Adjectival Modifiers and the Raising Analysis of Relative Clauses

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0.   Introduction

We start with the observation that (1) is ambiguous. The two readings 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 ≈ 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 ≈ 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)

Like (1), (2a, b) also have 'high' and 'low' readings.

(2)   a. The only book that John said that Tolstoy had written

b. The longest book that John said that Tolstoy had written

We show that it is not possible to derive the 'low' readings by using the head-external analysis of relative clauses. We then demonstrate how the 'low' readings can be derived using a version of the head-raising analysis of relative clauses.

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1.   'Low' Readings and the Head-external analysis of Relative Clauses

1.1.   The Head-external Analysis

The head-external analysis is quite ubiquitous in the literature, so much so that its origins
are unclear. Quine (1960) seems to suggest it, and it is assumed in Montague (1970), Partee
(1975), Chomsky (1977), Jackendoff (1977). In the head-external analysis, the *head* NP
originates outside the relative clause CP. The relative clause CP involves A'-movement of
a relative operator, which may be overt or covert. The relative clause CP is adjoined to the
head NP and the two combine semantically via intersective modification.

(3) $[_{DP}$ the $[_{NP}$ $[_{NP}$ book] $[_{CP}$ Op_i $[_{IP}$ John likes t_i]]]]
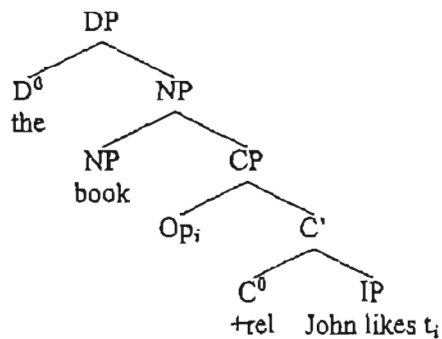
1.2.   'Low' Readings and the inadequacy of the Head-external Analysis

Let us apply the head-external analysis to (4a-c).

(4)   a. The first book that John said that Tolstoy had written
        b. The only book that John said that Tolstoy had written
        c. The longest book that John said that Tolstoy had written

The *head* NP and the relative clause are both predicates which combine via inter-
sective modification to create a new predicate. 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
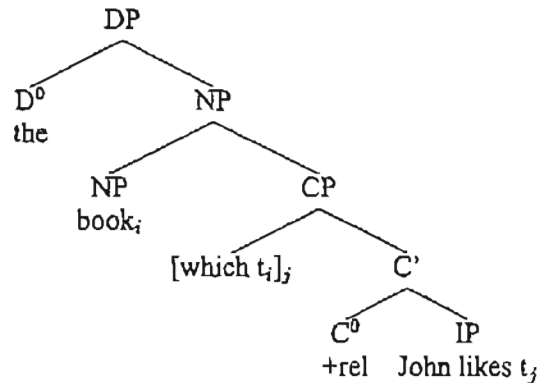inside the relative clause.

2.   'Low' Readings and the Head-Raising analysis of Relative Clauses

2.1.   The Head-Raising Analysis

The Head-Raising analysis was originally proposed by Brame (1968), Schachter (1973),
and Vergnaud (1974). Recent versions include Kayne (1994) among others. Under the

head-raising analysis that we are adopting, the *head* NP originates inside the Relative Clause CP. The *head* NP and the relative operator of which the *head* NP is a complement move to [Spec,CP] via A'-movement. From the [Spec,CP], the *head* NP moves out of the CP and adjoins to the CP.

(5) $[_{DP}$ the $[_{NP}$ $[_{NP}$ book$]_i$ $[_{CP}$ [which $t_i]_j$ $[_{C'}$ C^0 $[_{IP}$ John likes $t_j]]]]]$

Since the *head* NP originates inside the relative clause CP, it is possible to reconstruct it inside the relative clause. A brief summary of earlier arguments for the Head-Raising analysis of Relative Clauses and a discussion of some the problems faced by this analysis is provided in Appendix A.

2.2.   'Low' Readings and the Head-Raising Analysis

Under the head-raising analysis, we have the option of deciding which copy of the *head* NP to interpret.[1]

(6)   The [first/only/longest book]$_i$ $[_{CP}$ *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.)

