Asymmetry
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Antisymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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The Asymmetry and Antisymmetry of Syntax

A Relational Approach to Displacement

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13th April 2019, ULAB

Abstract

Restrictions on displacement in syntax and phonology lead to sequences of contiguous elements:

- Feature Geometry-based Relativised Minimality (Starke 2001)
- Contiguous Agree (Nevins 2007)
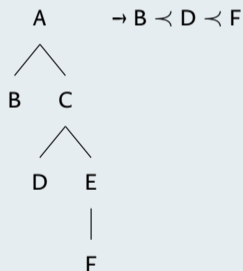- Line-Crossing Prohibition (Goldsmith 1976)

I argue that:

- Asymmetric relations are the basis of phrase structure
- Contiguity Effects follow from use of weak orders
- The existence of displacement and locality follows from use of Order Theory

❶ Evidence for asymmetry in syntax
  ① The status of c-command
  ② Phrase markers as strict orders

❷ The role of antisymmetry
  ① Properies of displacement
  ② Properties of weak orders

❸ Schematic derivations

❹ Antisymmetry and Contiguity Effects
  ① Relativised Minimality
  ② Contiguous Agree
  ③ Line-crossing Prohibition

❺ Conclusion

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Schematic derivations
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Contiguity Effects
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Conclusion
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What's (Kaynian) antisymmetry?

LCA

A   → B ≺ D ≺ F

B   C

D   E

F

- Hierarchical structure needs to be linearised for phonology

- Kayne's proposal for this: L(inear) C(orrespondence) A(xiom)

- Asymmetric c-command between terminals maps to linear precedence, yielding a strict total order

- Extensive empirical evidence for 'antisymmetry' in syntax (Kayne 1994 et seq.)
- If correct, then asymmetric c-command and strict orders are significant for system
- Why is the only part of Order Theory relevant to syntax **strict** orders?

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Schematic derivations
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Contiguity Effects
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Conclusion
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Kinds of relation

- 'Antisymmetry' referred to more commonly outside of linguistics as 'asymmetry', as based on asymmetric relations
- Symmetry holds when existence of a relation from a to b implies its inverse
- Asymmery is the opposite
- Antisymmetry holds if a symmetric relation implies equality

Symmetry

$aRb \iff bRa.$

Asymmetry

$aRb \Rightarrow \neg bRa.$

Antisymmetry

$aRb \wedge bRa \Rightarrow a = b.$

Kinds of order

- **Two of these relations have a corresponding order**
  - Asymmetric relations form strict orders
  - Antisymmetric relations form weak orders

- **Symmetric relations cannot be used for ordering**

Strict order

$$\beta \longrightarrow \alpha$$

Weak order

$$\delta \longrightarrow \gamma$$

No order

$$\zeta \longleftrightarrow \varepsilon$$

$$\theta \longleftrightarrow \eta$$

- Symmetric and asymmetric relations have been investigated
  - Asymmetric c-command due to Linear Correspondence Axiom (Kayne 1994)
  - Symmetric c-command due to Dynamic Antisymmetry (Moro 1997)
  - What about **antisymmetric** relations?
- Meanwhile...
  - Merge and BPS do not predict existence of chains
  - Antisymmetry ($aRb \wedge bRa \Rightarrow a = b$) may be basis for chains
  - If so there ought to be resulting idiosyncrasies

Section ❶ Evidence for asymmetry in syntax

Asymmetry

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The status of c-command

Subsection ① The status of c-command

- C-command relevant to disparate syntactic phenomena (binding, agreement, movement, etc.) suggesting fundamental place in system
- Use of c-command as a primitive in phrase structure restricts possible structures to a subset of LCA-compatible structures (Frank and Vijay-Shanker 2001)

Indistinguishable trees

- Why would c-command be basis of phrase structure?
  - C-command combines a symmetric relation, sisterhood, with an asymmetric relation, dominance (assuming proper dominance)
  - C-command proposed very early, and has outlasted many other proposed relations, so seems to be essentially correct (Epstein 1999)

- Other possibility would be to try to reduce c-command to only precedence or dominance

- Asymmetric c-command already coincides with both precedence and dominance to a large extent (under Kaynian assumptions)

- (Subparts of) structures able to be defined in terms of c-command can be modelled with Regular Grammars
- Regular Grammars are most restricted grammar on Chomsky Hierarchy

