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Embedded Sentences Are Not Noun Phrases

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Since Rosenbaum's (1967) Grammar of English Predicate Complement Constructions, most linguists have analyzed those embedded sentences which are not constituents of noun phrases with lexical head nouns as constituents of noun phrases with dummy or empty heads. Rosenbaum's analysis of embedded sentences appears in (1), which is used to bracket the sentence in (2). Following in the Rosenbaum tradition but employing an empty head noun node, Emonds has more recently argued for the structure in (3).

- (1) NP_N[it] S]
 (2) NP_N[it]_S[that Elmer likes porcupines]] is obvious.
 (3) NP_N[Δ] S]

A noun phrase analysis of embedded sentences¹ is motivated by the fact that embedded sentences generally behave like noun phrases, as sentences (4-9) illustrate (the embedded sentences are bracketed). That is, embedded sentences show up as subjects (4) and objects (5), in passives ("NP-Preposed") (6), "Tough Moved" (7), raised to object (then NP-Preposed) (8), and raised to subject (9).

- (4) [That Elmer lent me his porcupine] disturbed Hortense greatly.
 (5) Elmer did not intend [for me to lose his porcupine].
 (6) [That porcupines are precious] was proclaimed throughout the land.
 (7) [That embedded sentences sometimes behave like noun phrases] is easy to prove.
 (8) [That children learn language so quickly] was said to demonstrate the existence of a higher being.
 (9) [That Elmer lent me his porcupine] seems to have bred jealousy among animal lovers.

If embedded sentences are not generated under NP nodes in standard grammatical theories, it is necessary to add to each transformation (e.g., NP-Preposing) which affects both noun phrases and embedded sentences a rule to apply to S nodes. Even the phrase structure rules would contain disjunctions ({NP, S}) in subject and object positions. However, although it accounts for the distribution of embedded sentences in (4-9) without requiring a duplication of rules, the noun phrase analysis fails

to explain why embedded sentences do not occur in all noun phrase positions (cf. (10-12)) or co-occur with other NP constituents (cf. (13-14)).

- (10) *He based his theory on [that porcupines mate in the spring].
 (11) *Hortense was relieved by [that Elmer kept two porcupines for security].
 (12) *Elmer didn't buy [that porcupines predominate in Panama's] proof of the theory.
 (13) *We all believe _{NP}[the_S[that nice guys finish last]].
 (14) *The professor intended _{NP}[a quick_S[for us to finish the research]].

Proponents of the noun phrase analysis of embedded sentences do, of course, offer explanations for the ungrammaticality of sentences like (10-14); however, I find many of these explanations ad hoc and uninformative, particularly those for the failure of embedded sentences to occur as objects of prepositions (cf. (10-11)) or to co-occur with pronominal modifiers (cf. (13-14)).

When we consider the cases where embedded sentences fail to behave like noun phrases (e.g., (10-14) above), we find that the evidence in favor of a noun phrase analysis boils down to the fact that these sentences can appear as subjects and objects and can undergo certain transformations which affect subjects and objects.^{2,3}

Now the \bar{X} Convention states that a phrase node of type X is an X because it dominates a head category node of type X , not because it behaves like an X . This constraint on phrase structure (actually, a definition of what it means to be a phrase of a certain type) is usually stated as in (15):

- (15) Phrase structure rules are of the form:
 (a) $\bar{X} \rightarrow a\bar{X}b$
 (b) $\bar{X} \rightarrow cXd$

where X , a category node, is the "head" of \bar{X} and \bar{X} and a - d are node strings of any length.

The \bar{X} Convention implies that the failure to find distributional differences between phrases with different internal structures does not constitute sufficient cause to call them phrases of the same type. Thus even if embedded sentences occurred everywhere noun phrases do, we could not conclude that embedded sentences are noun phrases. Rather, because the head constituent of an embedded sentence--that constituent of which the others can be said

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to be grammatical dependents--is a verb, not a noun, embedded sentences must be generated as verb phrases (\bar{V} s) not noun phrases (cf. Jackendoff (1974)).⁴

I propose to generate embedded sentences as \bar{V} s right where they occur, that is, as "subjects" and "objects" directly dominated by \bar{V} (=S) and \bar{V} (=VP) respectively. The proposed phrase structure rules for \bar{V} and \bar{V} appear in (16) omitting certain details irrelevant to this paper. The rules should be written as shown in (17) where Jackendoff's (1974) feature system for node classification is used, purging the rules of some of the disjunctions in curly brackets.

