\text{CP}}$ [$_{\text{\&P}}$ [$_{\text{TP}}$ Darius [$_{\text{vP}}$ found [the book]$_i$ at home]] [$_{\text{\&}'}$ and [$_{\text{TP}}$ Jasmine [$_{\text{vP}}$ took [the book]$_i$]]]]]

- When [$_{\text{vP}}$ found [the book]$_i$ at home] is spelled out, *the book* is ordered before *at home.*

- When [$_{\text{vP}}$ took [the book]$_i$] is spelled out, *the book* is ordered after *took.*

- When the CP is spelled out, *at home* is ordered before *took.*

- This produces a contradiction: *the book* must be precede *at home*, which must precede *took*, which must precede *the book.*

- We can't delete the ordering statements that place *took* before *the book* without violating Order Preservation.

- We can't delete the ordering statements that place *the book* before *at home* and *at home* before *took* without violating totality.

- Thus, (5) cannot be linearized. This derives the Edge Restriction.

- This proposal maintains a core insight of Sabbagh (2007)—that the edge restriction on RNR is Order Preservation—without the baggage of a movement approach to RNR (see Bachrach & Katzir, 2017 and Larson, 2018 for discussion).

6 In left node raising, the gap must be initial in non-initial conjuncts.

6 Optionality and variation

- FCL also derives a multidominance-compatible implementation of Bobaljik's (2002) theory of covert movement as realization of a lower occurrence.
- Consider (6), which is an elaborated version of (1). For expositional purposes, I ignore head movement.

(6) What did you see?

[$_{\text{CP}}$ what$_i$ did you$_j$ [$_{\text{vP}}$ what$_i$ you$_j$ see what$_i$]]

- Spell-Out of the vP will produce the precedence relation in (7), which is not asymmetric and thus requires repair.

(7) Initial precedence relation for [$_{\text{vP}}$ what$_i$ you see what$_i$].

$$\left\{\begin{array}{ccc} \langle what, you\rangle & \langle what, see\rangle & \langle what, what\rangle \\ & \langle you, see\rangle & \langle you, what\rangle \\ & & \langle see, what\rangle \end{array}\right\}$$

- First, the reflexive ordering statement $\langle what, what\rangle$ must be deleted.
- We then have to resolve the remaining symmetry: $\langle what, you\rangle$ and $\langle what, see\rangle$ vs. $\langle you, what\rangle$ and $\langle see, what\rangle$.
- Crucially, no other factor determines whether to keep the former pair of ordering statements ($\langle what, you\rangle$ and $\langle what, see\rangle$) or the latter pair ($\langle you, what\rangle$ and $\langle see, what\rangle$).
  - Order Preservation plays no role, since this is an initial phase.
- I propose that the choice between ordering statements here is language-specific.
- Since English has overt wh-movement, we assume that it keeps $\langle what, you\rangle$ and $\langle what, see\rangle$, giving (8).

(8) Repaired precedence relation for [$_{\text{vP}}$ what$_i$ you see what$_i$].

$$\left\{\begin{array}{cc} \langle what, you\rangle & \langle what, see\rangle \\ & \langle you, see\rangle \end{array}\right\}$$

- Spell-Out of the CP then produces the precedence relation in (9), which is not asymmetric and thus requires repair.[7]

[7] I assume that the order of elements in the vP is not recalculated, so we do not re-generate $\langle see, what\rangle$. This is not crucial, as Order Preservation would force us to delete that ordering statement anyway.

(9) Initial precedence relation for the CP in (6). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{matrix} \langle \mathit{what}, \mathit{did}\rangle & \boldsymbol{\langle what, you\rangle} & \boldsymbol{\langle what, see\rangle} & \langle \mathit{what}, \mathit{what}\rangle \\ & \langle \mathit{did}, \mathit{you}\rangle & \langle \mathit{did}, \mathit{see}\rangle & \langle \mathit{did}, \mathit{what}\rangle \\ & \langle \mathit{you}, \mathit{you}\rangle & \boldsymbol{\langle you, see\rangle} & \langle \mathit{you}, \mathit{what}\rangle \end{matrix}\right\}$$

- First, the reflexive ordering statements must be deleted: $\langle \mathit{what}, \mathit{what}\rangle$ and $\langle \mathit{you}, \mathit{you}\rangle$.
- Second, the ordering statement that contradicts a previously established ordering statement must be deleted: $\langle \mathit{you}, \mathit{what}\rangle$.
- We are then left with a pair of symmetric ordering statements, $\langle \mathit{what}, \mathit{did}\rangle$ and $\langle \mathit{did}, \mathit{what}\rangle$. As in the vP, we assume that English chooses $\langle \mathit{what}, \mathit{did}\rangle$, since it linearizes *what* at the left edge of the clause.
- This leaves (10), which generates the surface order in (6).