   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 $[first$ [book, x] [Tolstoy had written 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, for some details see Appendix B).

Given a semantic mechanism for interpreting reconstruction into relative clauses (see Appendix C), we get the desired truth-conditions, which are indicated by the paraphrases in (6).

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[1] For simplicity, the null relative operator which takes *first/only/longest book* as a complement has been omitted in (6). A more complete representation would show A' movement of the phrase headed by the relative operator followed by the movement of *first/only/longest book* out of the relative clause CP.

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3.   Evidence for the proposal from NPI-licensing

So far, we have seen that there is a reading (the 'low' reading) which cannot be derived given the head-external analysis of relative clauses but which can be derived using a head-raising analysis of relative clauses. This is sufficient to show the inadequacy of the head-external analysis but does not in itself demonstrate that the head-raising analysis is the mechanism involved in the derivation of the 'low' reading. To show that the head-raising proposal sketched here is indeed how the 'low' reading is derived, we will show that the 'low' reading correlates with certain phenomena that require the presence of the raised modifier in the embedded clause at LF.

According to our proposal, for the 'low' readings, *first/only/-est* are at LF in a position that is distinct from their surface position. On the surface, *first/only/-est* appear as NP-modifiers, external to the relative clause. However, in the LF for the 'low' reading, they are in the embedded clause (the *write* clause in 6). We know that *first/only/-est* are able to license negative polarity items (cf. 7).

(7)   This is the only/longest/first book that I have *ever* read.

If the appropriate configuration for NPI licensing holds at LF, we expect to find reflexes of the reconstruction of *first/only/-est* for the 'low' reading in NPI licensing and we do. We can force a 'low' reading by putting a Negative Polarity Item in the embedded clause.

(8)   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

The examples in (8) only display the 'low' reading of *first/only/est*. (8a) only picks out the x such that John said that the first book that Tolstoy had ever written was x. This is not surprising given that we know that NPIs must have *local* licensors (cf. Linebarger 1980). Likewise, the examples in (9) only display the 'high' reading.

(9)   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

The correlation between NPI-licensing and 'low' vs. 'high' readings supports our proposal that for the 'low' reading, *first/only/-est* (the NPI-licensor) must be interpreted in a position lower than its surface position.

4.   A′-Reconstruction and 'Low' Readings

Our specific proposal that the derivation of 'low' readings of adjectival modifiers in relative clauses involves the head-raising analysis receives additional support from the existence of intermediate readings and the existence of intervention effects.

4.1.   Intermediate Readings

Since the device by which we are relating the *head* NP to the relative clause-internal trace

position is A'-movement[2], and A'-movement is successive cyclic, we predict the existence of *intermediate* readings i.e. readings that are neither 'high'(-est) nor 'low'(-est). This prediction is borne out. (10) has an 'intermediate' reading.

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

The LF corresponding to the intermediate reading of (10) is shown in (11).

(11)   the $[_{CP}\ \lambda x\ [_{IP}$ John said $[_{CP}\ first$ [book,x] that $[_{IP}$ Dan told Mary $[_{CP}$ that $[_{IP}$ 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*)

The *head* NP moves through successive cyclic movement from the most deeply embedded clause through the [Spec,CP] positions of all the intervening clauses. The *first/only/-est* can associate with any of the intervening clauses. When *first/only/-est* associate with the intermediate clause (the *tell* clause), the result is the 'intermediate' reading in (11).

4.2.   Intervention Effects

Our proposal that A'-movement is involved in the derivation of 'low' readings receives further support from the fact that the 'low' readings of modifiers are blocked by the presence of an intervening negation.

(12)   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*.

(13)   a.   This is the first book that John denied that Antonia wrote.

        b.   This is the longest book that John doubted that Antonia wrote.

        These are also environments where certain kinds of A'-dependencies are blocked. The intervention of a negative element between the position of a phrase in overt syntax and its reconstructed position triggers the Negative Island effect. This is the case with *how many* question cf. (14).