- (16) a. $\bar{V} \rightarrow \left\{ \begin{array}{l} \bar{V} \\ \bar{N} \end{array} \right\} - \text{AUX} - \bar{V} \quad (\text{AUX} \rightarrow \text{Tense} - (\text{Modal}))$
 b. $\bar{V} \rightarrow (\text{have-en}) - (\text{be-ing}) - (\bar{\text{Adv}}) - \bar{V} - \left\{ \begin{array}{l} \bar{V} \\ \bar{N} \end{array} \right\} -$
 $\left(\left\{ \begin{array}{l} \bar{P} \\ \bar{\text{Adv}} \end{array} \right\} \right) * - \left(\left\{ \begin{array}{l} \bar{V} \\ \bar{N} \end{array} \right\} \right) - \left(\left\{ \begin{array}{l} \bar{P} \\ \bar{\text{Adv}} \end{array} \right\} \right) *$
 (17) a. $\left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right] \rightarrow \left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right] - \text{AUX} - \left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right]$
 b. $\left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right] \rightarrow (\text{have-en}) - (\text{be-ing}) - (\bar{\text{Adv}}) - \left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right]$
 $- \left(\left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right] \right) - \left(\left\{ \begin{array}{l} \bar{P} \\ \bar{\text{Adv}} \end{array} \right\} \right) * - \left(\left[\begin{array}{l} \text{+sub} \\ \text{+comp} \\ \text{+obj} \end{array} \right] \right) - \left(\left\{ \begin{array}{l} \bar{P} \\ \bar{\text{Adv}} \end{array} \right\} \right) *$ ⁵

In Jackendoff's system both verbs and nouns and only verbs and nouns are +subject taking and +complement taking (+subj, +comp). If the transformations that affect both noun phrases and embedded sentences are rewritten to apply to the class of phrases \bar{X} +subj, +comp (hereafter, \bar{X} sc), then our rules will account for the distributional properties of embedded sentences which originally led to their being analyzed as noun phrases.⁶

In fact, the phrase structure rules (17) taken with Emonds' (1976) Structure Preserving Hypothesis predict exactly which movement and raising transformations should apply to embedded sentences (NP-Preposing, Extraposition, Raising to Object, Raising to Subject (Subject Raising), and Tough (Object) Movement).⁷ For the Structure Preserving Hypothesis demands that a \bar{V} move only from one potential \bar{X} sc position to another, i.e., only to a place where the phrase structure rules might have generated the \bar{V} in deep structure. An examination of the phrase structure rules (17) reveals not only that all the embedded sentence moving transformations listed above are structure preserving, but also that all transformations which move \bar{N} s from one \bar{X} sc position to another also affect \bar{V} s.

At some time or other, it has been claimed that each of the transformations listed above should be removed from the grammar in favor of deep structure or lexical accounts of the generali-

zations they capture, i.e., that the structures resulting from the application of the transformations should be generated in the base. On the view that no transformations move Vs too, the phrase structure rules (17) successfully account for the distribution of embedded sentences in surface structure. Under the Structure Preserving Hypothesis, phrase structure rules act like surface structure filters, imposing ordering and constituent structure constraints on all but root sentences. Thus phrase structure rules must account for the surface distribution of phrases without consideration of transformations.

Our rules have accounted for the major empirical finding concerning embedded sentences--that they behave like noun phrases in subject and object positions--without falsely claiming that embedded sentences are noun phrases. The rules also explain why embedded sentences and noun phrases behave similarly: they belong to the class of phrases \bar{X}^{sc} which may serve as subjects or objects. Because embedded sentences are not noun phrases or constituents of noun phrases under this analysis, no further explanation is required for their failure to occur in certain noun phrase positions or to co-occur with other noun phrase constituents.

