

Move and accommodate: A solution to Haddock's Puzzle

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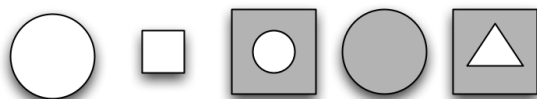
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1 Introduction

Outline

1. Definites embedded in other definites have mysteriously weakened presuppositions (Higginbotham (2006) called it “The simplest hard problem I know” ...)
2. This problem can be reduced to standard assumptions about accommodation and inverse linking
3. Predicted locality effects are experimentally confirmed, but appear to be soft constraints

Uniqueness conditions on singular definite descriptions



Example 1. The circle is in the square.

- Odd because there are several circles and several squares
 - Except if you point (anaphoric use)

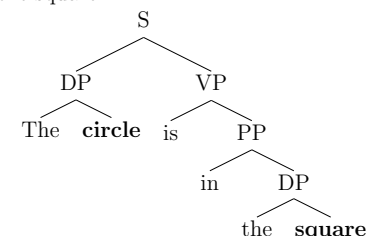
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“The” presupposes that its sister node is unique

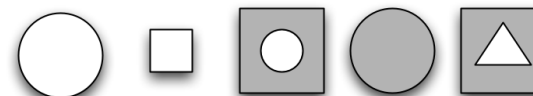
Tree for “The circle is in the square”:



- The upper “the” requires that there be only one **circle**
- The lower “the” requires that there be only one **square**

$$- \llbracket \text{the} \rrbracket = \lambda N : \exists ! x N(x). \iota x N(x) \quad (\text{Frege, Heim \& Kratzer})$$

Embedded definites: Test your intuitions



Example 2. The circle in the square is white.

- OK without pointing – **even though** there are several squares and several circles

(Haddock, 1987; Meier, 2003; Higginbotham, 2006)

Test your intuitions again

A different picture this time ...

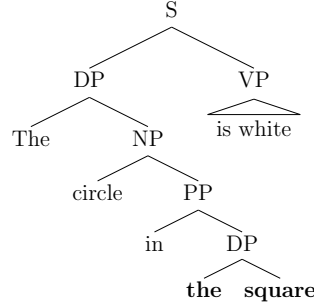


Example 3. The circle in the square is white.

- Now, pointing is required again or the sentence is odd!
- It seems a new presupposition has been introduced: that **there is exactly one nested circle-in-a-square pair**.

Why this is a problem for compositional semantics

Tree for “The circle in the square is white”:



The lower “the” doesn’t trigger its usual presupposition that there is only one square. (Haddock, 1987)

- Why is this possible at all?
- Why is there still a presupposition that there is only one circle-in-a-square?
- Why do “The circle in the square” and “The circle is in the square” have different presuppositions?

Discussion

The problem is due to two assumptions:

- that a definite description must always be interpreted in situ
- that its uniqueness presupposition is determined exclusively by the noun.

2 This proposal

Inverse linking and accommodation

We propose:

- that definite descriptions must undergo quantifier raising in certain cases, including **inverse linking configurations**

- that their uniqueness presupposition is interpreted relative to the set of those items that satisfy the presuppositions of their nuclear scope

– e.g. by **intermediate accommodation** (Kratzer, 1989; Berman, 1991)

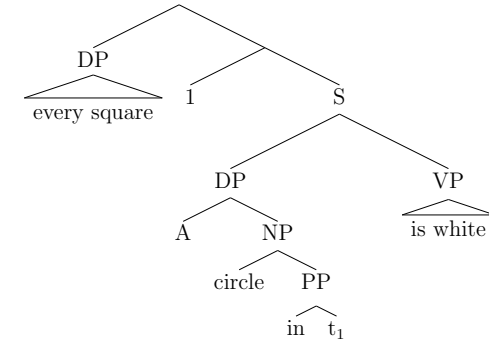
Both assumptions are natural if we represent definite descriptions as QNPs (e.g. Russell, 1905; Barwise and Cooper, 1981; Neale, 1990):

$$\llbracket \text{the} \rrbracket = \lambda N : [\exists! x N(x) \wedge \text{Presupp}(x)]. \lambda VP. VP(\iota x N(x))$$

- For concreteness, we assume that inversely linked QNPs adjoin to S (Sauerland, 2005). But this is not crucial.

