

Right node raising and Flexible Cyclic Linearization

Aidan Malanoski

CUNY Graduate Center

WCCFL 40

13 May 2022

Question

- How do we linearize **right node raising (RNR)** constructions such as (1)?
1. Darius found __ and Jasmine took the book.

Overview

1. Right node raising
2. Cyclic Linearization
3. Flexible Cyclic Linearization
4. Consequences
5. Conclusion

RIGHT NODE RAISING

Approaches to right node raising

Major approaches

- ~~ATB movement (e.g., Ross 1967, Sabbagh 2007)~~
~~[_{CP} [_{&P} [_{TP} Darius [_{VP} Darius found t_i]] [_{&'} and [_{TP} Jasmine [_{VP} Jasmine took t_i]]]] [_{the book}]_{*i*}]~~
- ~~Ellipsis (e.g., Wexler & Culicover 1980, Kayne 1994)~~
~~[_{CP} [_{&P} [_{TP} Darius [_{VP} Darius found [_{the book}]]] [_{&'} and [_{TP} Jasmine [_{VP} Jasmine took [_{the book}]]]]]]]~~
- Multidominance (e.g., McCawley 1982, Bachrach & Katzir 2017)
~~[_{CP} [_{&P} [_{TP} Darius [_{VP} Darius found [_{the book}]_{*i*}]] [_{&'} and [_{TP} Jasmine [_{VP} Jasmine took [_{the book}]_{*i*}]]]]]]]~~

(see Bachrach & Katzir 2017, Larson 2018)

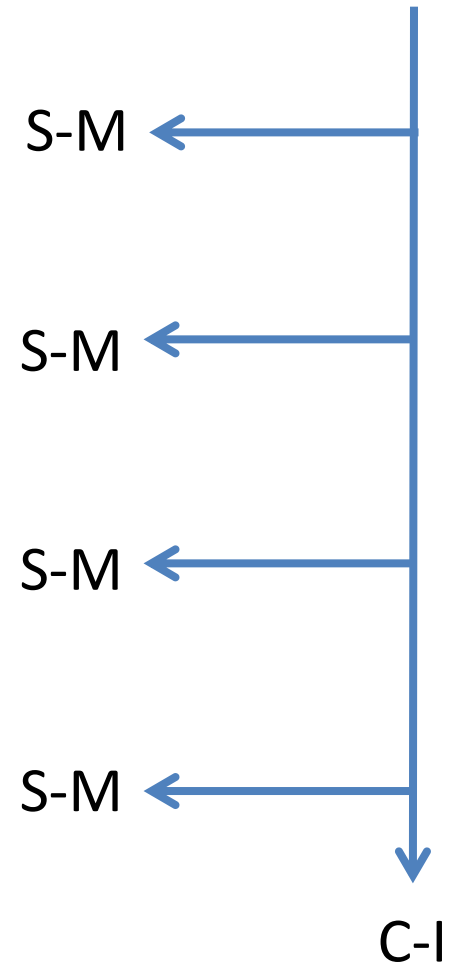
CYCLIC LINEARIZATION

Linearization

- Post-syntactic computation of linear order (Chomsky 1995)
- Linear order must have the following properties (Kayne 1994):
 - Transitive: If $a < b$ and $b < c$, then $a < c$.
 - Total: If $a \neq b$, then either $a < b$ or $b < a$.
 - Asymmetric: If $a < b$, then not $b < a$

Cyclic Linearization (Fox & Pesetsky 2005a)

- No distinction between phase and Spell-Out domain
- No phase impenetrability
- **Order Preservation:** “information about linearization, once established at the end of a given Spell-out domain, is never deleted in the course of the derivation” (Fox & Pesetsky 2005a: 6)



Cyclic Linearization: An example (1/2)

2. What did Darius find?

$[_{CP} \text{ what}_i \text{ did Darius } [_{VP} \text{ what}_i \text{ Darius find what}_i]]$

<i>what</i> < <i>Darius</i>	<i>what</i> < <i>find</i>
	<i>Darius</i> < <i>find</i>

Table 1: Ordering statements generated in the vP phase of (2).

