A Simpler Syntax for Coordinate Structures

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Coordination:

- a wealth of complex phenomena
- complexities explained by independent phenomena
  - semantics
  - phonology
  - ellipsis
  - cognitive processing effects
- a simpler and more parsimonious syntactic account
Overview

1. Structure
2. Right-Node Raising
3. Argument Cluster Coordination
4. Subject-verb agreement
5. Conclusion
1. Structure

2. Right-Node Raising

3. Argument Cluster Coordination

4. Subject-verb agreement

5. Conclusion
(1) a. [Fred went running] and [Kim stayed in bed].
   b. You can’t [drink] and [drive].
   c. A [tall] and [blond] man is here.
   d. We tried it [on the streets] and [in homeless centers].
   e. [Sue] and [Mia] are together in Waikato.
(2) a. Often, [Sue goes to the beach and Kim stays in bed].
   (Ohlerle 1987)

b. [Sue read the email and dried her hair] in twenty secs.

c. He became alternately [fearful and angry].
   (Lasersohn 1995)

d. My residence was alternately [in Berlin and in Freiburg].

e. Fred parked his car between [a bus and a truck].
On branching

(3) [Tom, Bill, and Fred]
On branching

(3) [Tom, Bill, and Fred]

Arguments for binary branching:
- phonology
- affixational coordination particles (e.g. Latin and Somali)
- processing
Heads or tails?

Headedness:

- non-headed
  (Bloomfield 1933; …)

- headed
Arguments

for a headed analysis:

- compatible with (most versions of) $\bar{X}$ Theory (Munn 1993)
- correlates with head order in head-initial/final languages (Kayne 1994; Johanessen 1998; ...)
- conjuncts and the coordinate structure differ distributionally (Johanessen 1998; ...)

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... but

- should avoid theory-dependent argumentation

- no typological correlation (Zwart 2005)

- semantics conditions distribution
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- semantics conditions distribution

\[
\begin{align*}
\{ & \text{Ruth and Ursula} \\
& \{ & \text{*Ruth / *Ursula} \\
& & \text{Two women} \\
& \} \text{ embraced}. \\
\end{align*}
\]
Arguments

for a non-headed analysis:

- neither conjunct is dependent
- no mobility:
  b. *And Jane arrived, John sang.

- same distribution for XP and [XP and XP]
- no lexical head selects for [and XP]
- iterative nature
for a non-headed analysis:

- neither conjunct is dependent
- no mobility:
  
  
  b. *And Jane arrived, John sang.

- same distribution for XP and [XP and XP]

- no lexical head selects for [and XP]

- iterative nature

  (6) a. Often [I wanted to buy the house, she wanted to sell it, but we couldn’t come to an agreement].

  b. How often would [Alice order a pizza, Jane order a burger, but Tom order nothing at all]?
...as a construction

- non-headed
- iterative nature
- lack of mobility

...rather than a ‘regular’ structure

- in which iteration is due to adjunction

(7) *Fred saw and Sue.
In sum

Coordination is best seen as a
- binary,
- non-headed,
- iterative
- construction.
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- binary,
- non-headed,
- iterative
- construction.

(8) a. $X_{crd+} \rightarrow \text{and} \ X_{crd-}$
    b. $X \rightarrow X \ X_{crd+}$
1. Structure
2. Right-Node Raising
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Examples of RNR

(9) a. Kim likes and Mia adores chocolate bagels.
   
b. I know a man who likes and you said that Mia knows someone who adores chocolate bagels.
   
c. One physicist said that he supported, and another even boasted that he had actually defended, the VSL theory.
   
d. The difference between an interesting and a tedious book.
   
e. Kim is on the cover of and featured in the July 2001 issue.
Main accounts

- Deletion
  
  \(\ldots;\) Wilder 1997; Hartman 2000; Beavers & Sag 2004

- Displacement
  
  \(\ldots;\) Gazdar 1981; Postal 1998; Steedman 2001; Sabbagh 2007

- Multidominance
  
  \(\ldots;\) Radford 1988; Johannessen 1998; Wilder 1999
Main accounts

Displacement (Movement)

S
/
S
/
S
/
S
/
S
/
NP
/
chocolate bagels
/
and
/
Kim likes t
/
Mia adores t
Main accounts

