

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]_i [_{CP} *first/only/longest* book_k that [John said [_{CP} *first/only/longest* book_k that [Tolstoy had written *first/only/longest* book_k]]]]] (copies are italicized.)
 - a. 'High' Reading: interpret the highest CP-internal copy
the λx 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 λx [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), Hulsey 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:

- a. the first book that John ever said that Tolstoy wrote
- b. the only book that John ever said that Tolstoy wrote
- c. 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 Syntactic Correlations

3.1 Only NPs Reconstruct

The raising analysis only raises NPs. The determiner is always merged externally. In certain environments the determiner must be merged externally:

- (10)
- a. *Head-Raising Analysis, the whole DP raises out of the relative clause
[[Every book]_i [that [there was t_i on the table]]] was obscene.
 - b. Head-Raising Analysis, only the NP raises out of the relative clause
[Every [book]_i [[Op t_i]_j that [there was t_j on the table]]] was obscene.

Potential for case conflict: nominative, accusative

- (11) 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.

- (12) 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
- (13)
- 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.

- (14) 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
- (15)
- 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.

- (16) 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)

3.2 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.

- (17) 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:

- (18) 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 (Recall Áfarli's suggestion)?

- (19) 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

Initial investigation indicates that there isn't suggesting that the raising analysis is available with *which*.

3.3 Extraposition

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

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

(20) (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.

(21) (from Hulsey and Sauerland (to appear))

- a. i. I saw the picture of himself_i that John_i liked.
 ii. *I saw the picture of himself_i yesterday that John_i liked.
 iii. I saw the picture of Clinton yesterday that John liked.
 b. i. Mary discovered the book about himself_i that Bob wrote.

- ii. *Mary discovered the book about himself_i 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:

- (22) 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.

• Hulseley 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.

4 Some background on Superlatives

Szabolcsi (1986), Heim (1995), Sharvit and Stateva (2002) among many others.

4.1 Absolute vs. Comparative Readings

- (23) John climbed the highest mountain.
- a. Absolute reading: John climbed Mt. Everest.
 - b. Comparative reading: Of the locally salient people who climbed mountains, John climbed the highest mountain.

The contents of the comparison set in the comparative reading seem to be influenced by focus.

- (24) John is angriest at Bill.
- a. [John]_F is angriest at Bill.
Of the people angry at Bill, John is the angriest.
 - b. John is angriest at [Bill]_F.
Of the people that John is angry at, John is angriest at Bill.

Another option:

I've always enjoyed his sense of humor, even when I was angriest at him.

Absolute readings seem to be unavailable with comparatives of quantity.

- (25) a. John read the most books.
b. John read the fewest books.

An initial proposal: superlatives have a contextual restriction, whose contents are influenced by focus.

4.2 Locality Effects on Comparative Readings

Unlike *only*, superlatives do not need to c-command the focus they associate with.

- (26) a. John gave the most presents to Sue.
(→ *-est* can associate with John.)
- b. John only gave that book to Sue.
(→ *only* cannot associate with John.)

But as Szabolcsi (1986) pointed out, the superlative and the DP it associates with cannot be too far away.

- (27) a. John gave the most presents to Sue.
b. John wants to give the most presents to Sue.
c. ?John demanded that Sue be given the most presents.
d. ?*John believes that Sue was given the most presents.
e. *John likes the student who was given the most presents.
(* under the reading where *-est* associates with John.)

Szabolcsi (1986) proposes that *-est* needs to undergo LF-movement to be in the vicinity of the element it associates with.

When the required LF-movement is blocked, the relevant interpretation is unavailable.

4.3 Split Readings: comparing desires

Another argument for the movement of *-est* comes from the existence of *split* readings.

- (28) John wants to climb the highest mountain.
- a. Split Reading: people want to climb mountains of various heights. The height that John has in mind is more than the height other people do.

-est moves over *want*, *high mountain* stays below *want*.

- b. Non-Split Reading: John is very competitive. He wants to climb a mountain higher than one anyone else climbs.

-est stays below *want*.

If we do not move *-est*, the split reading cannot be derived straightforwardly (but see Sharvit and Stateva (2002) for a detailed proposal).

4.4 A question of type: *dt* or *det*

4.4.1 Background Assumptions about Adjectival Semantics

- Adjectives are relations between degrees and individuals.

- (29) John is tall.

