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On the Interpretation of Two-headed
Stacked Relative Clauses

Gregory T. Stump
The University of Kansas

1. Among the regularities seen to govern the occurrence and behavior of relative clauses, those associated with the cooccurrence of stacked relative clauses with the presence of more than one possible head noun in the relativized NP have been for the most part ignored. The following is an attempt to define some of these regularities.¹

1.1 Two types of NP exhibiting this cooccurrence can be distinguished: Those denoting some incompletely- or fully-specified set and an incompletely- or fully-specified subset of it (for example, sentences 1 and 2); and those whose two potential head nouns aren't explicitly related sets (of which 3 and 4 are examples).

1. [One of John's elephants that came from
NP Africa that escaped]
2. [Those members of the committee that the
NP President appointed that approved]
3. [The parents of the children who were waiting
NP to see the movie who didn't have
tickets yet]
4. [The name of the character that I thought up
NP that everyone came to adore]

The semantically very exciting tendencies to which the former class of NPs having two potential head nouns and a stacked sequence of relative clauses is susceptible are, unfortunately, far too complex to treat within the scope of this paper; these are all, however, tendencies involving set relations between the head nouns which would therefore in no way govern the latter class of NPs, that is, that class exemplified by sentences 3 and 4. My intention is to show the more general regularities governing both of the above-mentioned classes of NPs--those regularities not dependent on set relations between head nouns.

1.2 If one considers the sentence

5. The parents of the children who were waiting to see the movie who didn't have tickets yet were soaked

one will see that it is three ways ambiguous; it has three grammatical readings:

- 5a. The parents (of the children [we were just talking about, etc.]) who were waiting to see the movie who didn't have tickets yet were soaked.
- 5b. The parents (of the children who were waiting to see the movie) who didn't have tickets yet were soaked.
- 5c. The parents (of the children who were waiting to see the movie who didn't have tickets yet) were soaked.

Clearly, both stacked restrictive relative clauses may refer to the first head noun (as in interpretation 5a); to the second head noun (as in 5c); or the first restrictive clause may refer to the second head noun while the second clause refers to the first head noun (5b).

At this point I should say something about the structure of the type of NP in question and the way in which restrictive relative clauses modify their head nouns.

A NP with two head nouns and a series of consecutive restrictive relative clauses will have the structure

$$\underset{\text{NP}}{[(\text{Det}) \text{N}]} \underset{\text{PP}}{[\underset{\text{NP}}{[(\text{Det}) \text{N} (S_1^a) \cdots (S_m^a)]}] (S_1^b) \cdots (S_n^b)]}.$$

The first crucial point is this:

- (I) In a surface sequence $N - (PP) - (S_1) \cdots (S_z)$, where N is a head noun, PP is a prepositional phrase, and S_i is a restrictive relative clause, the entity which will be within the scope of the restriction characterized by any relative clause S_i will be $N - (PP) - (S_1) \cdots (S_{i-1})$.

Thus, in interpretation 5a, the restrictive clause who didn't have tickets yet is not restrictive of parents or of parents of the children, but of parents of the children who were waiting to see the movie--that is, the set of parents who were soaked contains every member of the

intersection of the two sets denoted by the restrictive relative clauses with the set of parents itself.

The second observation derives from the first, and deals with scope-overlap:

(II) In a structure

$$\begin{array}{c} \text{NP} \end{array} \left[\begin{array}{c} \text{(Det)} \\ \text{NP} \end{array} \right] \text{N}^1 \left[\begin{array}{c} \text{PP} \\ \text{NP} \end{array} \right] \left[\begin{array}{c} \text{(Det)} \\ \text{NP} \end{array} \right] \text{N}^2 (S_1) \cdots (S_m) \left[\begin{array}{c} (S_1) \\ \text{NP} \end{array} \right] \cdots (S_n) \left[\begin{array}{c} \text{NP} \\ \text{NP} \end{array} \right]$$

where N^1 and N^2 are head nouns and where S_i is a restrictive relative clause, it is clear from (I) that if S_i belongs to a sequence of stacked restrictive relative clauses having N^2 as ultimate head noun, then S_h may not refer to N^1 , where $h < i$; or equivalently, if S_i belongs to a sequence of stacked restrictive relative clauses having N^1 as ultimate head noun, then S_j may not have N^2 as head noun, where $i < j$.