- To avoid unlinearizable orderings (e.g., *what* < *what*), Fox & Pesetsky assume that **only the most recent Merge of a constituent counts for linearization**

Cyclic Linearization: An example (2/2)

2. What did Darius find?

$[_{CP} \text{ what}_i \text{ did Darius } [_{VP} \text{ what}_i \text{ Darius find what}_i]]$

<i>what < did</i>	<i>what < Darius</i>	<i>what < find</i>
	<i>did < Darius</i>	<i>did < find</i>
		<i>Darius < find</i>

Table 2: Ordering statements generated in the CP phase of (2). Ordering statements established in the vP phase are in **bold**.

- This gives the observed linear order: *what < did < Darius < find*

RNR under Cyclic Linearization (1/4)

1. Darius found ___ and Jasmine took the book.
 $[_{CP} [_{\&P} [_{TP} \text{Darius } [_{VP} \text{Darius found } [\textbf{the book}]_i]] [_{\&P}$
and $[_{TP} \text{Jasmine } [_{VP} \text{Jasmine took } [\textbf{the book}]_i]]]]]$

<i>Darius < found</i>	<i>Darius < the</i>	<i>Darius < book</i>
	<i>found < the</i>	<i>found < book</i>
		<i>the < book</i>

Table 3. Ordering statements generated during the linearization of $[_{VP}$ Darius found the book].

RNR under Cyclic Linearization (2/4)

1. Darius found ___ and Jasmine took the book.
 $[_{CP} [_{\&P} [_{TP} \text{Darius } [_{VP} \text{Darius found } [\mathbf{the\ book}]_i]] [_{\&P}$
and $[_{TP} \text{Jasmine } [_{VP} \text{Jasmine took } [\mathbf{the\ book}]_i]]]]]$

<i>Jasmine < took</i>	<i>Jasmine < the</i>	<i>Jasmine < book</i>
	<i>took < the</i>	<i>took < book</i>
		<i>the < book</i>

Table 4. Ordering statements generated during the linearization of $[_{VP}$ Jasmine took the book].

RNR under Cyclic Linearization (3/4)

<i>Darius < found</i>	<i>Darius < and</i>	<i>Darius < Jasmine</i>	<i>Darius < took</i>	<i>Darius < the</i>	<i>Darius < book</i>
	<i>found < and</i>	<i>found < Jasmine</i>	<i>found < took</i>	<i>found < the</i>	<i>found < book</i>
	<i>the < and</i>	<i>the < Jasmine</i>	<i>the < took</i>	<i>the < the</i>	<i>the < book</i>
	<i>book < and</i>	<i>book < Jasmine</i>	<i>book < took</i>	<i>book < the</i>	<i>book < book</i>
		<i>and < Jasmine</i>	<i>and < took</i>	<i>and < the</i>	<i>and < book</i>
			<i>Jasmine < took</i>	<i>Jasmine < the</i>	<i>Jasmine < book</i>
				<i>took < the</i>	<i>took < book</i>

Table 5. Ordering statements generated during the CP phase of (1) under Cyclic Linearization. Ordering statements established in the vP phases are in **bold**. Ordering statements in **red** are unlinearizable.

RNR under Cyclic Linearization (4/4)