John is d_{pos} -tall.
(tall to a contextually suitable degree)

$$\llbracket \text{tall} \rrbracket = \lambda d \lambda x [\text{tall}(d)(x) = 1]$$

- Monotonicity Assumption

- (30) If x is P to degree d , then x is also P to every non-zero degree d' less than d .

This leads to the counterintuitive result that if John is 6 feet tall, then he is also 5 ft. tall and so on. I will assume that the oddness of the utterance 'John is 5ft. tall' when his (maximal) height is 6ft. falls out from conversational implicatures similar to the oddness of saying 'John has one daughter' when 'John has two daughters' is true.

- Movement of *-est* creates a degree abstraction:

- (31) *-est* leaves behind a trace of type d .
- a. Surface:A-est.....
 - b. LF: *-est* λd d -A

4.4.2 A 3-place relation

This is the semantics that the surface syntax suggests:

- (32) Mt. Everest is the highest mountain.

(Mt. Everest) (*-est*(C)($\lambda d \lambda x$ [$\text{high}(x, d) \wedge \text{mountain}(x)$]))

- (33) $\llbracket \text{-est} \rrbracket (C)(R)(y)$ is defined only if (a) $y \in C$, and (b) for all $x \in C$, there is a degree d s.t. $R(x, d) = 1$.
When defined, $\llbracket \text{-est} \rrbracket (C)(R)(y) = 1$ iff there is a degree d s.t. $R(y, d) = 1$ and for all $z \in C$ s.t. $z \neq y$, $R(z, d) = 0$.

Pros: generalizes naturally to comparative readings with relative clauses, questions, and control constructions - assuming they all yield predicates.

Cons: connection with focus-sensitivity left unexplained. Analysis works well only if the focused element is the 'external argument' of superlative.

4.4.3 A 2-place relation

- (34) $\text{est}(C)(P) = 1 \iff \exists d [P(d) \wedge \forall Q [Q \neq P \wedge Q \in C \rightarrow \neg Q(d)]]$
(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] λd [John is d -angry at Mary]

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

(a) the set of degree properties of the form λd [x is d -angry at Mary]

(b) the set of degree properties of the form λd [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.

- (35) a. Who_i does John think t_i got the fewest presents?
LF: Who_x [John thinks [*est* λd [x got d -few presents]]]
- b. The boy who_i John thinks t_i got the fewest presents
LF: the boy who_x [John thinks [*est* λd [x got d -few presents]]]
- c. John wants [PRO to get the fewest presents].
LF: John wants *est* λd [PRO to get d -few presents]

So the pros and cons are reversed - the focus cases work well, but the non-focus cases become problematic.

5 A Semantics for the Head Raising Analysis: First Try

5.1 Trace Conversion: Interpreting Reconstructed Phrases

The problem of types:

- (36) 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:

- (37) the [book] λx [Jonah thinks [that Olafur likes x]]

Enter Trace Conversion

(38) Trace Conversion

a. Variable Insertion:

(Det) Pred \rightarrow (Det) [Pred $\lambda y(y = x)$]

b. 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 λy [Pred(y) $\wedge y = x$]. Applying *the* to λy [Pred(y) $\wedge y = x$] yields $\iota \lambda y$ [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.

(39) the book [Jonah thinks [that Olafur likes]]

a. Syntactic structure with internal copies represented:

the book_i [[Op book_i]_j Jonah thinks [[Op book]_j that Olafur likes [Op book]_j]]

b. Syntactic structure with lowest copy interpreted (other copies deleted):

the λx [Jonah thinks [that Olafur likes [*Op book*]]]

(intermediate traces have been ignored)

Applying Trace Conversion:

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

5.2 Interpreting the low reading LF

- (41) the longest book that John said that Tolstoy wrote
- a. The Full Chain:
the [[longest book] [[Op longest book] that John said [[Op longest book] that [Tolstoy wrote [Op longest book]]]]]
- b. Copy Deletion:
the λx [that John said that [Tolstoy wrote [Op longest book]]]
- c. Trace Conversion:
the λx [that John said that [Tolstoy wrote [the longest book x]]]

- d. *-est* movement:
 the λx [that John said that *-est* λd [Tolstoy wrote [the *d*-long book x]]]
 \approx the x s.t. John said that x is the longest book that Tolstoy wrote.

- c. the present that Roland gave to the fewest boys
 $(C = \{\lambda d$ [Roland gave x to *d*-few boys], λd [Roland gave y to *d*-few boys], \dots , λd [Roland gave z to *d*-few boys])

How is ‘[-*est* λd [Tolstoy wrote [the *d*-long book x]]’ interpreted?