FSA-equivalent structure

γP

γ βP

β αP

α
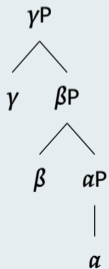
FSA rules

$\{\gamma P \to \gamma\ \beta P, \beta P \to \beta\ \alpha P, \alpha P \to \alpha\}$

- Regular Grammars on their own cannot accommodate specifiers
- Specifiers a challenge because they need to appear to the system to be simplex nodes
- Multiple Spell-out: specifiers linearised in multiple cycles (Uriagereka 2011)
- After each cycle specifier becomes opaque and inserted into larger structure

Multiple Spell-out
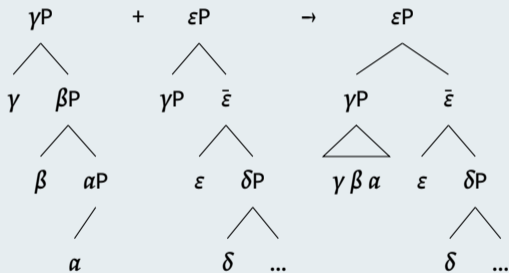
- Hypothesis that system works with Regular Grammars can be maintained if recursive embedding possible

- If system always manipulates these structures, for terminals hierarchy and order will always coincide with asymmetric c-command

- If phrase structure based on a single asymmetric relation, then phrase marker can be conceived as a single strict order of terminals

Subsection ②   **Phrase markers as strict orders**

- Labelling (of non-terminals) appears to be theory-internal (Chomsky 2013)
- Labelling determined by Labelling Algorithm (Chomsky 2013; 2015)

Labelled and unlabelled structures
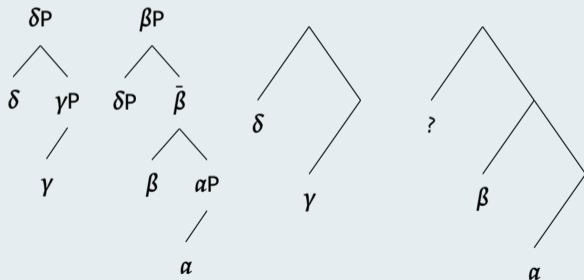
- Phrase comprising head and phrase {H,XP} → labeled by head H
- Phrase with two heads: root-categoriser distinction leads only categorisers to contribute labels
- Assume that specifiers never contribute label to phrase containing them because opaque to Labelling Algorithm due to embedding (cf. root-categoriser distinction)
- Specifiers would then be labelled by following node (unless also a specifier)

Phrase markers as strict orders

- If labelling predictable, and phrase markers have no labels, then possibile to derive phrasal nodes from strict orders using Labelling Algorithm
- Abstract asymmetric ordering relation axiomatic, hence no need to define c-command in terms of Graph Theory
- Abstract ordering relation would map to order and hierarchy in externalisation

FSA-equivalent orders

δ ?

$\quad\searrow \gamma \quad\quad \searrow \beta$

$\quad\quad\quad\quad\quad\quad \searrow \alpha$

Labelled specifier

$(\delta \prec \gamma)$

$\quad\quad\searrow \beta$

$\quad\quad\quad\quad\searrow \alpha$
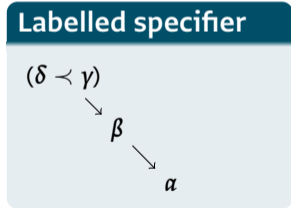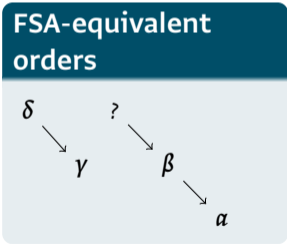
Strict order and equivalent tree
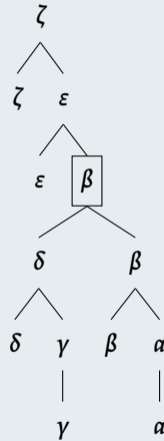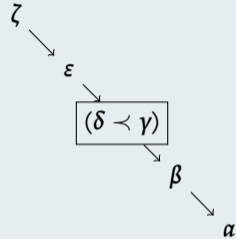
- Linearisation is doing much less than normally assumed—flattening recursively embedded specifiers into single total order

- Enforces 'antisymmetry' throughout derivation without claiming linearisation necessary for LF

- Far simpler relation than c-command (arguably simplest possible relation), and evidenced by both interfaces

- Biolinguistically plausible due to frequency of sequencing operations in natural world
- Strict order manipulation tested experimentally for primates (Samuels et al. 2017)

Asymmetry

Antisymmetry

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Contiguity Effects

Conclusion

Phrase markers as strict orders

Given use of strict orders, why not weak order if orders are either strict or weak?

Asymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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Schematic derivations
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Contiguity Effects
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Conclusion
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Section ❷ The role of antisymmetry

What's displacement?

- Displacement: extension or modification of existing structure using a subpart of this structure
- Formalisms modelling phenomenon substantially different (e.g. Internal Merge, Agree, and Autosegmental spreading)
- Similar condition has emerged in all
- Sequences of elements created must be contiguous in some sense (Starke 2001; Nevins 2007; Goldsmith 1976)

- Repetition of structure leads to tension between identity and distinctness
- Identical due to copying
- Distinct due to individuability
- Claim: tension results from conflicting ordering information
- Syntactic Objects may be in both strict and weak orders at the same time
- Possible resulting conflicting ordering information captures nature of displacement

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Properies of displacement

Subsection ① **Properies of displacement**

Properies of displacement

Similar condition on displacement in three formalisms:

- Feature Geometry-based Relativised Minimality (Starke 2001): movement blocked when chain of copies sharing particular feature interrupted by intervening element with shared feature

- Contiguous Agree (Nevins 2007): multiple Agree searching from higher probe for goal with marked or contrastive feature value cannot skip intervening unmarked or non-contrastive goals

- Line-crossing Prohibition (Goldsmith 1976): spreading cannot take place across intervening element already linked to tier for which spreading is taking place

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Schematic derivations · ○○○○○○○○○○○
Contiguity Effects · ○○○○○○○○○○○○○○○○○○○○
Conclusion · ○○○

Properies of displacement

*[Quant₁][Quant₂][Quant₁]

How much fun is she not   having <how much fun>?
[Quant]   [Quant]   [Quant]

*<2,1> with probe search relativisation for marked [Auth]

([+ Auth] is marked)

v	Maria tie-	m-	a	prezentat
	Maria 2-dat	1-acc		has introduced
[uAuth]		[– Auth]	[+ Auth]	

'Maria has introduced me to you.'
(Romanian; adapted from Nevins 2007)

*C₁C₂C₁

k   t
 \ \   /| /
  C V C V C
       \   /
         a

Properies of displacement
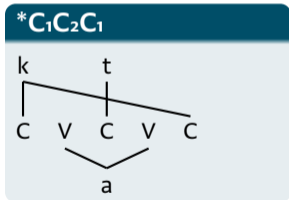
- **Displacement must form contiguous chain with source element**
- **Conditions can be accounted for separately, yet are suspiciously similar**

- Same element in multiple distinct positions
- Seems to be contradictory; most accounts imply it to be illusion
- Two basic options: copying or referencing
- Problems identical: identity and distinctness contradictory, but both necessary
- Copying approach leads to indices or variable interpretation
- Referencing approach often involves distinction between true element and references, or treating all occurrences as references

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Properies of displacement

- Not possible to use indices or referencing to capture identity aspect of displacement as these added later (violating Inclusiveness (Chomsky 2014/1995))
- Variable interpretation more feasible, but on what basis?
- What about Order Theory?

Asymmetry

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Properties of weak orders

Subsection ② Properties of weak orders

- Claim: same nodes exist in both strict and weak orders
- Whether a node judged identical depends on order considered
- Nodes always distinct in strict order
- Nodes may be distinct in weak orders

Ordering possibilities and identity and distinctness

Operation	Strict order	Weak order
External Merge	Distinct	Distinct
Internal Merge	Distinct	Identical

- Two-way distinction yields two possibilities corresponding to External and Internal Merge
- Internal Merge effectively establishes extra antisymmetric relation

External Merge

Internal Merge
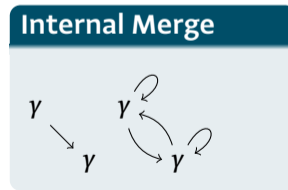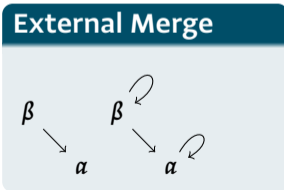
- Abstract asymmetric ordering relation corresponding to asymmetric c-command can be represented with precedence relation $\prec$

