

## Adjectival Modifiers and Relative Clauses

### 1 The interpretation of Adjectival Modifiers

The following cases of ambiguity can be characterized as involving a ‘high’ and a ‘low’ construal of the adjectival modifier respectively.

- (1) The first book that John said that Tolstoy had written  
‘high’ reading  $\approx$  In 1990, John said that Tolstoy had written *Anna Karenina*; in 1991, John said that Tolstoy had written *War and Peace*. Hence the NP in (1) is *Anna Karenina*.  
(i.e. order of *saying* matters, order of *writing* is irrelevant)  
‘low’ reading  $\approx$  John said that the first book that Tolstoy had written was *War and Peace*. Hence the NP in (1) is *War and Peace*.  
(i.e. order of *writing* matters, order of *saying* is irrelevant)
- (2) a. The only book that John said that Tolstoy had written  
b. The longest book that John said that Tolstoy had written

#### 1.1 ‘Low’ Readings and the Head External Analysis

- The *head* NP and the relative clause are both predicates (set-denoting expressions) which combine via intersective modification to create a new predicate (set-denoting expression).

- The modifiers *first/only/-est* apply to this predicate.

→ this yields the *first/only/longest* member of the set of books such that John said that Tolstoy wrote them. This is the ‘*high*’ reading.

There seems to be no way to put *first/only/-est* in the scope of *say*, which is what the ‘low’ reading requires.

Since under the head external analysis, the NP *head* of the relative clause does not originate inside the relative clause CP, there is no way to reconstruct it inside the relative clause.

#### 1.2 ‘Low’ Readings and the Head Raising Analysis of Relative Clauses

- Under the head raising analysis, the external head originates inside the relative clause and moves to its surface position. There is therefore a movement chain and we have the option of deciding which copy of the head NP to interpret.

- (3) The [*first/only/longest book*]<sub>i</sub> [<sub>CP</sub> *first/only/longest book*<sub>k</sub> that [John said [<sub>CP</sub> *first/only/longest book*<sub>k</sub> that [Tolstoy had written *first/only/longest book*<sub>k</sub>]]]] (copies are italicized.)
  - a. ‘High’ Reading: interpret the highest CP-internal copy  
the  $\lambda x$  first [book,  $x$ ] [John said that Tolstoy had written  $x$ ]  
 $\approx$  the first book about which John said that Tolstoy had written it
  - b. ‘Low’ Reading: interpret the lowest CP-internal copy  
the  $\lambda x$  [John said that [first [Tolstoy had written [book  $x$ ]]]]  
 $\approx$  the  $x$  s.t. John said that the first book that Tolstoy had written was  $x$ .

- The LFs for the ‘high’ and ‘low’ readings are generated through the independently motivated mechanisms of copy deletion and *-est*-movement (cf. Szabolcsi (1986), Heim (1995)).

→ How these LFs are interpreted and that these LFs are indeed the relevant ones is something we will return to (see also Sharvit (2004), Hulsev and Sauerland (to appear)).

→ Distinguishing between the structures provided by the matching analysis for the low reading from the structures provided by the raising analysis will also be deferred.

## 2 Additional Facts about the Low/High Contrast

### 2.1 A Correlation with NPI-Licensing

- (4) Only low reading:
  - a. the first book that John said that Tolstoy had ever written
  - b. the only book that John said that Tolstoy had ever written
  - c. the longest book that John said that Tolstoy had ever written

- (5) Only high reading:
- the first book that John ever said that Tolstoy wrote
  - the only book that John ever said that Tolstoy wrote
  - the longest book that John ever said that Tolstoy wrote

## 2.2 Intermediate Readings

- (6) the first book that John said that Dan told Mary that Antonia wrote

The LF corresponding to the intermediate reading of (6) is shown in (7).

- (7) the  $[_{CP} \lambda x [_{IP} \text{John said } [_{CP} \textit{first} [\text{book}, x] \text{ that } [_{IP} \text{Dan told Mary } [_{CP} \text{ that } [_{IP} \text{Antonia wrote } x]]]]]]]$   
 $\approx$  the  $x$  s.t. John said that the first book that Dan told Mary that Antonia wrote was  $x$ . (on the higher reading of this *first*)

## 2.3 Intervention Effects

Negation blocks low readings:

- (8) a. This is the first book that John didn't say that Antonia wrote.  
 b. This is the longest book that John didn't say that Antonia wrote.  
 c. This is the only book that John didn't say that Antonia wrote.