Displacement (Extraction; Steedman 2001)

\[
\begin{array}{ccc}
\text{Kim} & \frac{NP}{S/V_P} & \frac{VP/NP}{S/NP} \\
& & \rightarrow T \\
& \frac{S/NP}{S/NP} & \rightarrow B \\
& \frac{S/NP}{S/NP} & \rightarrow B \\
\end{array}
\]

and

\[
\begin{array}{ccc}
\text{Mia} & \frac{NP}{S/V_P} & \frac{VP/NP}{S/NP} \\
& & \rightarrow T \\
& \frac{S/NP}{S/NP} & \rightarrow B \\
& \frac{choc. bagels}{NP} & \langle \phi \rangle \\
\end{array}
\]
Main accounts

Multidominance

S

S

and

S

NP

VP

NP

VP

NP

NP

Mia

adores

NP

chocolate bagels
Known problems

... for displacement & multidominance accounts:

- no evidence for unbounded rightward extraction
  (10) *A man who loves wrote me an email chocolate bagels.

- no semantic identity for the ‘RNRaised’ element
  (11) I wanted to write and Bill actually wrote an email to him.

- sloppy / strict readings
  (12) Chris likes and Bill loves his friend.

- anaphoric linkages
  (13) Sue$_i$ liked and I thought she$_i$ hated, that picture of her$_i$. 
Problems continued
(Chaves 2006)

- RNR can also target sub-lexical elements
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(14) a. You can choose between [a five- ] and [a ten-minute therapy session].

b. You like [the heart- ] or [the sun-shaped bead box]?

c. [Pre- and post-war France] were very different.

d. [I’m interested in PRE- ] but [you seem to be interested only in POST-war France].

e. I am neither [un-] nor [overly patriotic].
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(Booij 1985)
Non-coordinate ‘RNR’
(Chaves and Sag 2007)

(15) a. The institution directed the interns who already had, to companies that didn’t have a great deal of experience with micro-industrial management.

b. The people who hate are in fact not very different from the people who love George W. Bush.
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b. The people who hate are in fact not very different from the people who love George W. Bush.

c. You do realize that [with the headquarters being located in, the drop must be made near, the western part of the city?]

d. Tom claimed that he liked, simply because he knows that Dana absolutely hates, the president’s handling of the economy.

e. If Tom says he liked, then I can only assume that you didn’t like the new Victoria Secret catalog.
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e. If Tom says he liked, then I can only assume that you didn’t like the new Victoria Secret catalog.

(Bresnan 1974; Hudson 1976; Goodall 1987; Postal 1994)
Constraints on RNR

Word form identity

(16) *Tom said that I and Ann claimed that the she is the best swimmer.

Phonology

(17) a. *They were sing and dancing.
   b. *He tried to persuade but he couldn’t convince them.
   c. *I think that I’d and I know that John’ll buy one of those portraits of Elvis.
Assumptions:

1. phonology is built locally and incrementally (Inkelas & Zec 1991)
2. Prosodic hierarchy: $\omega, C, \phi, I$. 
Locality and phonological independence

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1. phonology is built locally and incrementally (Inkelas & Zec 1991)
2. Prosodic hierarchy: $\omega$, $C$, $\phi$, $I$.

Hypothesis:
RNR is ellipsis of phonologically independent elements

(18) a. $[^I\text{wi l}\text{aik buks}][^I\text{bat p}\text{æt h}\text{eits buks}]$
   b. $[^I\text{wi l}\text{aik}][^I\text{buks}][^I\text{bat p}\text{æt h}\text{eits}][^I\text{buks}]$
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(18) a. $[^{I}wI \, IaIk \, bbucks] \, [^{I}b\text{at} \, pæt \, heits \, bbucks]$
   
   b. $[^{I}wI \, IaIk] \, [^{I}bucks] \, [^{I}b\text{at} \, pæt \, heits] \, [^{I}bucks]$

(19) a. Pre- and post-war Germany were very different.
   
   b. The people [[of whom and to whom] George speaks] are specially selected.
Phonology in HPSG:

\[
\text{PHON} \left[ [I\text{wi laik}], [I\text{buks}], [I\text{bæt pæt heits}], [I\text{buks}] \right]
\]
A phonological ellipsis account