(10) Repaired precedence relation for the CP in (6). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{matrix} \langle \mathit{what}, \mathit{did}\rangle & \boldsymbol{\langle what, you\rangle} & \boldsymbol{\langle what, see\rangle} \\ & \langle \mathit{did}, \mathit{you}\rangle & \langle \mathit{did}, \mathit{see}\rangle \\ & & \boldsymbol{\langle you, see\rangle} \end{matrix}\right\}$$

- What would have happened if we had instead chose $\langle \mathit{you}, \mathit{what}\rangle$ and $\langle \mathit{see}, \mathit{what}\rangle$ in the vP phase, giving (11)?
- We would get covert movement!

(11) Another possible precedence relation for [$_{\text{vP}}$ what$_i$ you see what$_i$].

$$\left\{\begin{matrix} \langle \mathit{you}, \mathit{see}\rangle & \langle \mathit{you}, \mathit{what}\rangle \\ & \langle \mathit{see}, \mathit{what}\rangle \end{matrix}\right\}$$

- Spell-Out of the CP would produce the precedence relation in (12). This is the same as (9), except that Order Preservation now protects different ordering statements.

(12) Alternative initial precedence relation for the CP in (6) given (11). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{matrix} \langle \mathit{what}, \mathit{did}\rangle & \langle \mathit{what}, \mathit{you}\rangle & \langle \mathit{what}, \mathit{see}\rangle & \langle \mathit{what}, \mathit{what}\rangle \\ & \langle \mathit{did}, \mathit{you}\rangle & \langle \mathit{did}, \mathit{see}\rangle & \langle \mathit{did}, \mathit{what}\rangle \\ & \langle \mathit{you}, \mathit{you}\rangle & \boldsymbol{\langle you, see\rangle} & \boldsymbol{\langle you, what\rangle} \\ & & & \boldsymbol{\langle see, what\rangle} \end{matrix}\right\}$$

- Again, the reflexive ordering statements must be deleted.

- Then, to satisfy Order Preservation, the ordering statements that contradict previously established ordering statements must be deleted: $\langle what, you\rangle$ and $\langle what, see\rangle$.

- We are then left with the symmetric ordering statements $\langle what, did\rangle$ and $\langle did, what\rangle$.

  - The precedence relation contains $\langle what, did\rangle$ and $\langle did, see\rangle$ but not $\langle what, see\rangle$ (which was deleted to satisfy Order Preservation), violating transitivity. We can resolve this violation of transitivity by deleting $\langle what, did\rangle$ or $\langle did, see\rangle$. However, if we delete $\langle did, see\rangle$, then *did* will not be ordered with respected to *see*, violating totality. Thus, to respect transitivity, we must delete $\langle what, did\rangle$. To respect totality, we must keep $\langle did, what\rangle$ instead.

- Deleting the indicated ordering statements leaves (13), which generates (14), corresponding to covert movement.

(13) Alternative repaired precedence relation for the CP in (6) given (11). Ordering statements in bold were generated in a prior phase.

$$\left\{\begin{matrix} \langle did, you\rangle & \langle did, see\rangle & \langle did, what\rangle \\ & \boldsymbol{\langle you, see\rangle} & \boldsymbol{\langle you, what\rangle} \\ & & \boldsymbol{\langle see, what\rangle} \end{matrix}\right\}$$

(14) * Did you see what?

- While this is obviously incorrect for English, an overt wh-movement language, this example illustrates that variation between overt and covert movement can be attributed to choices about how to repair asymmetry violations in the vP.

- FCL provides a similar account of variation between "full" and "scattered" deletion.

- Consider (15) and (16) (= Fanselow & Ćavar, 2002, (3)).

(15) A book about Chomsky appeared.

(16) A book appeared about Chomsky.

- One might propose that these examples have the same underlying structure (17), and differ in how the structure is externalized (Fanselow & Ćavar, 2002 hint at such an analysis, but do not defend the claim).