5.2.1 The interpretation of *-est*

A two-place *-est*:

- (42) $est(C)(P) = 1 \iff \exists d[P(d) \wedge \forall Q[Q \neq P \wedge Q \in C \rightarrow \neg Q(d)]]$
 (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*] λd [John is *d*-angry at Mary]

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

- (a) the set of degree properties of the form $\lambda d[x$ is *d*-angry at Mary]
 (b) the set of degree properties of the form λd [John is *d*-angry at x]
 (from Heim 1995)

5.2.2 Generating the right *C*

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

- (43) $C = \{\lambda d$ [Tolstoy wrote [the *d*-long book w]],
 λd [Tolstoy wrote [the *d*-long book x]],
 λd [Tolstoy wrote [the *d*-long book y]],
 \dots ,
 λd [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.

- (44) a. the boy that gave the fewest presents to Roland
 $(C = \{\lambda d$ [x gave *d*-few presents to Roland], λd [y gave *d*-few presents to Roland], \dots , λd [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], λd [Roland gave *d*-few presents to y], \dots , λd [Roland gave *d*-few presents to z]])

How is ‘[-*est* λd [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* λd [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 Hulsey and Sauerland (to appear) question this assumption and provide alternative proposals.

5.3 Other readings and related cases

5.3.1 Interactions with Plurality

- (45) 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 (45) 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.

5.3.2 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:

- (46) the [_{AP} longest [_{NP} book_{*i*} [_{CP} that Olafur said that Asa wrote t_i]]]

(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.

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

6 Interpreting the Matching Analysis

(48) The [first/only/longest book] [_{CP} first/only/longest book_i that [John said [_{CP} first/only/longest book_i that [Tolstoy had written first/only/longest book_i]]]] (copies are italicized.)

- 'High' Reading: interpret the highest CP-internal copy
the λx 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 λx 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 (48b) that the matching analysis provides us for the low reading has the intended semantics?

- (49)
- Structure with the external head and the lowest copy:
the [longest book] λx [John said that [Tolstoy had written [Op longest book]]]
 - Structure after Trace Conversion:
the [longest book] λx [John said that [Tolstoy had written [the longest book x]]]
 - Structure after *-est* Movement:
the [longest book] λx [John said that *-est* λd [Tolstoy had written [the d -long book x]]]

Does the structure in (49c) have the intended interpretation indicated in (48b)?

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 (49c) (= CP₁) is the same as in the head raising analysis (cf. 41d).

This predicate denoted by CP₁ 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.

(50) the [[longest book] CP₁]

One complicating factor: the head NP in (50) denotes a singleton set and so restrictive modification may not be available.

Two other matching structures:

- (51)
- the longest [[book] [_{CP}.book.....]]
 - est* $\lambda d \dots$ [[d -long book] [_{CP}.[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.

7 Sharvit (2004)'s Objections

- Central Point: low readings do not involve reconstruction of *-est*. The only element that reconstructs is the head NP.

7.1 Overgeneration

Sharvit (2004) notes that the LF proposed by Bhatt (2002) for the low reading only works if C is generated by varying the embedded variable.

Relative clauses that contain superlatives do not in general force such a setting of C .

- (52) a. The boy [who_i [Mary gave the most expensive present to t_i]]

Case where relativized variable is varied to get C :

$$C = \{\lambda d \text{ [Mary gave [the } d\text{-much expensive present] to } w], \\ \lambda d \text{ [Mary gave [the } d\text{-much expensive present] to } x], \\ \lambda d \text{ [Mary gave [the } d\text{-much expensive present] to } y], \\ \dots \\ \lambda d \text{ [Mary gave [the } d\text{-much expensive present] to } z]\}$$

the boy x s.t. out of the people Mary gave presents to, x got the most expensive present (i.e. the most expensive present given by Mary went to x).

- b. The boy [who_i [[Mary]_F gave the most expensive present to t_i]]

Case where another focused element is varied to get C :

$$C = \{\lambda d \text{ [Mary gave [the } d\text{-much expensive present] to } x], \\ \lambda d \text{ [Gina gave [the } d\text{-much expensive present] to } x], \\ \lambda d \text{ [Tara gave [the } d\text{-much expensive present] to } x], \\ \dots \\ \lambda d \text{ [Sara gave [the } d\text{-much expensive present] to } x]\}$$

the boy x s.t. out of the people who gave presents to him, Mary's present was the most expensive (i.e. his most expensive present came from Mary).

