Experimental Investigations of Presuppositions -
A Progress Report

Linguistic Evidence 2014
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Ingredients of Meaning

- **Overall conveyed meaning** results from conglomerate of inferences
- What classes are there?
- Key properties of inferences in each class?
Classifying Inferences

- Extensive theoretical literature, with at least some consensus. A toy example:

  Some of the boys failed the damn exam again.

- The traditional picture:
  - Literal asserted content: [a subset failed]
  - Conversational Implicatures: [not all]
  - Presuppositions: [it happened before]
  - Conventional Implicatures: [speaker has negative attitude towards exam]
Experimental Perspectives

- **Testing and refining** classification:
  - Systematic empirical evaluation of properties across expressions and languages
  - Potential re-grouping, refining of boundaries, more fine-grained distinctions

- Extend understanding of actual cognitive processes
  - Time course of access to types of meaning (in particular in relation to one another)
  - Insights into mechanisms giving rise to each type of meaning and combining them
Presuppositions - Theoretical Background
Basic Examples

- John met **the king of Lesotho**.
- John **stopped** smoking last month.
- John **also** called the **MAYOR**.
- John went to the movies **again**.
- ...
Core Properties

- (Typically) **taken for granted**

- Presupposition **Projection**: Presuppositions escape various embedding operators:

  (1) **John didn’t stop smoking.**
  
  (2) **If John stopped smoking, …**
  
  (3) **Did John stop smoking?**

  These all **still presuppose** that he **used to smoke**. (while not asserting that he no longer does)
Theoretical Tradition: Stalnaker

- **Communication** as information update
- **Common Ground** (CG) as set of possible worlds consistent with established propositions in discourse
- Presuppositions are required to be in CG
- Essentially **pragmatic**, but may be semantically triggered
Dynamic Semantics & DRT

- **Dynamic Semantics** (Heim 1983)
  - Semanticized Stalnaker Picture
  - Meanings as context updates
  - Presuppositions as update **definedness conditions**
  - Projection built into update procedure for operators

- **DRT** (Kamp 1981, van der Sandt 1990, Geurts 1999)
  - Same **dynamic spirit**
  - Additional layer of Discourse Representation
  - Presupposition as Anaphora
New Pragmatic Accounts

  Assimilation to Implicatures
  (at least for certain cases)

- Schlenker’s (2009) Local Contexts:
  - Re-cast of Heim (1983) in non-dynamic terms
  - Turns on Local Contexts for presupposition evaluation
  - Incorporates incremental interpretation in a more flexible way [a Processing Preference?]
Experimental Approaches
Scalar Implicature Processing

- **Some** --> **Some but not all** (based on Quantity Implicature)

- **Pragmatic Enrichment:**
  pre-encoded or computed online?

- (One set of) Empirical Results:
  implicature **slower than literal** meaning

- **Evidence** for online pragmatic reasoning?

- **BUT:** Recent Visual World **evidence** for rapid implicatures effects
  (Grodner et al., Breheny et al., a.o)
Experimental Approaches to Presuppositions

- **Questions** similar to implicatures:
  - Pragmatic or semantic status?
  - Processing time-course relative to assertion

- **Additional complexities**:
  - Status of rejection judgments (also: accommodation)
  - Dynamic interaction with linguistic context: **projection**
    - cognitive status of projection
    - nature of specific projected meanings
  - **Differences** between triggers
Focus for today

• Presupposition-based *rejections*
• **Time-course** of Presupposition Processing
• Presupposition **Projection** in Processing
Presupposition-based Rejection
Russell vs. Strawson

- The **Ur-Debate** of presuppositions:

  Are sentences with non-referring definites false (Russell) or infelicitous (Frege, Strawson)?

- **Judgments** clearly vary!

