Florian Schwarz: "Processing Presupposed Content" (and beyond) ♣

Agenda:

1. Discussion of "Processing Presupposed Content".

2. Presentation of a follow-up experiment on *also*.

1. General questions

- When are presuppositions computed? How quickly are they accessible to the parser? (late process vs. on-line computation) [note similarity with debate on implicatures]. From an update semantics perspective: when/where do context updates take place?

- Do presuppositions interact with other factors relevant in parsing (i.e., syntactic preferences.) Cf. Crain and Steedman (1985) [see Schwarz paper for more recent references]

1) The horse raced past the barn fell (Beaver 1970)

(a) [[the horse] [raced past the barn]]
(b) [the horse raced past the barn]

Analysis in (a) is preferred to the analysis in (b); strong garden path effect.

- Garden-path theory: (i) analysis (a) is preferred to analysis (b) on the grounds of structural strategies (e.g., Fodor & Frazier's Minimal Attachment: use as few new nodes as possible) Serial model: only preferred analysis is initially computed.

- C & S's explanation: (b) is presuppositionally more complex than (a): (b) "includes several horses rather than one, and a number of further facts about the basis on which they can be distinguished" [measure of complexity?]. Parallel model: several analyses are computed at the same time.

2) *The Principle of Parsimony:* If there is a reading that carries fewer unsatisfied but consistent presuppositions or entailments than any other, then, other criteria of plausibility being equal, that reading will be adopted as most plausible by the hearer, and the presuppositions in question will be incorporated in his or her model.

- C & S 1985: Sentences like (3m) judged grammatical more often than sentences like (1) [off-line study; results actually compatible with both theories]

3) Horses raced past the barn fell.

♣ Note: parts of this handout are taken from Florian Schwarz's slides for his SuB 10 presentation. You can find them at: http://people.umass.edu/florian/

2. Why do experiments on presuppositions?

[see Schwarz's slides at http://people.umass.edu/florian/]

(i) Provide new data for semantic theory

- Questions of timing may be crucial: local vs. global issue.

(ii) Inform theory of semantic processing

- We know little about when/how semantic processing takes place.
- Processing of presuppositions provides insights about an important part of semantic process: integration with the context.

2. Experiments

- How can we test the effects of presuppositions in processing?

(a) Present ambiguous sentences in which only one reading satisfies the presupposition.

(b) Present sentence with a presupposition trigger in a context where the presupposition is not satisfied.

- Potential problem: accommodation.
- Overcoming the problem: choosing a trigger that (at the very least) strongly resists accommodation: **auch** ('also') [Kripke 1990, Heim 1992, van der Sandt & Geurts 2001]

3) [JOHN] is having dinner in New York tonight too.

2.1. Questionnaire study

Method and materials

- Ambiguous bi-clause structures (RC and MC)
- One reading syntactically preferred; presupposition of *auch* not satisfied.
- Other reading syntactically dispreferred; presupposition of *auch* satisfied
- Task: choose between paraphrases.

4)

C1: Die Frau, die das Madchen sah, hatte auch der Mann gesehen
The womanN/A whoN/A the girlN/A saw had also the manN seen

C2: Die Frau, die das Madchen sah, hatte vorher der Mann gesehen
The womanN/A whoN/A the girlN/A saw had earlier the manN seen

C3: Die Frau, sah das Madchen, auch das auch den Mann gesehen hatte
The womanN/A saw the girl N/A who N/A also the manA seen had.

C4: Die Frau, sah das Madchen, auch das vorher den Mann gesehen hatte
The womanN/A saw the girl N/A who N/A also the manA seen had.

C5: Die Frau, sah das Madchen, auch die LehrerinN/A gesehen hatte
The womanN/A saw the girl N/A who N/A also the teacherN/A seen had.

Condition 1

C1: Die Frau, die das Madchen sah, hatte auch der Mann gesehen
The womanN/A whoN/A the girlN/A saw had also the manN seen

Main Clause is unambiguous: [the man] also had seen the woman.
Presupposes: Someone else had seen the woman

[if *auch* is unstressed – a plausible assumption- it must associate with *der Mann*]

Relative Clause is ambiguous:

(i) the woman saw the girl. [syntactically preferred (SO); presupposition not satisfied] ('the man had also seen the woman who saw the girl')
(ii) the girl saw the woman. [syntactically dispreferred (OS); presupposition satisfied] ('the man had also seen the woman who the girl saw')

Task: choose between paraphrases:

(a) The woman saw the girl and the man saw the woman. [corresponds to (i)]
(b) The man and the girl saw the woman [corresponds to (ii)]

Condition 2: Control.