But focusing *Tolstoy* does not seem to yield a comparable reading.

- (53) Low reading LF with Tolstoy focused:
the λx [that John said that -est λd [[Tolstoy]_F wrote [the d -long book x]]]
 $C = \{\lambda d$ [Tolstoy wrote [the d -long book x]],
 λd [Chekhov wrote [the d -long book x]],
 λd [Pushkin wrote [the d -long book x]],

...
 λd [Nabokov wrote [the d -long book x]]}

The truth conditions predicted here seem to be rather weak - with the above C , λx [that John said that -est λd [[Tolstoy]_F wrote [the d -long book x]]] will pick out any book that John said that Tolstoy wrote as long as we make the plausible assumption that John didn't say that more than one author wrote any given book.

The full DP will be defined in all (and only) the cases where there is a unique book which John said that Tolstoy wrote.

Such a reading seems to be absent.

7.2 Sharvit (2004)'s Proposal

- -est does not reconstruct
- the adjective (with the degree variable) + the NP reconstructs

- (54) Low reading LF for Sharvit (2004):
the -est $\lambda d \lambda x$ [that John said that [Tolstoy wrote [the d -long book x]]]

- (55) Assumptions about the semantics of -est and say:
- [-est](C)(R)(y) is defined only if (a) $y \in C$, and (b) for all $x \in C$, there is a degree d s.t. $R(x, d) = 1$.
When defined, [-est](C)(R)(y) = 1 iff there is a degree d s.t. $R(y, d) = 1$ and for all $z \in C$ s.t. $z \neq y$, $R(z, d) = 0$.
 - For any world w , proposition p , and individual x , [say](w)(p)(x) = 1 iff for all worlds w' compatible with what x says in w , $p(w') = 1$

Setting aside the intensional semantics of *say* for simplicity, let's see how the LF in (54) does.

Consider the following scenario:

- (56) John says:
- Tolstoy wrote the 450 pages long *War and Peace*.
 - Tolstoy wrote the 300 pages long *Anna Karenina*.
 - Tolstoy wrote the 290 pages long *Kavkas*.
 - Tolstoy wrote the 420 pages long *Prin*.

- (54) picks out *War and Peace*.

Note though that John never said that War and Peace was the longest book that Tolstoy ever wrote. He could very well deny that War and Peace was the longest book that Tolstoy ever wrote.

This is not quite the low reading. To see this consider another scenario:

- (57) John says: War and Peace is the longest book that Tolstoy wrote. He doesn't mention its length - he might not even know it or the names/lengths of other novels by Tolstoy - he just has reasons to believe that War and Peace is the longest Tolstoy novel.

(54) does not work in such a scenario.

To get the full low reading, we need something more - a mechanism that in effect puts *-est* in the scope of *say* - be it syntactic or semantic.

Sharvit (2004):13 provides a semantic mechanism for the purpose which intensionalizes *-est* and has its world argument be bound by *say*. The resulting semantic object is rather complex and I omit the details here.

8 Hulsey and Sauerland (to appear)'s Proposal

- Sharvit (2004) takes the problems that arise in Bhatt (2002)'s proposal with respect to the setting of the C variable to be a general argument against reconstruction of *-est*.

- Hulsey and Sauerland (to appear) take a different line, arguing that the problem with the setting of C can be remedied if we exploit intermediate traces.

8.1 Background Assumptions

- The world arguments of *long* and *book* must be bound within the complement of *believe*.

- 'the_x P ' is a shorthand for 'the $\lambda y(P(y) \wedge x = y)$ '.

- so even though P is not shown as taking any input, it actually is and it is because of this that we will treat it as if it of type t .

- A 3-place semantics for *-est* is assumed:

- (58) $\llbracket \text{-est} \rrbracket (C)(R)(y)$ is defined only if (a) $y \in C$, and (b) for all $x \in C$, there is a degree d s.t. $R(x, d) = 1$.

When defined, $\llbracket \text{-est} \rrbracket (C)(R)(y) = 1$ iff there is a degree d s.t. $R(y, d) = 1$ and for all $z \in C$ s.t. $z \neq y$, $R(z, d) = 0$.