This is to say that no restrictive relative clause may exceed in scope any restrictive relative clause in whose scope it is contained; or equivalently, no restrictive relative clause \underline{r} may restrict a noun in a restrictive clause \underline{s} within its scope if this noun isn't the head noun of \underline{s} . This generalization precludes the possibility of a fourth, conspicuously absent interpretation of sentence 5:

- 5d. *The parents (of the children who didn't have tickets yet) who were waiting to see the movie were soaked.

This interpretation is impossible because it requires a violation of (II).

1.3 Now consider the somewhat different results obtained when the restrictive relative clauses of sentence 5 are replaced with nonrestrictive clauses:

6. The parents of the children, who were waiting to see the movie, who didn't have tickets yet, were soaked.

Unlike sentence 5, 6 is only two ways ambiguous:

- 6a. The parents (of the children), who were waiting to see the movie, who didn't have tickets yet, were soaked.

- 6b. The parents (of the children, who were waiting to see the movie, who didn't have tickets yet,) were soaked.

In short, the nonrestrictive relative clauses may both refer to either head noun. The following two interpretations of sentence 6 do not occur:

- 6c. *The parents (of the children, who were waiting to see the movie), who didn't have tickets yet, were soaked.
- 6d. *The parents (of the children, who didn't have tickets yet), who were waiting to see the movie, were soaked.

We could, of course, account for the nonoccurrence of interpretation 6d as analogous to that of 5d, but this would seemingly miss the generalization predicting the anomaly of both 6c and 6d, namely, that a stacked series of nonrestrictive relative clauses dominated by NP must refer to a single head noun.

Now, it is generally conceded that, unlike restrictive relative clauses, nonrestrictive clauses may without inconsistency be considered to derive from a deep-structural conjunction of the S denoting the assertion made by the speaker to whom the nonrestrictive clause is attributed with the nonrestrictive clause itself.² Adoption of this analysis is necessary but not adequate for accounting for the nonoccurrence of 6c and 6d: We can show by this analysis that in deep structure no nonrestrictive relative clause will occur as an S embedded in a NP--in

$$\left[\begin{array}{c} \text{(Det)} \text{ N} \\ \text{NP} \end{array} \left[\begin{array}{c} \text{Prep} \\ \text{PP} \end{array} \left[\begin{array}{c} \text{(Det)} \text{ N} \text{ (S}_1^a) \cdots \text{(S}_m^a) \\ \text{NP} \end{array} \right] \text{(S}_1^b) \cdots \text{(S}_n^b) \right] \right]$$

no occurrence of S_i will be nonrestrictive; this allows us to prevent nonoccurring scope assignments (for successive nonrestrictive clauses) stemming from scope assignment potentiality inherent in the above two-headed structure. This analysis does not preclude the possibility that successive nonrestrictive clauses deep-structurally conjoined with the sentence in which in surface structure they are embedded will refer to different head nouns in this sentence.

An adequate justification of the nonoccurrence of 6c and 6d can be found in some speakers' insistence that all so-called stacked relative clauses must be conjoined both in deep and surface structure by and to be grammatical (that is, they cannot be stacked at all, for "stacked"

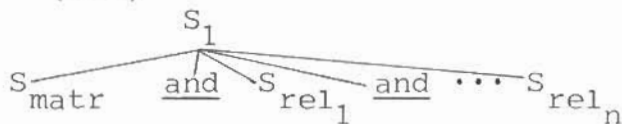
implies "without conjunction"--see Stockwell, Schachter, and Partee (1973), pp. 442-447). I shall return later to the impact of such a usage on the interpretation of consecutive restrictive relative clauses. As far as nonrestrictive relative clauses are concerned, this is a very helpful suggestion.