- von Fintel (2004): 
  **judgment data** need **not** map directly on theoretical concepts

- **But**: Hard empirical evidence hard to find
### Abrusan & Szendroi (2013)

- Judgment study varying factors like Topicality

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co</td>
<td>base line: ref. failure NP, no extra NP</td>
<td>The king of France is bald.</td>
</tr>
<tr>
<td>C1</td>
<td>control: no presupposition</td>
<td>France has a king and he is bald.</td>
</tr>
<tr>
<td>C2</td>
<td>von Fintel: independent unknown NP</td>
<td>The king of France is on a state visit to Australia this week.</td>
</tr>
<tr>
<td>C3</td>
<td>Lasersohn: independent known NP</td>
<td>The king of France is married to Carla Bruni.</td>
</tr>
<tr>
<td>C4</td>
<td>S./ R.: reference failure NP in topic</td>
<td>The king of France, he was invited to have dinner with Sarkozy.</td>
</tr>
<tr>
<td>C5</td>
<td>Strawson/ Reinhart: other NP in topic</td>
<td>Sarkozy, he was invited to have dinner with the king of France.</td>
</tr>
</tbody>
</table>
Abrusan & Szendroï Results

- For **affirmative** cases, mainly false judgments
- No significant difference between conditions

**Figure 1: Proportion of TRUE/ CAN'T SAY/ FALSE responses in each condition**
Another Take: False, but Slow

- **Only** give true / false response options
- Measure how long false responses are when
  - false based on assertion vs.
  - false based on presupposition
- **Control**: indefinites (in `there’-existentials)
- **Manipulation**:
  - NP internal PP false (Presupposed with definite)
  - Main predicate false (Asserted)
- **Judgments** about visual scenes
Definite Rejection - Materials

Auditory Stimuli:

(1) The boy with an outing on Tuesday is going to play golf.  
   (Def)

(2) There’s a boy with an outing on Tuesday who’s going to play golf.  
   (Ex)

True or False?
Definite Rejection - Results

- **Key result:** Interaction between definiteness and falsity status

- **Interpretation:** Status of falsity in the PP condition different for Definite and Indefinite
Why no delay within definite?

- **Independent factor:**
  
  **Timing** of falsifying information!

- **PP** is much earlier, and acted upon more quickly

- This **masks a delay** of the **infelicitous definite**

  (Another study found confirmed difference between the definite cases and no difference between indefinites for parallel reasons)
Discussion - Definite Rejection

- **Evidence** for presuppositionality of definites
- Potential **hallmark** for identifying presuppositions based on behavioral measures

(cf. previous difficulties in getting consistent judgment effects)

- Do we get similar effects for other presupposition triggers?
It doesn’t stop with **the**

- **Covered Box** design
  (select overt picture / covered box)

  John stopped going
to the movies on Wednesday

- **Presupposition:**
  Movies before Wednesday

- **Assertion:**
  No movies from Wednesday on
  (& possibly:
  Movies before Wednesday)

- **RT Prediction:**
  Ps True < Ps False

Ps. TRUE, Ass. FALSE

Ps FALSE, Ass. TRUE(?)
Stop Rejection Results

- Significant **increase** in ‘False’ RTs based on presuppositionality
- Also holds in negated cases
- Potentially **problematic** for accounts where the presupposition is also entailed (in affirmative case)
Discussion - Rejection results

- **RTs** might be more telling than judgments
- **Rejection** based on Presupposition is more effortful
- Possible **sources** of effect:
  - **Backgroundedness** of Presuppositions
    - Presuppositions are literally taken for granted; their falsity `catches you off-guard’
  - Presuppositions are **pragmatic inferences** that are **delayed** in ways parallel to corresponding claims for implicatures
Time-course in Online Processing
Online Time-course of Accessing Presuppositions

- Reaction times are a good first step, but we don’t know what happens between stimulus presentation and response.

- Measures closer to online time course:
  - Reading measures
  - Visual World Paradigm
Reading Studies

● Vary contextual support - measure reading times

● Schwarz (2007) on also:
  a. The congressman/ who wrote to John/...
  b. The congressman/ who John wrote to/...
      ...had also written to the mayor/...