8.2 Many LFs

8.2.1 LFs without Intermediate Traces

- (59) a. $\lambda w \dots$ the $\text{-est}(C) \lambda d \lambda x$ [John believes(w)
 $\lambda w'$ [Tolstoy wrote the_x [long(d)(w') \wedge book(w')]]]
- b. $\lambda w \dots$ the λx [John believes(w)
 $\lambda w'$ [Tolstoy wrote the_x $\text{-est}(C) \lambda d$ [long(d)(w') \wedge book(w')]]]

8.2.2 Exploiting Intermediate Traces: Option 1

- (60) the [longest book]_i [John believes [t_i [Tolstoy wrote t'_i]]]

(the [longest book]_i [John believes [[longest book]_i [Tolstoy wrote [longest book]_i]]])

(61) Potential LFs

- a. $\lambda w \dots$ the $\text{-est}(C) \lambda d \lambda x$ [John believes(w)
 $\lambda w' x \lambda x$ [Tolstoy wrote the_x [long(d)(w') \wedge book(w')]]]
- b. $\lambda w \dots$ the λx [John believes(w)
 $\lambda w' x \lambda x$ [Tolstoy wrote the_x $\text{-est}(C) \lambda d$ [long(d)(w') \wedge book(w')]]]
- c. $\lambda w \dots$ the λx [John believes(w)
 $\lambda w' x \text{-est}(C) \lambda d \lambda x$ [Tolstoy the_x [long(d)(w') \wedge book(w')]]]

→ note that (59a) is equivalent to (61a) and (59b) to (61b).

- 'the_x [long(d)(w') \wedge book(w')]' is defined for a pair (x, d) iff x is d -long in w' .

w' are the worlds of John's belief worlds.

...the second argument of *-est* in (53a) is only defined for a pair (x, d) if the book x is actually d -long, and then it is true. But since it cannot be false of any pair (x, d) , (53a) necessarily results in a presupposition failure. (from H&S)

It is the case that if x is not a d -long book in w' , 'the _{x} [long(d)(w') \wedge book(w')]' is undefined leading to the whole expression becoming undefined.

From x being d -long in w' , it does not (directly) follow that Tolstoy wrote x in w' .

Such cases get excluded from C by the presuppositional component of (8.2.2).

(62) $\llbracket \text{-est} \rrbracket (C)(R)(y)$ is defined only if (a) $y \in C$, and (b) for all $x \in C$, there is a degree d s.t. $R(x, d) = 1$.
When defined, $\llbracket \text{-est} \rrbracket (C)(R)(y) = 1$ iff there is a degree d s.t. $R(y, d) = 1$ and for all $z \in C$ s.t. $z \neq y$, $R(z, d) = 0$.

For (x, d) 's s.t. they are d -long books in w' but have not been written by Tolstoy, the predicate of degrees and individuals (R) will not satisfy the presupposition that every member of C but satisfy R to some degree.

Now we are left with (x, d) 's s.t. they are d -long books in w' and have been written by Tolstoy. Such cases will always satisfy R .

For *-est* to pick out a single element from R , R needs to be false for some (x, d) pair. Since this is not possible, we always end up with presupposition failure.

→ This is also the case with (61c).

• Hulsey and Sauerland (to appear) argue that (61b) is also ruled out, but for pragmatic reasons.

'the _{x} *-est*(C) λd [long(d)(w') \wedge book(w')]' picks out the longest book in C in w' . The whole relative clause is defined only for this book and either picks out this book (if John thinks Tolstoy wrote it) or nothing.

Hulsey and Sauerland (to appear) suggest that (61b) is blocked by a pragmatic condition according to which a restrictive relative clause cannot be used to express functions that are defined for only one individual (thus different from a relative clause like who is tallest).

Instead, they suggest that an appositive needs to be used here:

(63) the 'longest book', which John believes Tolstoy wrote (quotes indicate that scare quotes intonation is required.)

8.2.3 Exploiting Intermediate Traces: Option 2

Late Merger of Adjective in the intermediate trace position.¹

(64) Potential LFs

- a. $\lambda w \dots$ the *-est*(C) $\lambda d \lambda x$ [John believes(w)
 $\lambda w' x \lambda x$ [long _{x} (d)(w') \wedge Tolstoy wrote the _{x} [book(w')]]]
- $= \lambda w \dots$ the *-est*(C) $\lambda d \lambda x$ [John believes(w)
 $\lambda w'$ [long _{x} (d)(w') \wedge Tolstoy wrote the _{x} [book(w')]]]
- b. $\lambda w \dots$ the λx [John believes(w)
 $\lambda w' x$ *-est*(C) $\lambda d \lambda x$ [long _{x} (d)(w') \wedge Tolstoy wrote the _{x}
[book(w')]]]

As was the case with the LF that Sharvit (2004) adopts, where *-est* is not in the scope of the embedding predicate, (64a) runs into problems because it does not force 'exhaustivity'. This problem does not arise with (64b).

