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The Syntax and Semantics of Traces
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1. The Problem

How are traces interpreted given the copy theory of movement?

- (1) Mary likes every boy. -QR--->
[every boy]₁ [Mary likes [every boy]₁].

1.1. Two Syntactic Rules

Assumption: copies must be replaced with syntactic phrases that contain variables

Copy Insensitive Rule

- (2) **Traditional Trace Theory:** $DP \rightarrow x$
- (3) every boy A girl talked to every boy. \rightarrow
every boy λx [a girl talked to **x**]?
- (4) Which boy Mary visited which boy? \rightarrow
which boy λx [Mary visited **x**]?

The inspiration: pronoun binding

- (5) Every boy is such that a girl talked to him.

Copy Sensitive Rule (Fox 1999; in press; Sauerland in press; Elbourne in press):

(6) Trace Conversion:

- a. Variable Insertion (Det) Pred \rightarrow (Det) [Pred λy (y=x)]
b. Determiner Replacement (Det) Pred \rightarrow the [Pred λy (y=x)]
- (7) every boy A girl talked to every boy. \rightarrow
every boy λx [a girl talked to **the boy x**]?
- (8) Which boy Mary visited which boy? \rightarrow
which boy λx [Mary visited **the boy x**]?
(See Rullmann and Beck (1997))

The inspiration: binding of definite descriptions (e.g., epithets)

(9) Every boy is such that a girl talked to that boy.

1.2. Two Semantic Rules

Chomsky's conceptual argument for the copy theory of movement

- Even if we have a syntactic rule that replaces copies with variables, we need a semantic rule that would tell us how to interpret variables, and this rule could apply directly to structures with copies.
- So, there is no need for the syntactic rule, hence no need for traces distinct from copies.

Copy Insensitive Rule

(10) In a structure formed by XP movement, $XP_n[\varphi \dots XP_n \dots]$, the derived sister of XP, φ , is interpreted as a function that maps an individual, x , to the meaning of $\varphi[x/n]$.

$\varphi[x/n]$ is the result of replacing every constituent with the index n in φ with the DP, him_x .

$$\llbracket him_x \rrbracket = x.$$

Copy Sensitive Rule (compare with Elbourne in press)

(11) In a structure formed by XP movement, $XP_n[\varphi \dots XP_n \dots]$, the derived sister of XP, φ , is interpreted as a function that maps an individual, x , to the meaning of $\varphi[x/n]$.

$\varphi[x/n]$ is the result of replacing the head of every constituent with the index n in φ with the head the_x .

$$\llbracket the_x \rrbracket = \lambda P. \llbracket the \rrbracket (P \cap \lambda y. y = x)$$

I don't know how to distinguish on empirical grounds between the syntactic and the semantic versions of Copy (In)sensitive Rules.

Goal: To present various arguments in favor of Copy Sensitive Rules (which are independent of whether the implementation is syntactic or semantic). These arguments will provide empirical support for the copy theory of movement.

Chomsky's conceptual argument suggests that the semantic version of the debate is the correct one. Nevertheless, I will stick to the syntactic version because I suspect it will be easier to follow.

The arguments:

- **Conservativity**
- **Condition C**
- **Antecedent Contained Deletion**
- **A constraint on Extraposition**
- **An argument from Focus (Sauerland 2001)**

2. Conservativity

It is hard to distinguish between Copy Sensitive and Copy Insensitive rules because quantifiers in NL are conservative.

$$\begin{aligned}
 Q(A,B) &= Q(A, A \cap B) && \text{(by conservativity)} \\
 &= Q(A, A \cap \lambda x: A(x).B(x)) && \text{(by defensible assumptions about Pres. Projection)} \\
 &= Q(A, \lambda x: A(x).B(x)) && \text{(by conservativity)} \\
 &= Q(A, \lambda x. B(\text{the}Ax))
 \end{aligned}$$

But a Copy Sensitive Rule might account for conservativity.

Non-conservative quantifiers (if they existed) would be quite pointless.

(12) #Only girls are such that those girls are intelligent.

For a standard non-conservative quantifier, Q , the truth value of $Q(A,B)$ depends on the value of $B(x)$ for objects x that are not in A . However, for such objects B is undefined (since B is really $\lambda x. B(\text{the}Ax)$ ($= \lambda x: A(x).B(x)$)).

A very tentative attempt to specify the general principle that is at work here:

$Q(A,B)$ is inappropriate if in all worlds in the context set $Q(A,B)$ is not true.

