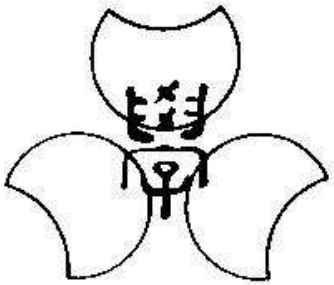

“This text is incoherent!”: How people understand discourse

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Gunma Prefectural Women’s University

20 July 2007
Gunma University

Introduction

Put these sentences in order:

A. The cat chased a mouse through the field.

B. So, a cow mooed.

C. A stranger walked along the road.

D. It was tired.

E. The weather was beautiful.

How did you make your decision?

Overview

- Some Observations about Discourse Processing
- Kamp & Reyle's Discourse Representation Theory (DRT)
- Application of DRT to Discourse Processing
- Pronoun Interpretation
- Experiment Planning
- Conclusion

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Context Matters!

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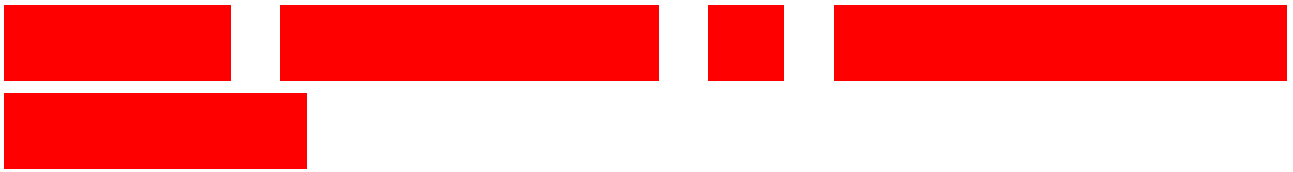

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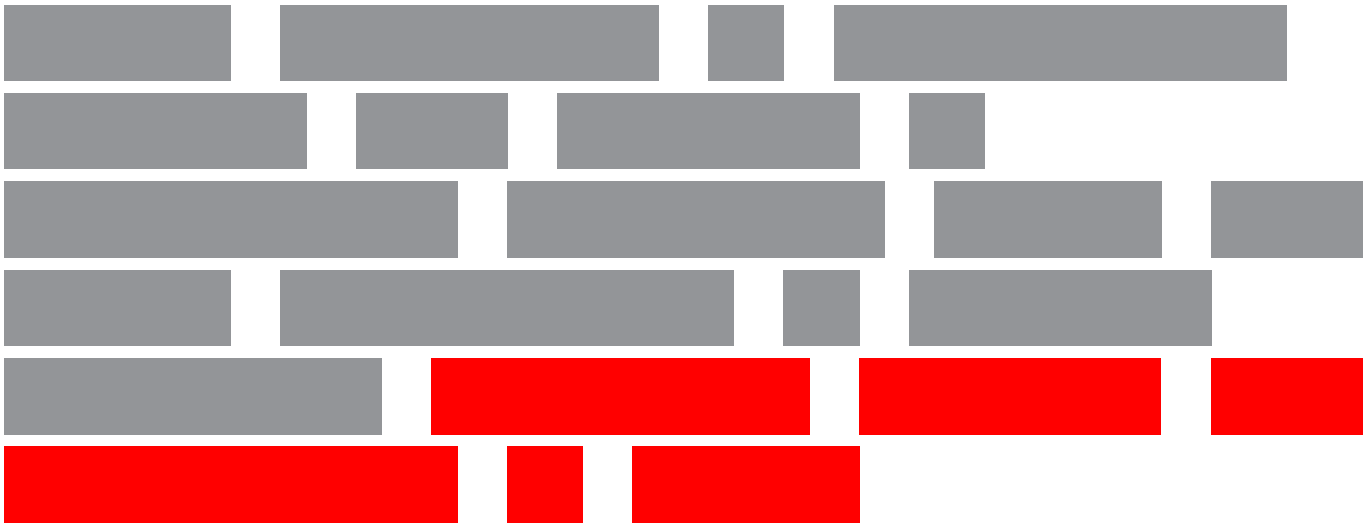

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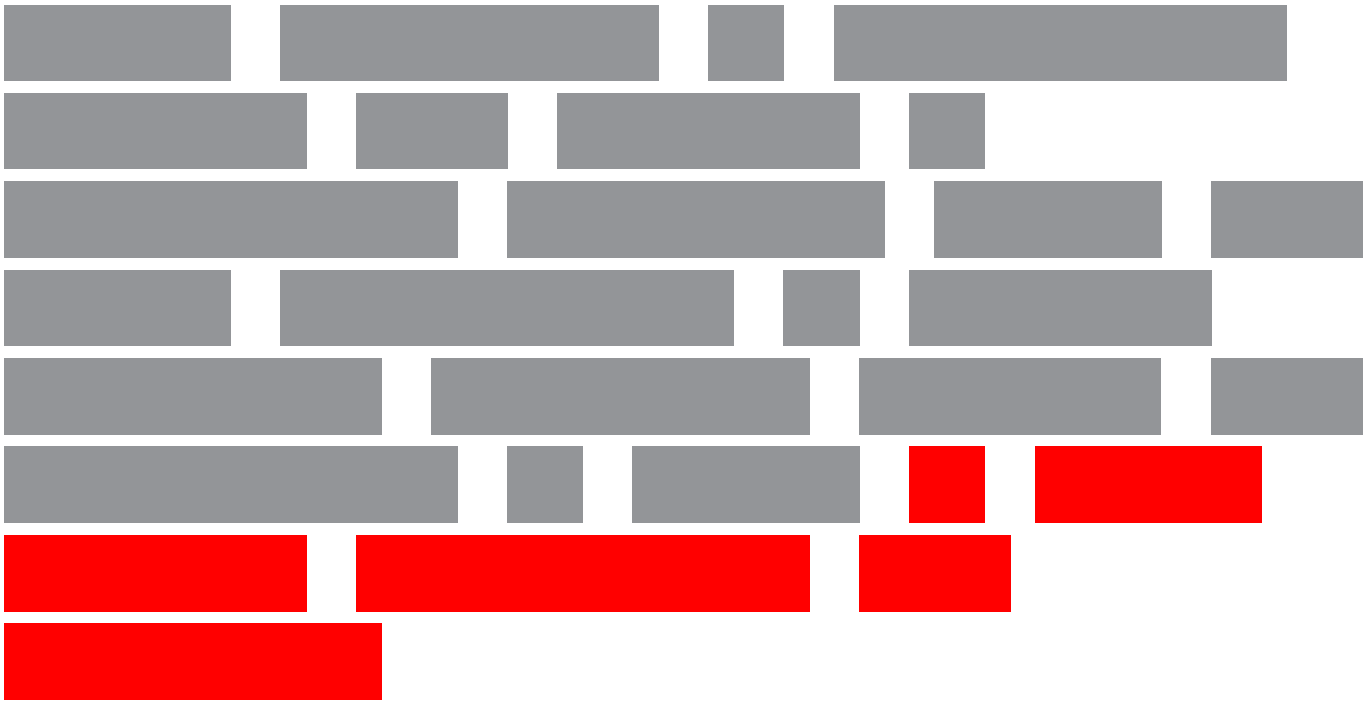