C2: Die Frau die das Madchen sah, hatte vorher der Mann gesehen
The womanN/A whoN/A the girlN/A saw had earlier the manN gesehen

Condition 3

C3: Die Frau sah das Madchen, das auch den Mann gesehen hatte
The womanN/A saw the girl N/A who N/A also the manA seen had.

Order of clauses switched around: MC first, 'auch' in RC.

Main clause ambiguous:	The woman saw the girl	(preferred order)
	The girl saw the woman.	(dispreferred order)

RC unambiguous: the girl also had seen the man.

(i) The woman saw the girl who also had seen the man.
(preferred syntactic order; presupposition not satisfied)

(ii) The girl who also had seen the man saw the woman
(dispreferred syntactic order; presupposition not satisfied).

Condition 4: Control

C4: Die Frau sah das Madchen, das vorher den Mann gesehen hatte
The womanN/A saw the girl N/A who N/A also the manA seen had.

Condition 5: Three way ambiguous. [actually 4 way ambiguous – but in the 4th reading both clauses have OS order and presupposition is not satisfied]

C5: Die Frau sah das Madchen, das auch die LehrerinN/A gesehen hatte
The womanN/A saw the girl N/A who N/A also the teacherN/A seen had.

(i) The woman saw the girl that had also seen the teacher
Syntactically preferred; presupposition not satisfied.

(ii) The girl who had also seen the teacher saw the woman.
MC has OS order.
Syntactically dispreferred; ps. satisfied.

(iii) The woman saw the girl that the teacher had also seen.
RC has OS order
Syntactically dispreferred; ps. satisfied.

- 30 sentences with the conditions above; 23 fillers; counterbalanced design; 90 subjects.

- 2 by 2 design (plus C5, treated separately)

	Clause 1	Clause 2	Auch/vorher	'auch' ps satisfied if
C1	RC	MC	Auch	RC has OS order
C2	RC	MC	Vorher	--
C3	MC	RC	Auch	MC has OS order
C4	MC	RC	Vorher	--

- If presupposition can have an effect on choice of syntactic analysis, we expect that the OS paraphrase will be chosen more frequently when *auch* is present than when it is not.

Results/Discussion

Conditions 1 – 4

- Percentage of OS paraphrases for condition: see figure 1, page 14.

- When *auch* is present the otherwise dispreferred choice of paraphrase is chosen more frequently than when it is not, presumably because this order yields satisfaction of the presupposition. Effect significant in both clause orders but stronger in the RC-MC order.

- Difference between RC/MC and MC/RC conditions (C1-C2 vs. C3-C4)

(i) Assume a serial model of processing in which perceivers initially pursue only one analysis, the one that is syntactically preferred.

(ii) Perceivers will go for the SO interpretation of the ambiguous clause. Upon realization of the presupposition failure, they will reanalyze, at least in some of the trials.

(iii) Reanalysis easier when RC is ambiguous. Harder when the MC is ambiguous, since this requires that the initial DP will be interpreted as topic, which is not supported by the context.

In order to interpret the first DP as topic, its referent would have to have been mentioned previously – and (roughly) the discourse should be "about" that individual. One possible way of licensing topics is by means of a contrastive topic:

5) We saw a man and a boy today. The man I talked to.

General point: in order to have an object DP in sentence initial position, some non-default context is needed. But these sentences are read in isolation, so the special requirements for object topics, whatever that may be, can't be satisfied.

Practice effect: increase in the percentage of OS paraphrases in second half of questionnaire. In the RC-MC order there was only a small numerical increase, not significant. Supports the conclusion that it is harder to get the OS I interpretation in the MC-RC order. "Apparently, perceivers become more likely to choose the OS-interpretation after having been exposed to a number of these constructions and paraphrases for the MC-RC order, whereas they start out as a fairly high level for the other clause order".

Condition 5

C5: Die Frau, sah das Madchen, auch die LehrerinN/A gesehen hatte
The womanN/A saw the girl N/A who N/A also the teacherN/A seen had.

(i) The woman saw the girl that had also seen the teacher
Syntactically preferred; presupposition not satisfied.

(ii) The girl who had also seen the teacher saw the woman.
MC has OS order.
Syntactically dispreferred; ps. satisfied.

(iii) The woman saw the girl that the teacher had also seen.
RC has OS order
Syntactically dispreferred; ps. satisfied.

6)

OS RC	43%
OS MC	8%
SO MC and RC	49%

- Asymmetry between RC and MC. This tells us that:

(i) The differences between MC and RC are not due to parallelism

What does this mean?

- Processing advantage for parallel structures (NP coordination (Frazier et al., 2000), sentence coordination (Frazier et al., 1984), and gapping and ellipsis (Carlson, 2002; Mauner et al., 1995).