● Tiemann et al. (2011 and following):
  ● additional triggers
  ● word by word data
  ● vary lack of support vs. inconsistency

● Schwarz & Tiemann (2012): Eyetracking in reading

● General result: infelicity leads to delays as soon as possible (compared to controls!)
Visual World Paradigm

- **Timing of fixation** (shifts) relative to visual scene during auditory stimulus presentation

- **Typical setup:**
  
  Set up **time period** where only one piece of information could affect shift in fixations

- **Advantages:**
  
  - Very **close** to real time-course
  
  - No conscious decisions involved (in initial eye movements)
Again vs. Twice

- Adapt **Visual World** method as used for implicatures
- **Again & Twice** both involve two occurrences of an event
- But **first event** presupposed for **Again**
- How does the processing of the inference compare in the two cases?

**General approach:**
- manipulate whether crucial inference narrows choice to target or not
- manipulate whether inference is presupposed or asserted
Again vs. Twice Materials

Context:
Some of these children went to play golf on Monday, and some to play volleyball.

Target:
John went to play golf

a) ... again later on ...
b) ... twice this week ...

... and also played soccer on Tuesday.

Disambiguation only via inference

Ambiguous during underline portion
Visual World Analysis

- **Dependent measures:**
  - Proportion of looks to target
  - Time-linked to onset of critical word
  - **Target Advantage:**
    Looks to target - Looks to Competitor

- **Statistical Analysis:**
  mixed-effect models using logistic regressions on proportions for time-windows of interest
Again vs. Twice: Results

- **Main and Simple** effects of Control vs. Critical
- **Significant** from 200ms after onset of *Again/Twice*
- **No** interaction
- **Clear evidence** for rapid presupposition utilization
- **No difference** from assertion of same content
- Parallel result for *also* vs. *only* (Schwarz 2014a)
Recall Theoretical Issue:

are some triggers (e.g., ‘soft’ ones) derived via pragmatic inferencing similar to implicatures?

If so, this might lead to slower processing

Calendar-strip paradigm extended to stop:

Equally immediate shift in fixations
Discussion - Time Course

- Consistent **evidence** for rapid availability of presupposed content from:
  - Self-paced reading
  - Eyetracking during Reading
  - Visual World Eyetracking

- **No evidence** for differences between triggers

- Suggests **Rejection RT delays** are not due to delayed availability, but rather due to backgrounded status

- **No support** for delayed pragmatic inferences (either semantic account or rapid pragmatics)
Presupposition Projection in Processing
Projection Experimentally

- Tina didn’t \textit{[go ice-skating again]}

  Presupposition: she went before

- Presupposition \textit{projection}:

  mismatch between where trigger is syntactically and where it is interpreted

- Does this create additional \textit{processing efforts} relative to unembedded contexts? Yes:
  
  - Eyetracking during reading, Stops-making sense
  
  - Initial visual world eyetracking evidence
Projection in Reading

- **Again** in consequent of conditionals
- Vary location of presuppositional support
- Up to 3 levels of embedding
  - Context sentence
  - Antecedent of conditional
  - Negation
- **[Context [Antecedent [ {Negation Again} ]]]**

[Schwarz & Tiemann 2013]
Projection in Reading - Materials

**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

- If *projection* causes *delays*, correlation of depth of embedding with reading times
Projection in Reading - Materials

**Illustration:** DRT Projection paths

\[
\begin{array}{|c|}
\hline
x \\
\hline
Tina(x) \\
\hline
x \text{ went ice-skating before } (C) \\
\hline
\end{array}
\]

\[
\begin{array}{|c|}
\hline
p \\
\hline
x \text{ went ice-skating before } (B) \\
\hline
\end{array}
\Rightarrow
\begin{array}{|c|}
\hline
x \text{ went ice-skating before } (A_2) \\
\hline
\sim x \text{ went ice-skating today} \\
x \text{ went ice-skating before } (A_1) \\
\hline
\end{array}
\]

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

**Antecedent + Not Again = Context + AgainNot**
Projection in Reading - Results

- **Distance** predicts reading time (Total Time, Regression Path Duration, Rereading)

- **No difference** between local vs. global support paired with **Not Again** vs. **Again Not**

- What matters are **projection steps**, not intra- vs. inter-sentential support
Not (directly) compatible with non-representational dynamic semantic frame-work or linear-order based pragmatic proposals (e.g., Local Contexts Theory)

--> No differentiation between levels of preceding context

Support for representational account of presupposition resolution (as in DRT)

Possible tie-in with psychological models of representing intermediate levels of structure (e.g., `text-base`)
Projection in the Visual World

- **stop** under negation in Stop VW
- **Varied** whether there was a day with no preceding calendar entries
- **Stop** presupposition incompatible when that was the case
(Don’t) Stop VW Materials

Context:
These children got nice treats for their snacks this week.