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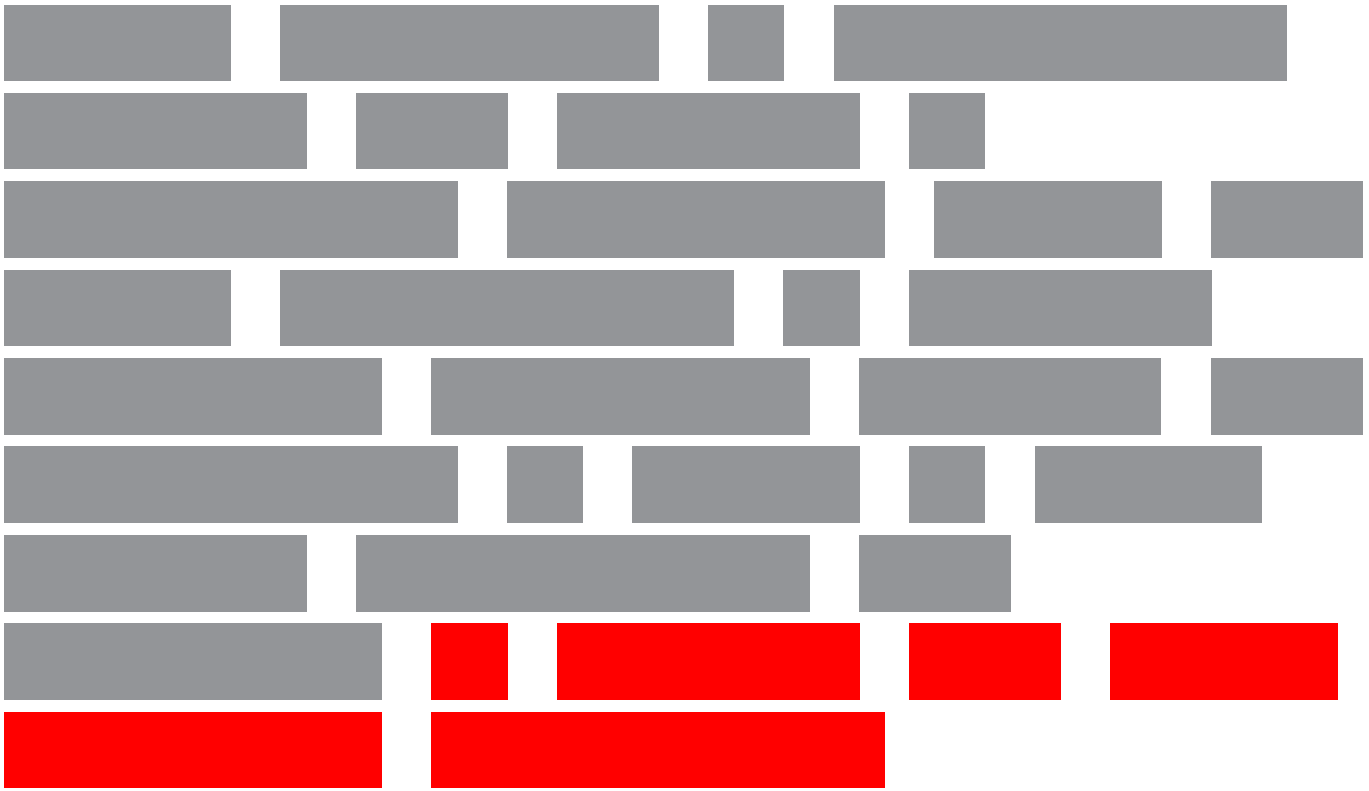

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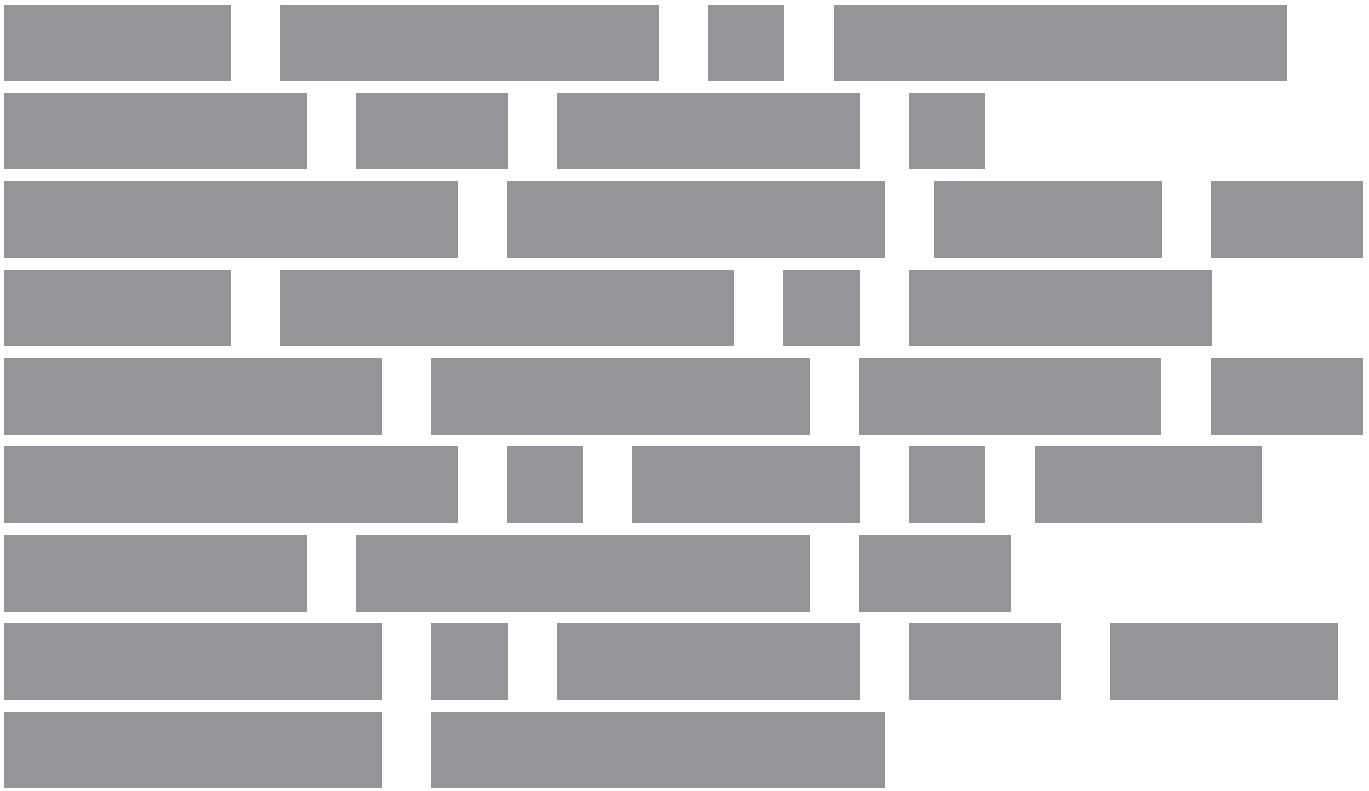

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In English, discourses such as these take longer to read than those with pronouns. This has been labelled the *repeated-name penalty* by Gordon et al. (1993) and has been replicated in several experiments (e.g., Arnold, 1998; Rose, 2005).

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Logical relations influence how we process discourse.

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- Logical relationships influence how we process discourse.

How can we account for these observations?

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Let's look at an example...

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The Context

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John saw Mary.

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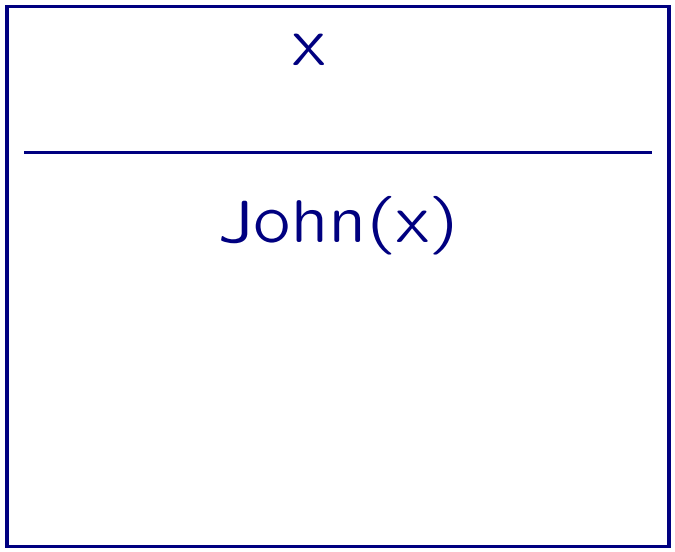

The Context

Discourse Representation Theory

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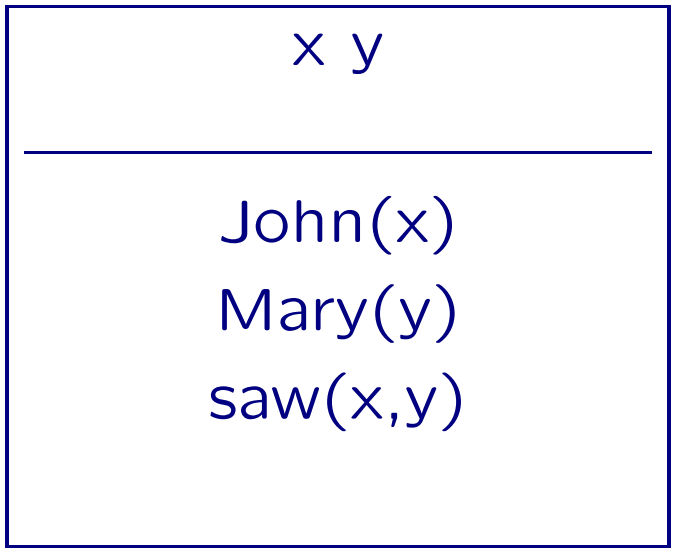

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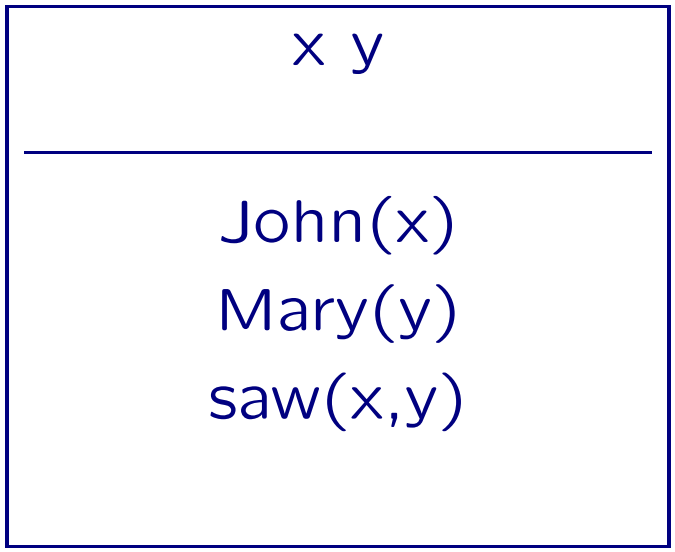
Discourse Representation Theory

John saw Mary. He kissed her.