7) a. Terry wrote a long novel and a short poem during her sabbatical.
b. Terry wrote a novel and a short poem during her sabbatical

Frazier et al. 2000, eye-movement study:

Total RTs for the underlined region were faster in (8a), where *short poem* is coordinated with a syntactically parallel noun phrase (a long novel), than in (8b), where it is coordinated with a syntactically non-parallel phrase.

- In the first four conditions:

C1: OS in the MC. So choosing the OS order in the RC would give us a parallel structure.

C1: Die Frau, die das Madchen sah, hatte auch der Mann gesehen
The womanN/A whoN/A the girlN/A saw had also the manN gesehen

C3: SO in the RC. So choosing the OS order in the MC would give us a non-parallel structure.

C3: Die Frau, sah das Madchen, auch das auch den Mann gesehen hatte
The womanN/A saw the girl N/A who N/A also the manA seen had.

Thus, we could hypothesize that the asymmetry between RC and MC is due to parallelism.

- But in C5, choosing the OS order in the RC doesn't yield a parallel structure [on the reading where the presupposition is satisfied]

C5: Die Frau, sah das Madchen, auch die LehrerinN/A gesehen hatte
The womanN/A saw the girl N/A who N/A also the teacherN/A seen had.

OS order in the RC:
The woman saw the girl that the teacher had also seen.

(ii) This asymmetry also helps fend off another alternative hypothesis: higher percentage of OS interpretation for RC-MC order is due to the obligatory OS interpretation of matrix clause. [no obligatory OS order of MC in C5]

Overall conclusion:

- Presupposition interacts with other parsing factors.

- Remarkable amount of work (i.e., reanalysis) to get the presupposition satisfied.

[• Results problematic for the theory of processing proposed by Crain and Steedman: According to the Principle of Parsimony, we would expect that perceivers choose the reading on which the presupposition of *auch* is satisfied more often than they do.]

What we don't know yet: Does the presupposition effect occur online?

- Questionnaire leaves open the possibility that subjects reason at length about the sentences.
- Second study: Try to find on-line effect of presuppositions.

2.2. Self-paced reading study

- Self-paced reading method (moving windows). [see slides]
- Unambiguous sentences which vary with respect to whether the presupposition is satisfied or not. Since the effect in the questionnaire was larger for the RC-MC order, only sentences of this type were used the online study.
- Control conditions with *vorher*.
- Question asked after every sentence
- Main measure: RTs on *auch* phrase.
- 24 sentences; counterbalanced across conditions; 84 fillers; 20 subjects.

8)

C1: Die Frau / die der Junge sah / hatte auch der Mann gesehen.
The womanN/A who N/A the boyN saw/ had also the manN seen.
The woman that the boy saw had also been seen by the man.

OS order for RC; presupposition (somebody else saw the woman) satisfied.

C2: Die Frau / die der Junge sah / hatte vorher der Mann gesehen.
The womanN/A who N/A the boyN saw/ had earlier the man seen.

(control)

C3: Die Frau / die den Jungen sah / hatte auch der Mann gesehen.
The womanN/A who N/A the boyA saw / had also the manN seen.
The woman who saw the boy had also been seen by the man.

SO order for RC; presupposition not satisfied.

C4: Die Frau / die den Jungen sah / hatte vorher der Mann gesehen.
The womanN/A who N/A the boyA saw/ had earlier the manN seen.
(control)

Sample question: Who did the man see?

Results [see slides, or page 21]

- *Auch* region read faster in the OS condition – ps satisfied – than in the SO condition.

  Note: this is not an effect of parallelism. The effect is reversed in the *vorher* conditions.

- Additional effect: *auch* is faster than *vorher* in OS.

- Big slowdown when the presupposition is not satisfied suggests that presupposition is computed online [but see caveat below and follow-up experiment]

- The advantage of the *auch* condition in the OS version might be that presupposed content facilitates the integration of new content into contextual information, by connecting new and old information (But it could also be due to a lexical effect)

3. Theoretical implications

- The RC in C1 (SPR) satisfies the presupposition of *auch*.

C1: Die Frau / die der Junge sah / hatte auch der Mann gesehen.
The womanN/A who N/A the boyN saw/ had also the manN seen.
The woman that the boy saw had also been seen by the man.

- The context with respect to which the *auch* presupposition is evaluated must already include the content of the RC.

- So the initial context must be updated with the content of the initial DP.

- Heim (1982, 1983) [the part we didn't do!]: non-pronominal NPs denote atomic propositions with free variables in them.