(14)   How many dogs did John not feed?

        a.   For which n: there are n-many dogs that John did not feed.
             (available reading; negation does not intervene between the degree operator and the degree variable)

        b.   For which n: it is not the case that John has fed n-many dogs.
             (unavailable reading; negation intervenes between the degree operator and the degree variable)

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[2]There are two movements involved in the head-raising analysis according to our proposal: there is A'-movement internal to the CP and then there is a head-raising movement that extracts the *head* NP out of the relative clause and adjoins it to the relative clause CP. See §6.6 for some details.

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The observations regarding Negative Islands are due to Ross (1984), the particular correlation between reconstruction across a negation and the Negative Island effect that I have in mind is due to Heim (1992) and Beck (1996). We are not providing a complete explanation of why we find intervention effects with 'low' readings here.[3] Our objective is merely to show that the existence of intervention effects patterns with certain cases of A'-movement, thus lending support to our proposal that the derivation of 'low' readings involves A'-movement and reconstruction.

5. Only NPs reconstruct

In the version of the head-raising analysis of relative clauses that we have adopted, it is the NP (and associated adjectival modifiers) that raises out of the relative clause CP. The D^o is merged external to the structure created by the adjunction of the raised NP to the relative clause CP. 'Low' readings arise by reconstruction of the adjectival modifier into a position lower than its surface position. Within our proposal, only the NP (and associated adjectival modifiers) have the option of reconstruction. Since the D^o originates in its surface position, it cannot participate in reconstruction.

If a particular element could appear both as an 'adjectival' modifier and as a determiner, we would expect it to have 'low' readings only in its 'adjectival' guise. This prediction is borne out. 'High' and 'low' readings are available with numeral modifiers when they occur with *the*, with numeral-like uses of *few/many* when they occur with *the*, and adjectives in general.

(15)   a.   the two books that John said that Antonia has written

b.   the few books that John said that Antonia has written

c.   the many books that John said that Antonia has written

When *few/many*/numerals are used without a *the*, the lower readings disappear.

(16)   a.   two books that John said that Antonia has written

b.   few books that John said that Antonia has written

c.   many books that John said that Antonia has written

This is precisely what is predicted by our proposal. In the absence of *the*, *two/few/many* function as determiners. They are merged external to the relative clause CP and cannot be reconstructed inside the CP. The 'low' reading which requires reconstruction is therefore absent.

6. Appendix A: Earlier Arguments for the Head-Raising Analysis

In the following sections, we provide a brief summary of some of the arguments that have been previously adduced in favor of the head raising analysis of relative clauses.

6.1 Idioms

The logic behind the argument from 'idioms' for a raising analysis goes as follows: the

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[3]For example, it is not clear why there are no intervention effects with *Which picture of himself$_i$ does Mary deny that John$_i$ admires?*. Further, it is not obvious why the A'-movement involved in the derivation of the 'low' reading is the kind of A'-movement that displays intervention effects.

'idiom' can only appear as part of a larger expression. The larger expression is shown in the (17-20a). That it cannot appear outside this context is shown in (17-20b). However, the 'idiom' is able to felicitously appear as the *head* NP of a relative clause, where the position it is associated with inside the relative clause (its trace) is part of the larger expression it needs to appear with. This is shown by the examples in (17-20c).

      Under a head-external analysis, given the unacceptability of the examples in (17-20b), the acceptability of the examples in (17-20c) is unexpected and vice versa. The raising analysis is able to explain these facts parsimoniously. 'Idioms' need to appear in a particular environments as shown by the examples in (17-20a) and the unacceptability of the examples in (17-20b). The examples in (17-20c) are acceptable because the 'idiom' appears in the relevant environment at some point in the derivation (minimally point of Merge, maybe also at LF).

(17)   (cited to Brame 1968 ms., ex. 35 from Schachter 1973)

     a. We made headway.

     b. * (The) headway was satisfactory.

     c. The headway that we made was satisfactory.

(18)   (ex. 36 from Schachter 1973)

     a. She's keeping careful track of her expenses.

     b. * (The) careful track pleases me.

     c. The careful track that she's keeping of her expenses pleases me.

(19)   (ex. 37 from Schachter 1973)

     a. Lip service was paid to civil liberties at the trial.

     b. * I was offended at (the) lip service.

     c. I was offended by the lip service that was paid to civil liberties at the trial.