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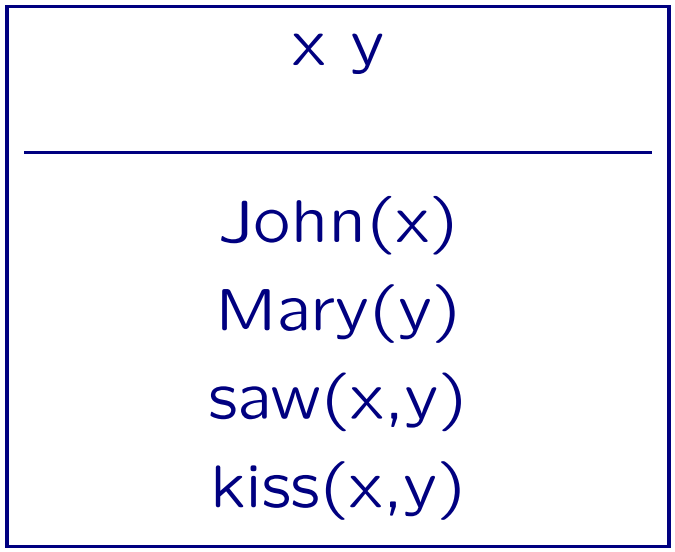

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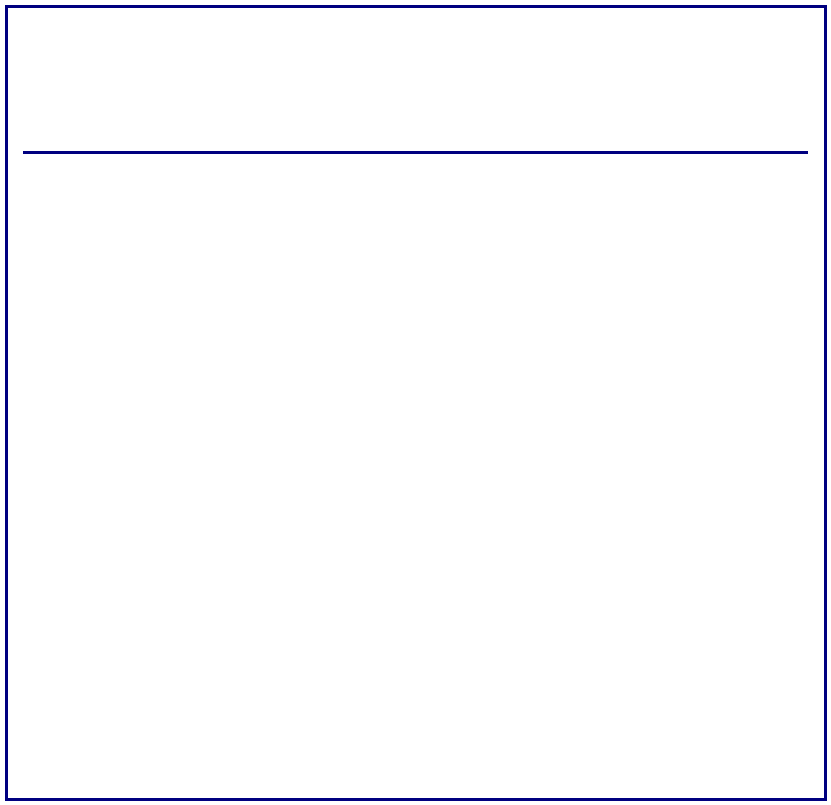

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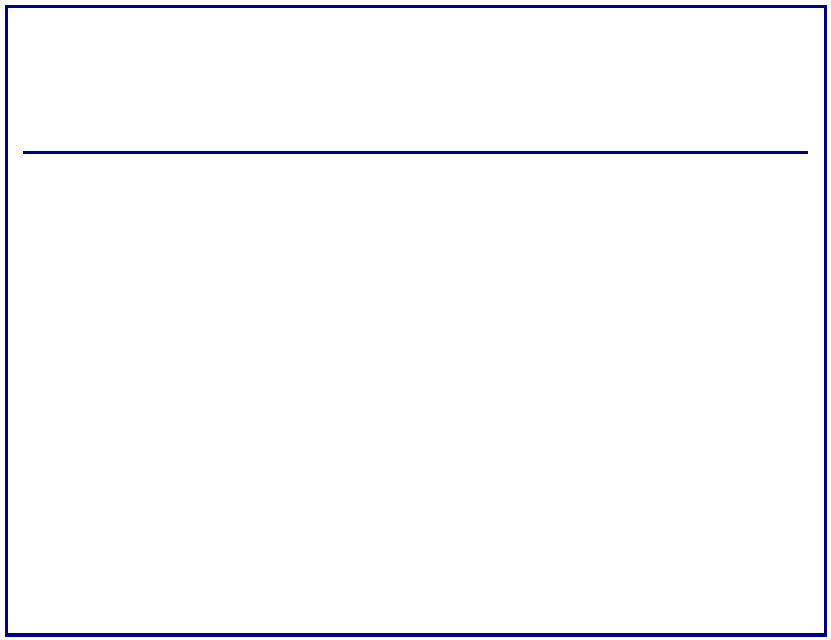

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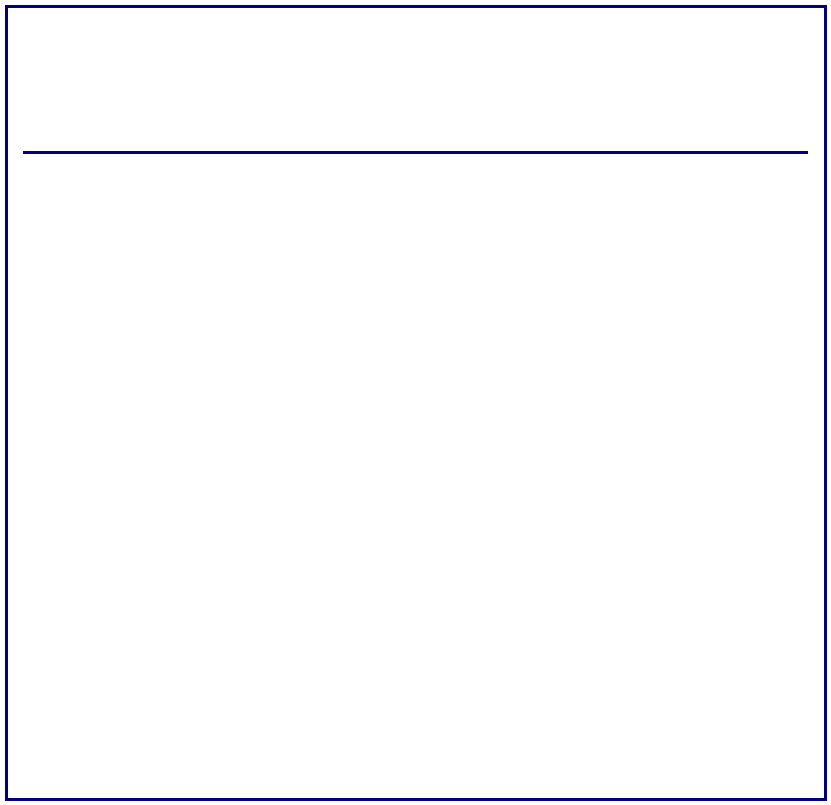

