

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

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Conjunction

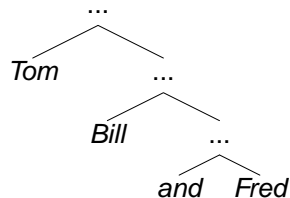
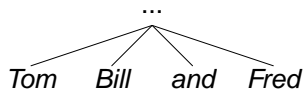
- (1) a. [Fred went running] and [Kim stayed in bed].
- b. You can't [drink] and [drive].
- c. A [tall] and [blond] man is here.
- d. We tried it [on the streets] and [in homeless centers].
- e. [Sue] and [Mia] are together in Waikato.

Conjunction

- (2) a. Often, [Sue goes to the beach and Kim stays in bed].
(Oherle 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].

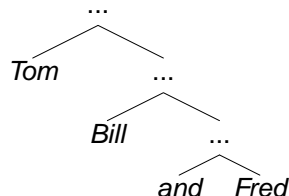
On branching

(3) [Tom, Bill, and Fred]



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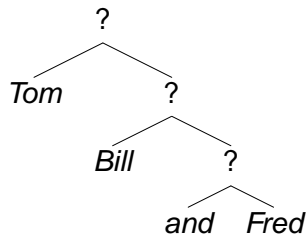
Arguments for binary branching:

- phonology
- affixational coordination particles (e.g. Latin and Somali)
- processing

Heads or tails?

Headedness:

- non-headed
(Bloomfield 1933; ...)
- headed
(Rothstein 1991; Munn 1993; Kayne 1994; Johanessen 1998)



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
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... but

- should avoid theory-dependent argumentation
- no typological correlation (Zwart 2005)
- semantics conditions distribution

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(4) $\left\{ \begin{array}{l} \text{Ruth and Ursula} \\ *Ruth / *Ursula \\ \text{Two women} \end{array} \right\}$ embraced.

Arguments

for a non-headed analysis:

- neither conjunct is dependent
- no mobility:
 - (5) a. Before Jane arrived, John sang.
 - b. *And Jane arrived, John sang.
- same distribution for *XP* and [*XP and XP*]
- no lexical head selects for [*and XP*]
- iterative nature

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- 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]?

Coordination

... 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
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*In sum***Coordination is best seen as a**

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- (8) a. $X_{crd+} \rightarrow \text{and } X_{crd-}$
 b. $X \rightarrow X \quad X_{crd+}$

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Examples of RNR

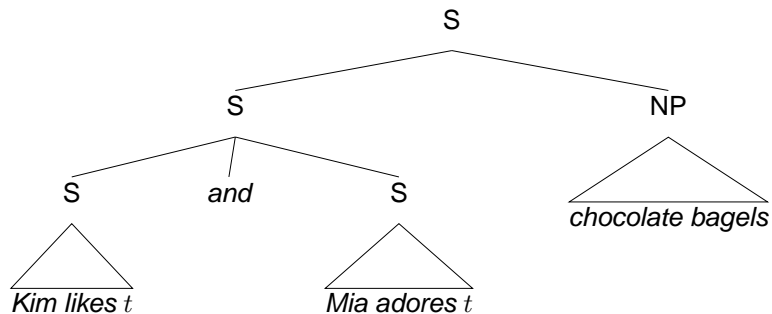
- (9) a. Kim likes and Mia adores chocolate bagels.
- b. I know a man who likes and you said that Mia knows someone who adores chocolate bagels.
- c. One physicist said that he supported, and another even boasted that he had actually defended, the VSL theory.
- d. The difference between an interesting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

Main accounts

- Deletion
(...; Wilder 1997; Hartman 2000; Beavers & Sag 2004)
- Displacement
(...; Gazdar 1981; Postal 1998; Steedman 2001; Sabbagh 2007)
- Multidominance
(...; Radford 1988; Johannessen 1998; Wilder 1999)

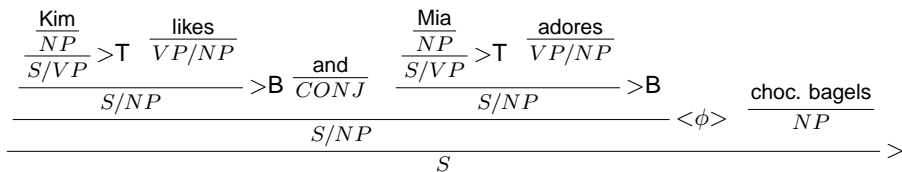
Main accounts

Displacement (Movement)