'Low' readings are also blocked by negative verbs like *doubt* and *deny*:

- (9) a. This is the first book that John denied that Antonia wrote.  
 b. This is the longest book that John doubted that Antonia wrote.

## 3 A Semantics for the Head Raising Analysis: First Try

### 3.1 Trace Conversion: Interpreting Reconstructed Phrases

The problem of types:

- (10) the book [Jonah thinks [that Olafur likes ]]  
 LF with *book* reconstructed into the relative clause:  
 the [Jonah thinks [that Olafur likes *book*]]

We can try covertly moving the head but that undoes the reconstruction:

- (11) the [book]  $\lambda x$  [Jonah thinks [that Olafur likes  $x$ ]]

Enter Trace Conversion

- (12) Trace Conversion
- Variable Insertion:  
 (Det) Pred  $\rightarrow$  (Det) [Pred  $\lambda y(y = x)$ ]
  - Determiner Replacement:  
 (Det) [Pred  $\lambda y(y = x)$ ]  $\rightarrow$  the [Pred  $\lambda y(y = x)$ ]  
 (Pred and  $\lambda y(y = x)$  combine by way of intersective modification to yield  $\lambda y[\text{Pred}(y) \wedge y = x]$ . Applying *the* to  $\lambda y[\text{Pred}(y) \wedge y = x]$  yields  $\iota \lambda y[\text{Pred}(y) \wedge y = x]$ , and we will use **the Pred**  $x$  as an abbreviation for this last expression.)  
 (from Fox (2001)/Fox (2002))

• Relative determiner is semantically vacuous (like the relative operator in Heim and Kratzer (1998)).

• The movement of the relative phrase creates an abstraction over the variable introduced by Variable Insertion. This needs to be specified.

- (13) the book [Jonah thinks [that Olafur likes ]]
- Syntactic structure with internal copies represented:  
 the book<sub>*i*</sub> [[Op book<sub>*i*</sub>]<sub>*j*</sub> Jonah thinks [[Op book]<sub>*j*</sub> that Olafur likes [Op book]<sub>*j*</sub>]]
  - Syntactic structure with lowest copy interpreted (other copies deleted):  
 the  $\lambda x$  [Jonah thinks [that Olafur likes [Op *book*]]]  
 (intermediate traces have been ignored)

Applying Trace Conversion:

- (14) the  $\lambda x$  [Jonah thinks [that Olafur likes **the book**  $x$ ]]  
 (**the book**  $x$  stands for  $\iota \lambda y [\text{book}(y) \wedge y = x]$ ; the book **identical to**  $x$ )

### 3.2 Interpreting the low reading LF

- (15) the longest book that John said that Tolstoy wrote
- The Full Chain:  
 the [[longest book] [[Op longest book] that John said [[Op longest book] that [Tolstoy wrote [Op longest book]]]]]
  - Copy Deletion:  
 the  $\lambda x$  [that John said that [Tolstoy wrote [Op longest book]]]
  - Trace Conversion:  
 the  $\lambda x$  [that John said that [Tolstoy wrote [the longest book  $x$ ]]]
  - est movement:  
 the  $\lambda x$  [that John said that -est  $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $x$ ]]]  
 $\approx$  the  $x$  s.t. John said that  $x$  is the longest book that Tolstoy wrote.

How is '[-est  $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $x$ ]]]' interpreted?

#### 3.2.1 The interpretation of -est

- (16)  $est(C)(P) = 1 \iff \exists d [P(d) \wedge \forall Q [Q \neq P \wedge Q \in C \rightarrow \neg Q(d)]]$   
 (P is a property of degrees, C a set of such properties)  
 (-est has no external argument under this analysis.)

John is angriest at Mary

LF: [C-est]  $\lambda d$  [John is  $d$ -angry at Mary]

Depending upon the context (and associated focus-marking),  $C$  can be:

- the set of degree properties of the form  $\lambda d [x \text{ is } d\text{-angry at Mary}]$
- the set of degree properties of the form  $\lambda d$  [John is  $d$ -angry at  $x$ ]  
 (from Heim 1995)

In the above example, the alternatives in  $C$  are generated by focus. In other cases, there is no focus - just a covert element such as a *wh*-trace, a relative clause trace, or a PRO.