- $\preceq$: equivalent antisymmetric relation (precedes or equal to)

- =: equality

- Difference between $\prec$ and $\preceq$ relations parallel to that between < and ≤ relations (asymmetric versus antisymmetric)

Properties of weak orders

- Symmetric antisymmetric relations yield equality
- Existence of such relations between two or more nodes corresponds to traditional chain
- Unlike indices, weak orders impose limits on possible chains

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Schematic derivations
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Contiguity Effects
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Properties of weak orders
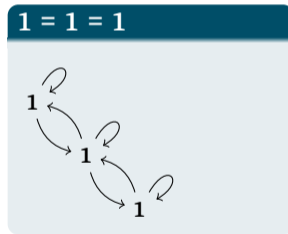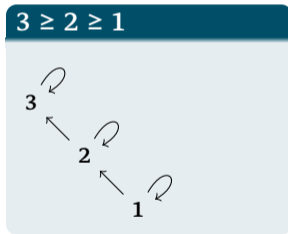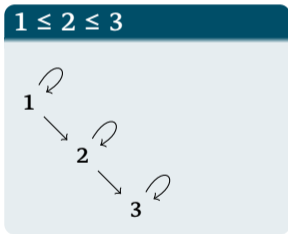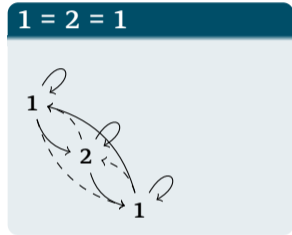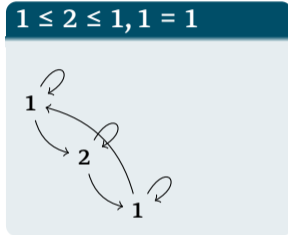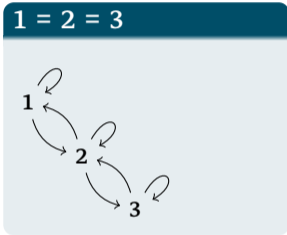
- By transitivity, $1 \leq 2 \leq 1$ gives $1 = 2 = 1$, which is false
- Monotonicity rules out existence of interveners

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Schematic derivations
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Contiguity Effects
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Properties of weak orders

Order inventory

Order	Membership criteria
Strict	None (all nodes)
Weak	Head positions
Weak	Argumental features: Person, Number, Gender, Case,...
Weak	Quantificational features: *wh*, Foc, Neg, Measure, Frequency
Weak	Modifier features: Evaluative, Evidential, Manner, Measure, Frequency, Neg,...
Weak	Topic

(adapted from Rizzi 2011)

- Relativised Minimality, Contiguous Agree, and the Line-crossing Prohibition all result from weak ordering effect
- Conflicting requirements of identity and distinctness in displacement due to the possibility for elements to be in two potentially contradictory orders
- Strict orders
  - Used to extend phrase marker
  - May be recursively embedded (at least in syntax)
  - Contain information used for linearisation at PF as well as information about e.g. scope and other LF concerns
- Weak orders
  - Allow displacement to occur by formation of equality relations between nodes
  - Only contain subset of the nodes in strict order

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Schematic derivations
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Section ❸ Schematic derivations

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Conclusion
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Before External Merge of ε

Strict order	Weak order: [F₁]	Weak order: [F₂]

Asymmetry
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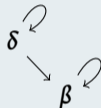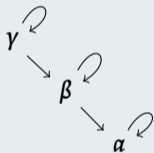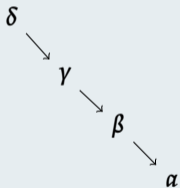
- A new item ε is merged with the existing structure
- ε has [F_1]

After External Merge of ε

Strict order	Weak order: [F_1]	Weak order: [F_2]

Asymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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Before Internal Merge of γ

Strict order	Weak order: [F_1]	Weak order: [F_2]

Asymmetry
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Antisymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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- γ, part of the existing structure, is merged with the overall structure
- γ again has [F₁]