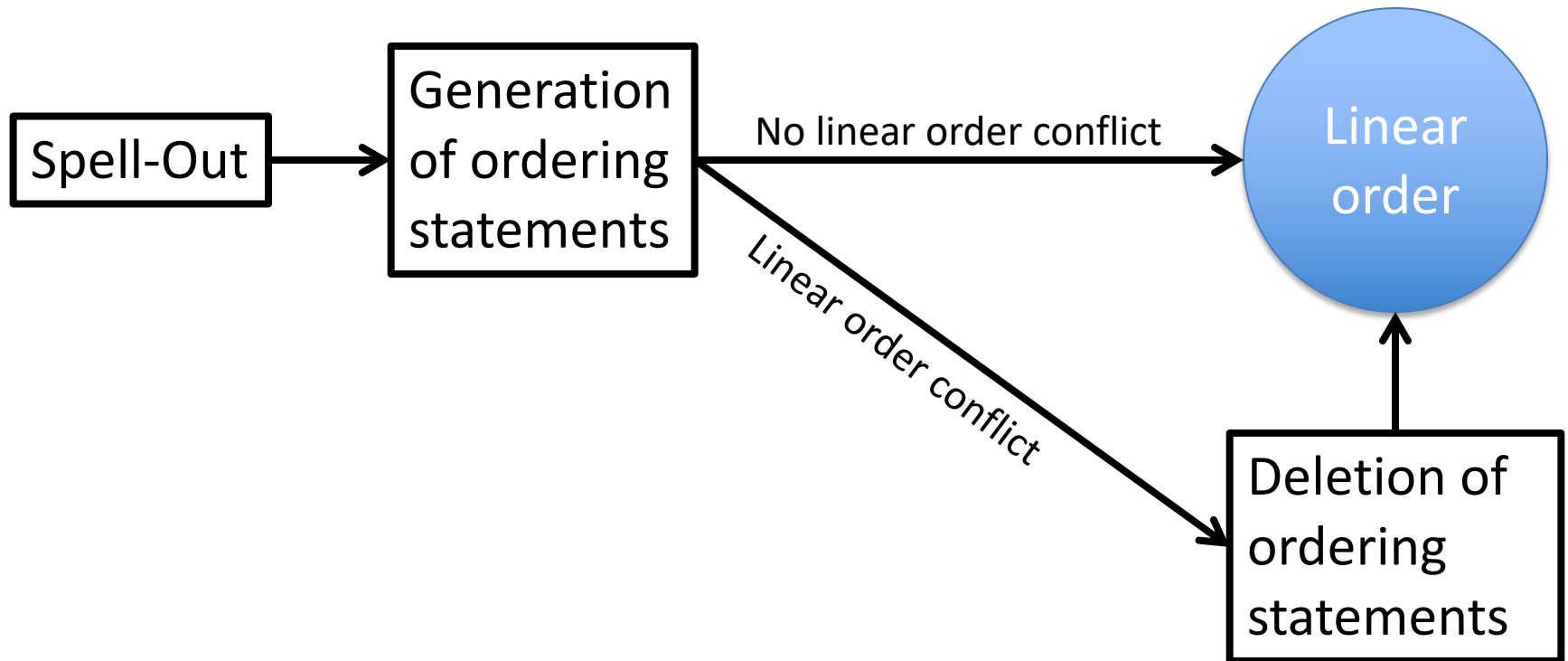
- There are a number of unlinearizable ordering statements:
 - *the* < *the*; *book* < *book* (reflexive)
 - *the* < *and* BUT *and* < *the*; *etc.* (symmetric)
- There are ordering statements that contradict previously established ordering statements (*e.g.*, *book* < *Jasmine*)
- Because there is no way of determining which Merge of *the book* happened first, there is no principled way to resolve these ordering conflicts

FLEXIBLE CYCLIC LINEARIZATION

Flexible Cyclic Linearization (FCL)

- All positions count for linearization
- Ordering statements may be deleted in the phase in which they arise as necessary to linearize the structure.
 - cf. Fox & Pesetsky 2005b
- Ordering statements are deleted according to:
 - Order Preservation
 - Transitivity, totality, asymmetry
 - Economy?

How to linearize flexibly



RNR under FCL (1/10)

1. Darius found ___ and Jasmine took the book.
 $[_{CP} [_{\&P} [_{TP} \text{Darius } [_{VP} \text{Darius found } [\mathbf{the\ book}]_i]] [_{\&'}$
and $[_{TP} \text{Jasmine } [_{VP} \text{Jasmine took } [\mathbf{the\ book}]_i]]]]]$

<i>Darius < found</i>	<i>Darius < the</i>	<i>Darius < book</i>
	<i>found < the</i>	<i>found < book</i>
		<i>the < book</i>

Table 3. Ordering statements generated during the linearization of $[_{VP}$ Darius found the book].

RNR under FCL (2/10)

1. Darius found ___ and Jasmine took the book.
 $[_{CP} [_{\&P} [_{TP} \text{Darius } [_{VP} \text{Darius found } [\textbf{the book}]_i]] [_{\&P}$
and $[_{TP} \text{Jasmine } [_{VP} \text{Jasmine took } [\textbf{the book}]_i]]]]]$

<i>Jasmine < took</i>	<i>Jasmine < the</i>	<i>Jasmine < book</i>
	<i>took < the</i>	<i>took < book</i>
		<i>the < book</i>

Table 4. Ordering statements generated during the linearization of $[_{VP}$ Jasmine took the book].

