Experimenting with Meaning:  
Some case-studies in presupposition projection

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The Past, Present and Future of Formal Semantics

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Semantics - Mathematics or Psychology?

Barbara Hall Partee
University of Massachusetts, Amherst

University of Konstanz Colloquium "Semantics from Different Points of View" September, 1978

of mathematics and psychology for a general answer to be possible. What I have tried to suggest is that the linguist's concern for psychological representation may be relevant to every semanticist's concern for an account of the semantics of propositional attitudes. So far I don't see how to achieve either goal; my only positive suggestion is that a good theory might be expected to achieve both at once.
Meaning: an Empirical Phenomenon

- **Studying** Natural Language Meaning is inherently an empirical endeavor (at least in part):

  Our **explanandum** is linguistic behavior,

  e.g., in form of intuitions about
  
  - truth of sentences in a given situation
  - reference
  - entailments / meaning relations between sentences
  - acceptability in contexts
Experimenting with Meaning

- **Experiments** are a key tool for empirical science
- They can help us:
  - test fine-grained predictions of ever more sophisticated theories
  - identify and tease apart factors at play in judgment patterns
- Taking the variety of factors seriously leads to...
Semantics as Cognitive Science

- **Empirical nature** forces us to get into the weeds of the cognitive reality of language:

- **Theoretical constructs** must have some reflex in cognitive representations

  \(\text{(to explain empirically observed linguistic behavior)}\)

- Experiments can help us **test hypotheses** about these cognitive representations
Not just what, but how?

- **Theoretical controversies** not just about outcomes, but also how outcomes are derived

- Investigating **cognitive processes** involved in reaching an interpretation

  -> hope for differentiating such theories

  (based on suitable linking hypotheses)
Language Specific or Domain General

A central question in accounting for any given linguistic phenomenon:

Best explained in terms of

Language-specific knowledge or

Domain general cognition?

Again, experiments can provide a tool for teasing these apart
Plan for this talk

- Case studies on presupposition projection as illustrations
  - Cognitive representations at play in presupposition projection
  - The role of `left-to-right’ processing in theories of presupposition projection
- Reflections on the role of experiments in the field of semantics and pragmatics
Background:

Presuppositions & Projection
Presuppositions

- Presuppositions (Ps): a type of meaning that is (typically) **taken for granted**

  Mary *stopped doing yoga*

  **presupposes**: she used to do yoga

- Traditionally captured in

  Stalnaker’s **Common Ground** model
Stalnakerian Context Updates

- **Goal of conversation:**
  increase mutually shared information

- **Common Ground (CG):**
  worlds compatible with propositions mutually endorsed for purposes of conversation

- Sequence of **Assertions** $S_1$, $S_2$ update contexts
  i.e., add constraints on CG worlds
Presuppositions and Contexts

- **Presuppositions** as constraints on CG
Presupposition Projection

- Presuppositions project, i.e. they escape various embedding environments:
  
  a) Mary didn’t stop doing yoga
  
  b) Maybe Mary stopped doing yoga
  
  c) Did Mary stop doing yoga?

- All still presuppose: Mary used to do yoga
Presupposition Filtering

- Presuppositions in Complex Sentences?

- Mary is in bad health
  and she **stopped doing yoga**

  DOES *presuppose*: she used to do yoga
  \[\text{(-} \rightarrow \text{ Projection)}\]

- Mary **used to do yoga**
  and she **stopped doing yoga**

  Does **NOT presuppose**: she used to do yoga
  \[\text{(-} \rightarrow \text{ NO Projection)}\]
  (but entails it, via first conjunct)
Filtering in Conditionals

- If Mary is in bad health, then she **stopped doing yoga**

  **DOES presuppose**: she used to do yoga  
  (-> Projection)

- If Mary **used to do yoga**, then she **stopped doing yoga**

  Does **NOT presuppose**: she used to do yoga  
  (-> NO Projection)
Determining presuppositions of complex sentences requires relating their parts to one another.

**Classic Approach (Karttunen, Stalnaker):** Presuppositional expressions are evaluated relative to their **Local Context**: For $S_1$ and $S_2$ —> Does $C_2$ entail $Ps$ of $S_2$?

**YES, because $S_1$ entails $Ps$**
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Classic Approach (Karttunen, Stalnaker): Presuppositional expressions are evaluated relative to their Local Context:

For $S_1$ and $S_2$ → Does $C_2$ entail Ps of $S_2$?

YES, because $C_1$ entails Ps
Representations of Linguistic Context
Set of issues in relating linguistic input to Context:

What structures are present in the cognitive representation of context?

How do they relate to linguistic structures?

Schwarz & Tiemann 2016:

Test Discourse Representation Theory (DRT) predictions for different locations of support for presupposition
Projection in Processing

- Eye-tracking during reading
- German *wieder* (again) in *then*-clauses
- **Ps-support** in *if*-clause or discourse context
- Additional embedding variation: *negation*

- **Target** *(not > again version)*:
  
  ... she is **not** [going ice-skating **again**] today

  **Ps**: There is a salient prior event of her ice-skating

[Schwarz & Tiemann 2016]
Varying Location of Support

- **German** materials, **disambiguating**
  scope of **again** and **negation**

**Context:**
Tina was last week (a. **not** / b. **--** ) ice-skating.

If she yesterday (a. **--** / b. **not**) ice-skating was, then...