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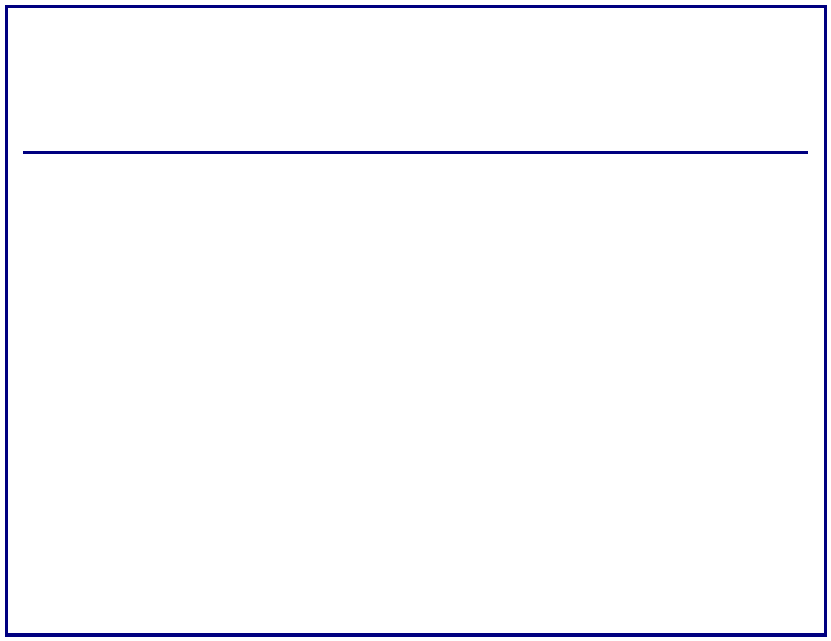

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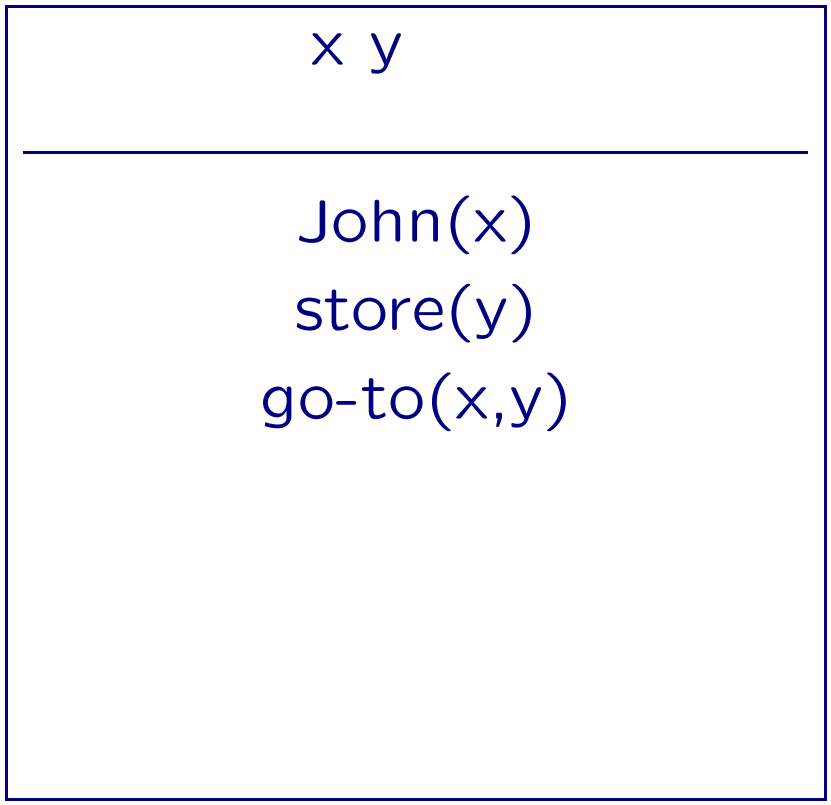

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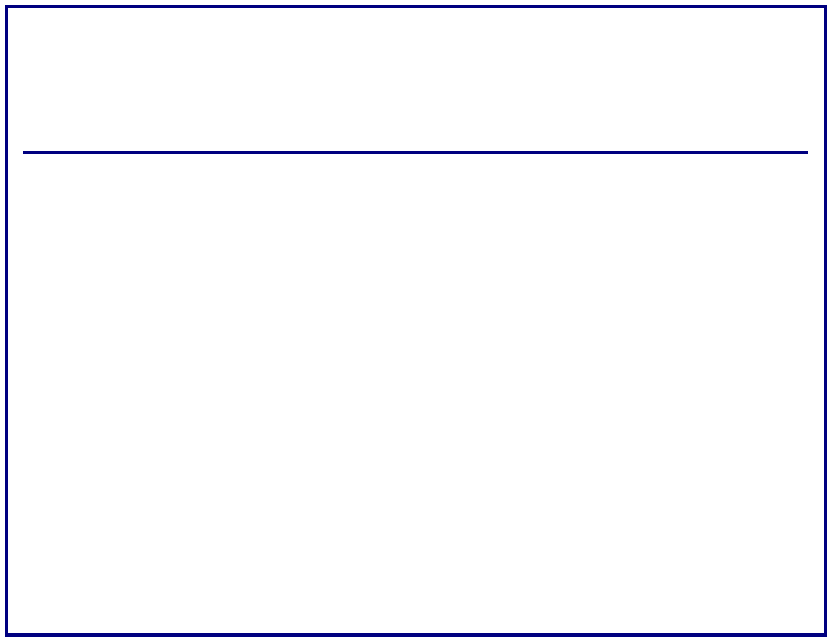

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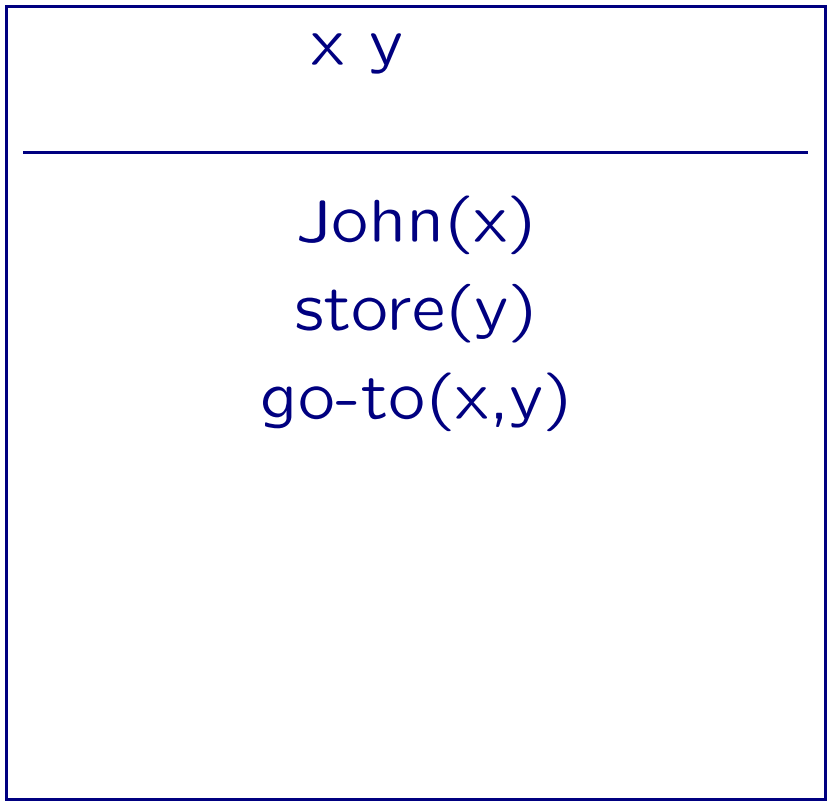

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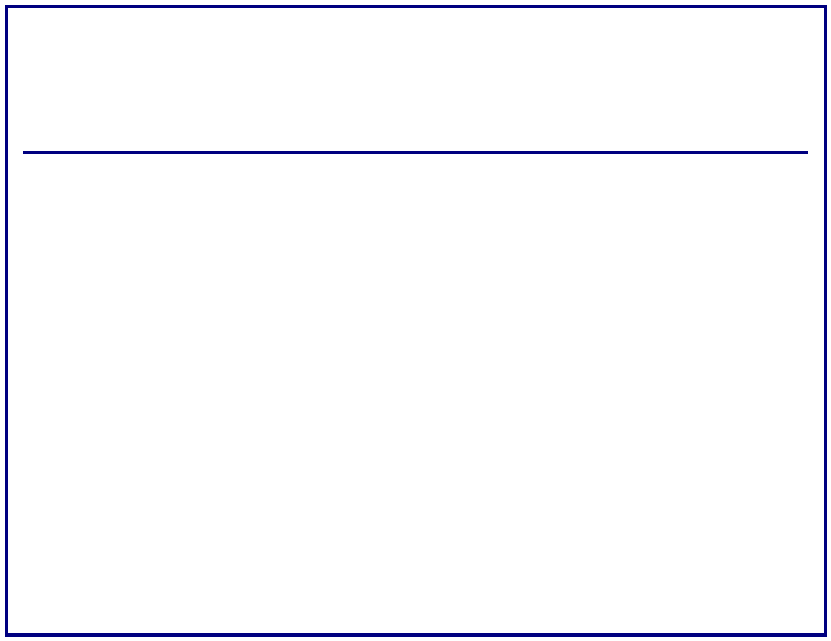