RNR under FCL (3/10)

<i>Darius < Darius</i>	<i>Darius < found</i>	<i>Darius < and</i>	<i>Darius < Jasmine</i>	<i>Darius < took</i>	<i>Darius < the</i>	<i>Darius < book</i>
		<i>found < and</i>	<i>found < Jasmine</i>	<i>found < took</i>	<i>found < the</i>	<i>found < book</i>
			<i>and < Jasmine</i>	<i>and < took</i>	<i>and < the</i>	<i>and < book</i>
			<i>Jasmine < Jasmine</i>	<i>Jasmine < took</i>	<i>Jasmine < the</i>	<i>Jasmine < book</i>
					<i>took < the</i>	<i>took < book</i>
		<i>the < and</i>	<i>the < Jasmine</i>	<i>the < took</i>	<i>the < the</i>	<i>the < book</i>
		<i>book < and</i>	<i>book < Jasmine</i>	<i>book < took</i>	<i>book < the</i>	<i>book < book</i>

Table 6. Ordering statements generated during the CP phase of (1) under Flexible Cyclic Linearization. Ordering statements in **bold** were established in an earlier phase.

RNR under FCL (4/10)

- We can delete ordering statements which contradict previously established ordering statements
 - *the* < *Jasmine* (prior phase: *Jasmine* < *the*)
 - *the* < *took* (prior phase: *took* < *the*)
 - *book* < *Jasmine* (prior phase: *Jasmine* < *book*)
 - *book* < *took* (prior phase: *took* < *book*)
 - *book* < *the* (prior phase: *the* < *book*)
- We can delete reflexive ordering statements
 - *Darius* < *Darius*
 - *Jasmine* < *Jasmine*
 - *the* < *the*
 - *book* < *book*

RNR under FCL (5/10)

Darius < Darius	Darius < found	Darius < and	Darius < Jasmine	Darius < took	Darius < the	Darius < book
		found < and	found < Jasmine	found < took	found < the	found < book
			and < Jasmine	and < took	and < the	and < book
			Jasmine < Jasmine	Jasmine < took	Jasmine < the	Jasmine < book
					took < the	took < book
		the < and	the < Jasmine	the < took	the < the	the < book
		book < and	book < Jasmine	book < took	book < the	book < book

Table 6. Ordering statements generated during the CP phase of (1) under Flexible Cyclic Linearization. Ordering statements in **bold** were established in an earlier phase.

RNR under FCL (6/10)

Darius < found	<i>Darius < and</i>	<i>Darius < Jasmine</i>	<i>Darius < took</i>	Darius < the	Darius < book
	<i>found < and</i>	<i>found < Jasmine</i>	<i>found < took</i>	found < the	found < book
		<i>and < Jasmine</i>	<i>and < took</i>	<i>and < the</i>	<i>and < book</i>
			Jasmine < took	Jasmine < the	Jasmine < book
				took < the	took < book
	<i>the < and</i>				the < book
	<i>book < and</i>				

Table 7. Ordering statements established during the CP phase of (1) under Flexible Cyclic Linearization. Ordering statements in **bold** were established in an earlier phase. Ordering statements that are reflexive or that violate Order Preservation have been removed.

RNR under FCL (7/10)

- We have to resolve symmetric ordering statements:
 - ~~*the < and*~~ BUT *and < the*
 - ~~*book < and*~~ BUT *and < book*
- Keeping the ordering statements on the left will leave a non-transitive ordering:
 - *the < and* AND *and < took* BUT NOT *the < took*
 - *book < and* AND *and < took* BUT NOT *book < took*
- Therefore, we must delete the ordering statements on the left

RNR under FCL (8/10)

Darius < found	<i>Darius < and</i>	<i>Darius < Jasmine</i>	<i>Darius < took</i>	Darius < the	Darius < book
	<i>found < and</i>	<i>found < Jasmine</i>	<i>found < took</i>	found < the	found < book
		<i>and < Jasmine</i>	<i>and < took</i>	<i>and < the</i>	<i>and < book</i>
			Jasmine < took	Jasmine < the	Jasmine < book
				took < the	took < book
	<i>the < and</i>				the < book
	<i>book < and</i>				

Table 7. Ordering statements established during the CP phase of (1) under Flexible Cyclic Linearization. Ordering statements in **bold** were established in an earlier phase. Ordering statements that are reflexive or that contradict previously established ordering statements have been removed.

RNR under FCL (9/10)

Darius < found	<i>Darius < and</i>	<i>Darius < Jasmine</i>	<i>Darius < took</i>	Darius < the	Darius < book
	<i>found < and</i>	<i>found < Jasmine</i>	<i>found < took</i>	found < the	found < book
		<i>and < Jasmine</i>	<i>and < took</i>	<i>and < the</i>	<i>and < book</i>
			Jasmine < took	Jasmine < the	Jasmine < book
				took < the	took < book
					the < book

Table 8. Ordering statements established during the CP phase of (1) under Flexible Cyclic Linearization. Ordering statements in **bold** were established in an earlier phase. Problematic ordering statements have been removed.