One way to make (64a) work better is to enrich the semantics of believe. We will return to this point after the discussion of Heycock (2003).

• Choosing between (64a and b):

(65) John is sure that out of Tolstoy's novels, War and Peace has 1000 pages, and Anna Karenina is either 50 pages longer or shorter than that. Furthermore he believes that all other novels by Tolstoy are shorter than 900 pages.

Relevant Belief Worlds:

- w_1 : War and Peace: 1000 pages, Anna Karenina: 1050 pages
- w_2 : War and Peace: 1000 pages, Anna Karenina: 950 pages

Assumption about the semantics of adjectives: monotonic semantics i.e. if a book is 1000 pages long, then it is also 900 pages long and so on.

¹The LFs shown below are not completely faithful to the LFs in Hulsey and Sauerland (to appear), ex. 53. Their (53d, e) seem to involve a type mismatch. I have moved the λx a bit to avoid the type mismatch.

- (66) I am reading the longest book that John said that Tolstoy wrote.
- a. Prediction of (64a): well-defined, should pick out *War and Peace*
 - b. Prediction of (64b): presupposition failure
- Intuition: presupposition failure

→ Putative support for (64b).

9 Heycock (2003)'s Analysis

Heycock (2003) shows that the distribution of 'low' readings is limited in ways that do not immediately follow from a raising analysis.

She argues that the particular shape of these restrictions suggests an entirely different analysis that does not involve head raising/reconstruction.

9.1 Nonsuperlative Modifiers

Ordinary adjectives also seem to give rise to putative low readings:

- (67) the wonderful books that Siouxsie said that Lydia had written

But unlike the superlative cases seen earlier, low readings require a scare quote intonation.

Such readings seem to be available even without an intensional embedding predicate as long as a scare quotes intonation is available.

- (68) the wonderful books that Lydia has written

In fact, Heycock (2003) points out that such readings seem to be available even when there is no relative clause:

- (69) Siouxsie was always going on about the books that Lydia had written. But I've read those wonderful books and they are complete rubbish.

For these reasons, Bhatt (2002) and Heycock (2003) focus on low readings with superlative-like modifiers. Hulse and Sauerland (to appear), however, do not give up on such cases.

Explanation for the scare quotes intonation requirement:

- (70) John believes that the thousand page book is interesting.
- a. 'the thousand page book' could be a 1000 page book just in John's beliefs
→ world variable of *thousand page book* bound by *believe*.
 - b. 'the thousand page book' could be a real 1000 page book but John could think it was something else.
→ world variable of *thousand page book* linked to world of evaluation.

Both *thousand page* and *book* can have their own world variables and these can be contra-indexed.

- (71) John believes that the thousand page section of wall will keep him entertained.
- a. Scenario 1: John is renting a new apartment. The previous occupant has painted the picture of a bookshelf on the wall, but John mistakes the picture for a real bookshelf. In particular, he forms the belief that one thick volume in the painted shelf has one-thousand pages and will keep him entertained.
 - b. Scenario 2: John is renting another new apartment. The previous occupant has left behind a bookshelf with one-thousand page volume in it. John, however, perhaps because he suffered through Scenario 1, believes that the bookshelf is a painted-on-the-wall fake. One of John's hobbies is cleaning and repainting walls, and he forms the belief that working on the section of the wall that he takes the book to be will keep him entertained.

Requirement: any time the world variables of two parts of an NP are contra-indexed, the part whose world variable is locally bound receives scare quotes intonation.

If there is no contra-indexation of variables, a low reading does not seem to require a scare-quotes intonation:

- (72) The thousand page book that John believes he bought turned out to be a DVD.

Low readings in the absence of relative clauses/embedding intensional verbs: Hulse and Sauerland (to appear) claim that superlative low readings also surface without relative clauses:

- (73) Siouxsie was always going on about the new Tolstoy book she bought and that it's the longest by Tolstoy. But I've read that longest book and it's a lot shorter than 'War and Peace'.

What about cases where there is no embedding predicate in the relative clause:

- (74) I've read the longest book Tolstoy wrote.

- Hulseley and Sauerland (to appear)'s conclusion: 'low' readings of adjectival modifiers are parallel to low readings found with superlatives.