- (17) a. Who <sub>$i$</sub>  does John think  $t_i$  got the fewest presents?  
 LF: Who <sub>$x$</sub>  [John thinks [ $est \lambda d$  [ $x$  got  $d$ -few presents]]]
- b. The boy who <sub>$i$</sub>  John thinks  $t_i$  got the fewest presents  
 LF: the boy who <sub>$x$</sub>  [John thinks [ $est \lambda d$  [ $x$  got  $d$ -few presents]]]
- c. John wants [PRO to get the fewest presents].  
 LF: John wants  $est \lambda d$  [PRO to get  $d$ -few presents]

#### 3.2.2 Generating the right $C$

The alternatives are generated by varying over the variable associated with the relative clause abstraction.

- (18)  $C = \{ \lambda d$  [Tolstoy wrote [the  $d$ -long book  $w$ ]],  
 $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $x$ ]],  
 $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $y$ ]],  
 $\dots$ ,  
 $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $z$ ]] }

Further examples of the role played by the head of the relative clause in determining the domain of comparison of the superlative.

- (19) a. the boy that gave the fewest presents to Roland  
 ( $C = \{ \lambda d$  [ $x$  gave  $d$ -few presents to Roland],  $\lambda d$  [ $y$  gave  $d$ -few presents to Roland],  $\dots$ ,  $\lambda d$  [ $z$  gave  $d$ -few presents to Roland]})
- b. the boy that Roland gave the fewest presents to  
 ( $C = \{ \lambda d$  [Roland gave  $d$ -few presents to  $x$ ],  $\lambda d$  [Roland gave  $d$ -few presents to  $y$ ],  $\dots$ ,  $\lambda d$  [Roland gave  $d$ -few presents to  $z$ ]])
- c. the present that Roland gave to the fewest boys  
 ( $C = \{ \lambda d$  [Roland gave  $x$  to  $d$ -few boys],  $\lambda d$  [Roland gave  $y$  to  $d$ -few boys],  $\dots$ ,  $\lambda d$  [Roland gave  $z$  to  $d$ -few boys]})

How is '[-est  $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $x$ ]]]' interpreted?

Given the above semantics for -est and associated assumptions about how  $C$  is determined, the subexpression -est  $\lambda d$  [Tolstoy wrote [the  $d$ -long book  $x$ ]] is equivalent to  $x$  was the longest book that Tolstoy wrote.

- This is the desired result, but it depends upon a particular assumption about how  $C$  is set. Sharvit (2004) and Hulse and Sauerland (to appear) question this assumption and provide alternative proposals.

### 3.3 Other readings and related cases

#### 3.3.1 Interactions with Plurality

- (20) the longest books that John said that Tolstoy wrote

Situation 1: Consider a world in which John makes different claims about the identity of Tolstoy's longest book on different occasions. First he says that it was War & Peace. Then he says it was Anna Karenina.

What if anything does (20) denote in Situation 1? What about Situation 2?

Situation 2: At one point John says that War & Peace, Anna Karenina, and *Kavkas* are Tolstoy's longest books and at another point of time he says that Anna Karenina and *Kavkas* are Tolstoy's longest books.

#### 3.3.2 Deriving High and Intermediate Readings

- High readings don't need the raising analysis but can be generated under a raising analysis by interpreting the highest copy.

Another option is shown below:

- (21) the [<sub>AP</sub> longest [<sub>NP</sub> book<sub>i</sub> [<sub>CP</sub> that Olafur said that Asa wrote t<sub>i</sub>]]]

(adjective is merged CP-externally, NP inside the relative clause, highest copy is interpreted.)

- Intermediate readings are obtained in the manner one might expect - by interpreting the intermediate copy.

- (22) the longest book that John said that Dan told Mary that Antonia wrote

## 4 Interpreting the Matching Analysis

- (23) The [first/only/longest book] [<sub>CP</sub> first/only/longest book<sub>i</sub> that [John said [<sub>CP</sub> first/only/longest book<sub>i</sub> that [Tolstoy had written first/only/longest book<sub>i</sub>]]]]] (copies are italicized.)
- 'High' Reading: interpret the highest CP-internal copy  
the  $\lambda x$  first [book,  $x$ ] [first [book,  $x$ ] [John said that Tolstoy had written  $x$ ]]  
Intended Interpretation: the first book about which John said that Tolstoy had written it
  - 'Low' Reading: interpret the lowest CP-internal copy  
the  $\lambda x$  first [book,  $x$ ] [John said that [first [Tolstoy had written [book,  $x$ ]]]]  
Intended Interpretation: the  $x$  s.t. John said that the first book that Tolstoy had written was  $x$ .

But does the structure in (23b) that the matching analysis provides us for the low reading has the intended semantics?