- (13) a. #Very few boys in my class have a car, and Every boy drives his car to school.
 b. Very few boys in my class have a car, but one boy drives his car to school.
 Beaver 1992

Every $(A,B) = 1$ iff for every x , s.t. $A(x) = 1$, $B(x) = 1$. If we know that **there is an x in A** , such that $B(x)$ is undefined, we know there is no way for the sentence to be true.

Some $(A,B) = 1$ iff there is some x , s.t. $A(x) = 1$ and $B(x) = 1$. If we know that **every x in A** is such that $B(x)$ is undefined, we know there is no way for the sentence to be true.

Only $(A, B) = 1$ iff for every x , s.t. $A(x) = 0$, $B(x) = 0$. If we know that **there is an x in the complement set of A** , such that $B(x)$ is undefined, we know there is no way for the sentence to be true.

Under a Copy Sensitive Rule, $B(x)$ is undefined for every x in the complement set of A . Hence, *only* cannot be a natural language determiner.

However, the structures that are derived by QR can be the LF structures:

(20') [every boy λx Mary does < likes x >]
 λy John likes y

But this is true only if a Copy Insensitive Rule is adopted. Under a Copy Sensitive Rule, we get the following structure:

(20'') [every boy λx Mary does < likes the boy x >]
 λy John likes [the boy y ~~that~~ λz Mary does < likes z /the boy z >]

4.2. However, Sauerland...

4.2.1. Kennedy's puzzle

(21) a. I saw a book about a person_j you did <*saw t_j >
 b. I like the car that belongs to the man_j you do <*like t_j >

Sauerland's explanation: The sentences do not obey Parallelism because the trace in the relative clause and the trace of QR are semantically distinct (given the copy theory of movement).

(22) a. *[a book about a person_j you <saw person_j>]_i
 I saw book_j.
 b. [the car that belongs to the man_j you <*like man_j>]_i
 I like car_j

4.2.2. Sauerland's extension

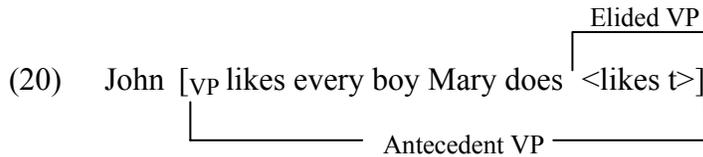
(23) a. *I visited a city near the lake_j John did <visited t_j >.
 b. (??)I visited a city near the city_j John did <visited t_j >.
 c. I visited a city near the one_j John did <visited t_j >.

(24) a. [a city near the lake_j John <visited lake_j>]_i
 I visited city_j.
 b. [a city near the city_j John <visited city_j>]_i
 I visited city_j.

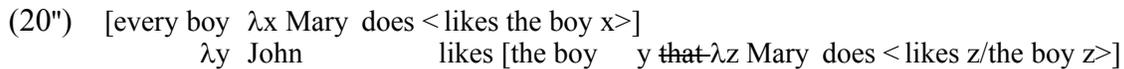
4.3. The Problem

The existence of ACD poses a serious problem for Copy Sensitive Rules. However, Sauerland's contrast suggests that we might want to deal with this problem. Specifically, it suggests that if we had a way to overcome the problems that ACD poses for a Copy Sensitive Rule, we might be able to account for Kennedy's puzzle.

4.4. Extraposition/late merger provides the answer

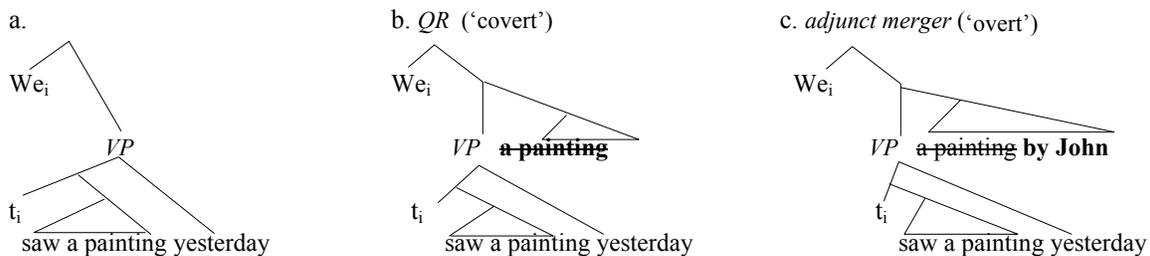


Simple QR doesn't work



Extraposition/Late Merger (Fox and Nissenbaum 1999):

(25) We saw a painting yesterday by John.