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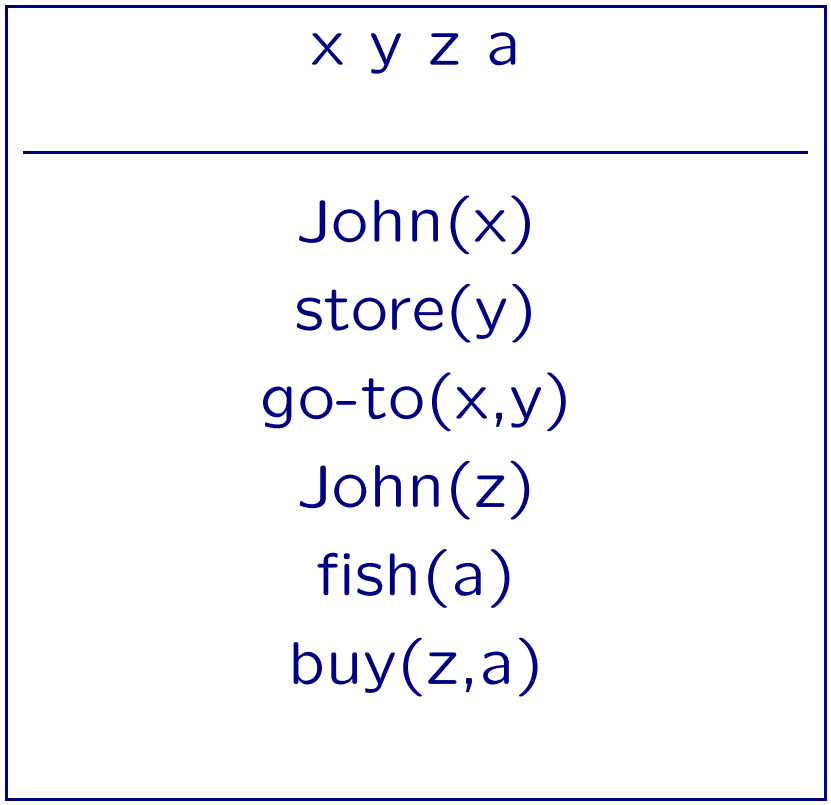

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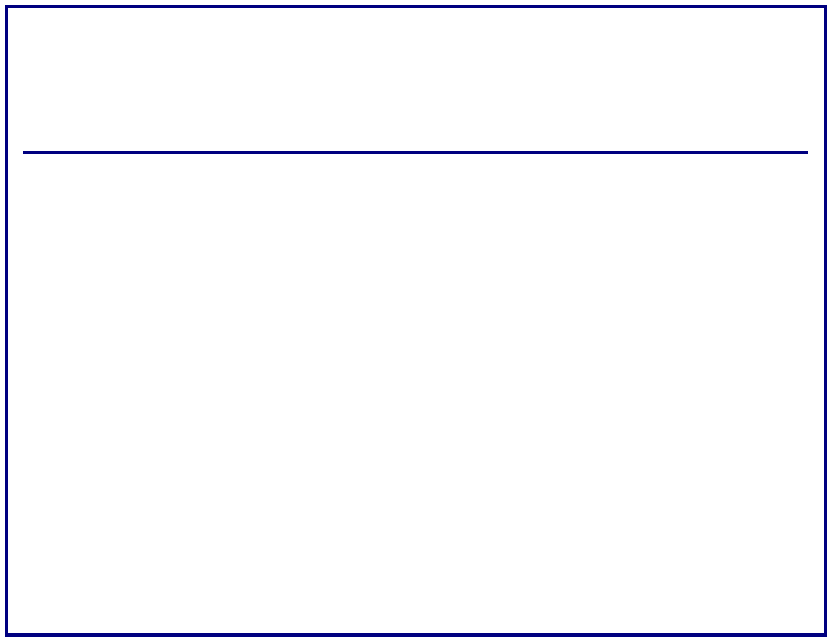

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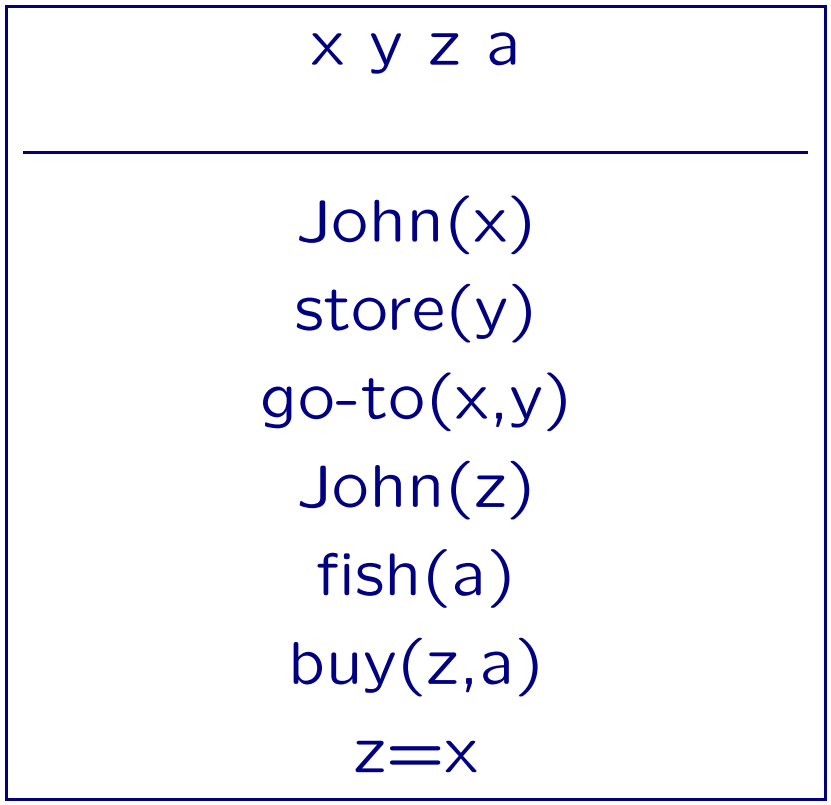

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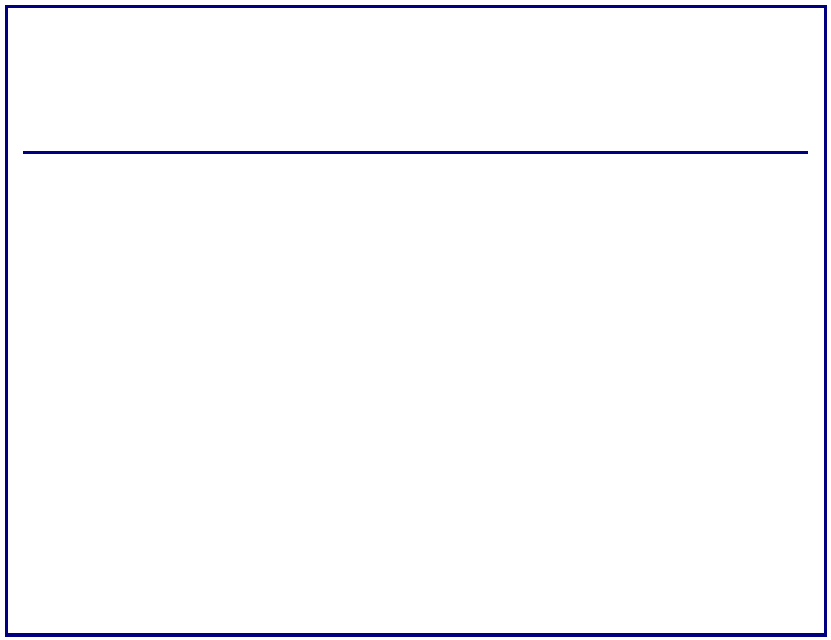