**Target:**
...goes she today (i. **not**) again (ii. **not**) ice-skating
Does Context History Matter?

- Parallel question illustrated for conjunction example:

- **Local Context:** For $S_1$ and $S_2$

  $\implies$ Does $C_2$ entail $Ps$ of $S_2$?

- Are these scenarios differentiated in processing?

  $\implies$ In **interpreting** $S_2$,
  do you only have access to $C_2$?
Does Context History Matter?

- Parallel question illustrated for conjunction example:

- **Local Context:** For $S_1$ and $S_2$

  $\rightarrow$ Does $C_2$ entail $P_s$ of $S_2$?

- Are these scenarios differentiated in processing?

  $\rightarrow$ In interpreting $S_2$, do you only have access to $C_2$?
... then goes she today (not) again (not) ice-skating

- Are there processing reflexes of DRT structures?
## DRT Prediction

<table>
<thead>
<tr>
<th>Order</th>
<th>Support in</th>
<th>Projection path length</th>
</tr>
</thead>
<tbody>
<tr>
<td>again not</td>
<td>antecedent</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>context</td>
<td></td>
</tr>
<tr>
<td>not again</td>
<td>antecedent</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>context</td>
<td>3</td>
</tr>
</tbody>
</table>

- **Note:** Distinct from simple distance-hypothesis!

**Antecedent + Not Again = Context + AgainNot**
Results

- **DRT Distance measure** predicts reading time

- **No difference** between If-clause vs. context support paired with **Not Again vs. Again Not**

- What seems to matter are **projection steps**, not intra- vs. inter-sentential support
The Structure of Contexts

- Context Histories DO matter:
  - Cognitive context representations can access richer structure than local contexts

- DRT offers linguistic representations with a structure consistent with results

- But: structure could also be at more general level of contextual representation that goes beyond linguistic structure
Left-to-Right Processing and Theories of Projection
Filtering seems to **only work** when the relevant material comes before the presupposition

Mary used to do yoga and she stopped doing yoga

#Mary stopped doing yoga and she used to do yoga

**(Tentative) Upshot:** Local Contexts **only** include preceding linguistic material
Source of Asymmetry?

- Is asymmetry part of **semantics of conjunction**?
- Or rooted in general aspect of **language use**:

  Signal unfolds in time  
  → **asymmetry** between before & after
Asymmetries in Semantics?

- **Semantic** approach (Heim; and similarly Kamp):

  The **semantics** of conjunction is **asymmetric**:

  S\(_1\) and S\(_2\) uttered in context C\(_1\):
  \((C\_1 + S\_1) + S\_2\) (‘+’ indicates updates)

  ![Diagram showing semantic approach to conjunction asymmetry]
The Explanatory Challenge

- Rooth (in a letter to Heim; also sees Soames 1989):

Asymmetry in **semantic** approach is **stipulative**:

Why no **and’** that updates the other way around?

\[ S_1 \text{ and’ } S_2 \rightarrow (C_1 + S_2) + S_1 \]
Asymmetries in Pragmatics?

- Stalnaker-Schlenker: **Pragmatic** projection approach

- Maintain **coverage** of semantic approach within a classical semantics (including fully symmetric conjunction)

- **Explain asymmetry** with left-to-right order:
  
  ![Diagram showing steps 1 and 2]

  **Step 1**

  **Step 2**
Status of Asymmetry

- Schlenker 2009:
  - **Asymmetry is a default** based on Left-to-right processing preference that can be overridden (at a cost)
  - **Core of projection machinery** is symmetric

- Chemla & Schlenker 2012:
  - Experimental data on disjunction and conditionals
  
- Is conjunction symmetric after all?

- Removing redundancy helps (Rothschild 2011):
  
  (?) Mary **stopped doing yoga**
  and she **used to do Jivamukti yoga**
Conjunctions in Conditionals

- Crucial variation: (cf. Rothschild 2008)

If Mary stopped doing yoga and she used to do Jivamukti yoga, then Matt will interview her for his story.

?—> Mary used to do yoga

**Asymmetric** prediction: Yes

**Symmetric** prediction: No
An Experimental Approach

- Subtle judgments call for experimental assessment
- Prior experimental work not on conjunction
- But conjunction is the poster-child for asymmetry

Our question:

Is projection from conjunction ever symmetric?

[Mandelkern et al. 2019]
Design

• Initial studies using inference task (ask in discussion!)
• Here: **acceptability** task with 4 different triggers
• Main Factors:
  • Ps in **First** vs. **Second** conjunct
  • **Context** manipulation:
    • **Support** vs.
    • ‘**Explicit ignorance**’ contexts (incompatible with projection)
• Only symmetric **Right-to-left** filtering could remedy infelicity in key condition
Mary always was involved in a lot of sports, but I don’t know whether she ever did any yoga. If Mary used to do Jivamukti yoga and she stopped doing yoga, then Matthew will interview her for his story.

