Homogeneity and Plurals: From the Strongest Meaning Hypothesis to Supervaluations

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The problem

(1) **Peter solved the maths problems he was assigned**
$\rightsquigarrow$ Peter solved all the maths problems he was assigned (or almost all)

- Adding a negation in (1) does not yield the 'expected' reading.

(2) **Peter didn't solve the maths problems he was assigned**
$\not\rightsquigarrow$ Peter didn't solve all the maths problems he was assigned
$\rightsquigarrow$ Peter didn't solve any of the maths problems he was assigned (or he solved very few)

Not just a matter of scope

- A *prima facie* plausible analysis: plural definites outscope negation.

But consider:

(3) [No student]$_1$ solved the maths problems he$_1$ was assigned
$\rightsquigarrow$ Every student failed to solve any of the problems he was assigned (or at best solved very few)

The pronoun is bound by ‘No student’, and ‘the maths problems he$_1$ was assigned’ is a ’functional’ definite containing a variable bound by the quantifier, hence trapped in its scope.

Not restricted to plural predication.

(4) a. The wall is blue
b. The wall isn't blue $\rightsquigarrow$ What if the wall is half-blue?

- In this talk I will focus on cases with plural definites combining with distributive predicates.

Homogeneity

Löbner (2000) and previous works by the same author.

Application of a predicate P to a plurality X yields the *presupposition* that X is homogeneous with respect to P in the following sense: either every part of X is P, or none if.

(5) [The maths problems].λX.Peter solved X.

- By this Löbner means that $P(X)$ is neither true nor false if the homogeneity condition is not met.
- Does the homogeneity condition project like a standard presupposition?

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Plan for today

- Argue against a presuppositional account
- Review and improve on a proposal by Krifka (1996) in terms of the Stronger Meaning Hypothesis
- Argue for a supervaluationist view
- Homogeneity and non-maximality (cf. Malamud 2012; Kriz 2013)
- Open issues
- Something I will not do today: discuss Magri's recent paper on this topic. (Magri 2013)

The presuppositional approach (Löbner 1985, 1987, 2000, Schwarzschild 1993)

Distributivity operator Δ (simplistic version)

$$[\![\Delta]\!] = \lambda P_{\langle e,t\rangle}.\lambda X_e : \underline{\forall x_e(x \preceq X \rightarrow P(x)) \vee \forall x_e(x \preceq X \rightarrow \neg P(x))}.$$
$$\forall x_e(x \preceq X \rightarrow P(x))$$

(6) a. The children are blond

b. $(\Delta([\![\text{blond}]\!]))([\![\text{the children}]\!])$

$\rightsquigarrow$ Presupposes that either all the children are blond or none of them is

$\rightsquigarrow$ Asserts that all the children are blond

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$\rightsquigarrow$ Asserts that all the children are blond

(7) The children are not blond
$\rightsquigarrow$ Presupposes that either all the children are blond or none of them is
$\rightsquigarrow$ Asserts that the children are not all blond
$\rightsquigarrow$ None of them are.

A weak objection: epistemic status - WAM test

(8) a. Does John know that Mary either bought all the jewels or none of them ?
b. Wait a minute! I didn't know she cannot possibly have bought just some of them!

(9) a. Did Mary buy the jewels ?
b. #Wait a minute! I didn't know she cannot possibly have bought just some of them.

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A stronger objection: presupposition projection in quantified contexts

- Under the scope of a universal quantifier, a presuppositional predicate P (*stopped smoking*) presupposing p (*used to smoke*) gives rise to *universal projection*. (Chemla 2009)

(10) a. These ten students <u>all</u> stopped smoking
b. These ten students did <u>not all</u> stop smoking
$\rightsquigarrow$ They all used to smoke

Constructing the test-case: projection in universally quantified contexts

- Construct a predicate P that triggers on its own a homogeneity presupposition H:

  P = *read the books*
  H = *read either none or all of the books*

- Prediction: 'All the As are (not) P' presupposes 'All the As are H'

- So what about:

(11) These ten boys did not all read the books

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- So what about:

(11) These ten boys did <u>not all</u> read the books

(12) These ten boys did <u>not all</u> read the books

- (12) is predicted to presuppose that no boy read just some of the books.
- Suppose that 2 boys read none of the books, 4 read about half of them, and 4 read all of them.
- In such a situation, (12) is clearly true.
- A less clear situation: 5 boys read all of the books, and the other 5 read half of them.

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Projection in questions

(13) Did John stop smoking?
$\rightsquigarrow$ John used to smoke.

(14) Did John read the books?
$\not\rightsquigarrow$ If John read some of the books, he read all of them.

(15) Did everyone of these ten boys stop smoking?
$\rightsquigarrow$ They all used to smoke.