To this point, the discussion has been limited to "that" and "for-to" complements. If these exhausted the list of embedded sentences, the paper could probably end here. However, there are phrases known as gerunds or gerundive nominals which bear a striking resemblance to embedded sentences although they appear in almost all noun phrase positions, including those which exclude other sentential complements (cf. (18-21); gerunds are bracketed).

- (18) Hortense was horrified by [Elmer's lending me his porcupine].
 (19) Did [his rejecting the porcupine] offend you?
 (20) Elmer puts a great deal of effort into [lending porcupines to others].
 (21) ?We were all convinced by [his finishing off the last two bananas'] proof that he could eat twenty-three.

Since I have just claimed that distributional evidence alone cannot identify the type of a phrase, my example sentences do not prove that gerunds are Ns. However, there is reason to believe that gerunds have the internal structure of noun phrases, i.e., that something in gerunds can be identified as the head noun of a noun phrase. I leave the demonstration that gerunds are noun phrases to Schachter (1976). Although he presents additional distributional evidence, the weight of Schachter's argument falls on his claim that the possessive subject of a gerund is a determiner which can be replaced by other noun phrase determiners. I am a

little doubtful about the grammaticality of some of Schachter's example sentences. However, I think it is hard to dispute his contention that gerunds appear with null as well as possessive determiners:

(22) [_{DET}[\emptyset] Lending porcupines] may be unlawful.

In Schachter's analysis of gerunds (23), a verb phrase serves as the head nominal or NOM of a noun phrase dominating the gerund. Working in ignorance of Schachter's proposal, I developed the analysis (24) which approximates a translation of Schachter's into the vocabulary of the \bar{X} Convention, in which "NOM" is not a legal phrase node label.

(23) NP [_{DET} [_{NOM} [VP]]]

(24) \bar{N} [_{DET} [_N [\bar{V}]]]

This analysis (24) requires the phrase structure rule (25), which I shall discuss below.

(25) $N \rightarrow \bar{V}^0$

So if gerunds are noun phrases, that is, if the verb phrase in a gerund is a head noun, then the difference in behavior between gerunds and other embedded sentences is just the difference in behavior between \bar{N} s and \bar{V} s, a difference we have already explained.

But if gerunds are noun phrases, why do the subjects of gerunds raise to object, as in sentences (26) and (28), while the subjects of "derived nominals" do not (cf. (27) and (29))?

(26) Hortense saw Elmer lending porcupines.

(27) *Hortense saw Elmer loan of the porcupines.

(28) Elmer was seen lending porcupines.

(29) *Elmer was seen loan of the porcupines.

As their subjects lack a possessive ending, the gerund-like phrases in (26) ("Elmer lending porcupines"), (28), and (33) and (38) below (bracketed) are sometimes called "accusative-ing" (ACC-ing) complements. Note that the behavior of these complements directly parallels that of "for-to" complements whose "for" is absent in surface structure (hereafter, ACC-to complements; cf. (30), (34), and (37) below) rather than that of gerunds with possessive or null determiners (subjects) (cf. (30-37)).

(28) Elmer was seen [lending porcupines].

- (30) Elmer was asked to lend porcupines to everyone.
 (31) *Elmer's was seen lending porcupines.
 (32) It was \emptyset lending porcupines that Hortense didn't like.
 (33) *It was [lending porcupines] that Hortense didn't like Elmer.
 (34) *It was to lend porcupines that Hortense didn't want Elmer.
 (35) Elmer's lending porcupines destroyed the quilled animal renting business.
 (36) *[Elmer lending porcupines] destroyed the quilled animal renting business.
 (37) *Elmer to lend porcupines would destroy the quilled animal renting business.

In fact, while gerunds can appear in (almost) any noun phrase position, ACC-ing and ACC-to complements occur only in \bar{V} final position with their subjects raised to object (or subject; see below). If we merely generate ACC-ing complements like ACC-to complements as \bar{V} s, not \bar{N} s, we can explain why their subjects raise to object in contrast to those of noun phrases: only subjects of \bar{V} s can be raised. Recall that it is the possessive ending on the subject of the gerund that indicates it is a determiner and that, as a consequence, the verb phrase is a head noun of a noun phrase. Since ACC-ing complements lack a possessive subject, there seems to be little justification for calling them noun phrases in any case.

