

## Embedded implicatures

- Gricean: Embedded implicatures are the exception.
- Conventionalist: Embedded implicatures “occur systematically and freely.” (Chierchia, Fox, and Spector)

### The problem

- (1) Bob believes that Edna ate some of the cookies.
- Gricean pragmatics only predicts the following inference:  
 $\mathbf{Bel}_{\text{Speaker}} \neg \mathbf{Bel}_{\text{Bob}}[\text{Edna ate all the cookies}]$
  - But, on some occasions at least, we would like to have:  
 $\mathbf{Bel}_{\text{Speaker}} \mathbf{Bel}_{\text{Bob}} \neg [\text{Edna ate all the cookies}]$

### The Gricean approach

- Embedded implicatures don't exist.
- But: under special circumstances, we may observe inferences that look like embedded implicatures.
- Example (van Rooij and Schulz, Russell):
  - (1) George believes that some of his advisors are crooks.  
 Implicature:  $\mathbf{Bel}_S \neg \mathbf{Bel}_G[\text{all of G's advisors are crooks}]$   
 Assumption:  $\mathbf{Bel}_S \mathbf{Bel}_G[\text{all of G's advisors are crooks}] \vee$   
 $\mathbf{Bel}_S \mathbf{Bel}_G \neg [\text{all of G's advisors are crooks}]$   
 Ergo:  $\mathbf{Bel}_S \mathbf{Bel}_G \neg [\text{all of G's advisors are crooks}]$
- ☞ Note that this analysis does not readily generalise to other forms of embedding.

## The conventionalist approach

- Silent “only”:  
 $\mathbf{So}[\varphi]$  is true iff  $\varphi$  is true and  
 $\forall \psi \in \text{Alt}(\varphi)$ : if  $\psi$  is stronger than  $\varphi$ , then  $\psi$  is false.
- **So** is inserted in the parse tree ad libitum.
- The strongest reading is preferred.
- Examples:
  - (1) a. George believes that some of his advisors are crooks.  
b. **So**[George believes that some of his advisors are crooks]  
c. George believes that **So**[some of his advisors are crooks]
  - (2) a. You can have an apple or a pear.  
b. **SoSo**[you can have an apple or have a pear]  
c. **SoSo**[you can **So**[have an apple] or **So**[have a pear]]

## Experiments 1a-b: Participants, method

- Participants: 30 and 31 French-speaking students
- Sample trial:

Emilie says:

“Betty thinks that Fred heard some of the Verdi operas.”

Would you infer from this that Betty thinks that Fred didn’t hear all the Verdi operas?

yes     no

## Experiments 1a-b: Materials

	target sentence	candidate inference
	$\emptyset$ Fred heard some of the Verdi operas.	He didn’t hear all of them.
<b>all</b>	All students heard some of the Verdi operas.	None of the students heard them all.
<b>must</b>	Fred has to hear some of the Verdi operas.	He isn’t allowed to hear all of them.
<b>think</b>	Betty thinks Fred heard some of the Verdi operas.	She thinks he didn’t hear all of them.
<b>want</b>	Betty wants Fred to hear some of the Verdi operas.	She wants him not to hear all of them.

## Experiments 1a-b: Results and discussion

	$\emptyset$	all	must	think	want
Experiment 1a	.93	.27	.03	.50	—
Experiment 1b	.94	—	—	.65	.32

- Overall, the rates of embedded implicatures are very low.
- The only exception is “think”.
- Differences between complex conditions are significant.

## Two ways of rescuing conventionalism

- **Complexity argument:** Low rates of embedded implicatures are due to increased processing demands.
- **Implausibility argument:** In the complex conditions, embedded implicatures were suppressed because they yielded implausible interpretations.

## Problems with the complexity argument

Mary has to put some but not all of the stamps in a blue envelope.  
HENCE: She is not allowed to put all the stamps in the blue envelope.

- 27 out of 31 subjects agreed that this argument is valid.

## Problems with the implausibility argument (1)

The argument doesn't work for embedding under "all" or "thinks":

- (1) All students heard some of the Beethoven symphonies.
  - a. All students heard some but not all of the Beethoven symphonies.
  - b. All students heard some and maybe all of the Beethoven symphonies.
- (2) Betty thinks that Fred heard some of the Beethoven symphonies.
  - a. Betty thinks that Fred heard some but not all of the Beethoven symphonies.
  - b. Betty thinks that Fred heard some and maybe all of the Beethoven symphonies.

## Problems with the implausibility argument (2)

Contrary to widespread opinion, genuine implicatures aren't so easy to cancel:

- (1) In order to prevent the rinderpest from spreading through his herd, some of Jones's cows were vaccinated.
- (2) Edna threw all her marbles in the swimming pool. Some of them sank to the bottom.
- (3) Harry wants some of his grandchildren to be happy.