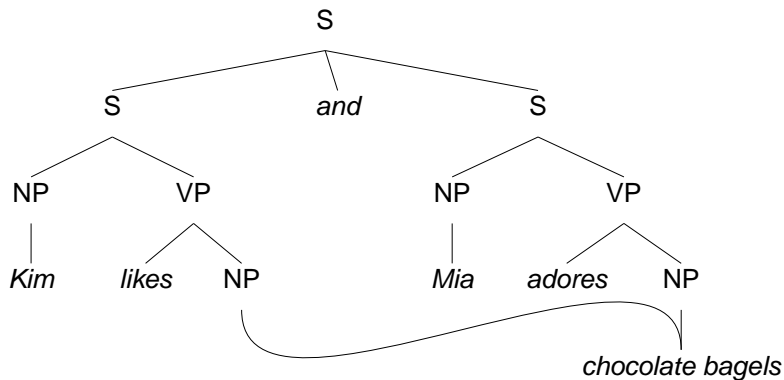
Main accounts

Displacement (Extraction; Steedman 2001)



Main accounts

Multidominance



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

Locality and phonological independence

Assumptions:

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

A phonological ellipsis account

Phonology in HPSG:

$\left[\text{PHON} \langle [{}^I wɪ laɪk], [{}^I bʊks], [{}^I bʌt pæt heɪts], [{}^I bʊks] \rangle \right]$

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'RNR' Phonological Ellipsis rule

$$X \left[\text{PHON} \boxed{A} \oplus \boxed{B} \oplus \boxed{R} \right] \rightarrow X \left[\text{PHON} \boxed{A}_{ne-list} \oplus \boxed{R}_{ne-list} \oplus \boxed{B}_{ne-list} \oplus \boxed{R} \right]$$

In sum

'Right-Node Raising'

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

- 1 Structure
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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.

Empirical consequences of ellipsis

Ambiguity predictions

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

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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

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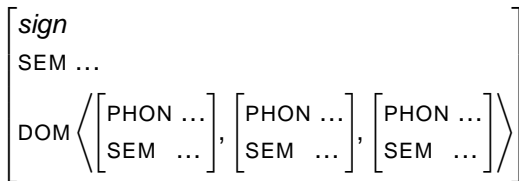
- **Linearization in HPSG**

$$\left[\begin{array}{l} \textit{sign} \\ \text{SEM ...} \\ \text{DOM} \left\langle \left[\begin{array}{l} \text{PHON ...} \\ \text{SEM ...} \end{array} \right], \left[\begin{array}{l} \text{PHON ...} \\ \text{SEM ...} \end{array} \right], \left[\begin{array}{l} \text{PHON ...} \\ \text{SEM ...} \end{array} \right] \right\rangle \end{array} \right]$$

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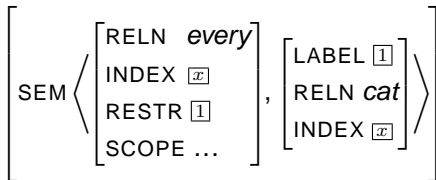
Feature geometry assumptions

- **Linearization in HPSG**



- **Semantic underspecification in HPSG**

(Minimal Recursion Semantics)



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(Minimal Recursion Semantics)

$$\left[\begin{array}{l} \text{SEM} \left\langle \left[\begin{array}{l} \text{RELN } \textit{every} \\ \text{INDEX } \boxed{x} \\ \text{RESTR } \boxed{1} \\ \text{SCOPE ...} \end{array} \right], \left[\begin{array}{l} \text{LABEL } \boxed{1} \\ \text{RELN } \textit{cat} \\ \text{INDEX } \boxed{x} \end{array} \right] \right\rangle \end{array} \right] \equiv \forall x(\textit{cat}(x) \rightarrow \dots)$$

Ellipsis under sense identity

(Chaves 2006)

$$X \left[\text{DOM } \boxed{L} \oplus \boxed{A}_{ne-list} \oplus \boxed{C}/list([\text{conj}]) \oplus \boxed{B}_{ne-list} \right] \rightarrow$$

$$X \left[\text{DOM } \boxed{L} \left\{ \begin{array}{l} \left[\text{SEM} \langle [\text{RELN } \boxed{R_{00}}], \dots, [\text{RELN } \boxed{R_{0n}}] \rangle \right] \\ \dots, \\ \left[\text{SEM} \langle [\text{RELN } \boxed{R_{m0}}], \dots, [\text{RELN } \boxed{R_{mk}}] \rangle \right] \end{array} \right\} \oplus \boxed{A} \right]$$

$$X \left[\text{DOM } \boxed{C} \oplus \left\{ \begin{array}{l} \left[\text{SEM} \langle [\text{RELN } \boxed{R_{00}}], \dots, [\text{RELN } \boxed{R_{0n}}] \rangle \right] \\ \dots, \\ \left[\text{SEM} \langle [\text{RELN } \boxed{R_{m0}}], \dots, [\text{RELN } \boxed{R_{mk}}] \rangle \right] \end{array} \right\} \oplus \boxed{B} \right]$$