- (26) a. [A painting by John] λx we saw [the painting x] (Copy Sensitive Rule)
 b. [A painting by John] λx we saw [x] (Copy Insensitive Rule)

Assumption (following Sauerland 1998): Relative clauses are both head internal and head external:

- (27) Every [boy [~~boy~~ Mary likes boy]]
 \rightarrow Every' (boy' \cap λx . Mary likes the boy x)

The derivation for ACD:

- (28) [_{VP} John likes every boy]. -QR-->
 [[_{VP} John likes every boy] ~~every boy~~]. -adjunct insertion-->
 [[_{VP} John likes every boy] ~~every boy~~ that Mary does <likes boy>].
 [every boy λx Mary does <likes the boy x>]
 λy John likes the boy y]

Extraposition/late merger is necessary for ACD because without it, the VP and its antecedent don't satisfy Parallelism.

- b. I did none of the dives that my coach told me to <*do in order to prove that I could> in order to prove that I could.
- b. Bill read every book that I did <*read with great care> with great care.
- (36) a. I discussed nothing in order to upset my teachers that you did <discussed in order to upset your teacher>
- b. I did none of the dives in order to prove that I could that my coach told me to <do in order to prove that I could>.
- b. Bill read every book with great care that I did. <read with great care>
- (37) a. I read the book after you did <read it>
- b. *I read the book Bill did <read t after you read it> after you did <read it>
- c. I read the book after you did <read it> that Bill did <read t after you did>
- (38) a. You sent him_i the letter that John_j expected you would.
- b. You introduced him_i to everyone John_j wanted you to.
- c. I reported him_i to every cop John_j was afraid I would.

5. A constraint on Extraposition

5.1. Rochemont and Culicover's discovery

- (39) a. John saw an alleged mouse from Mars yesterday
- b. John saw an alleged Mouse yesterday from Mars.

Rochemont and Culicover: When EC is "extraposed" from DP, NP does not dominate EC.

- (40) 1. An [[alleged mouse] from Mars]
2. An [alleged [mouse from Mars]]
- (40') 1. $\lambda Q.\exists x(Qx \ \& \ \text{from-Mars}'(x) \ \& \ \text{alleged}'(\text{mouse}'(x)))$
2. $\lambda Q.\exists x(Qx \ \& \ \text{alleged}'(\text{mouse}'(x) \ \& \ \text{from-Mars}'(x)))$

- (41) $\llbracket \text{alleged} \rrbracket (P)(x) = 1$ iff there is an allegation that P is true of x.

When a speaker utters *An alleged mouse is in the room*, there is a feeling that the speaker doesn't believe that the alleged mouse is a real mouse. This is probably an implicature but since the distinction doesn't matter for our purposes, I will add this as part of the meaning of the lexical entry.

- (42) $\llbracket \text{alleged} \rrbracket (P)(x) = 1$ iff P is not true of x and there is an allegation that P is true of x.

5.2. The Complement Adjunct distinction

- (43) a. John read an alleged book yesterday about Irene Heim.
- b. John read an alleged book yesterday by Irene Heim.
- (44) a. John read an alleged book yesterday about Ronald Reagan.
- c. John read an alleged book yesterday by Ronald Reagan.

5.3. The constraint is more subtle

(39b) can also be true when the alleged mouse is not necessarily from Mars, i.e., only alleged to be from Mars.

Evidence in favor:

- (45) a. I saw an alleged antique yesterday from the 15th century.
 b. I met an alleged New-Yorker yesterday from the Upper East Side.
 c. They told me about an alleged alien the other day from Mars.

5.4. An Explanation

The observation is very surprising. There is no obvious way of getting the relevant reading from a parse of *an alleged NP adjunct*.

Take (45a) as an example. The relevant reading can be described with the following paraphrase:

- (46) $\exists x(\text{alleged}(\text{antique}(x)) \wedge \text{alleged}(\text{from-the-15}^{\text{th}}\text{-century}(x)) \wedge \text{saw}(I,x))$

The relevant reading is one under which (45a) is true if the thing I saw is (a) alleged to be an antique and (b) alleged to be from the 15th century. (45a) is false, or rather inappropriate, under this reading (as well as under the other relevant reading) when the thing I saw is known to be an antique and alleged to be from the 15th century.

However, we have more options once we consider the independent contribution to meaning that the trace makes under a Copy Sensitive Rule.

- (47) a. John saw an alleged mouse yesterday from Mars.
 b. Right after John saw an alleged mouse from Mars, he brought the alleged mouse to the lab.

- (45a') [An alleged [antique from the 15th century]]
 λx I saw [the alleged antique (identical to) x]

6. An argument from Focus (Sauerland in press)

- (48) a. I read every book before YOU *read every book*.
 b. I read every book before YOU *read EVERY book*.