If sentence 6 were accommodated to this dialect, we would have

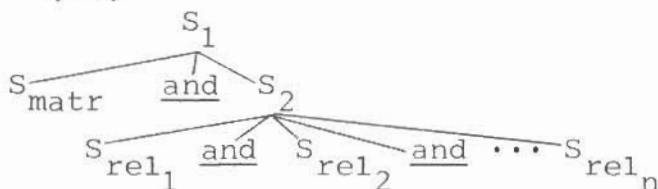
- 6.' The parents of the children, who were waiting to see the movie, and who didn't have tickets yet, were soaked.

The sequence of nonrestrictive relative clauses would, in short, be treated as deriving from a single compound sentence. Thus, rather than derive a sequence of nonrestrictive relative clauses dominated in surface structure by some NP from a deep structure configuration resembling the schematization in (III), we should instead, according to speakers of this dialect, derive it from such a structure as is shown in (IV).

(III)



(IV)



If this were the case, then the movement transformation which moves nonrestrictive clauses from a position coordinate with a sentence to the proper position of embedding within the sentence would move S_2 (see (IV)) and embed it as a single compound relative clause. Since a relative clause can have only one head noun, all nonrestrictive clauses contained in this compound relative clause would then necessarily refer to the same head noun. This analysis of successive surface nonrestrictive relative clauses dominated by a particular NP³ seems profitable, even for dialects (such as mine) not requiring conjunction of nonrestrictive clauses, which dialects may be thought to optionally delete the ands conjoining consecutive nonrestrictive clauses in surface structure. It is profitable because, in combination with the treatment of nonrestrictive clauses as deriving from deep structure conjunctions

and not deep structure embeddings, it simply and efficaciously predicts the nonoccurrence of interpretations 6c and 6d. Also, it gives me empirical justification for my uneasiness in considering consecutive nonrestrictive clauses to be "stacked" at all, even when no conjunction is present in surface structure. Sequences of unconjoined nonrestrictive clauses certainly possess none of the characteristics associated with stacked restrictive relative clauses. Stacked restrictive clauses, when referring to a single head noun, have the capacity to progressively restrict it to membership of ever smaller intersections of the sets they denote, full specification of the head noun being the limit of this progressive restriction (see (I)). Since nonrestrictive clauses refer to fully-specified head nouns, they in no way participate in this progressive restriction inherent in the structure of stacked restrictive clauses. Also, stacked restrictive clauses have the ability to refer to different head nouns (with the scope conditions shown in (II)). Again, successive nonrestrictive clauses dominated by the same NP must refer to the same head noun, and therefore do not share in this capability. Essentially, it seems as though the phenomenon of stacking is, for restrictive relative clauses, deep-structural and semantically significant, whereas for nonrestrictive clauses, it is present only in some dialects, and there merely as a surface phenomenon, having negligible semantic significance. This disjunction in their stacked behavior is further justification for considering restrictive and nonrestrictive relative clauses to be radically different types of constructions, whose similarity is limited to a syntactic closeness in surface structure.

1.4 I will now consider the consequences of replacing the first nonrestrictive relative clause in sentence 6 with a restrictive relative clause:

7. The parents of the children who were waiting to see the movie, who didn't have tickets yet, were soaked.

This sentence, like sentence 5, is three ways ambiguous:

- 7a. The parents (of the children) who were waiting to see the movie, who didn't have tickets yet, were soaked.
- 7b. The parents (of the children who were waiting to see the movie), who didn't have tickets yet, were soaked.

- 7c. The parents (of the children who were waiting to see the movie, who didn't have tickets yet,) were soaked.

Both relative clauses in 7 may refer to the first head noun (as in 7a); to the second head noun (as in 7c); or the first, restrictive relative clause may restrict the second head noun, while the second, nonrestrictive relative clause refers to the first head noun. The fourth conceivable interpretation, which doesn't occur, is

- 7d. *The parents (of the children, who didn't have tickets yet,) who were waiting to see the movie were soaked.