Target:
Henry didn’t stop eating the delicious apples all week.

Disambiguated by presupposition

Ambiguous up until apples

Competitors:

Critical:

Control:
Don’t Stop VW - Results

- **Not stop delayed** relative to affirmative
- **Interaction** (as early as 400-600ms)
- **Parallel projection delay** effect to reading study

- **BUT**: Haven’t found the same effect for **again**, but very slow and relatively small fixation shifts altogether
Local Accommodation

- **Projection** is not obligatory: ‘local accommodation’
- **Truth-value Judgment** study in Bott & Noveck paradigm
- **Zoologists don’t realize that elephants are reptiles**
  - **Local:** True
  - **Global:** False
- **RT result:** local > global
Local Accommodation with stop

[Romoli & Schwarz 2014]

- **Covered Box task** (Choose overt vs. covered box)
- Avoiding True vs. False RT comparison
- John didn’t stop eating apples on Wednesday

Also replicated for again

**Targets:**

Global:

Local:
Incorporating Projection Data

- **Apparent tension:**
  Delay for projection, but **also** for local interpretation?

- **Easily reconcilable:** two different comparisons:
  - Embedded vs. unembedded content
  - **Embedded content** that is interpreted
    - outside of embedding
    - inside of embedding
  - DRT:
    projection search path up (--> local resolution first) accommodation search path down (-->local accommodation)
Other Areas of Progress
Progress on Related Topics

- **Variation** between Triggers (Amaral & Cummins 2014, Jayez et al. 2014, Tiemann 2014)
- **Cross-linguistic variation** (Destruel et al. 2014)
- Presuppositions and **Quantifiers** (Chemla 2009, Tiemann 2014)
- Accommodation (Gibson et al. 2013)
- Acquisition (Hoehle et al 2009, Dudley et al. 2014)
- **Relation** to conventional implicatures (Syrett et al. 2013)

(further references in Schwarz 2014b)
Conclusions & Questions
Conclusions

- **Experimental approaches** able to shed light on subtle theoretical questions at the semantics pragmatics interface

- Findings reported here:
  - Presuppositions are hard to reject
  - Presuppositions processed rapidly
  - Projection is costly in processing
Questions & Future Work

- **Role and limits** of accommodation?
- **Relation** to pronouns?
- **Other methods** and **populations**
  (neuro-imaging, acquisition, ASD...)
- **Nature** of projected content? (next talk!)
Thank You!
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Appendix: Stop VW Materials

Context:
These children got nice treats for their snacks this week.

Target:
Henry stopped eating the delicious apples on Thursday.

Disambiguated by presupposition

Ambiguous up until apples
Also Materials

**Context:**
One of the boys is carrying a fork.

Click on the girl who...

**Critical Condition:**
... *ALSO* is carrying a fork.

**Control Condition:**
... *is carrying* a fork and a spoon.

During **underlined part**, presupposition of *also* is only lead to target
Only Materials

Context:
One of the boys is carrying a fork and a knife.

Click on the girl who...

Critical Condition:
...only is carrying a fork.

Control Condition:
... is carrying a fork.

During underlined part, asserted exclusivity of only is only lead to target
Also vs. Only Results

- **Also < Only**
- **Interaction** in 400-600ms time window
- Presupposition before Assertion?
- **Caution:** Further differences could be behind difference in effects
- **Certain:** Also presupposition available immediately
Selected References


Schwarz, Florian. 2013. Rejecting statements with non-referring definites – experimental support for a presuppositional view. Ms., UPenn. Schwarz,

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