Phonology in HPSG:

\[
\text{PHON} \left[ [I\text{wi laik}], [I\text{buks}], [I\text{ba\text{t p\text{\ae}t heits}}], [I\text{buks}] \right]
\]

‘RNR’ Phonological Ellipsis rule

\[
X \left[ \text{PHON} A \oplus B \oplus R \right] \rightarrow X \left[ \text{PHON} A_{ne-list} \oplus R_{ne-list} \oplus B_{ne-list} \oplus R \right]
\]
In sum

‘Right-Node Raising’

- not specific to coordination
- previous accounts lack in coverage and adequacy
- ellipsis of phonologically independent elements
1 Structure

2 Right-Node Raising

3 Argument Cluster Coordination

4 Subject-verb agreement

5 Conclusion
Examples of ACC

(20) a. John gave a book to Mary and a rose to Sue.
    b. I gave him a coloring book and new roller skates to his sister.
    c. I sent a postcard to your brother on Monday and to your sister on Tuesday.
Evidence for ellipsis

ACC as ellipsis:

- one perceived event per conjunct
- no independent evidence for such conjuncts being constituents
- word-part ellipsis

(21) According to the law of intestate succession, half-brothers and -sisters are considered the same as full brothers and sisters.
Ambiguity predictions

(22) a. Several letters were recognized by me in 1982, and by my wife in 1993.
Empirical consequences of ellipsis

Ambiguity predictions

(22) a. Several letters were recognized by me in 1982, and by my wife in 1993.

b. Several letters were discovered by me in 1982, and by my wife in 1993.
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(23) I found a coin in the kitchen and in the garden.
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b. Several letters were discovered by me in 1982, and by my wife in 1993.

(23) I found a coin in the kitchen and in the garden.

Other predictions (‘coordination of unlikes’)

(24) a. We left the hotel frightened and in a hurry.

b. Fred became wealthy and a Republican.

c. Sue is healthy and in good shape.
Identity conditions

Phonology not sufficient nor necessary

(25) a. *George fired his advisors and a gun in his office.
    b. *I can tuna and be contacted by phone.

(26) a. Was the message easy to find and the instructions easy to follow?
    b. There were two guards when I arrived, and only one guard when I left.
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Word-sense identity

(27) a. *God loves us and to see us happy.
    b. *Mia went home and to get a bottle-opener.
    c. *Fred tried the shrimp and being humorous about it.
### Head-Driven Phrase Structure Grammar

*Feature geometry assumptions*
Linearization in HPSG

\[
\begin{array}{c}
sign \\
SEM \ldots \\
\text{DOM} \left\langle \left[ \begin{array}{c}
\text{PHON} \ldots \\
\text{SEM} \ldots 
\end{array} \right], \left[ \begin{array}{c}
\text{PHON} \ldots \\
\text{SEM} \ldots 
\end{array} \right], \left[ \begin{array}{c}
\text{PHON} \ldots \\
\text{SEM} \ldots 
\end{array} \right] \right\rangle
\end{array}
\]
Head-Driven Phrase Structure Grammar
Feature geometry assumptions

- **Linearization in HPSG**
  
  $\begin{pmatrix}
  \text{sign} \\
  \text{SEM} \ldots
  \end{pmatrix}
  
  \text{DOM} \left( 
  \begin{pmatrix}
  \text{PHON} \ldots \\
  \text{SEM} \ldots
  \end{pmatrix}, \begin{pmatrix}
  \text{PHON} \ldots \\
  \text{SEM} \ldots
  \end{pmatrix}, \begin{pmatrix}
  \text{PHON} \ldots \\
  \text{SEM} \ldots
  \end{pmatrix}\right)
  
- **Semantic underspecification in HPSG**
  *(Minimal Recursion Semantics)*

  $\begin{pmatrix}
  \text{SEM} \left( 
  \begin{pmatrix}
  \text{RELN} & \text{every} \\
  \text{INDEX} \ [x] \\
  \text{RESTR} \ [1] \\
  \text{SCOPE} \ldots
  \end{pmatrix}, 
  \begin{pmatrix}
  \text{LABEL} \ [1] \\
  \text{RELN} & \text{cat} \\
  \text{INDEX} \ [x]
  \end{pmatrix} \right)
  $
**Linearization in HPSG**

\[
\begin{array}{c}
\text{sign} \\
\text{SEM} \ldots \\
\text{DOM} \left< \left[ \text{PHON} \ldots \right], \left[ \text{PHON} \ldots \right], \left[ \text{PHON} \ldots \right] \right>
\end{array}
\]