- (24) a. Structure with the external head and the lowest copy:  
the [longest book]  $\lambda x$ [John said that [Tolstoy had written [Op longest book]]]
- b. Structure after Trace Conversion:  
the [longest book]  $\lambda x$ [John said that [Tolstoy had written [the longest book  $x$ ]]]
- c. Structure after *-est* Movement:  
the [longest book]  $\lambda x$ [John said that *-est*  $\lambda d$  [Tolstoy had written [the *d*-long book  $x$ ]]]

Does the structure in (24c) have the intended interpretation indicated in (23b)?

A situation where things work out:

John said that War & Peace was Tolstoy's longest book and War & Peace happens to be Tolstoy's longest book.

But more generally, the structure at hand does not have the desired interpretation.

Note that the subexpression that excludes the determiner and the external head in (24c) (= CP<sub>1</sub>) is the same as in the head raising analysis (cf. 15d).

This predicate denoted by CP<sub>1</sub> can in principle pick out more than one book - for example in a situation where John is given to making claims about which book by Tolstoy was the longest.

→ Intuition: such a situation is not compatible with the low reading.

In principle, the following matching structure might predict acceptability under the above situation.

(25) the [[longest book] CP<sub>1</sub>]

One complicating factor: the head NP in (25) denotes a singleton set and so restrictive modification may not be available.

Two other matching structures:

(26) a. the longest [[book] [<sub>CP</sub>..book.....]]  
 b. *est*  $\lambda d \dots$  [[*d*-long book] [<sub>CP</sub>..[*d*-long book].....]]  
 (assumption: identity between external and internal head is established at LF, as in Sauerland (1998))

Neither of the above structures have *-est* internal to the relative clause so given our current assumptions, they cannot derive the low reading.

• An important aspect of the low reading is that the attribution of length etc. is relative to the embedding intensional verb. For a matching analysis to be viable, we need to use a device to do this, presumably semantic reconstruction.

## 5 Syntactic Correlations

### 5.1 Only NPs Reconstruct

The raising analysis only raises NPs. The determiner is always merged externally.

In certain environments the determiner must be merged externally:

- (27) Every book that there was on the table was obscene.  
 a. \*Head-Raising Analysis, the whole DP raises out of the relative clause  
 [[Every book]<sub>i</sub> [that [there was t<sub>i</sub> on the table]]] was obscene.  
 b. Head-Raising Analysis, only the NP raises out of the relative clause  
 [Every [book<sub>i</sub> [[Op t<sub>i</sub>]<sub>j</sub> that [there was t<sub>j</sub> on the table]]]] was obscene.

Potential for case conflict: nominative, accusative

(28) The book which John likes is good.

Certain elements can function as both determiners and adjectival modifiers. A low construal of such elements is only possible when the element appears in an adjectival guise.

- (29) Adjectival Usage:  
 a. the two books that John said that Tolstoy had finished  
 b. the few books that John said that Tolstoy had finished  
 c. the many books that John said that Tolstoy had finished  
 (30) a. the few books that John ever said that Tolstoy had finished (high)  
 b. the few books that John said that Tolstoy had ever finished (low)

In English, in the absence of the definite article, *two/few/many* must function as determiners and we find that the low reading is unavailable.

- (31) Determiner Usage:  
 a. two books that John said that Tolstoy had finished  
 b. few books that John said that Tolstoy has finished  
 c. many books that John said that Tolstoy has finished  
 (32) a. few books that John ever said that Tolstoy had finished (high)  
 b. \* few books that John said that Tolstoy had ever finished (low)

In Serbo-Croatian, numeral modifiers function adjectivally across the board and it is reported that low readings are available even when there is no overt definite determiner.

- (33) *dve knjige koje/sto je Jovan rekao da je Nada kupila*  
 two books which/that is Jovan said that is Nada bought  
 'two books that Jovan said Nada bought'  
 'the two books that Jovan said Nada bought' (on the low reading)

## 5.2 Pied-Piping

We noted earlier that overt pied-piping blocks the raising analysis of relative clauses. If raising is involved in the derivation of low readings, we would expect low readings and pied-piping to be in complementary distribution. This seems to be correct.

- (34) The first movie whose score John said that Shostakovich composed
- a. High Reading Available:  
The first movie whose score John ever said that Shostakovich composed
  - b. Low Reading Unavailable:  
\*The first movie whose score John said that Shostakovich ever composed

Some cute minimal pairs:

- (35) a. the first man a picture of whom John said that Mary liked
- i. High Reading Available:  
the first man [[a picture of whom] John ever said that Mary liked]
  - ii. Low Reading Unavailable:  
\*the first man [[a picture of whom] John said that Mary ever liked]
- b. the first man John said that Mary liked a picture of
- i. High Reading Available:  
the first man [John ever said that Mary liked a picture of]
  - ii. Low Reading Available:  
the first man [John said that Mary ever liked a picture of]

What about the following? Is there a contrast here?