(16) Did everyone of these ten boys read the books?
$\not\rightsquigarrow$ None of them read just some of the books

- (16) clearly licenses 'NO' if 2 boys read none of the books, 4 about half of them and four all of them
- Less clear if 5 read half of the books, and the other five all of the books

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(16) Did everyone of these ten boys read the books?
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- (16) clearly licenses 'NO' if 2 boys read none of the books, 4 about half of them and four all of them
- Less clear if 5 read half of the books, and the other five all of the books

Krifka (1996)

- Plural referential expressions trigger an ambiguity between an *existential* and a *universal reading*.

(17) John read the books

a. $\exists x(x \preceq \textit{THE BOOKS} \wedge \textit{John read } x)$

b. $\forall x(x \preceq \textit{THE BOOKS} \rightarrow \textit{John read } x)$

- Stronger meaning hypothesis

Pick the stronger meaning.
Predictions:

(18) a. Universal reading in upward-entailing contexts

b. Existential reading in downward-entailing contexts

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Negation

(19) John read the books

a. $*\exists x(x \preceq \mathit{THE\ BOOKS} \wedge \mathit{John\ read\ x})$

b. $!\ \forall x(x \preceq \mathit{THE\ BOOKS} \rightarrow \mathit{John\ read\ x})$

(20) John didn't read the books

a. $!\ \neg\exists x(x \preceq \mathit{THE\ BOOKS} \wedge \mathit{John\ read\ x})$

b. $*\neg\forall x(x \preceq \mathit{THE\ BOOKS} \rightarrow \mathit{John\ read\ x})$

Negation

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a. *$\exists x(x \preceq \mathit{THE\ BOOKS} \wedge \mathit{John\ read}\ x)$

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Universally quantified contexts

(21) They all read the books.
$\leadsto$ Everyone of them read the books.

(22) They did not all read the books.
$\leadsto$ They did not all read one or more than one of the books.
$\leadsto$ At least one of them didn't read any book.

- True if 2 (out of 10) read none of the books, 4 read about half of them, and 4 read all of them

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(22) They did not all read the books.
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- True if 2 (out of 10) read none of the books, 4 read about half of them, and 4 read all of them

Interrogative contexts

- What to expect: maybe a genuine ambiguity?

(23) Did he read the books?

a. Yes, some of them

b. No, he didn't read all of them

(p.c. Giorgio Magri)

Other DE-contexts

Unclear data.

(24) Whenever my friends visit me, I'm happy.
$\rightsquigarrow$? Whenever some of my friends visit my, I'm happy.

(25) Every student who read the books passed.
$\rightsquigarrow$? Every student who read some of the books passed.

(26) Every student who read the books liked them.
$\rightsquigarrow$? Every student who read some of the books liked the books he read

A problem: non-monotonic contexts

- No prediction for non-monotonic contexts.

(27) Exactly one student solved the maths problems

a. Exactly one student solved some of the maths problems

b. Exactly one student solved all of the maths problems

No reading is stronger than the other one. Hence the SMH cannot pick a winner.

- Failure to generate the most natural reading.

(28) One of the students solved all of the maths problems and all the other students didn't solve any of the maths problems. (cf. also Magri 2013)

(29) Only John solved the maths problems.
$\rightsquigarrow$ John solved all the maths problems, and nobody else solved any.

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(29) Only John solved the maths problems.
$\rightsquigarrow$ John solved all the maths problems, and nobody else solved any.

Fixing the SMH- based account

- A sentence of the from $[_S$ ..... the NPs .....$]$ counts as true if it is true under both the $\exists$-reading and the $\forall$-reading for 'the NPs', false if it is false under both reading, neither clearly true nor false otherwise.
- Same predictions as the SMH-based story when 'The NPs' occurs in a monotonic environment.

Whenever 'The NPs' occurs in a monotonic context, one of the readings entails the other, and so their conjunction is equivalent to the stronger reading.

- This entails that the right projection patterns are predicted for 'Not all'.

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Non-monotonic contexts

(30) Exactly one student solved the maths problems

Exactly one student solved some of the maths problems and exactly one student solved all of the maths problems.

$\Leftrightarrow$

There is a unique student who solved all of the problems, and all the others solved no maths problems.

Supervaluationism

- Three-valued system with an underlying bivalent semantics.
- A model M assigns to *atomic sentences* one of the three values TRUE (1), FALSE (0), UNDEFINED (#)
- Given a model M, M' is a bivalent extension of M if:
  1. M' agrees with M on any atomic sentence that has a standard truth-value in M, and
  2. M' is bivalent, i.e. does not assign # to any atomic sentence.
- Super truth and super falsity

A (possibly complex) sentence ϕ is **super-true** (resp. *super-false)* in a model M if and only if it is true (resp. false) in every bivalent extension of M.