Completely unnatural  ○ ○ ○ ○ ○ ○ ○ ○  Completely natural
Context: Mary always was involved in a lot of sports

Expl Ignorance:  
... but I don’t know whether she ever did any yoga.

Support:  
... and she used to do yoga, too.

Target:  

If Mary stopped doing yoga  
and she used to do Jivamukti yoga, ...  

If Mary used to do Jivamukti yoga  
and she stopped doing yoga, ...
If Mary \{frowns on doing yoga and she used to do Jivamukti yoga\}, ...

If Mary stopped doing yoga, ...

...then Matthew will interview her for his story.
Predictions

- Unacceptability should only arise for
- Explicit Ignorance paired with
- Ps with no option for filtering

→ Simple Ps
I don’t know whether Mary ever did any yoga. If she stopped doing yoga, then...

What will happen in Conj-Ps-First?
(Right-to-Left Filtering? → 2nd conjunct support Ps in 1st?)
Context effects only for Simple-Ps & Cont-Ps-First
Discussion

- We set up contexts where there was pressure to use Right-to-left / symmetric filtering to ensure felicity.
- We find no evidence of its existence.
- Theoretical implication: asymmetry in conjunction seems to be categorical, not just an overridable left-to-right processing default.
Where does that leave us?

- Can we maintain explanatory advantage of pragmatic account?

  -> Maybe Left-to-Right processing pressure is so strong it can’t be overridden?

- Prediction:

  Left-to-Right pattern should be uniform across connectives
Partee’s Bathroom Sentences

- Disjunction DOES seem to exhibit symmetry:
  - Either the bathroom in this house is well hidden, or there is no bathroom.
  - Either John stopped doing yoga or he never was a yoga practitioner.

- Part of Schlenker’s motivation to allow symmetry

- Alternative (Hirsch & Hackl 2014):
  Local Accommodation
  (triggered by pragmatic constraints on disjunction)

- Both predict processing costs for PsFirst!
Adapting Mandelkern et al. to Disjunctions:

[...] I don’t know if John has ever had research interests in Tolkien’s work, so I thought:

Either John \{has / continues having\} research interests in Tolkien, or he has never had an interest in Tolkien and the book is unrelated to his research.

(No-)Ps-First

Comparison with (No-)Ps-Second and SimplePs
Disjunction Results

- **No effects** of linear order
- **Ps** and **No-Ps** have comparable acceptability
- Support in **PsFirst** and **PsSecond** seems to have parallel effects

$\Rightarrow$ Symmetry

![Bar Chart]

*Fig. 1. Mean acceptability rating by condition*
Kalomoirots & Schwarz (in progress)

- Limitation: No direct comparison with conjunction
- Other Differences (e.g., embedding)
- New study:
  - Minimally varied stimuli
  - Same contexts
  - Embedding under could
- First analysis of results:

  **Opposite order effects across connectives!**
Summary & Discussion

- Projection from **conjunction**: Categorical asymmetry
- **Disjunction**: No Left-to-Right preference
- **Pragmatic theories** predicting **uniform order effects** across connectives

**Theoretical Avenues:**

- **Encode** projection properties **lexically**
  
  (Explanatory Adequacy?)

- Pragmatic theory variant with **order effects** that vary across connectives

  (How? Alex has ideas...)
Key Role of Experiments

- **Crucial judgments** are subtle

- Accounts posit **different processes** of deriving same interpretation (e.g., local accommodation vs. Right-to-Left Filtering)

- **Complex patterns** needed for key theoretical points (to control for confounds etc.) - → **beyond** what our intuitions can access

- More **fine-grained processing measures** can inform what cognitive representations are involved
The Role of Experimenting in Semantics & Pragmatics
Should everyone do experiments?

- Well, in a sense everyone does anyway:
  
  Experiments are the **continuation of minimal pairs**
  
  with other means

  (Clausewitz for linguists!)

- Both aspects matter:
  
  - **continuation** - nothing fundamentally different from other empirical data
  
  - **other means** - broader range of empirical tools expands what we can do

- **Upshot**: Let’s **not** think of this as a binary division!
Linguistic Training

- Reasonable minimum **goal**: Basic experimental literacy
  - Know when an experiment would help
  - Understand design logic and data discussion

- Foster collaboration
  (befriend some experimentalists!)

- Again: **Leave behind** binary thinking:

  **No need** to become a (full-blown) psycho-linguist just because some targeted experiments might supplement one of your projects
Access

- **Experimenting** has become so much easier

- **Online tools**
  - PCIbex - https://www.pcibex.net/ (and many others)

- **Recruitment** platforms
  - Prolific
  - Mechanical Turk
  - University Subject Pools

- **No need** for a ‘lab’ and lots of money to get experimental data
Conclusion

- **Greater range of empirical data** can be key for refining our theories

- Integration with **more full-fledged models** of cognitive representations

- **Increased accessibility** makes it easier for more people to utilize these tools

- Also **opens up the door** to more cross-linguistic work and where possible even integration with field-work
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