After Internal Merge of γ
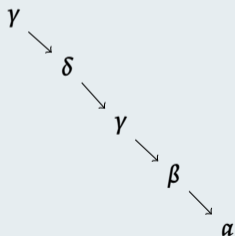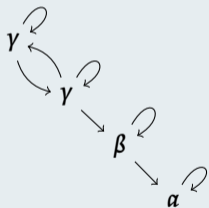
| Strict order | Weak order: [F₁] | Weak order: [F₂] |

Collapsing of copies of γ

Strict order	Weak order: [F$_1$]	Weak order: [F$_2$]

Asymmetry
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Antisymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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Before valuation of δ's [F_1]

Strict order	Weak order: [F_1]	Weak order: [F_2]

Asymmetry
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Antisymmetry
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Schematic derivations
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Contiguity Effects
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Conclusion
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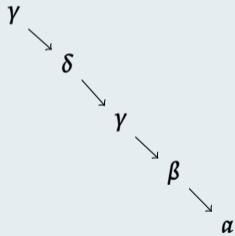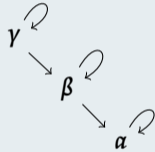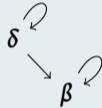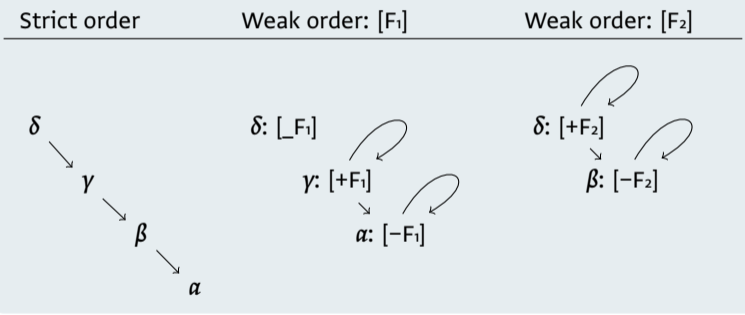
- Agree is similar but with feature values
- δ has an unvalued [F_1] feature
- Value from γ is copied

After valuation of δ's [F_1]
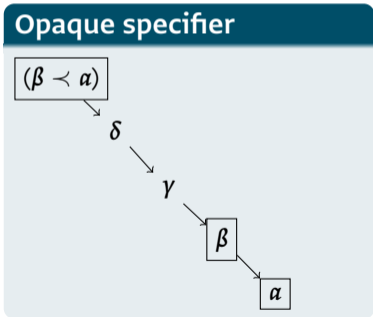
Strict order	Weak order: [F_1]	Weak order: [F_2]

Asymmetry
○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○●○○

Contiguity Effects
○○○○○○○○○○○○○○○○○○○○○

Conclusion
○○○
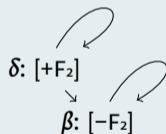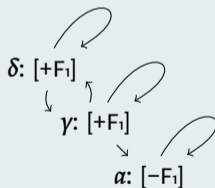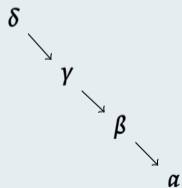
Collapsing of values for [F₁]

Strict order   Weak order: [F₁]   Weak order: [F₂]

δ

  γ

    β

      α

δ/γ: [+F₁]

  α: [−F₁]

δ: [+F₂]

  β: [−F₂]

Asymmetry
○○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○●

Contiguity Effects
○○○○○○○○○○○○○○○○○○○○

Conclusion
○○○
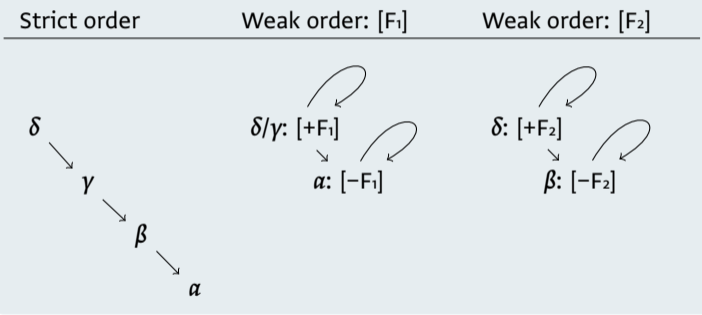
- Problem: apparently identical elements in strict orders resulting from Internal Merge
- If phrasal and head movement both create specifiers (Matushansky 2006), then what is moved becomes embedded and distinct from original element
- Occurs recursively (if more movement)