9) [[a woman]] = woman (x)

- Contexts as sets of assignment functions (Heim 1983: contexts as sets of pairs of worlds and assignment functions)

- Procedure in informal update semantic terms

10) c + *the woman who the boy saw was also seen by the man*

c + *the woman x who the boy saw* =

c' = {g: g verifies woman(x) & boy (y) & see (y)(x)}

[after accommodation of definite description!]

c' + *x was also seen by the man*

Only defined there is a z ≠ the man in c' & see (z) (x)

DEFINED –presupposition satisfied (the boy saw the woman). Hence

c' + *x was also seen by the man*

= {g: g verifies woman (x) & boy (y) & see (x)(y) & man (z) & see (x)(y)}

- The semantics has to update the sentence bit by bit, so that *auch* is evaluated with respect to the local context c'.

"The more general picture (…) is that in processing, the context is updated as soon as possible. Since noun phrases have context change potentials of their own, the processor can update the context as soon as it has been given a noun phrase"

→ Results show that the processor goes about interpreting a sentence in steps much like the ones assumed by dynamic semantic theories.

- Do we have conclusive evidence that update happens on the fly?

NOT YET.

The critical region in the SPR is sentence final. So: the update could

(i) take place on the fly.
(ii) Be applied to the whole sentence in the end.

→ Follow-up study

4. Follow-up study: English

- Addresses the question of whether update happens on the fly by adding additional regions after the *also* region.
- Self-paced reading
- 24 experimental sentences; 48 subjects.

11) C1 The congressman/ who wrote to John/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.

[presupposition satisfied]

C2 The congressman/ who John wrote to/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.

[presupposition not satisfied]

C3 The congressman/ who wrote to John/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.

C4 The congressman/ who John wrote to/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.

[controls]

[Remember: Conditions 3 and 4 are needed to rule out a parallelism type of account]

RTs for region 3

		Mean (ms)
C1	Also presupposition satisfied	1601. 45
C2	Also-presupposition not satisfied	1804. 52
C3	Control for C1	1615.33
C4	Control for C2	1678. 94

- Significant interaction: Difference between C1 and C2 significantly bigger than difference between C3 and C4.

→ RTs slower when presupposition is not satisfied (and effect can't be due to parallelism.)

- Evidence that update happens on the fly: effect shows up right away (in a non-final region).

- Other notes:

(i) RTs much more normal – ununsually slow in *auch* study – probably due to the questions that were asked after experimental items (hard to figure out who did that to whom).

(ii) There was a highly significant main effect for relative clause order, with subject relative clauses being over 250ms faster than object relative clauses. This indicates that we are at a speed where we see normal online effects.

Mean (ms)

C1	Also presupposition satisfied	1413.86
C2	Also-presupposition not satisfied	1685.41
C3	Control for C1	1350.33
C4	Control for C2	1650. 53

(iii) In the *auch* study, the *auch* region was read faster than the *vorher* region when the presupposition was satisfied. Hypothesis: when the presupposition is satisfied, this speeds up integration of new information. But this could also be a lexical effect. To rule out that possibility, different types of adverbs were used in the control conditions of the English study. But: no significant difference between adverb and *also* in this study.

(iv) First 12 sentences use the same verb in RC and MC (as in (11)) Last 12 sentences, near synonyms (as in (12))

12) C1 The congressman/ who wrote to John/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.

C2 The congressman/ who John wrote to/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.
C3 The congressman/ who wrote to John/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.
C4 The congressman/ who John wrote to/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.

13) C1 The law professor/ who advised the committee/ also counseled the governor/ about the education program/ for underprivileged youth.
C2 The law professor/ who the committee advised/ also counseled the governor/ about the education program/ for underprivileged youth.
C3 The law professor/ who advised the committee/ often counseled the governor/ about the education program/ for underprivileged youth.
C4 The law professor/ who the committee advised/ often counseled the governor/ about the education program/ for underprivileged youth.

- Representational vs. non-representational theories.

Questionnaire: presupposition failure triggers reanalysis. “The fact that this revision is even considered indicates that the meaning of the relative clause is already accessible to the parser at the time it encounters the presupposition. With respect to this point, representational theories such as DRT might have an advantage over non-representational theories such as update semantics. When the parser considers the revision of the analysis of the relative clause, it must somehow see that the reversal of the roles of the subject and object yields an interpretation that will just be of the right kind to satisfy the presupposition of *too.* This is easily imaginable if the parser has access to the representations such as *see*(x,y), but possibly problematic if all the parser can see is syntactic structure and propositons. Since there is no obvious connection or relation between the set of worlds in which x sees y and the set of worlds in which y sees x, having access to the propositional meaning only does not seem to be enough to trigger reanalysis” (pp. 31-32).

If we were really operating on the representations, we would expect a difference between the first 12 sentences and the last 12 sentences. If we don’t, this shows that we are targeting a deeper level of representation.

In fact, there is no significant difference between the cases where the same verb was used and the cases where different verbs were used.

[caveat: this argument only works if VP focus is not possible].