Application to plural definites in basic cases

- Assume that for any individual d, READ-THE-BOOKS(d) is true if d read all of the books, false if d read no books, undefined otherwise

(31) John read the books
$\rightsquigarrow$ If John read some but not all of the books in a model M, the sentence is true in some bivalent extension of M, false in others, hence is neither supertrue nor superfalse.

(32) John didn't read the books
$\rightsquigarrow$ super-true in M if true in every bivalent extension of M, i.e. (32) false in every extension of M. This can be the case only if John didn't read any of the books

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Non-monotonic contexts again

(33) Only John read the books
$\rightsquigarrow$ Desired prediction: supertrue just in case John read all of the books and nobody else read any books.

- We have to show that (33) can't be supertrue if either John didn't read all of the books or someone different from John read at least one of the books.
- Consider a model M in which 'John didn't read all the books' is true, i.e. 'John read the books' is false or undefined. Then in some bivalent extension M' of M, 'John read the books' is false, making (33) false in M', hence not supertrue.
- Consider a model M in which an individual d, named by D, distinct from John, read some or all of the books. In some bivalent extension M' of M, 'D read the books' is true, hence (33) is false in M', hence not supertrue.

Non-monotonic contexts again

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- Consider a model M in which 'John didn't read all the books' is true, i.e. 'John read the books' is false or undefined. Then in some bivalent extension M' of M, 'John read the books' is false, making (33) false in M', hence not supertrue.
- Consider a model M in which an individual d, named by D, distinct from John, read some or all of the books. In some bivalent extension M' of M, 'D read the books' is true, hence (33) is false in M', hence not supertrue.

Non-monotonic contexts again

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$\rightsquigarrow$ Desired prediction: supertrue just in case John read all of the books and nobody else read any books.

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- Consider a model M in which 'John didn't read all the books' is true, i.e. 'John read the books' is false or undefined. Then in some bivalent extension M' of M, 'John read the books' is false, making (33) false in M', hence not supertrue.
- Consider a model M in which an individual d, named by D, distinct from John, read some or all of the books. In some bivalent extension M' of M, 'D read the books' is true, hence (33) is false in M', hence not supertrue.

A useful result

- If ‘the NP’ has at least one occurrence in a given sentence S, then S is supertrue (resp. superfalse) if it is true (resp. false) under both a $\exists$-interpretation for each occurrence of ‘the NP’ and a $\forall$-interpretation for each occurrence of ‘the NP’.
- This follows from a more general fact about supervaluationism.

- Let $S(p)$ be a sentence with p an atomic sentence that can be either true, false or undefined (depending on the model) [assume everything else is bivalent].

- Let p^+ and p^- be two bivalent atomic propositions with the following meaning postulates:

1. p^+ is true in M if p is true in M, false if p is either undefined or false in M.
2. p^- is true in M if p is true or undefined in M, false if p is false in M (i.e. true if p is not false in M)

- Then: $S(p)$ is supertrue (resp. superfalse) in M if and only if both $S(p^+)$ and $S(p^-)$ are true (resp. false) in M.

- Let p be 'X read the books'.

Then we have:

- $p^{+} \Leftrightarrow$ 'X read all of the books',
  $p^{-} \Leftrightarrow$ 'X read some of the books'.

Non-maximal readings

- ‘John read the books’ can be judged true even if there are exceptions (see Malamud 2012 and the references cited therein)
- Malamud’s observation

  (34) The doors are open!

  a. Prisoner: all are open (we can escape)

  b. Guard: some are open (we failed to do our job).
- Conclusion: the reference of a plural definite description is flexible, depends on speakers’ interests, standards, etc. $\rightsquigarrow$ much like the threshold used for relative gradable adjectives.

A reconstruction of Malamud's (2012) approach

1. Candidate denotations for 'The NPs' = all (atomic or plural) individuals that are part of the denotation of 'The NPs'.
2. Given a sentence S(The NPs), collect the *most relevant* candidate denotations $\{X_1, \ldots, X_n\}$ relative to S, i.e. such that interpreting 'the NPs' in S as denoting X_i gives rise to a maximally relevant proposition. Let us note the resulting propositions $\{S(X_1), \ldots, S(X_n)\}$.
3. Contextual meaning of S(The NPs) is $S(X_1) \vee \ldots \vee S(X_n)$

Malamud's notion of relevance

- ϕ is more relevant that ψ if:

ϕ satisfies the addressee's goals better than ψ

OR

ϕ satisfies the addressee's goals exactly as well as ψ and is less informative than ψ

- In out-of-the blue contexts, assume that the speaker's goal is to get as much information as possible, i.e. 'maximally relevant' = 'maximally informative'.
  $\rightsquigarrow$ Hope: derive the same predictions as Krifka.

A technical problem with Malamud's account (Manuel Kriz, p.c.)