It seems, then, that when restrictive and nonrestrictive clauses cooccur in a sequence dominated by some NP (since the nonrestrictive clauses derive from a deep-structural conjunction with the clause containing the restrictive clauses, this would be a shallow- or surface-structural sequence), they must be governed by the same conditions (schematized in (II)) governing the scope assignment of stacked restrictive relative clauses (with, of course, the added restriction that a surface sequence of nonrestrictive clauses dominated by a single NP must, as a single compound relative clause, refer to one and only one head noun). Thus, as was the case with sentence 5, the relative clauses in sentence 7 may not have overlapping scope of reference.

1.5 So far, I have considered relative clause sequences consisting of two restrictive clauses; of two nonrestrictive clauses; and of a restrictive and a nonrestrictive clause, in that order. The fourth logical possibility, a sequence consisting of a nonrestrictive followed by a restrictive clause, never occurs. Consider the sentence

8. *The parents of the children, who were waiting to see the movie, who didn't have tickets yet were soaked.

Clearly, either "interpretation" that this sentence would have if both relative clauses referred to one of the head nouns would be semantically anomalous: A nonrestrictive relative clause affixed to a head noun implies that the head noun is fully-specified, while a restrictive clause implies that it is not. That is, a nonrestrictive clause may follow a restrictive clause, because the latter may serve to fully specify a head noun--in which case a nonrestrictive clause could assert something about the fully-specified combination of head noun plus restrictive relative clause; if, however, a restrictive clause

immediately follows a nonrestrictive clause, then either the restrictive clause is being used to "restrict" a head noun that is implied to be already maximally restricted, or equivalently, the nonrestrictive clause is being used to assert⁴ something about a fully-specified head noun that is later implied to be less than fully-specified. Thus, the two such conceivable interpretations of 8 would be spurious.

Because of the general shallow structure constraints on scope assignment to successive relative clauses (see (II)) already seen to operate in sentences 5 and 7, the conceivable interpretation of 8 in which the restrictive clause restricts the head noun children while the nonrestrictive clause refers to the head noun parents could not occur.

What, exactly, prevents the last conceivable interpretation--that in which the nonrestrictive clause refers to children while the restrictive clause following it restricts the head noun parents--is difficult to say.⁵ Most speakers, myself included, reject any interpretation of sentence 8; some, however, say at least this last interpretation does occur. There is, what's more, no obvious, logical reason why it shouldn't. Now, all speakers I have asked consider sentence 8' to be different (distinguished especially by intonation) from sentence 8:

8.' The parents of the children--who were waiting to see the movie--who didn't have tickets yet were soaked.

Those that reject any interpretation of 8 find 8' at least better, if not wholly acceptable. Perhaps 8 is truly ungrammatical and interference between parenthesis (an aspect of performance) and nonrestrictive-clausality (an aspect of competence) sometimes leads native intuition astray. Even if some speakers' acceptance of this last interpretation of sentence 8 could be explained away in this manner, however, there is still no obvious reason why it should be. It suffices at present to say that most speakers reject the interpretation in which the nonrestrictive clause refers to children while the restrictive clause refers to parents. This could be provided for in the formulation of the transformation which moves the structure underlying a nonrestrictive relative clause from its position of coordinate conjunction with its surface matrix to its embedded position within some NP contained in this matrix. This transformation could adjoin this underlying structure to the end of the two-headed structure

$$\begin{array}{c} \text{NP} \end{array} \left[\begin{array}{c} \text{(Det)} \text{ N} \end{array} \left[\begin{array}{c} \text{PP} \end{array} \left[\begin{array}{c} \text{(Det)} \text{ N} \end{array} \left(S_1^a \right) \cdots \left(S_m^a \right) \right] \right] \left(S_1^b \right) \cdots \left(S_n^b \right) \right] .$$

This formulation in effect requires that, in a sequence of relative clauses, no nonrestrictive clause may ever precede a restrictive clause.