An example of inverse linking

Example 4. A circle in every square is white.



$$\forall x[\text{square}(x) \rightarrow \exists y[\text{circle}(y) \wedge \text{in}(y, x) \wedge \text{white}(y)]]$$

Inverse linking with intermediate accommodation

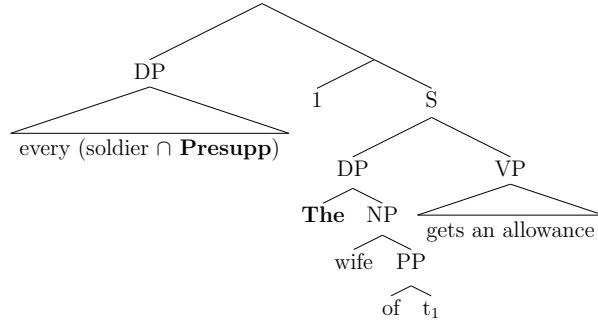
Example 5. On enlistment, **the wife of every soldier** receives from the government a separation allowance of \$20 a month, recently increased to \$25 a month.¹

- No presupposition failure, even if not every soldier has a wife
- The restrictor of *Every* contains only those soldiers *s* for which the presupposition of the nucleus *the wife of s* is satisfied

¹Attested example: Ames, Hebert, Canada’s War Relief Work. The Annals of the American Academy of Political and Social Science 1918, 79: 44

Inverse linking with intermediate accommodation

Tree for “The wife of every soldier gets an allowance”:

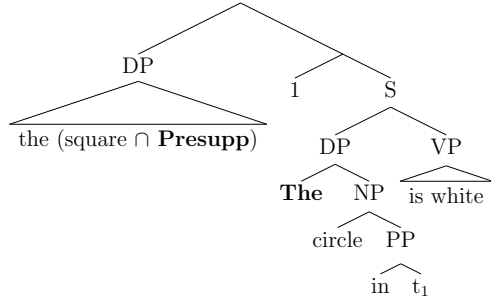


$$\forall x[\text{soldier}(x) \wedge \mathbf{Presupp}(x) \rightarrow \text{gets-an-allowance}(\iota y.\text{wife-of}(y, x))]$$

$\text{Presupp}(x)$ = there is exactly one wife of x (i.e. x is married)

Application to our example

Tree for “The circle in the square is white”:



$$\text{is-white}(\iota y[\text{circle}(y) \wedge \text{in}(y, \iota x[\text{square}(x) \wedge \mathbf{Presupp}(x)])])$$

$\text{Presupp} = \lambda x.$ there is exactly one circle in x

Accommodation produces the right truth conditions

Truth conditions for “The circle in the square is white”:

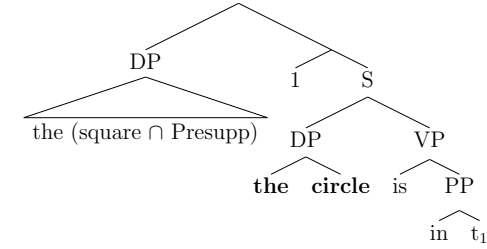
$$\text{is-white}(\iota y[\text{circle}(y) \wedge \text{in}(y, \iota x[\text{square}(x) \wedge \text{there is exactly one circle in } x])])$$

Presupposition: The number of squares that contain exactly one circle is one.

Assertion: The circle in that square is white.

Accommodation in non-inverse linking cases is vacuous

Tree for “The circle is in the square”:



$$\text{is-in}(\iota y[\text{circle}(y)], \iota x[\text{square}(x) \wedge \text{Presupp}(x)])$$

$\text{Presupp}(x) = \lambda x.$ there is exactly one circle **in the whole domain**

(Similarly: #The wife accompanied every soldier.)

3 Comparison with previous accounts

Haddock (1987)

- A constraint-based computational account
- Context is successively narrowed down as the sentence is evaluated word-by-word
- After “the circle in ...”, context contains only circles in things, and things that contain circles
- Observationally equivalent to our account as long as the effect can be restricted to **nested** definite descriptions:
 - The circle in the square is white.
 - # The circle is in the square.

- But no explanation in terms of independently justified mechanisms

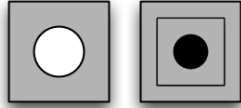
Meier (2003)

- Definite descriptions stay in situ
- Nonstandard syntax (“in the” is a constituent!) and entries for “in” and “the”.
- The NP “circle in the square” means “circle in exactly one square”, without any presuppositions. But that seems wrong:

- Every circle in the square is white.
- ≠ Every circle in exactly one square is white.

- Different predictions for the following picture:

Example 6. The circle in the square is white.



Meier predicts that it is felicitous, even though the black circle is in two squares. Our account predicts that it should be odd.