Opaque specifier

$(\beta \prec \alpha)$

δ

γ

β

α

Opaque moved head

(α)

γ

β

α

Asymmetry
○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○

Contiguity Effects
●○○○○○○○○○○○○○○○○○○○○

Conclusion
○○○

Section ❹ Antisymmetry and Contiguity Effects

Subsection ① Relativised Minimality

Asymmetry ○○○○○○○○○○○○○○○○○○○○

Antisymmetry ○○○○○○○○○○○○○○○○○○○○

Schematic derivations ○○○○○○○○○○○○

Contiguity Effects ○○○●○○○○○○○○○○○○○

Conclusion ○○○

Relativised Minimality

Before head movement

Strict order   Weak order: [F_1]

Asymmetry
○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○

Contiguity Effects
○○○○●○○○○○○○○○○○○○

Conclusion
○○○

Relativised Minimality
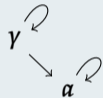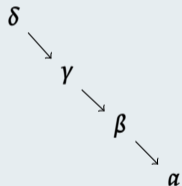
Relativised Minimality violation

Strict order	Weak order: [F₁]
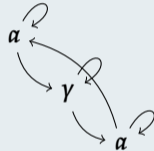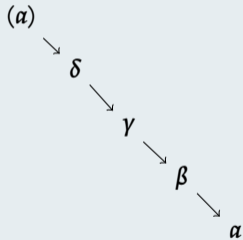
No Relativised Minimality violation

Strict order	Weak order: [F₁]

Before phrasal movement

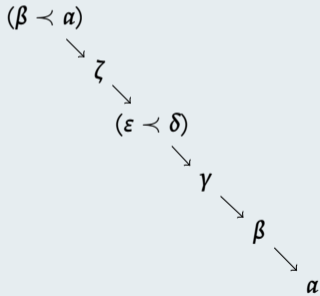| Strict order	Weak order: [F₁]

Asymmetry   Antisymmetry   Schematic derivations   Contiguity Effects   Conclusion
○○○○○○○○○○○○○○○○○○○   ○○○○○○○○○○○○○○○○○○○   ○○○○○○○○○○○   ○○○○○○○●○○○○○○○○○   ○○○

Relativised Minimality

Relativised Minimality violation

Strict order   Weak order: [F₁]

Asymmetry
○○○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○○○

Contiguity Effects
○○○○○○○○●○○○○○○○○○

Conclusion
○○○

Relativised Minimality

No Relativised Minimality violation

Strict order	Weak order: [F₁]

$(\beta \prec \alpha)$

ζ

$(\varepsilon \prec \delta)$

γ

β

α

$(\beta \prec \alpha)$

$(\beta \prec \alpha)$

Asymmetry ○○○○○○○○○○○○○○○○○○

Antisymmetry ○○○○○○○○○○○○○○○○○

Schematic derivations ○○○○○○○○○○○○

Contiguity Effects ○○○○○○○○○○●○○○○○○○

Conclusion ○○○

Contiguous Agree

Subsection ② Contiguous Agree

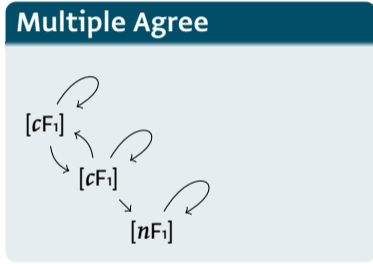Asymmetry ○○○○○○○○○○○○○○○○○○○ Antisymmetry ○○○○○○○○○○○○○○○○○○○○ Schematic derivations ○○○○○○○○○○○ **Contiguity Effects** ○○○○○○○○○○●○○○○○○ Conclusion ○○○
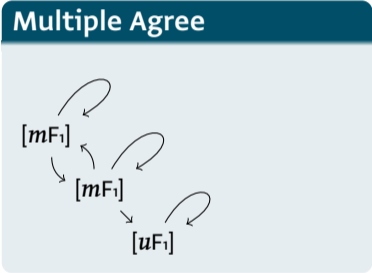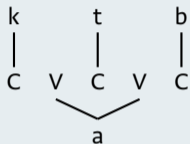
Contiguous Agree