(35) John didn't read the books

- Out of the blue, the most relevant candidate denotations for 'the books' in the case of (35) are the atomic books $B_1, B_2, B_3, \ldots$
- Predicted reading

John didn't read B_1 or John didn't read B_2 or John didn't read B_3 or . . .

$\Leftrightarrow$

John didn't read every books.

Fixing Malamud's account

1. Candidate denotations for 'The NPs' = all (atomic or plural) individuals that are part of the denotation of 'The NPs'.

2. Given a sentence S(The NPs), collect the *most relevant* candidate denotations $\{X_1, \ldots, X_n\}$ relative to S, i.e. such that interpreting 'the NPs' in S as denoting X_i gives rise to a maximally relevant proposition. Let us note the resulting propositions $\{S(X_1), \ldots, S(X_n)\}$.

3. Contextual meaning of S(The NPs) is $S(X_1 \vee \ldots \vee X_n)$

- Prediction for 'John didn't read the books':

John didn't read B_1 or B_2 or $\ldots \Leftrightarrow$ John didn't read any books

Non-monotonic environments again

(36) Only John read the books

No matter what the candidate denotations are, there is no way one can get 'John read all of the books and all others read none'.

This is so because 'The books' occurs only once, so it has to be interpreted in the same way in the 'positive' part and in the 'negative' part of the proposition.

My proposal (Thanks to Manuel Kriz for crucial insights!)

- Model relevance independently of informativity, by means of partition semantics.
- Given a question Q, two propositions are Q-equivalent if they intersect exactly the same equivalence classes (cells).
- Potential Denotations for 'the books' in S(the books): all GQs of the form $X_1 \vee X_2 \vee \ldots X_n$, where X_i is a part of the THE-BOOKS. Let $D_1, ..., D_i$ be the potential denotations.
- $S(D_i)$ is a *candidate meaning* iff no $S(D_j)$ is both Q-equivalent to $S(D_i)$ and entails $S(D_i)$.
- S(The books) is supertrue (resp. superfalse) just in case all the candidate meanings are true (resp. false)

Illustration #1

- Maximal partition: everything is relevant.
- All the potential denotations give rise to candidate meanings
- We get the above story: S(The books) is true if and only $S(THE - BOOKS)$ is true and $S(B_1$ or B_2 or $\ldots B_n)$ is true.

Illustration #2

(37) The doors are open

- Suppose what is relevant is whether at least one of the door is open (guard's perspective)
- Q has two cells: the cell where no door is open and the cell were at least one door is open.
- Note that for any plurality of doors D, 'D are open' is Q-equivalent to 'A door is open', i.e. 'D_1 or D_2 or ... D_n is open'
- We thus have only one candidate-meaning, and thus an existential reading

(38) The doors are not open
$\rightsquigarrow$ Likewise, only one candidate meaning.

Illustration #3 (cf. Kriz 2013)

(39) The committee members smiled

- Assume that a job talk probably went well if at least 8 out of the 10 committee members smiled, went badly if no more than two smiled, unclear otherwise.
- The partition now has three cells.
- Three candidate-meanings:

  One member smiled (true in all cells)
  More than two members smiled (true in two cells)
  At least 8 members smiled (true in one cell)

Illustration #4

(40) They didn't smile

- Candidate meanings:

NOT(more than 2 members smiled) (true in one cell)
NOT(8 or more members smiled) (true in two cells)
NOT (9 or more members smiled) (true in all cells)

Open issues

- Source of the phenomenon: distributivity operator?
- Pronouns, free and bound

(41) Whenever my children play, they are happy

- Loss of the effect in ‘John did (not) read the three books’
- Interaction with plural quantifiers

Selected References

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10:00-10:45Benjamin Spector Homogeneity and plurals: From the stronger meaning hypothesis to supervaluations. 10:45-11:30 Corien Bary and Emar Maier Unembedded indirect discourse. 11:30-12:00 Coffee break. 12:00-12:45 Guillaume Thomas Circumstantial modality and the diversity condition. 12:45-13:30 Andreea Nicolae Encoding strength of exhaustivity within the question nucleus. 13:30-15:30Lunch break. Homogeneity and Plurals: From the Strongest Meaning Hypothesis to Supervaluations, Sinn und Bedeutung 18, University of the Basque Country, Vitoria-Gasteiz, September 11, 2013. Plurals, Homogeneity and Vagueness, talk presented the Workshop on Semantics, University of Vienna, May 21, 2012. Generalized Scope Economy (joint work with Clemens Mayr). MIT Linguistics Colloquium talk, April 2012. Are there obligatory scalar implicatures? An argument from global positive polarity items, Talk given at Tprag, Berlin, October 2011. At least at last, Talk given in March 2011, ENS. With Danny Fox, Economy