4 Locality prediction

Movement and locality

- Our account differs from all previous approaches by explaining embedded definites via **movement**. Movement is subject to locality constraints.
- Only our account predicts that the effect should degrade when we insert an **island** between the two definites.

Illustration of the locality effect

Inverse linking is degraded or impossible in subject relatives containing an object quantifier (Rodman, 1976):

Examples 7.

- An apple in every basket is rotten.
- # An apple that is in every basket is rotten.

Examples 8.

- The wife of every soldier attended the ceremony.
- # The woman who married every soldier attended the ceremony.

Our prediction

Embedded definites should be sensitive to the same constraint:

Examples 9.

- The circle in the square is white.
- # The circle that is in the square is white.

5 Online survey

Testing the locality prediction

Forced-choice experiment with drop-down boxes:

No-island condition: The circle in

Select
the
a

 square is white.

Island condition: The circle that is in

Select
the
a

 square is white.

Prediction: People are significantly less likely to choose “the” if there is an island

- Assuming a background preference for “the” (Maximize presupposition, Hawkins (1981); Heim (1992))
- Caution: All islands leak! (Island effects are rarely clear-cut)

Online survey setup

- 1200 participants, recruited via Amazon Mechanical Turk at a total cost of about \$38 (about 3 cent per answer).
- Kept only native speakers who grew up and now live in the US. Removed repeat participants and incomplete answers.
 - 797 participants after cleanup
- Each participant saw instructions, the picture, one test item, and three fillers. Each gave only one data point apart from demographics.
- The words “a” and “the” in the dropdown boxes were presented in random order.

Results confirm our locality prediction

No-island condition:

The circle in

the	85.5%	(N = 336)
a	14.5%	(N = 57)

 square is white.

Island condition:

The circle that is in

the	76.2%	(N = 308)
a	23.8%	(N = 96)

 square is white.

Prediction confirmed:

People are significantly less likely to choose “the” if there is an island.

- $\chi^2 = 11.0088$ (1 degree of freedom); $p < 0.001$
- But only a preference, not a hard constraint

6 Summary

Our account is the first to reduce the embedded-definites effect to independently supported properties of quantifiers: **movement** and **accommodation**.

Q: Why can you say “The circle in the square is white” even when there are two circles and two squares?

A: “The square” moves above “the circle in ...” and accommodates the presupposition of that phrase into its own.

Q: Why is “The circle is in the square” odd in the same situation?

A: “The circle” does not contain the trace of “the square” in its restrictor, so it has its usual presupposition, i.e. that there is exactly one circle in the whole domain.

7 Outlook

- Can be seen as a new argument for a treatment of definite descriptions as scope-taking
 - Natural if $\llbracket \text{the square} \rrbracket$ is $\langle et, t \rangle$ (Russell, 1905; Barwise and Cooper, 1981; Neale, 1990; Isac, 2006)
 - How do referential accounts (Frege, 1892; Strawson, 1950) account for the facts?
- Attempts to reduce local accommodation to pragmatic principles (von Fintel, 1994) or anaphora resolution (van der Sandt, 1992): How do they fare on embedded definites?
- Why do definite complements of relational nouns not accommodate? Meier (2003) reports that “The destruction of the city occurred at midnight” is odd if there are two cities, of which one was destructed, and a small village was also destructed.

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8 Appendix

Mechanical Turk: Lessons learned

- Quick and cheap way to perform very-large-scale surveys
- Forced-choice worked best for us
 - Strong order effect, but can be counterbalanced
- Sentence rating on a numbered scale didn't work well
 - Most people gave both sentences a 10 on a 1-10 scale
- Thermometer scale confuses participants, most likely also magnitude estimation. They mostly flocked to a few salient values
- MTurk GUI has limited functionality (possibly less so in API)
 - On mturk.com, only one screen per survey, no Next button
 - Taking people to your own website reportedly reduces participant rate, but allows for more flexible design
 - No easy way to prevent repeat participants – but IDs can be used to filter them out afterwards

Mechanical Turk participants love linguistic experiments!

Some comments by participants:

- *Fun little task, wish I could do more than one.*
- *This HIT is “different”.*
- *More HITs like this*
- *I hope that there will be future HITs that ask for my natural and first reaction to something. I prefer these types of HITs to a lot of the dull stuff out there on the Mechanical Turk virtual workplace.*
- *The sentences lead me to believe that you are looking for the everyday usage of words not necessarily to correct usage. The English language has long been skewed for the comfort of individuals.*