9.2 Intervention Effects

Bhatt (2002) observed that a negation on the embedding intensional predicate blocks low readings:

- (75) 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*:

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

9.2.1 Connections with Amount Quantification

Even though an explicit theory is not provided in Bhatt (2002), it is suggested that the above facts are related to intervention effects found with amount quantification (see Kroch (1989), Cinque (1990), Heycock (1999), Beck (1996) among others).

- (77) a. How many articles does the editor want to have in this volume?
 i. for which n the editor wants to have n -articles in this volume?
 (consistent with the editor not having considered any particular articles yet)
 ii. for which n there are n -many articles that the editor wants to have in this volume?
 (the editor has article that s/he wants to publish in this volume; how many are there?)
 b. How many articles does the editor not want to have in this volume?

- i. **unavailable**: for which n the editor does not want to have n -articles in this volume?
 (consistent with the editor not having considered any particular articles yet)
 ii. **available**: for which n there are n -many articles that the editor does not want to have in this volume?
 (the editor has article that s/he wants to publish in this volume; how many are there?)

9.2.2 Divergence from Amount Quantification

Heycock (2003) suggests that these 'intervention' effects seem to only affect superlative modifiers and not idiom/anaphor interpretation.

- (78) a. *few* causes intervention for amount quantification:

How much do those/*few people weigh?

- b. *few* also blocks low readings:

This is the longest book that few people said that Tolstoy wrote.

high reading: of the books that few people said that Tolstoy wrote, this is the longest.

*low reading: This is the x s.t. few people said that x is the longest book T. wrote.

- c. but it does not block idiom interpretation:

This is the kind of headway that few people can make.

Further putative anaphor reconstruction is not blocked by negation/negative predicates:

- (79) a. Mary saw the picture of himself_i that John_i didn't show his mother.
 b. The picture of himself_i that everybody_i denied keeping was always eventually discovered in some drawer.

9.2.3 Predicate based Restrictions

The central observation in Heycock (2003) is that the class of embedding predicates that disallow low readings is bigger than the class of predicate that cause intervention effects for amount quantification.

According to Heycock (2003), *decide/be willing to/mistakenly think/agree/concede/prove* block low readings.

- (80) (slight modifications of her examples)
- a. This is the longest article that they have **decided** to publish.
 - i. high: Of the articles that they have decided to publish, this is the longest.
 - ii. ???low: This is the x s.t. they have decided that x will be the longest article they will publish.
 - b. This is the longest book that we **mistakenly thought** Antonia had written.
 - i. high: Of the books that we mistakenly thought Antonia had written, this is the longest.
 - ii. ???low: This is the x s.t. we mistakenly thought that x was the longest book Antonia had written.
 - c. This is the longest book that they **agreed** that Antonia had written.
 - i. high: Of the books that they agreed that Antonia had written, this is the longest.
 - ii. (???)low: This is the x that they agreed that x was the longest book A. had written.

They do not, however, cause intervention effects for amount quantification:

- (81) amount readings are available:
- a. How many articles did they decide/are they willing to publish?
 - b. How many books did you mistakenly think that Antonia had written?
 - c. How many books did they agree/concede/prove that Antonia was willing to write?

9.3 Enter Neg-Raising

Heycock (2003) relates the distribution of low readings to the availability of Neg Raising (see Horn (1978)/Horn (1989)).

- (82) a. *think* allows for Neg Raising:

I don't think they like me.

has an interpretation as

I think they don't like me.

- b. *know* does not allow for Neg Raising:

They don't know that John has left.

has no interpretation as

They know that John hasn't left.

Even though Heycock (2003) does not provide a detailed proposal as to how low readings are generated, it is clear that she assumes that the availability of Neg Raising is necessary for a low reading to be generated.

9.3.1 Non-Neg-Raising Predicates

She claims that predicates that block Neg Raising also block low readings.

- (83) Non-Neg-Raising Predicates

- a. factives: *know, regret*
- b. implicatives: *manage to*
- c. weak epistemic operators: *be possible*
- d. strong epistemic operators: *be certain*
- e. weak deontic operators: *can/could*
- f. strong deontic operators: *need/be necessary*
- g. others: *agree, concede, prove*

- (84) a. The longest book that we know she wrote
(\neq The x s.t. we know that x was the longest book she wrote.)
- b. Those are the most famous people he managed to befriend.
(\neq The x s.t. he managed it to be the case that x were the most famous people he befriended.)
- c. This is the longest book that it is possible he wrote.
(\neq The x s.t. it is possible that x is the longest book he wrote.)
- d. This is the longest book that it is certain he wrote.
(\neq The x s.t. it is possible that x is the longest book he wrote.)