(20)   (cited to George Bedell, fn. 15 from Schachter 1973)

     a. He solved the problem in a clever way.

     b. The clever way in which he solved the problem impressed me.

     c. *The clever way impressed me.

6.2.   Subcategorization

Larson (1985) observes that headed relative clauses containing a trace in adjunct position, but neither a relative adverb or a stranded preposition, are grammatical only if the *head* NP is a *bare-NP adverb*.

(21)   (from Larson 1985) (Roumyana Izvorski p.c.)

     a. the way [Op$_i$ that you talk t$_i$]

     b. *the manner/fashion [Op$_i$ that you talk t$_i$]

     c. You talk that way.

     d. *You talk that manner/fashion.

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The well-formedness of the operator-variable chain in (21a) depends upon what the *head* NP is. Information about the *head* NP is required internal to the relative clause. Under a head-raising analysis, the ill-formedness of (21b) directly follows from the ungrammaticality of (21d). This explanation is not directly available under the head-external analysis and Larson, who is assuming the head-external analysis, has to introduce a feature-transmission mechanism which makes the relevant information about the *head* NP available internal to the relative clause.

6.3.   Binding Theory Evidence

The argument from binding theory evidence is based on the examples in (22-24), which show that here for the purposes of binding theory the *head* NP behaves as if it was in its (lowest) trace position inside the relative clause.

(22)   (exs. 42a, 43a from Schachter 1973)

    a.   The portrait of himself$_i$ that John$_i$ painted is extremely flattering.

    b.   The interest in each other$_i$ that John and Mary$_i$ showed was fleeting.

(23)   *The opinion of him$_i$ that John$_i$ has is favorable.
    (compare with: *The opinion of himself$_i$ that John$_i$ has is favorable.*)

(24)   (exs. 41b, 42b from Schachter 1973)

    a.   *The opinion of John$_i$ that he$_i$ thinks Mary has is unfavorable.

    b.   *The portrait of John$_i$ that he$_i$ painted is extremely unflattering.

Under the 'head-external' analysis, we expect the Condn. A example to be bad (unless we appeal to a device such as logophoricity etc.) and we expect the Condn. B and Condn. C examples to be good. The actually observed pattern of (un)grammaticality can be explained under the raising analysis if the *head* NP is interpreted at LF in its trace position. All the binding theory examples below are cases where like in the 'idiom' cases (*paint a portrait of, show an interest in, have a (Adj) opinion of*) it is plausible that at LF the *head* NP has to form a unit at LF with relative-clause internal material. This might explain why we get reconstruction of the *head* NP into the relative clause for binding purposes.[4]

6.4.   Amount Relatives

The existence of amount readings provides another reason for assuming a raising analysis of relative clauses. In (25), for independent reasons, we do not wish to entertain a variable following *there be* (cf. Carlson 1977, Heim 1987).

(25)   (from Heim 1987:33, also see Carlson 1977)
    The very few books that there were on his shelves were all mysteries.
    LF: The very few λd that there were *d*-many-books on his shelves were all mysteries.

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[4]The obligatory relative-clause internal interpretation of the *head* NP that we see in (23) and (24) is not a general property of relative clauses. There exist cases where the *head* NP must be interpreted in a relative-clause external position (cf. i).

   i.   In [[pictures of Al$_i$] which he$_i$ lent to us], he is shaking hands with the president. (from Munn 1994 via Safir 1999)

Therefore it is postulated that the *head* NP is reconstructed in the trace position and the abstraction is over a degree variable. It is possible to interpret the *head* NP in the trace NP only under the raising analysis. Thus the analysis of amount relatives provides independent support to the raising analysis.

Reconstruction in amount readings can take the *head* NP below another scope bearing element thus producing scope reconstruction effects. This is the the case in (26).

(26) (exs. from Sauerland 1998:54a, b)

    a. No linguist would read the many books Gina will need for vet school.
       possible reading: need > many

    b. Mary shouldn't even have the few drinks that she can take.
       possible reading: can > few

6.5. Scope Reconstruction

In (26), we saw an instance of the *head* NP taking scope under a relative clause internal modal. (26), however, involved amount readings. The *head* NP can take scope under a relative clause internal operator even in the absence of amount readings. This point is made by examples like (27).