Thus, sentence 8 is almost certainly without any acceptable interpretation, and is therefore ungrammatical.

2. As I mentioned before, stacking of relative clauses⁶ is, in some dialects of English, considered ungrammatical, as Smith (1964) (of nonrestrictive relative clauses--pp. 40-41) and Stockwell in Stockwell, Schachter, and Partee (1973) (of relative clauses in general--pp. 442-447) point out.⁷ In these dialects, the successive relative clauses in sentences 5-7 would have to be conjoined in surface structure (and would therefore no longer be sequences of stacked clauses, but single compound relative clauses):

$$\left[\underset{S}{W} \left[\underset{NP}{X} \left[\underset{S}{\left[\text{that } \dots \right]} \right] \text{ and } \left[\underset{S}{\left[\text{that } \dots \right]} \right] \right] \right] \underset{S}{Y}$$

We have already seen in connection with sentence 6 that not only does this analysis cause no ill effects in the interpretation of "stacked" nonrestrictive relative clauses, but it is even an expedient way of accounting for their behavior, even in dialects in which the and is deleted in surface structure. But what would be the consequences of so revising sentences 5 and 7?

2.1 One consequence would be that interpretation 5b would become impossible; that is, if sentence 5 were rewritten as

5.' The parents of the children who were waiting to see the movie and who didn't have tickets yet were soaked

the entire sequence of restrictive relative clauses would, as a single compound sentence, occupy the position of a single occurrence of S_i in the structure

$$\left[\underset{NP}{(\text{Det}) N} \left[\underset{PP}{\text{Prep}} \left[\underset{NP}{(\text{Det}) N} (S_1^a) \dots (S_m^a) \right] \right] (S_1^b) \dots (S_n^b) \right]$$

and, needless to say, could therefore refer to at most one head noun. Thus, at least one interpretation of a sentence of this type--having a sequence of relative clauses with two possible head nouns--is blocked in those dialects requiring stacked relative clauses to be represented as a single compound relative clause.

2.2 Another more striking consequence of deriving a stacked set of relative clauses from a single underlying compound relative clause is the problem it would pose for

the interpretation of sentences containing a sequence of one or more restrictive relative clauses followed by one or more nonrestrictive clauses. Consider 7', a rewriting of sentence 7 with the relative clauses conjoined:

- 7.' ?The parents of the children who were waiting to see the movie, and who didn't have tickets yet, were soaked.

One characteristic of compound predicates, of which the above relative clauses are an example, is that both of their conjuncts make some assertion about the same subject; that is, the sequence who were waiting to see the movie, and who didn't have tickets yet, could be thought of as a conjunction of open sentences bound to the same variable. Thus, interpretation 7b is precluded in dialects requiring the conjunction of consecutive relative clauses.

But this isn't all: Any interpretation whatsoever of sentence 7' seems to me impossible. First, how could a restrictive and a nonrestrictive clause derive from a single underlying compound S if restrictive clauses originate in deep structure in the same embedded position which they occupy in surface structure but nonrestrictive clauses originate in a position of coordinate conjunction with the S in which they are ultimately embedded? This seems to me to be decisive evidence against the analysis in question, but one could argue that the transformation moving the structure underlying a surface nonrestrictive clause to its embedded position within a NP will Chomsky-adjoin that structure to the occurrence of S⁸ in the structure under consideration,

$$\left[\begin{array}{c} \text{(Det)} \\ \text{NP} \end{array} \right] \text{N} \left[\begin{array}{c} \text{Prep} \\ \text{PP} \end{array} \right] \left[\begin{array}{c} \text{(Det)} \\ \text{NP} \end{array} \right] \text{N} \left\{ \begin{array}{c} \text{S} \\ \emptyset \\ \text{S}_i \end{array} \right\} \left\{ \begin{array}{c} \emptyset \\ \text{S}_i \end{array} \right\}$$

or to one of the markers \emptyset if no embedded S occurs. This is no solution at all, in fact. The conjunction of a restrictive and a nonrestrictive relative clause seems suspect: This conjunction seems to imply that the head noun is both in need of fuller specification and fully-specified, which is, of course, a contradiction. Consider: In a NP containing a sequence of relative clauses referring to a head noun (hN), of which part are restrictive (rc) and part are nonrestrictive (nc) clauses, scope will be assigned to the relative clauses in the following manner;

$$(V) \left(\left(\dots \left(\text{hN} \right) \text{rc}_1 \right) \dots \right) \text{rc}_n \wedge (\text{nc}_1, \dots, \text{nc}_m)$$