(17) $[_{\text{CP}}$ [a book about Chomsky]$_i$ $[_{\text{vP}}$ appeared [a book about Chomsky]$_i$]]

- For simplicity, I assume that vP is not a phase, since *appeared* is unaccusative. This is not crucial.[8]

- Spell-out of (17) will produce the precedence relation in (18).

[8] If the vP is a phase, then we would have to propose that *a book about Chomsky* passes through the phase edge. The ensuing discussion would then apply to the linearization of the vP rather than the CP.

(18) Initial precedence relation for the CP in (17).

$$\left\{\begin{array}{ccccc} \langle a, a\rangle & \langle a, book\rangle & \langle a, about\rangle & \langle a, Chomsky\rangle & \langle a, appeared\rangle \\ \langle book, a\rangle & \langle book, book\rangle & \langle book, about\rangle & \langle book, Chomsky\rangle & \langle book, appeared\rangle \\ \langle about, a\rangle & \langle about, book\rangle & \langle about, about\rangle & \langle about, Chomsky\rangle & \langle about, appeared\rangle \\ \langle Chomsky, a\rangle & \langle Chomsky, book\rangle & \langle Chomsky, about\rangle & \langle Chomsky, Chomsky\rangle & \langle Chomsky, appeared\rangle \\ \langle appeared, a\rangle & \langle appeared, book\rangle & \langle appeared, about\rangle & \langle appeared, Chomsky\rangle & \langle appeared, appeared\rangle \end{array}\right\}$$

- First, the reflexive ordering statements must be deleting: $\langle a, a\rangle$, $\langle book, book\rangle$, $\langle about, about\rangle$, $\langle Chomsky, Chomsky\rangle$, and $\langle appeared, appeared\rangle$.
- Each of the remaining ordering statements has a symmetric counterpart, meaning that there are numerous ways to render the precedence relation asymmetric.
- We generate (15) by deleting the following ordering statements:
  - $\langle book, a\rangle$, $\langle about, a\rangle$, $\langle Chomsky, a\rangle$, $\langle appeared, a\rangle$—deleting these places *a* at the beginning of the sentence.
  - $\langle about, book\rangle$, $\langle Chomsky, book\rangle$, $\langle appeared, book\rangle$—deleting these places *book* before *about*, *Chomsky*, and *appeared*.
  - $\langle Chomsky, about\rangle$, $\langle appeared, about\rangle$—deleting these places *about* before *Chomsky* and *appeared*.
  - $\langle appeared, Chomsky\rangle$—deleting this places *Chomsky* before *appeared*.
- We generate (16) by deleting the following ordering statements:
  - $\langle book, a\rangle$, $\langle appeared, a\rangle$, $\langle about, a\rangle$, $\langle Chomsky, a\rangle$—deleting these places *a* at the beginning of the sentence.
  - $\langle appeared, book\rangle$, $\langle about, book\rangle$, $\langle Chomsky, book\rangle$—deleting these places *book* before *appeared*, *about*, and *Chomsky*.
  - $\langle about, appeared\rangle$, $\langle Chomsky, appeared\rangle$—deleting these places *appeared* before *about* and *Chomsky*.
  - $\langle Chomsky, about\rangle$—deleting this places *about* before *Chomsky*.
- There are additional possibilities for linearization. While the remaining possibilities are not well-formed in English, the existence of such possibilities is not problematic if one of the following is true:
  - The possibilities are attested in other languages.
  - The possibilities can be ruled out on independent grounds.
- The key point is that under FCL, the difference between "full" and "scattered" deletion can be attributed to linearization without assuming the copy theory (cf. Fanselow & Ćavar, 2002; Nunes, 2004).

7 Discussion

- I have shown that FCL can linearize parallel structures and account for at least some types of variation in where a constituent is realized.
- As mentioned, FCL is compatible with multidominance, since its repair mechanism does not operate on copies.
- FCL avoids the potentially problematic consequences of many redefinition approaches (e.g., precluding multiple specifiers; Bachrach & Katzir, 2017).
- To synthesize the preceding discussion, there are three types of asymmetry violations ("ordering contradictions"), each with different outcomes:
  - Contradiction in the current phase: Because Order Preservation plays no role, there is optionality (i.e., room for variation) in how the contradiction is repaired.
  - Contradiction between an earlier phase and the current phase: Order Preservation protects the earlier ordering statements, so the relevant ordering statements from the current phase are deleted.
    - The operation that led to the ordering contradiction is "covert" in that it does not affect the linearization.
  - Contradiction between earlier, parallel phases: Order Preservation protects the ordering statements from both phases, so the contradiction cannot be resolved, leading to ungrammaticality (as with the Edge Restriction).
- In many cases, if not in general, we can attribute variation in where a constituent is realized to variation in how precedence relations are repaired. We may thus be able to maintain an algorithm based on asymmetric c-command (for example) for the *generation* of ordering statements.[9]