(27) I am worried about the twenty five people likely to come for dinner tomorrow.
    possible reading: likely > 25 people (Heim p.c.)

A head external analysis is unable to derive the relevant reading of (27). A head raising analysis has more success since it provides us with a way of putting the *head* NP under the scope of *likely*.[5]

6.6. Some Problems

The head raising analysis faces two primary problems. Both problems are related to the step where the *head* NP moves out of the relative clause CP and adjoins to it. The first problem is that the movement involved is an unorthodox one which involves extractions of unboundedly deeply embedded possessors.[6]

(28) Assumption: *which* with a covert [+human] complement is pronounced *who* (cf. Kayne 1994, fn. 12, pg. 154)

    a. the [[$_{NP}$student]$_i$ [$_{CP}$ [which [$_{NP}$student]$_i$], C^0 [Jonah likes t$_j$]]]
       Pronounced: 'the student who Jonah likes'

    b. the [[$_{NP}$student]$_i$ [$_{CP}$ [[which [$_{NP}$student]$_i$]'s brother]$_j$ C^0 [Jonah likes t$_j$]]]
       Pronounced: 'the student whose brother Jonah likes'

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[5]The question, however, remains of exactly what kind of object the NP + relative clause denotes and how this object is derived from the relative clause.

[6]It may be the case that the movement of the *head* NP out of the relative clause seems unusual only because the other cases of phrasal movement we are comparing it to all involve DP, and not NP, movement. Unlike DP movement, NP movement does not have to obey the usual constraints on case and θ-roles. This is so because plausibly, DP's, and not NP's, receive case and θ-roles. So it should not be surprising if NP and DP movement have different properties. If this suggestion is on the right track, then the question will arise as to why (and whether) NP movement is only found in relative clauses.

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   c. the $[[_{NP}\text{student}]_i$ $[_{CP}$ $[[[\text{which}$ $[_{NP}\text{student}]_i]$'s brother]'s roommate]$_j$ C^0 [Jonah
     likes t_j]]]
     Pronounced: 'the student whose brother's roommate Jonah likes'

     The second problem relates to the nature of the landing site of the problematic movement. When the *head* NP moves out of the relative clause CP, it is an instance of a projecting movement i.e. an instance of movement where the moving phrase and not the target projects. None of the instance of movement that we are familiar with, e.g. *wh*-movement, raising, and head-raising, involve a projecting movement. In all these cases, it is the target that projects. Chomsky (1995, §4.4.2), Chomsky (1998, §5:pg. 51) build into the derivational mechanism that in cases of of movement, it is always the target that projects.[7]

     For the above reasons, it has been proposed that the relationship between the *head* NP and the complement of the relative operator is one of *matching* (and deletion) and not actual movement (cf. Chomsky 1965). There are three arguments in favor of treating the relationship between the *head* NP and the complement of the relative operator as involving actual movement. First, with the head raising analysis we can explain why the *head* NP is pronounced, based on general conceptions of how movement chains are pronounced. Second, under the head raising analysis, it follows why the *head* NP must be pronounced and the relative clause internal material must be deleted (i.e. * the book which book Mary likes). Finally, in ellipsis (which is what the *matching* and deletion account amounts to), while only phrase is pronounced both phrases are interpreted. In relative clauses, we find cases where the *head* NP seems to be interpreted wholly relative-clause-internally. This is to be expected under a movement analysis but not under a *matching* story.

7.   Appendix B: Movement of *first/only/-est*

There is independent evidence provided by Szabolcsi (1986), Heim (1995) that shows that *est* moves to associate with focus. The examples in (29) show that *est* associates with focus (cf. Ross 1964, Jackendoff 1972, Szabolcsi 1986, Gawron 1995, Heim 1995):

(29)   a. **Joan**$_F$ gave Caterina the most expensive present.
       ≈ Some people gave Caterina presents. Of all those presents, the present that was given by Joan was the most expensive.

     b. Joan gave **Caterina** $_F$ the most expensive present.
       ≈ Joan gave some people present. Of all those presents, the present given to Caterina was the most expensive.