## Problems with the implausibility argument (3)

- Embedded implicatures were relatively frequent with “think” (57.5%), practically non-existent with “must” (3%), and rare with “all” (27%) and “want” (32%).
- If the argument from implausibility is correct, people’s plausibility judgements should mirror these differences.
  - (1) a. Betty thinks that Fred read some but not all of the Harry Potter books.  
b. All the students read some but not all of the Harry Potter books.  
c. Fred has to read some but not all of the Harry Potter books.

## Worries about the inference paradigm

- If people endorse an argument when asked, that doesn’t mean they would spontaneously draw the same conclusion under normal circumstances.
- The very question whether (1b) follows from (1a) changes the context in which (1a) is interpreted:
  - (1) a. Fred has heard some of the Verdi operas.  
b. Fred hasn’t heard all the Verdi operas.
- People may endorse embedded implicatures simply because they are superficially similar to inferences that *are* pragmatically valid.

## Experiment 2: Procedure

- Participants: 29 native speakers of Dutch.
- Design: compare inference paradigm with verification paradigm.
- Target sentence:

Some of the B’s are in the box on the left.
- Inference task: “Does it follow from this that not all the B’s are in the box on the left?”
- Verification task: “Is this sentence true in the following situation?”

B B B A A A

C C C
- Check for positive response bias in the verification task.

## Experiment 2: Results

Participants’ performance on the filler items in the verification task was nearly perfect (97% correct).

Rates of positive responses on the critical items:

- Verification task: 66%
- Inference task: 62%

Conclusion: The inference paradigm is biased.

## Experiment 2: Implications

The rates observed in Experiment 1 must have been too high:

	$\emptyset$	all	must	think	want
Experiment 1a	.93	.27	.03	.50	—
Experiment 1b	.94	—	—	.65	.32

## UE and non-DE contexts

- All versions of conventionalism agree that there is a preference for embedded implicatures in upward-entailing (UE) contexts:
  - (2) a. All the squares are connected with some of the circles  $\leadsto$  All the squares are connected with some but not all of the circles.  
b. There is more than one square that is connected with some of the circles  $\leadsto$  There is more than one square that is connected with some but not all of the circles.
- And some versions predict such a preference in all non-DE contexts:
  - (3) There are exactly two squares that are connected with some of the circles  $\leadsto$  There are exactly two squares that are connected with some but not all of the circles.

## Downward-entailing contexts

Everybody agrees that there is no preference for embedded implicatures in downward-entailing (DE) contexts:

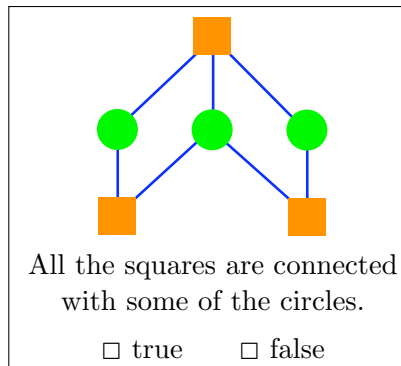
- (1) a. Not all the squares are connected with some of the circles  $\not\leadsto$  Not all the squares are connected with some but not all of the circles.  
b. There isn't more than one square that is connected with some of the circles  $\not\leadsto$  There isn't more than one square that is connected with some but not all of the circles.

## Experiment 3: Goals

- Test conventionalist predictions about UE and non-DE contexts.
- Test our own prediction that the inference paradigm is biased in complex sentences, too.

## Experiment 3: Method

- Participants: 25 native speakers of Dutch.
- Verification paradigm vs. inference paradigm.
- Verification task:



## Experiment 3: Results

Observed rates of embedded-implicature responses  
(predicted rates in brackets):

	verification		inference	
all	1	(0)	.46	(1)
more than one	1	(0)	.62	(1)
exactly two	1	(0)	.5	(1)
exactly two	0	(1)		
not all	.04	(0)	.58	(0)
not more than one	.04	(0)	.46	(0)

- ☞ Conventionalist predictions are consistently off the mark.

## Experiment 3: Method

Verification task:

Betty says:

*“All the squares are connected with some of the circles.”*

Could you infer from this that, according to Betty:

*All the squares are connected with some but not all of the circles.*

yes     no

## Minimal conventionalism

- Embedded implicatures in UE/non-DE contexts may not be preferred,
- but at least speakers know that they are available.

## Experiment 4: Method

- Participants: 22 native speakers of English
- Verification task with three response options: “Yes”, “No”, “Could be either.”
- Ambiguous controls:

The circles and the squares are connected with each other.

true    false    could be either

## Experiment 4: Results

Rates of “could be either” responses for ambiguous items:

The circles and the squares are connected with each other	.82
The green and the orange figures are connected with each other	.73
All the figures are orange and green	.59
There are green circles and squares	.77
The circles and the squares have the same colour	.59

## Experiment 4: Results

Same pattern as in the previous experiment:

	yes	no	both
all	.95	.05	0
more than one	1	0	0
exactly two	.86	.05	.09
exactly two	.09	.77	.14
not all	.09	.86	.05
not more than one	.09	.91	0

## Conclusions

- Overall, we didn't observe embedded implicatures, except under “think”.
- Our data are in line with the Gricean approach and disagree with even the weakest version of conventionalism.