RNR under FCL (10/10)

- Flexible Cyclic Linearization derives the observed linear order of (1): *Darius* < *found* < *and* < *Jasmine* < *took* < *the* < *book*

CONSEQUENCES

Edge Restriction (1/2)

- **Edge Restriction** (Bachrach & Katzir 2017: 2):
 - a. Either [the shared string] α 's position is rightmost in all the nonrightmost constituents containing it, in which case it surfaces within the rightmost constituent;
 - b. Or α 's position is leftmost in all the nonleftmost constituents containing it, in which case it surfaces in the leftmost constituent
- 3. (As for the dishes,) [Brady rinsed __ (*off)] and [Yngvarr dried them].

Edge Restriction (2/2)

- The Edge Restriction is Order Preservation: if the shared string appears in the final (initial) conjunct, then it must follow (precede) all the material in the non-final (non-initial) conjuncts.

Right node wrapping

- In RNR, shared material can be followed by non-shared material
4. Nkiru washed ___ and put the dishes away.
- FCL predicts right node wrapping: Order Preservation requires the shared string to follow the material in non-final conjuncts, but not in final conjuncts

RNR outside of coordination

- RNR can occur outside of coordination
- 5. Those who ignore __ dislike those who obey authority.
- This is predicted by FCL: RNR is the result of Order Preservation in parallel phases, so we expect it to be possible wherever there are parallel phases

Overt and covert movement (1/15)

- Flexible Cyclic Linearization allows a new account of variation between overt and covert movement

Overt and covert movement (2/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < you</i>	<i>who < see</i>	<i>who < who</i>
	<i>you < see</i>	<i>you < who</i>
		<i>see < who</i>

Table 9: Ordering statements generated in the vP phase of (6).

Overt and covert movement (3/15)

- We can delete reflexive ordering statements

<i>who < you</i>	<i>who < see</i>	<i>who < who</i>
	<i>you < see</i>	<i>you < who</i>
		<i>see < who</i>

Table 9: Ordering statements generated in the vP phase of (6).

Overt and covert movement (4/15)

- We can delete reflexive ordering statements

<i>who < you</i>	<i>who < see</i>	
	<i>you < see</i>	<i>you < who</i>
		<i>see < who</i>

Table 10: Ordering statements generated in the vP phase of (6). Reflexive ordering statements have been removed.

Overt and covert movement (5/15)

- We have to resolve symmetric ordering statements
 - *who* < *you* BUT *you* < *who*
 - *who* < *see* BUT *see* < *who*
- We can keep the ordering statements on the left or the ones on the right
- For now, we stipulate that we keep the ordering statements on the left because *who* is pronounced before *you* and *see*

Overt and covert movement (6/15)

<i>who < you</i>	<i>who < see</i>	
	<i>you < see</i>	<i>you < who</i>
		<i>see < who</i>

Table 10: Ordering statements generated in the vP phase of (6). Reflexive ordering statements have been removed.

Overt and covert movement (7/15)

<i>who < you</i>	<i>who < see</i>
	<i>you < see</i>

Table 11: Ordering statements generated in the vP phase of (6). Reflexive and symmetric ordering statements have been resolved.

Overt and covert movement (8/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < did</i>	<i>who < you</i>	<i>who < see</i>	<i>who < who</i>
	<i>did < you</i>	<i>did < see</i>	<i>did < who</i>
	<i>you < you</i>	<i>you < see</i>	<i>you < who</i>
			<i>see < who</i>

Table 12: Ordering statements generated in the CP phase of (6). Ordering statements in **bold** were established in a prior phase.

Overt and covert movement (9/15)

- We can delete ordering statements which contradict previously established ordering statements
 - $you < who$ (prior phase: $who < you$)
 - $see < who$ (prior phase: $who < see$)
- We can delete reflexive ordering statements
 - $who < who$
 - $you < you$

Overt and covert movement (10/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < did</i>	<i>who < you</i>	<i>who < see</i>	<i>who < who</i>
	<i>did < you</i>	<i>did < see</i>	<i>did < who</i>
	<i>you < you</i>	<i>you < see</i>	<i>you < who</i>
			<i>see < who</i>

Table 12: Ordering statements generated in the CP phase of (6). Ordering statements in **bold** were established in a prior phase.