[9] If we want to maintain something like Kayne's (1994) proposal for generating ordering statements, then we have to follow Nunes (2004) in assuming that the algorithm pays attention to occurrences rather than constituents. This is because a moved constituent reflexively c-commands itself and symmetrically c-commands the constituents it crosses over—we do not get asymmetric c-command between these constituents. In the absence of asymmetric c-command, we will not get a total order, and a failure of totality cannot be resolved by deleting ordering statements. On the other hand, the higher occurrence of a moved constituent asymmetrically c-commands the lower occurrence. Likewise, the higher occurrence of the constituent asymmetrically c-commands the occurrences of constituents it crosses over, which asymmetrically c-command the lower occurrence of the moved constituent. Thus, an algorithm based on asymmetric c-command between occurrences rather than constituents will provide a total order. See Collins & Stabler (2016) for a definition of occurrences in a multidominance-based framework.

Appendices

A Why we can't just delete copies

- A natural question is how the deletion of ordering statements relates to the deletion of copies: do both have a role to play?
- I argue that copy deletion should be replaced (or at least supplemented) by the deletion of ordering statements.
- Under Nunes's (2004) proposal, violations of asymmetry are resolved by deleting all but one copy of a constituent (in the general case), as formalized in (19) (= Nunes, 2004, (44)).

(19) **Chain Reduction**: Delete the minimal number of constituents of a nontrivial chain CH that suffices for CH to be mapped into a linear order in accordance with the LCA.

- However, this is not a solution to the formal problem of asymmetry.
- Recall that a precedence relation is a binary relation, which needs to be asymmetric to be grammatical.
- Chain Reduction deletes constituents. It does not delete ordered pairs (ordering statements) from the precedence relation. In fact, it does not affect the precedence relation whatsoever.
- Thus, Chain Reduction cannot make a precedence relation asymmetric.
- There are several possible solutions:
  - **Solution 1**: Have Chain Reduction precede linearization.
    - If Chain Reduction precedes linearization, then we can generate an asymmetric precedence relation without the need for repair.
    - However, if Chain Reduction is motivated by linearization (Nunes, 2004), then this creates a look-ahead problem.
    - Thus, this solution is conceptually problematic, unless something else triggers Chain Reduction before linearization.
  - **Solution 2**: Linearize again after Chain Reduction.
    - The logic here is the same as in solution 1: if Chain Reduction precedes linearization, then we get an asymmetric precedence relation.
    - However, since linearization is the trigger for Chain Reduction, the order of operations must be linearization first, then Chain Reduction, then linearization again (replacing the results of the first linearization).

    - This is not an elegant solution, but it does not seem to have any fatal flaws, either.
  - **Solution 3**: Delete ordering statements that reference the deleted copies.
    - If, after Chain Reduction, we delete the ordering statements that involve deleted copies, that will resolve the asymmetry violation.
    - However, we do not need to delete the copies themselves.
    - For example, if we assume that copies with unchecked features get deleted (Nunes, 2004), then we can instead delete the ordering statements that include such copies without deleting the copies themselves. As demonstrated in this handout, deleting ordering statements is sufficient to determine where to pronounce a constituent.
    - Thus, Chain Reduction is redundant; we can just delete ordering statements.[10,11]

- So, if we adopt the copy theory, then there seem to be two real options: linearize again after Chain Reduction, or forego Chain Reduction entirely in favor of deleting ordering statements.

- The latter option is arguably preferable, at least insofar as it is compatible with multidominance as well.

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[10] In fact, this is how Johnson (2012, 2020) implements Chain Reduction, although he ultimately rejects a repair approach.

[11] Strictly speaking, deletion of ordering statements is sufficient only if we assume that syntactic structure is paired with phonological content post-syntactically (e.g., Halle & Marantz, 1993). If lexical items enter the syntax with phonological features, then we still need something like Chain Reduction, or else we expect that each copy's phonological features will be expressed.

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