**Semantic underspecification in HPSG**

*(Minimal Recursion Semantics)*

\[
\begin{array}{c}
\text{SEM} \left< \left[ \text{RELN} \ every \right], \left[ \text{LABEL} \ 1 \right], \left[ \text{RELN} \ cat \right] \right> \\
\text{INDEX} \ 2 \\
\text{RESTR} \ 1 \\
\text{SCOPE} \ldots 
\end{array}
\]

\[\equiv \forall x (\text{cat}(x) \rightarrow \ldots)\]
Ellipsis under sense identity
(Chaves 2006)

\[ X \text{DOM} \left[ L \oplus A_{ne-list} \oplus C_{list} \left( \text{[conj]} \right) \oplus B_{ne-list} \right] \rightarrow \]

\[ X \text{DOM} \left[ \right. \left. \begin{array}{c}
\text{SEM} \left< \text{RELN} \left[ R_{00} \right], \ldots, \text{RELN} \left[ R_{0n} \right] \right> \\
\ldots \\
\text{SEM} \left< \text{RELN} \left[ R_{m0} \right], \ldots, \text{RELN} \left[ R_{mk} \right] \right>
\end{array} \right] \oplus A \]

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\ldots \\
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\end{array} \right] \oplus B \]

\[ \text{CRD} + \]
In sum

‘Argument Cluster Coordination’

- ellipsis under sense-identity
- elliptical parse is sensitive to plausibility
- ellipsis predicts ‘coordination of unlikes’ phenomena
<table>
<thead>
<tr>
<th></th>
<th>Structure</th>
<th>Right-Node Raising</th>
<th>Argument Cluster Coordination</th>
<th>Subject-verb agreement</th>
<th>Conclusion</th>
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<td>1</td>
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An agreement puzzle

Number in NP coordination:

(28) a. Every boy and every girl were happy.
    b. Every boy and every girl was happy.

(29) a. A boy and a girl were happy.
    b. *A boy and a girl was happy.
Number in NP coordination:

(28) a. Every boy and every girl were happy.
    b. Every boy and every girl was happy.

(29) a. A boy and a girl were happy.
    b. *A boy and a girl was happy.

Ellipsis predicts:

(30) a. Every boy was happy and every girl was happy.
    b. A boy was happy and a girl was happy.
On the role of frequency

British National Corpus
Occurrence of \([\text{Det} \ldots^n \text{ and Det}]\) \((1 < n < 4)\):

<table>
<thead>
<tr>
<th>(\text{Det})</th>
<th>abs. frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>each</td>
<td>36</td>
</tr>
<tr>
<td>every</td>
<td>74</td>
</tr>
<tr>
<td>a</td>
<td>4,682</td>
</tr>
<tr>
<td>the</td>
<td>28,952</td>
</tr>
</tbody>
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Frequency influences ambiguity resolution preferences
Parse competition

- High frequency coordination type ⇒ preferential NP parse and inhibition of alternative parses

(31) a. The boy and the girl were happy.
   b. *The boy and the girl was happy.
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- Lower frequency coordination type ⇒ alternative parses are accessible and can compete
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Lower frequency coordination type ⇒ alternative parses are accessible and can compete

(32) a. Every boy and every girl were happy.
    b. Every boy and every girl was happy.

Supporting evidence:

(33) a. Every boy and every girl \( \{ \text{were} \} \) happy with each other.
    b. Each boy and each girl \( \{ \text{were} \} \) going to hug each other.
Subject-verb agreement and NP conjunction

- NP conjunction systematically yields plural agreement
- Apparent agreement flexibility due to ellipsis
- Elliptical parses are sensitive to frequency effects
1. Structure
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Coordination

- a binary, non-headed, iterative construction
Taking stock

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  - a binary, non-headed, iterative construction

- **Right-Node Raising**
  - phonologically-conditioned ellipsis
  - not particular to coordination
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  - semantically-conditioned ellipsis
  - sensitive to plausibility conditions
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- **Future research**
  - obtain experimental data (i.e., magnitude estimation, self-paced reading, eye-tracking)
References

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