CRD +

In sum

‘Argument Cluster Coordination’

- ellipsis under sense-identity
- elliptical parse is sensitive to plausibility
- ellipsis predicts ‘coordination of unlikes’ phenomena

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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.
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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 [*Det* ... n *and Det*] ($1 < n < 4$):

<i>Det</i>	abs. frequency
<i>each</i>	36
<i>every</i>	74
<i>a</i>	4,682
<i>the</i>	28,952

- Frequency influences ambiguity resolution preferences

Parse competition

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

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(32) a. Every boy and every girl were happy.
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Supporting evidence:

(33) a. Every boy and every girl $\left\{ \begin{array}{l} \text{were} \\ * \text{was} \end{array} \right\}$ happy with each other.
 b. Each boy and each girl $\left\{ \begin{array}{l} \text{were} \\ * \text{is} \end{array} \right\}$ going to hug each other.

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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

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- **Future research**

- obtain experimental data (i.e., magnitude estimation, self-paced reading, eye-tracking)

References

- Beavers, J. & I. A. Sag (2004). Ellipsis and apparent non-constituent coordination. In S. Müller (Ed.), *11th HPSG Conference*, Leuven, pp. 48–69.
- Bloomfield, L. (1933). *Language*. New York: Henry Holt.
- Booij, B. (1985) Coordination reduction in complex words: A case for prosodic phonology. In H. van der Hulst and N. Smith (Eds.), *Advances in Nonlinear Phonology, vol. 7 of Linguistic Models*, pp. 143–160. Dordrecht: Foris.
- Bresnan, J. (1974). On the position of certain clause-particles in phrase structure. *Linguistic Inquiry* 5, 614–619.
- Chaves, R. P. (2006). Linearization-based Word-Part Ellipsis. pp.40. (*under rev.*).
- Chaves, R. P. & I. A. Sag (2007). Two kinds of ellipsis in English coordinate structures. (*submitted*), pp. 49.
- Gazdar, G. (1981). Unbounded dependencies and coordinate structure. *Linguistic Inquiry* 12 (2), 155–184.
- Goodall, G. (1987). *Parallel Structures in Syntax: Coordination, Causatives, and Restructuring*. New York: Cambridge University Press.
- Hartmann, K. (2000). Right Node Raising and Gapping: Interface conditions on prosodic deletion. Philadelphia/Amsterdam: John Benjamins.
- Hudson, R. (1976). Conjunction reduction, gapping, and right-node-raising. *Language* 52, 535–562.
- Inkelas, S. & I. Zec (1990) Prosodically Constrained Syntax, *The phonology-syntax connection*, pp. 365–378. CSLI & Chicago Press.
- Johannessen, J. (1998). *Coordination*. New York: Oxford University Press.
- Kayne, R. (1994). *The Antisymmetry of Syntax*. MIT Press, Cambridge, Mass.

References

- Lasersohn, P. (1995). *Plurality, Conjunction and Events*. Kluwer: Dordrecht.
- Munn, A. B. (1993). Topics in the Syntax and Semantics of coordinate structures. PhD. dissertation, University of Maryland, Maryland.
- Oehrle, R. T. (1987). Boolean properties in the analysis of gapping. In G. J. Huck and A. E. Ojeda (Eds.), *Syntax and Semantics 20: Discontinuous Constituency*, pp. 201–240. Academic Press, Orlando, FL.
- Postal, P. M. (1994). Parasitic and pseudoparasitic gaps. *LI* 25, 63–117.
- Postal, P. M. (1998). *Three investigations of extraction*. MIT: Cambridge, Mass.
- Radford, A. (1988). *Transformational Grammar*. Cambridge, Cambridge University Press.
- Rothstein, S. (1991). Heads, projections, and categorial determination. In K. Leffel and D. Bouchard (Eds.), *Views on Phrase Structure*, pp. 97–112. Kluwer.
- Sabbagh, J. (2007). Ordering and linearizing rightward movement. *Natural Language and Linguistic Theory* 25 (2), 349–401.
- Steedman, M. (2001). *The Syntactic Process*. MIT Press.
- Wilder, C. (1997). Some properties of ellipsis in coordination. In A. Alexiadou and T. A. Hall (Eds.), *Studies on Universal Grammar and Typological Variation*, *Studies on Universal Grammar and Typological Variation*, pp. 59–107.
- Wilder, C. (1999). Right-node raising and the LCA. In S. Bird, A. Carnie, J. D. Haugen, and P. Norquest (Eds.), *Proceedings of the 18th West Coast Conference on Formal Linguistics*, pp. 586–598.
- Zwart, J.-W. (2005). Some notes on coordination in head-final languages. J. Doetjes and J. van de Weijer (Eds.), *Linguistics in The Netherlands*, pp.232–241.