     Depending upon where the focus falls, we get truth-conditionally distinct readings (29a vs. b). It turns out that the association of *est* with focus is constrained by syntactic islands (cf. 30).

(30)   (* indicates the unavailability of the indicated reading)

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[7]The problem of projecting movement might turn out not to be a problem at all. Iatridou, Anagnostopoulou, & Izvorski (2000) argue that projecting movement is necessary for the proper analysis of reduced relatives. They note that it is unnecessary to have a stipulation against projecting movement built into the grammar. The surrounding environment is sufficient in all the relevant cases to determine whether it is the target that projects or the moved phrase.

    a. **Bill**$_F$ expected [PRO to get the fewest letters].
        $\approx$ Bill expected to get 2 letters, Jane expected to get 3, Polly expected to get 5 letters. Hence Bill expected to get the fewest letters.

    b. **Bill**$_F$ wanted [PRO to climb the highest mountain].
        $\approx_{dedicto}$ Bill wanted to climb a mtn. of height 10kms., Jane wanted to climb a mtn. of height 7kms., Polly wanted to climb a mtn. of height 5kms. Hence Bill expected to climb the highest mountain.

    c. **Bill*$_F$ likes the student who John gave the fewest presents.
        $\neq$ Bill likes the student who John gave 10 presents. Jane likes the student who John gave 15 presents. Polly likes the student who John gave 20 presents. John also gave Einar 3 presents, but nobody seems to like Einar. (There may also be students who John gave no presents). Hence Bill likes the student who John gave the fewest presents.

    d. **Bill*$_F$ made the claim that you got the fewest letters.
        $\neq$ Bill made the claim that you got 2 letters, Jane made the claim that you got 3, Polly made the claim that got 5. Hence Bill made the claim that you got the fewest letters.

        Szabolcsi (1986), Heim (1995) argue that the paradigm in (30) reflects LF-movement of *est* and the assumption that *est* can only associate with a focus that it c-commands at LF. In order for the *est* to associate with the focus on *Bill*, *est* has to move to a position where it c-commands *Bill*. In the case of (30c, d), this would involve movement of *est* out of an island. Therefore, *est* is unable to associate with focus on *Bill* in (30c, d). The evidence provided for movement of *est* extends to *first* and nominal *only*.

8.   Appendix C: Semantic interpretation of Reconstructed Phrases

The problem with interpreting the *head* NP in a relative clause-internal position from a semantic perspective is that the types do not fit. NPs are predicates (of type $< e, t >$) but the position of reconstruction requires an individual (of type e) or a generalized quantifier (of type $<< e, t >, t >$).

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

        For example, in (31), how does *likes* which takes an individual/generalized quantifier argument take *book*, which is a predicate as an argument. To get around this problem, we assume that the predicate can undergo short movement to a position where the semantic types are correct. This, however, is not sufficient. In addition, we need a type-adjustment rule.

(32)   The book [Jonah thinks [that Jones likes]]

    a. After Copy deletion: the [C^0 [Jonah thinks [that Jones likes [book]]]]

    b. Local movement for interpretive reasons
        the [C^0 [Jonah thinks [that [[book] λx [John likes x]]]
        the [C^0 [Jonah thinks [that $\lambda x[book(x) \wedge like(j, x)]]]]$

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  c. Type adjustment: C^0 requires a propositional complement, it gets a predicate as a complement. C^0 type-lifts the predicate into a proposition with a free variable.
$[C^0] = \lambda P \exists x [P(x) \wedge x = y] = P(y)$
the $[C^0$ [Jonah thinks $|\exists x|book(x) \wedge like(j,x) \wedge x = y]]]]$

  d. Relative C^0 binds the free variable
the λx [Jonah thinks $[book(x) \wedge like(j,x)]]$

    The type-adjustment rule in (32c) is an innovation, used to make the types come out right. Without it, *think* which takes a propositional complement would receive a predicate as a complement. It is possible that a more independently motivated rule of interpretation could derive the reading that we are going for. In that case, the type-adjustment rule can be abandoned without damage to the remaining proposal.

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