Overt and covert movement (11/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < did</i>	<i>who < you</i>	<i>who < see</i>	
	<i>did < you</i>	<i>did < see</i>	<i>did < who</i>
		<i>you < see</i>	

Table 13: Ordering statements generated in the CP phase of (6). Ordering statements in **bold** were established in a prior phase. Ordering statements that are reflexive or that contradict previously established ordering statements have been removed.

Overt and covert movement (12/15)

- We have to resolve symmetric ordering statements
 - *who* < *did* BUT *did* < *who*
- We can keep the ordering statement on the left or the one on the right
- We stipulate that we keep the ordering statement on the left because *who* is pronounced before *did*

Overt and covert movement (13/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < did</i>	<i>who < you</i>	<i>who < see</i>	
	<i>did < you</i>	<i>did < see</i>	<i>did < who</i>
		<i>you < see</i>	

Table 13: Ordering statements generated in the CP phase of (6). Ordering statements in **bold** were established in a prior phase. Ordering statements that are reflexive or that contradict previously established ordering statements have been removed.

Overt and covert movement (14/15)

6. Who did you see?

$[_{CP} \text{ who did you } [_{VP} \text{ who you see who}]]$

<i>who < did</i>	<i>who < you</i>	<i>who < see</i>
	<i>did < you</i>	<i>did < see</i>
		<i>you < see</i>

Table 14: Ordering statements generated in the CP phase of (6). Ordering statements in **bold** were established in a prior phase. Problematic ordering statements have been removed.

Overt and covert movement (15/15)

- Stipulating in the vP that *who* is pronounced before *you* and *see* leads to an overt movement configuration
- What happens if *who* is linearized after *you* and *see* in the vP?
- *who* would be pronounced after *you* and *see* (*i.e.*, *in situ*)
- “the complexity, the variety of language arise overwhelmingly if not completely from the ancillary operations which lead to externalization which we know draws upon our sensory motor system” (Chomsky, 2019, 265)

Conclusion

- Cyclic Linearization cannot linearize multidominant right node raising structures
- Flexible Cyclic Linearization, which allows deletion of ordering statements, can
- The Edge Restriction is Order Preservation
- Flexible Cyclic Linearization predicts the existence of right node wrapping and RNR outside of coordination
- Flexible Cyclic Linearization permits a purely phonological account of variation between overt and covert movement

Thank you!

- Matt Pearson
- Jason Kandybowicz

References

- Bachrach, Asaf & Roni Katzir. 2017. Linearizing structures. *Syntax* 20(1). 1–40.
- Chomsky, Noam. 1995. Bare phrase structure. In Héctor Campos & Paula Kempchinsky (eds.), *Evolution and revolution in linguistic theory*, 51–109. Washington, D.C., USA: Georgetown University Press.
- Chomsky, Noam. 2019. Some puzzling foundational issues: The Reading program. *Catalan Journal of Linguistics*. 263–285.
- Fox, Danny & David Pesetsky. 2005a. Cyclic linearization of syntactic structure. *Theoretical Linguistics* 31. 1–45.
- Fox, Danny & David Pesetsky. 2005b. Cyclic Linearization and its interaction with other aspects of grammar: A reply. *Theoretical Linguistics* 31. 235–262.
- Huang, Cheng-Teh James. 1982. *Logical relations in Chinese and the theory of grammar*. Cambridge, MA, USA: Massachusetts Institute of Technology PhD dissertation.
- Kayne, Richard. 1994. *The antisymmetry of syntax*. Cambridge, MA, USA: MIT Press.
- Larson, Brooke. 2018. Right node raising and nongrammaticality. *Studia Linguistica* 72(2). 214–260.
- McCawley, James D. 1982. Parentheticals and discontinuous constituent structure. *Linguistic Inquiry* 13(1). 91–106.
- Ross, John Robert. 1967. *Constraints on variables in syntax*. Cambridge, MA, USA: Massachusetts Institute of Technology PhD dissertation.
- Sabbagh, Joseph. 2007. Ordering and linearizing rightward movement. *Natural Language & Linguistic Theory* 25(2). 349–401.
- Wexler, Kenneth & Peter W. Culicover. 1980. *Formal principles of language acquisition*. MIT Press.