9.3.2 Neg Raising Predicates

- (85) Neg-Raising Predicates

- a. believe, think
- b. want
- c. 'mid scalar' epistemic operators: likely, probable
- d. 'mid scalar' deontic operators: should, ought to

(86) Neg Raising predicates allow for low readings (from Heycock (2003):8-9)

- a. Those are the only people that he **wanted** to insult.
(possible reading: the x s.t. he wanted to insult only these people x)
- b. This is the only book that it's likely that he wrote.
(possible reading: the x s.t. it is likely that he wrote only x .)
- c. This is the only offence that he should claim to have committed.
(possible reading: the x s.t. he should claim that he committed only offence x .)

9.3.3 The effect of adverbials

Veloudis (1982) noted that VP adverbs can block Neg Raising.

- (87) a. I'm so relieved! For a moment I didn't think that you loved me.
 b. #I'm so relieved! For a moment I didn't mistakenly think that you loved me.

Presence of VP-adverbs also blocks low readings:

- (88) This is the only book that I mistakenly/foolishly thought that he had written.
 (≠ This is the x s.t. I mistakenly/foolishly thought that x was the only book that he had written.)

Heycock (2003) uses the adverbial blocking of Neg Raising and the necessity of Neg Raising for low readings to provide an explanation for the following observation:

- (89) NPI in embedding predicate blocks low reading:
- a. the first book that John ever said that Tolstoy wrote
 - b. the only book that John ever said that Tolstoy wrote
 - c. the longest book that John ever said that Tolstoy wrote

According to Heycock (2003), *ever* makes Neg Raising unavailable and hence blocks the low reading.

• But the facts seem to be more general. It seems that low reading is also blocked by a non-adverbial NPI in the embedding predicate.

(90) non-adverbial NPI in embedding predicate also blocks low reading:

- a. the first book that anyone said that Tolstoy wrote
- b. the only book that anyone said that Tolstoy wrote
- c. the longest book that anyone said that Tolstoy wrote

And it is not clear that such NPIs block Neg Raising:

- (91) a. John doesn't know that I don't think that Mary loves me. (has an interpretation: John doesn't know that I think that Mary doesn't love me.)
 b. John doesn't know that anyone came.
 c. (0)John doesn't know that anyone doesn't think that Mary loves them.
 d. If anyone thinks that Mary loves them, they are deluded.
 e. (0)If anyone doesn't think that Mary loves them, they are on the right track.

9.3.4 What about say?

say is not a Neg Raising predicate:

- (92) I didn't say he was here.
 ≠ I said he was not here.

Heycock (2003) proposes that *say* when it has a low reading functions as an evidential and is Neg Raising in that guise.

- (93) This is the only book that John said that Tolstoy wrote.
 (≈ This is the only book that Tolstoy wrote, according to John.)

In support of her contention, she notes that if we force the true verb of communication reading, the low reading becomes hard to get:

- (94) a. This is the only book that John said to me that Tolstoy wrote.
 b. This is the only book that John said on that occasion that Tolstoy wrote.

- An alternate line of attack is developed in Bhatt and Sharvit (in progress) where the factor responsible is not Neg Raising but the existence of an entailment relationship between low and high readings.

10 Summing Up

- Heycock (2003) shows that the lexical semantics of embedding predicates constrain the availability of low readings.
- She argues that Neg Raising is the relevant factor, but this is not so clear.
- Further, she does not provide an actual procedure to generate the low readings and Neg Raising, by itself, does not yield the right interpretation.
- An alternate proposal: reconstruct head and adjective but not the superlative into the scope of the embedding predicate (as argued for by Sharvit (2004) and explored in Hulsey and Sauerland (to appear)).

The lexical semantics of certain predicates will allow for a 'low' reading and others will not.

Semantic assumption about *believe*:

- (95) $\llbracket \text{believe} \rrbracket(w)(P)(x)$ is defined only if:
 $\forall w' \in \text{Dox}(x,w): P(w') = 1$, or
 $\forall w' \in \text{Dox}(x,w): P(w') = 0$.

(where $\text{Dox}(x,w)$ is the set of all worlds compatible with what x believes in w)

The above assumption predicts that *John believes AK is d-long* is undefined for degrees between 950 and 1050. This correctly predicts a presupposition violation.

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