- Agreement may involve only marked or contrastive values of features (Nevins 2007)
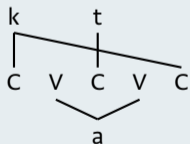- Values being agreed with must be contiguous with element needing to agree (Nevins 2007)

Contiguous Agree violation

$[m\text{F}_1]$

$[u\text{F}_1]$

$[m\text{F}_1]$

Contiguous Agree violation

$[c\text{F}_1]$

$[n\text{F}_1]$

$[c\text{F}_1]$

Asymmetry

Antisymmetry

Schematic derivations

Contiguity Effects

Conclusion

Line-crossing Prohibition

Subsection ③ Line-crossing Prohibition

Spreading

```
k        t        b
|        |        |
C   V    C   V    C
      \     /
         a
```

Line-crossing Prohibition violation

```
k        t
|        |
C   V    C   V    C
      \     /
         a
```

Asymmetry
○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○○

Contiguity Effects
○○○○○○○○○○○○○○○○●○○○

Conclusion
○○○

Line-crossing Prohibition

Line-crossing Prohibition violation

Strict order   **Weak order: [F₁]**

Asymmetry
○○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○○○

Contiguity Effects
○○○○○○○○○○○○○○○●○○

Conclusion
○○○

Line-crossing Prohibition
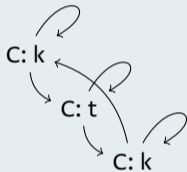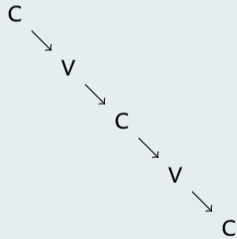
Before spreading

Strict order	Weak order: [F_1]
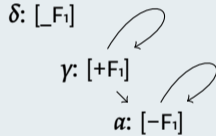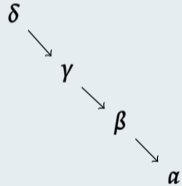
δ

γ

β

α

δ: [_F_1]

γ: [+F_1]

α: [−F_1]

Line-crossing Prohibition violation
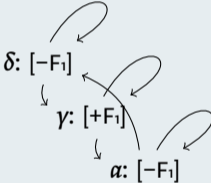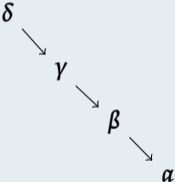
Strict order   Weak order: [F_1]

δ

γ

β

α

δ: [$-F_1$]

γ: [$+F_1$]

α: [$-F_1$]

Section ⑤ Conclusion

Asymmetry
○○○○○○○○○○○○○○○○○○○

Antisymmetry
○○○○○○○○○○○○○○○○○○○

Schematic derivations
○○○○○○○○○○○○

Contiguity Effects
○○○○○○○○○○○○○○○○○○○○○

Conclusion
○○●

- Strict orders may be more fundamental to syntax than usually assumed
- Contiguity effects in syntax and phonology seem to be a weak ordering effect
- Displacement and locality is expected in these systems because they make use of order theory, and weak orders allow displacement but impose severe restrictions on its use

📖 Chomsky, Noam. 2013.
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Lingua 130:33–49.
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URL http://dx.doi.org/10.1162/002438906775321184.

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URL http://dx.doi.org/10.1111/1467-9582.00017.

📰 Nevins, Andrew. 2007.
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Natural Language & Linguistic Theory 25:273–313.
URL http://dx.doi.org/10.1007/s11049-006-9017-2.

📘 Rizzi, Luigi. 2011.
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Oxford University Press.
URL http://dx.doi.org/10.1093/oxfordhb/9780199549368.013.0010.

❑ **Samuels, Bridget D., Marc Hauser, and Cedric Boeckx. 2017.**
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In *The Oxford Handbook of Universal Grammar*, ed. Ian Roberts, 527–546. Oxford, UK: Oxford University Press.
URL http://dx.doi.org/10.1093/oxfordhb/9780199573776.013.22.

❑ **Starke, Michal. 2001.**
Move Dissolves Into Merge: A Theory of Locality.
Doctoral Dissertation, University of Geneva, Geneva.

❑ **Uriagereka, Juan. 2011.**
Spell-Out and the Minimalist Program.
Oxford, UK: Oxford University Press.
URL http://dx.doi.org/10.1093/acprof:oso/9780199593521.001.0001.