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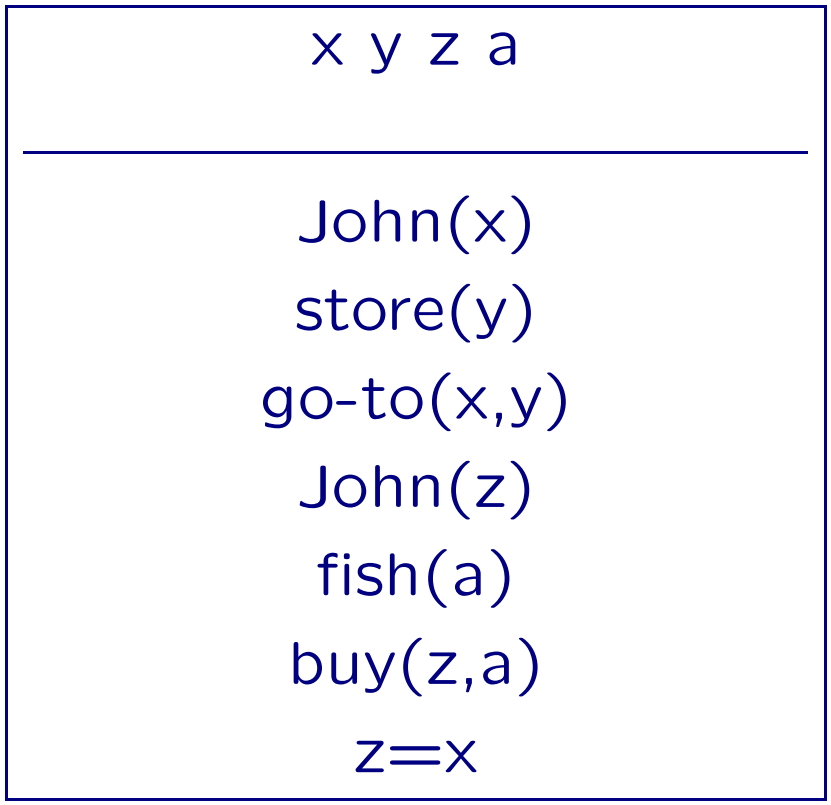

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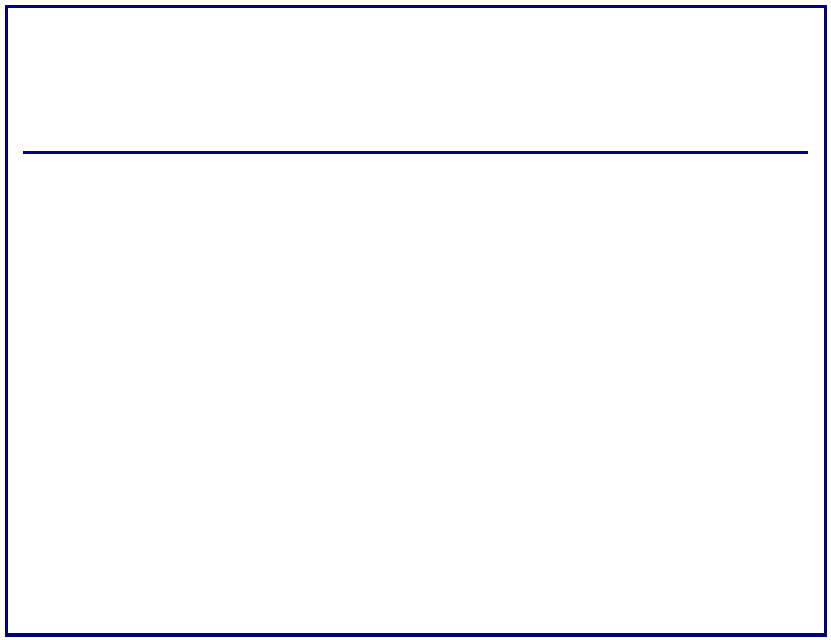

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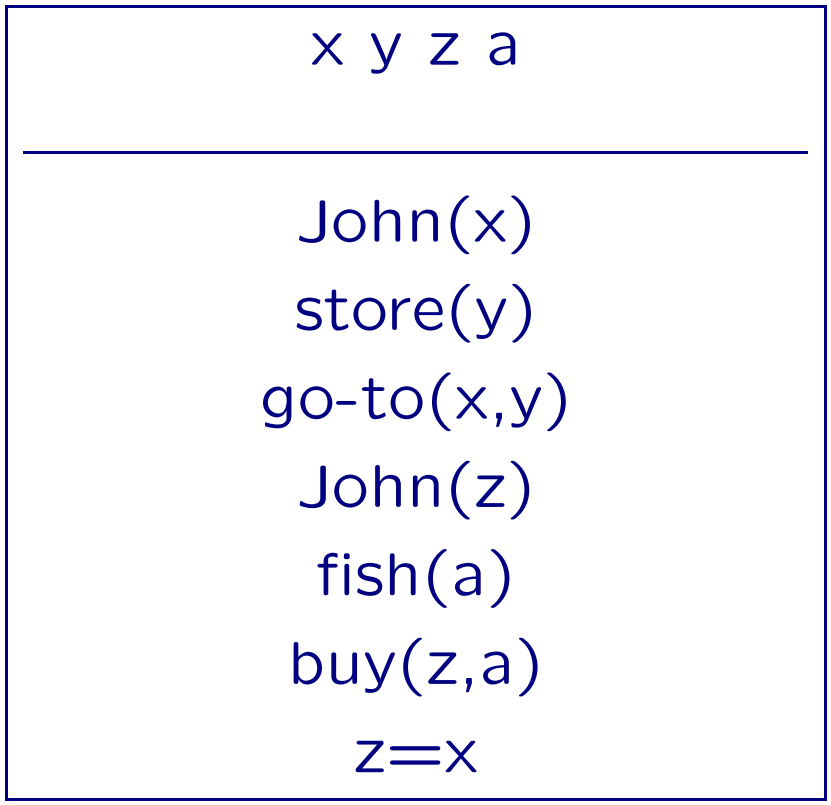

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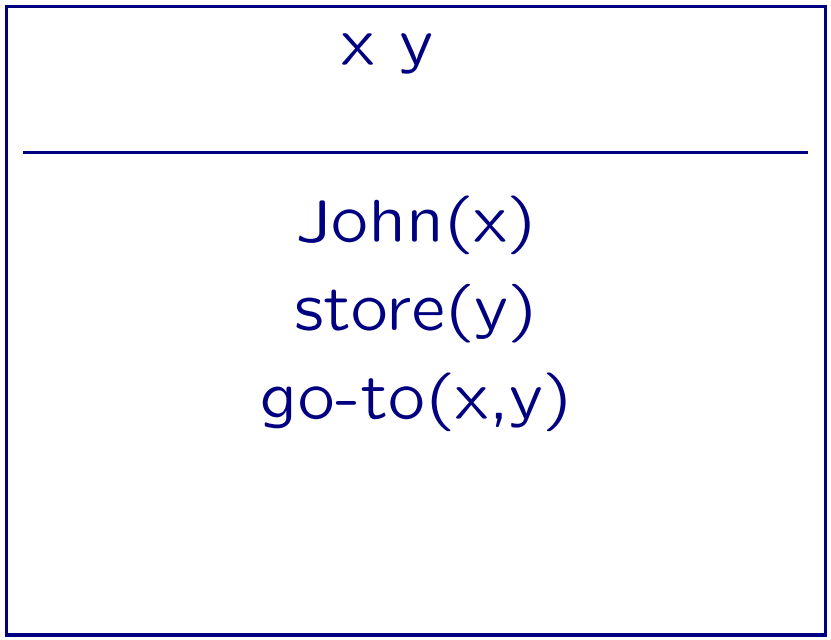

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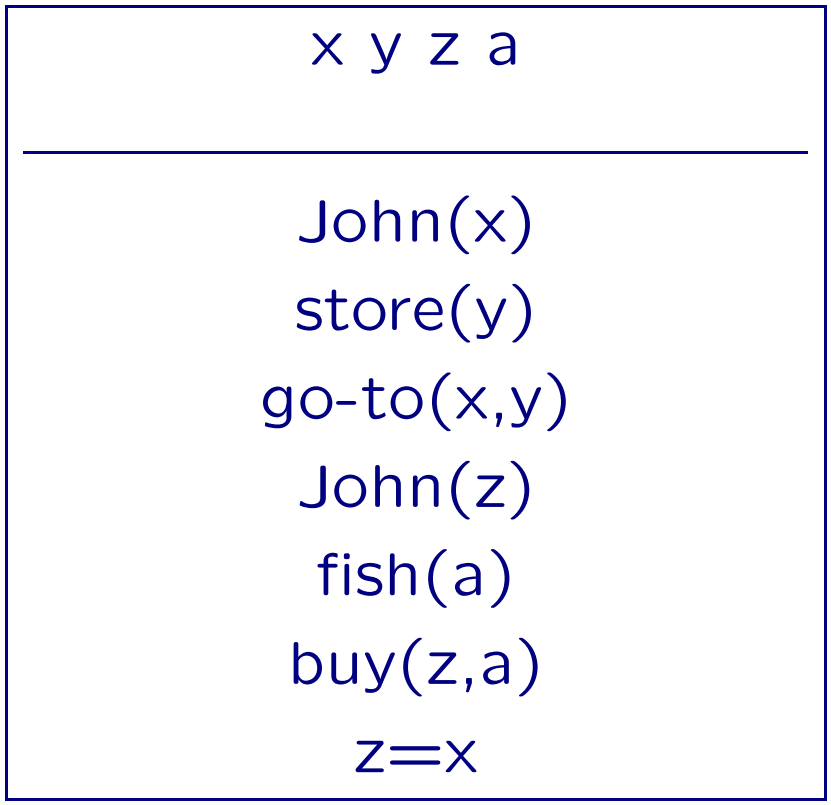