This is to say that every nonrestrictive clause will be an assertion concerning the set containing only and all

members of the intersection of every set of which one of the restrictive clauses is the characteristic function. Now, if a surface sequence of restrictive and nonrestrictive relative clauses dominated by some NP derived from a single compound sentence (perhaps not present in deep structure), scope assignment to this sequence would have to be characterized as

(VI) ((hN) S).

But this characterization misses a crucial semantic fact that (V) captures: It is not merely the head noun of which the nonrestrictive part of the sentence asserts something, but the head noun as restricted by whatever restrictive clauses occur (all of which would be a part of S in (VI)). In short, part of the single compound relative clause has to be able to contain another part of it within its scope--and since, as is shown in (VI), conjuncts of a compound relative clause refer to precisely the same head noun, this is clearly impossible. For this reason, 7' is simply uninterpretable.

Thus, as seen in its consequences for sentences 5 and 7, the usage requiring all stacked relative clauses to be conjoined limits the semantic capabilities of multiple relative clause constructions, by comparison with the nonconjoining usage.

3. From all of these generalizations, three surface-structural tendencies can be abstracted concerning stacked relative clauses referring to two head nouns.

3.1 First, in sequences of consecutive restrictive relative clauses or of both restrictive and nonrestrictive relative clauses, the following formula governs the reference of the relative clauses (rel) to the head noun (hN):

$$\cdots hN_1 \cdots hN_m \underbrace{\text{rel}_1 \cdots \text{rel}_n}_{\text{stacked series}} \cdots$$

NP

If rel_i has hN_j as ultimate head noun, rel_{i+1} must have hN_k as ultimate head noun, where $k \leq j$.

This formulation essentially states that if all stacked relative clauses do not refer to one head noun, then the relative clauses will refer to the head nouns in a more or less "mirror-image" relation.⁹ It is because of this tendency that sentences 5 and 7 cannot possibly be interpreted as 5d or 7d, respectively.

3.2 Secondly, as Smith notes, no nonrestrictive relative clause may ever, for some reason, precede a restrictive relative clause in a stacked sequence of relative clauses dominated by NP. This unexplained phenomenon could be provided for in the formulation of the structural change produced by the transformation which moves the structure underlying a nonrestrictive relative clause to its embedded position within a NP. This provision would predict most speakers' judgement of such sentences as 8 as ungrammatical.

3.3 And finally, all members of a set of consecutive nonrestrictive relative clauses dominated by some single NP must refer to the same head noun. This justifies the analysis of nonrestrictive relative clauses a) as being in general deep-structurally conjoined with the sentence denoting the assertion made by the speaker to whom they are attributed; and b) as being conjoined constituents of a single S in deep structure when they occur in a "stacked" sequence dominated by some NP--deletion of these conjunctions in surface structure is dialectally optional. This tendency accounts for the impossibility of interpreting sentence 6 as 6c or 6d.

3.4 These surface tendencies, one should note, allow for the interpretation of stacked relative clauses potentially referring to more than two head nouns. Thus, the unlikely but not ungrammatical sentence 9

9. The teachers of the children of the parents who were waiting to see the movie who didn't have tickets yet who got soaked were stoic

has ten distinct readings, each predicted by the first generalization above (see section 3.1).¹⁰

The second generalization predicts the ungrammaticality of sentence 10:

10. *The teachers of the children of the parents who were waiting to see the movie, who didn't have tickets yet, who got soaked were stoic.