- (36) a. i. the first book that John said that Tolstoy ever wrote  
ii. the first book which John said that Tolstoy ever wrote
- b. i. the first Russian that John said that he ever met  
ii. the first Russian which John said that he ever met

## 5.3 Extraposition

Hulsey and Sauerland (to appear) observe that extraposition blocks the raising analysis.

- Idiom interpretation forces raising analysis, extraposition in such cases is blocked.

- (37) (from Hulsey and Sauerland (to appear))
- a. *headway*:
    - i. Mary praised the headway that John made.
    - ii. \*Mary praised the headway last year that John made.
    - iii. Mary praised the headway that as of yesterday John had made.
  - b. *take advantage*:
    - i. I was shocked by the advantage that she took of her mother.
    - ii. \*I was shocked by the advantage yesterday that she took of her mother.
    - iii. I was shocked by the advantage that as of yesterday she had taken of her mother.
  - c. controls:
    - i. Mary praised the pot roast yesterday that John made.
    - ii. I was shocked by the garish dress yesterday that she took from her mother.

- Relative clause internal DPs binding into the head forces raising analysis, extraposition in such cases is blocked.

- (38) (from Hulsey and Sauerland (to appear))
- a. i. I saw the picture of himself<sub>i</sub> that John<sub>i</sub> liked.  
ii. \*I saw the picture of himself<sub>i</sub> yesterday that John<sub>i</sub> liked.  
iii. I saw the picture of Clinton yesterday that John liked.
  - b. i. Mary discovered the book about himself<sub>i</sub> that Bob wrote.  
ii. \*Mary discovered the book about himself<sub>i</sub> yesterday that Bob wrote.  
iii. Mary discovered the book about Rome yesterday that Bob wrote.
  - c. External Variable Binding does not force raising analysis, extraposition ok:
    - i. I saw the picture of myself yesterday that John liked.
    - ii. Mary discovered the book about herself that her father secretly wrote.

- Low readings need raising analysis - hence blocked by extraposition:

- (39) a. Low reading:  
 \*I read the first novel last week that John said that Tolstoy had ever written.
- b. High reading:  
 I read the first novel last week that John ever said that Tolstoy had written.

- Hulsev and Sauerland (to appear) argue that the observation that the raising analysis is incompatible with extraposition and that extraposition structures force the matching analysis follows largely from the proposal concerning late merge of relative clauses in Fox and Nissenbaum (1999)/Fox (2002).

- only matching analysis relative clauses can be late merged

- late merger is not an option for the raising analysis

- overt movement of the relative clause in a raising style analysis to the right is not permitted.

## References

- Fox, D. (2001) "The Syntax and Semantics of Traces," handout of Nov. 2001 talk at the University of Connecticut.
- Fox, D. (2002) "Antecedent Contained Deletion and The Copy Theory of Movement," *Linguistic Inquiry* 34.
- Fox, D., and J. Nissenbaum (1999) "Extraposition and Scope: A case for overt QR," in *Proceedings of the 18th West Coast Conference on Formal Linguistics*, Somerville, MA, Cascadia Press, 132-144.
- Heim, I. (1995) "Superlatives: A case study on the division of labor of syntax and semantics," unpublished manuscript, Massachusetts Institute of Technology.
- Heim, I., and A. Kratzer (1998) *Semantics in Generative Grammar*, Blackwell textbooks in Linguistics 13, Blackwell, Oxford.
- Hulsev, S., and U. Sauerland (to appear) "Sorting out Relative Clauses," *Natural Language Semantics*.
- Sauerland, U. (1998) *The Meaning of Chains*, Doctoral dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts. Distributed by MIT Working Papers in Linguistics.
- Sharvit, Y. (2004) "Two Reconstruction Puzzles," university of Connecticut ms., to appear in the proceedings of the Brown Conference on Direct Compositionality.
- Szabolcsi, A. (1986) "Comparative Superlatives," in N. Fukui, T. R. Rapoport, and E. Sagey, eds., *Papers in Theoretical Linguistics*, MIT Working Papers in Linguistics 8, MITWPL, Cambridge, MA, 245-265.