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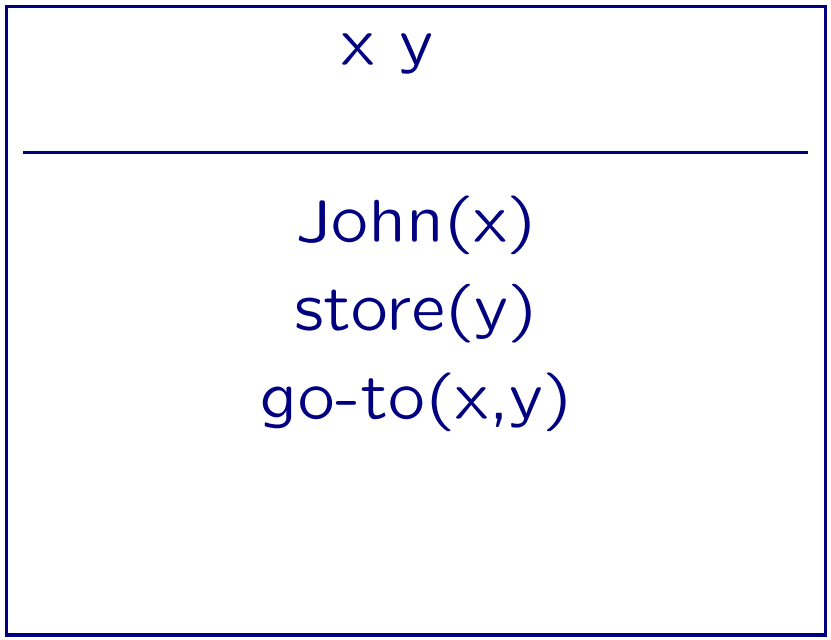

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x y z a
John(x)
store(y)
go-to(x,y)
John(z)
fish(a)
buy(z,a)
z=x

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... Perhaps next time?

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How did *you* decide in each case? Did you choose the SUBJECT?

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Question: How is the referent list ordered?

Answer: Some have said that it is ordered by syntactic prominence (e.g., classical Centering Theory Grosz and Sidner, 1986; Grosz et al., 1995); that is, *subject-preference*:

$$subject > object > others$$

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1. John$_i^{\star\bullet}$ could easily hit Matt$_j$. He ...
2. Matt$_j^{\star}$ was easy for John$_i^{\bullet}$ to hit $\emptyset_j$. He ...

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1. John$_i^{\star\bullet}$ could easily hit Matt$_j$. He ...
2. Matt$_j^{\star}$ was easy for John$_i^{\bullet}$ to hit $\emptyset_j$. He ...

Predictions about pronoun interpretation preferences are different depending on whether subject or agent preference determines order of referent list.

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order determined by	preferred target of pronoun
subject-preference	SUBJECT $\star$
agent-preference	AGENT $\bullet$

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CONTROL	John$_i$ could easily hit Matt$_j$.
AGENT	He$_i$ even managed to land a knockout punch.
PATIENT	He$_j$ became bruised and bloodied all over.

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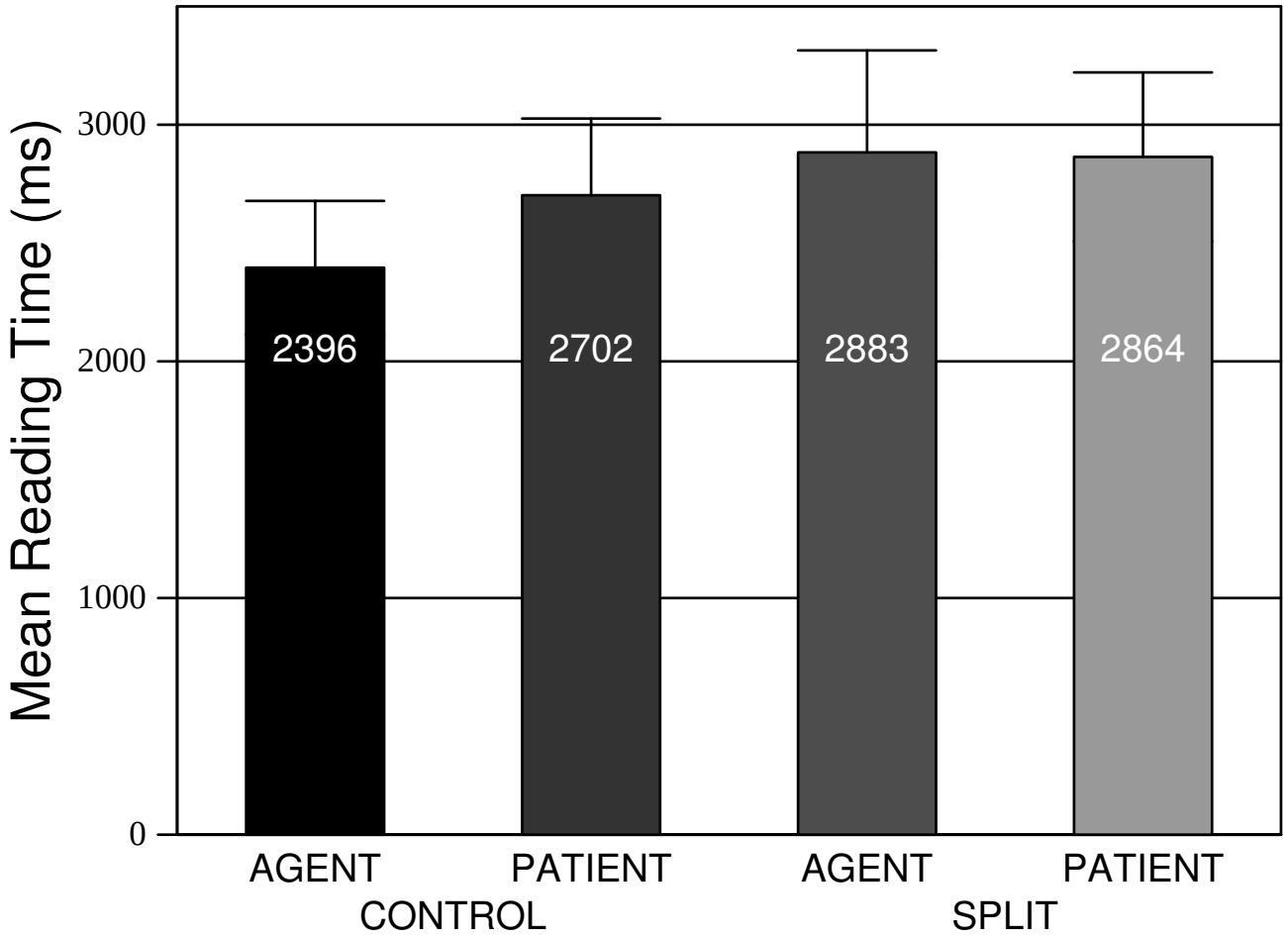
Procedures: Stimuli were shown one sentence at a time in a self-paced reading task. Measurements of the continuation sentence were recorded. Participants included 32 native-English speaking undergraduate students.