Clearly, a nonrestrictive relative clause may not be sandwiched between two restrictive relative clauses.

Finally, the third generalization correctly predicts that sentence 11

11. The teachers of the children of the parents, who were waiting to see the movie, who didn't have tickets yet, who got soaked, were stoic

will have no more than three readings.

Footnotes

1. I wish to express my thanks to Dr. Choon-kyu Oh and to Walt Hull for their many acute observations regarding these regularities.

2. This seemingly redundant conception of the conjunction underlying a sentence containing a nonrestrictive clause is necessary for differentiating between the two deep structures underlying such sentences as Mary said that John, who is a real jerk, made off with it. In one representation, the structure underlying the nonrestrictive clause will be conjoined with that underlying John made off with it (attribution of relative clause to Mary); in the other representation, the structure underlying the relative clause will be conjoined with Mary said that John made off with it (attribution of relative clause to the speaker of the sentence).

3. The sentences dominated by S_2 in (IV) must, of course, be only and all those which, in shallow structure, occur successively and are dominated by some single NP (not necessarily immediately dominated). Thus, in the sentence (suggested to me by Dr. Choon-kyu Oh)

John, who is a professional, was beaten in a chess game by Tom, who has played chess only a week, which puzzled both John and Tom

it is clear that none of the nonrestrictive clauses originated as a constituent of S_2 in a structure resembling (IV), because the first nonrestrictive clause is adjacent to neither the second nor the third; and because the second and the third nonrestrictive clauses are at no time in the derivation of the sentence constituents of a single NP (Note that the entire sentence may not be embedded in some NP: *I believe that John, who is a professional, was beaten in a chess game by Tom, who has played chess only a week, which puzzled both John and Tom).

4. Since they derive from deep-structural conjunctions with the S denoting the assertion made by the speaker to whom they are attributed, nonrestrictive relative clauses are, of course, assertions.

5. Walt Hull has suggested that some general but as yet unformulated constraint might be involved--one which would block the movement of the nonrestrictive clause, who were waiting to see the movie, from its position of coordinate conjunction to a position beyond the embedded restrictive clause, who didn't have tickets yet.

6. I shall persist in referring to nonrestrictive relative clauses in a surface sequence dominated by some NP as being stacked, even though, as I have already shown, this is something of a misnomer.

7. There seems to be a greater reluctance to stack nonrestrictive relative clauses than restrictive relative clauses (Smith limits the number of nonrestrictive clauses modifying a head noun to one, but allows the possibility of infinite embedding of restrictive relative clauses). Nevertheless, stacked nonrestrictive clauses are commonly used in two ways: In long topical enumerations (often typographically set off with semicolons) and in pairs in which the second relative clause affirms or adds to the first, as in John, who has never been out of the country, who has in fact never even been out of Indiana, teaches geography.

8. This, of course, could be a compound S.

9. Lakoff (1970) (pp. 401-402) makes this same observation with regard to a related set of phenomena.

10. The first generalization, if adequate, isn't very explicit in its indication of the number of scope ambiguities a given string of head nouns and relative clauses can have. Perhaps the following formula, redundant but explicit, should be appended to it:

If m = the number of head nouns, and n = the number of relative clauses, then the greatest possible number of scope assignments a string of the form

$$hN_1 \cdots hN_m \text{ rel}_1 \cdots \text{rel}_n$$

will have will be

$$\frac{1}{n!} \frac{(m+n-1)!}{(m-1)!}$$

provided every relative clause is restrictive. If there are any nonrestrictive relative clauses in the sequence under consideration, let the number of them equal c ; substitute $(n - (c - 1))$ for every occurrence of n in the above formula.

Note that this formula predicts not the actual number of scope ambiguities, but their greatest possible number. Thus, the formula correctly predicts that the greatest possible number of ambiguities of scope in One of John's elephants that came from Africa that escaped was found is three; but because of the nature of the set-relations in this sentence, all three ambiguities are logically equivalent and collapse into a single reading. (Thanks are due to Daniel R. Stump for providing the above formula.)

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