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Pronoun Interpretation

John could easily hit Matt.

x y
John(x)
Matt(y)
hit(x,y)
⋮

Matt was easy for John to hit.

x y
John(x)
Matt(y)
hit(x,y)
⋮

Pronoun Interpretation

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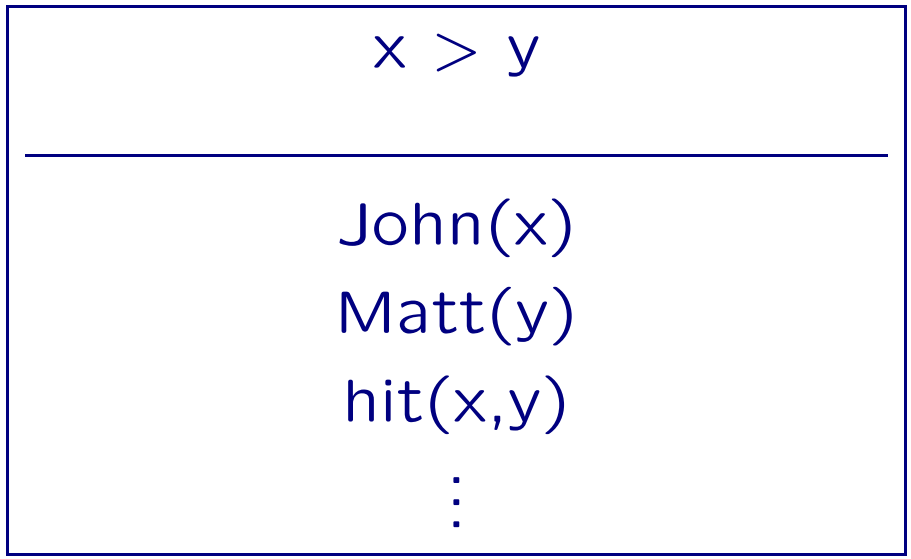
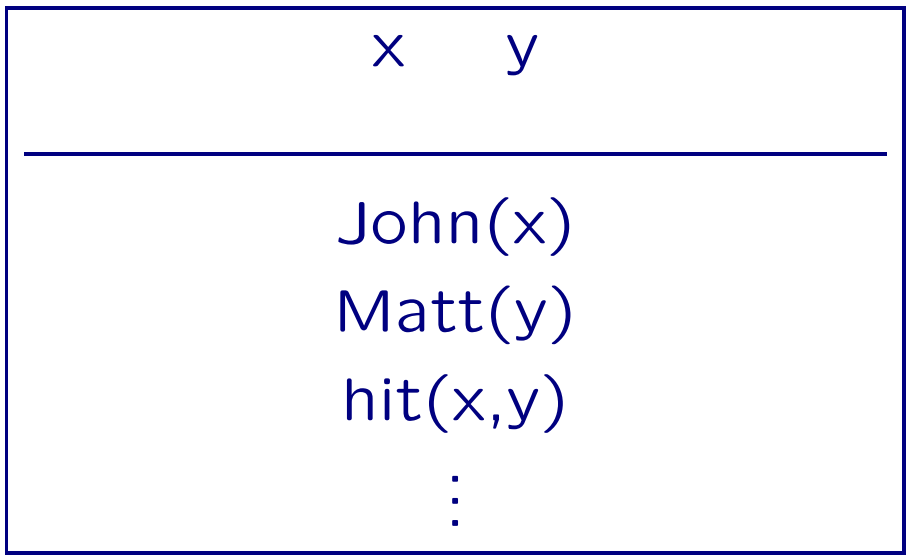


Matt was easy for John to hit.



Pronoun Interpretation

John could easily hit Matt.

He ...

x > y
John(x)
Matt(y)
hit(x,y)
⋮

Matt was easy for John to hit.

x y
John(x)
Matt(y)
hit(x,y)
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Pronoun Interpretation

John could easily hit Matt.

He ...

$x > y$

John(x)

Matt(y)

hit(x,y)

⋮

Matt was easy for John to hit.

$x = y$

John(x)

Matt(y)

hit(x,y)

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So, *both* subject preference and agent preference influence the order of the list of referents in DRT.

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So, *both* subject preference and agent preference influence the order of the list of referents in DRT.

But, perhaps it's even more complex ...

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Listen to the sentences and decide whether the pronoun *he* refers to *John* or *Matt* in each case.

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- John met Matt at the party.
  He became happy.
- John gave Matt a present for Christmas.
  Then he gave him a hug.

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Listen to the sentences and decide whether the pronoun *he* refers to *John* or *Matt* in each case.

- John met Matt at the party.
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- John was easy for Matt to beat in the race.
  After that, he ran home.

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- John asked Matt to be quiet.
  Then *he* got angry.

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- John saw Matt because he ran home.

How did *you* decide in each case?

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- Coherence Relations: Stevenson et al. (1994, 2000)

Pronoun Interpretation

So, the order of the list of referents is determined by a large number of factors in a rather complex way. There are some proposals for how to combine these factors.

Additive Lappin and Leass (1994)

Constraint Beaver (2003)

Combinatorial Rose (2005)

Experiment Planning

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Objective: Investigate a "repeated-name penalty" in Japanese.

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One problem: empty pronouns in Japanese:

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b. Soshite, [Tarou wa] Jirou ni nagutta.

With empty pronouns, (b) will always be read faster.

Experiment Planning

But is there any difference between nouns introduced as subjects and objects?

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Will there be a larger penalty for (1) than for (2)?

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Conclusions

So, today I have showed you a few things about how people process discourse:

- Discourse processing is context-dependent.
- DRT provides a nice framework in which to develop a comprehensive model of discourse processing.
- The interpretation of pronouns in discourse depends on a wide variety of factors.

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Future Work:

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- (For me) How is discourse processing in Japanese different from that in English?

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Future Work:

- (For me) How is discourse processing in Japanese different from that in English?
- What is the best way to explain the way that various factors influence pronoun interpretation?
- Is there any analogy to the *repeated-name penalty* in Japanese discourse processing?

Thank You!

References

Arnold, J. (1998). *Reference Form and Discourse Patterns*. PhD thesis, Stanford University.

Asher, N. and Lascarides, A., editors (2003). *Logics of Conversation*. Cambridge University Press, Cambridge, UK.

Beaver, D. (2003). The optimization of discourse anaphora. *Linguistics and Philosophy*, 27:3–56.

Gordon, P., Grosz, B., and Gilliom, L. (1993). Pronouns, names, and the centering of attention in discourse. *Cognitive Science*, 17:311–347.

Grosz, B., Joshi, A., and Weinstein, S. (1995). Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics*, 21:203–225.

Grosz, B. and Sidner, C. (1986). Attention, intentions, and the structure of discourse. *Computational Linguistics*, 12:175–204.

Hirschberg, J. and Pierrehumbert, J. (1986). The intonational structuring of discourse. In *Proceedings of the 24^{th} Conference of Association for Computational Linguistics*, pages 136–144, New York.

Hobbs, J. (1979). Coherence and coreference. *Cognitive Science*, 3:67–90.

Hudson-D'Zmura, S. and Tanenhaus, M. (1997). Assigning antecedents to ambiguous pronouns: The role of the center of attention as the default assignment. In Walker, M., Joshi, A., and Prince, E., editors, *Centering Theory in Discourse*, pages 199–226. Clarendon Press, Oxford.

Kamp, H. (1981). A theory of truth and semantic representation. In Groenendijk, J., Janssen, T., and Stokhof, M., editors, *Formal Methods in the Study of Language*, pages 277–322. Mathematisch Centrum, Amsterdam.

Kamp, H. and Reyle, U. (1993). *From Discourse to Logic*. Kluwer Academic, Dordrecht.

Kehler, A. (2002). *Coherence, Reference, and the Theory of Grammar*. CSLI Publications, Stanford University, CA.

Lappin, S. and Leass, H. (1994). An algorithm for pronominal anaphora resolution. *Computational Linguistics*, 20:535–561.

Mathews, A. and Chodorow, M. (1988). Pronoun resolution in two-clause sentences: Effects of ambiguity, antecedent location, and depth of embedding. *Journal of Memory and Language*, 27:245–260.

Rose, R. (2005). *The Relative Contribution of Syntactic and Semantic Prominence to the Salience of Discourse Entities*. PhD thesis, Northwestern University.

Rose, R. (2006). Evidence for gradient salience: What happens with competing non-salient referents during pronoun resolution. In *Proceedings of the Australian Language Technology Workshop*, pages 91–98, University of Sydney.

Smyth, R. (1994). Grammatical determinants of ambiguous pronoun resolution. *Journal of Psycholinguistic Research*, 23(3):197–229.

Stevenson, R., Crawley, R., and Kleinman, D. (1994). Thematic roles, focus and the representation of events. *Language and Cognitive Processes*, 9:519–548.

Stevenson, R., Knott, A., Oberlander, J., and McDonald, S. (2000). Interpreting pronouns and connectives: Interactions among focusing, thematic roles and coherence relations. *Language and Cognitive Processes*, 15(3):225–262.

Stevenson, R., Nelson, A., and Stenning, K. (1995). The role of parallelism in strategies of pronoun comprehension. *Language and Speech*, 38(4):393–418.