I preserved my account of gerunds by distinguishing them from a class of gerund-like phrases with different properties--ACC-ing complements. Now I must explain why ACC-ing and ACC-to complements do not behave like "that" and "for-to" complements although all are generated as \bar{V} s in deep structure. As I have just noted, ACC-ing and ACC-to complements, in contrast to the embedded sentences introduced by complementizers, appear only in \bar{V} final position with their subjects raised into the matrix sentence. The kind of solution a given reader will accept to this problem depends on his bias toward various forms of grammatical theory. The most parsimonious account of sentential complements is found in a theory which does not recognize rules of extraposition, raising, or EQUI-NP deletion. On this theory (see Jenkins (1977)), ACC-ing and ACC-to complements are generated in deep structure with traces in subject position, traces which must eventually be bound to either the subject or object of the matrix sentence depending on the lexical properties of the main verb. If these complements appeared in subject position, no constituent of the matrix sentence could fall into the proper "commanding" position to be able to bind the trace; i.e., the trace would be unassociable with a noun phrase. Sentences containing unbound traces are marked

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ungrammatical by the interpretive rules.

Any theory will have to deal with the fact that Extrapolation and Raising are complementary transformations. In other words, the "it" of Extrapolation (either from subject position or within a verb phrase) may only be "coreferential" with a "that" or "for-to" complement, from which complements raising may not remove the subject:

- (38) It is possible that Elmer has some thoroughbred porcupines.
- (39) *It is possible Elmer lending his thoroughbred porcupines.
- (40) Elmer seems to have lent all his peculiar porcupines.
- (41) *Elmer seems that has lent all his peculiar porcupines.
- (42) It seems that Elmer has lent all his peculiar porcupines.

A theory in the Rosebaum tradition which treats Extrapolation and Raising as unrelated movement transformations (sometimes moving constituents in opposite directions) would seem to be missing an important generalization. Nevertheless, even a unified approach to the sentences generated by these transformations fails to explain the connection between the "it" of Extrapolation and the presence of a complementizer in an embedded sentence. I know of no "natural" explanation for the ungrammaticality of sentence (43) (where "t" is a trace).

- (43) *It seems Elmer_i [t to have lent me his last porcupine].

The non-NP analysis of embedded sentences just presented simplifies several aspects of grammar. For example, note how the Complex Noun Phrase Constraint (Ross (1967), p. 70) must be stated under a NP analysis of embedded sentences:

- (44) The Complex NP Constraint

No element contained in a sentence dominated by a noun phrase with a lexical head noun may be moved out of that noun phrase by a transformation.

Because all noun phrases dominating sentences will contain lexical head nouns on my analysis, we can simplify (44) to (45).

- (45) The Complex NP Constraint Simplified

No element contained in a \bar{V} dominated by a \bar{N} may be moved out of that \bar{N} by a transformation.

A second simplification involves the phrase structure rule

for \bar{V} . Jackendoff (1974) among others has recognized the need under a NP analysis of embedded sentences for an S position in \bar{V} in addition to the \bar{N} positions. Thus he places three \bar{X} sc slots in \bar{V} (NP, NP, S) while my rule for \bar{V} (17b) contains only two such positions. Under the Structure Preserving Hypothesis, rule (17b) but not Jackendoff's rule predicts what seems to be the case: only two \bar{X} scs may appear directly dominated by \bar{V} at any point in the derivation of a sentence.

Although my analysis of embedded sentences appears, I hope, attractive, it hinges in part on rule (25), $N \rightarrow \bar{V}$, a rule re-writing a category node as a phrase node. In previous grammars, that is, under different interpretations of what it means to be a member of a constituent class, such rules have been prohibited or avoided. Under the \bar{X} Convention, however, although the identity of a phrase is determined by its internal structure, the identity of a category node is determined by the grammatical interactions in which it participates. It is for this reason that Jackendoff's (1974) feature system for classifying members of constituent categories contains features like "plus subject taking" or "plus object taking." A verb is a verb in Jackendoff's theory precisely because it can take a subject, a complement, and in many cases an object.

Thus one can identify a head category node through its grammatical dependents. Any phrase X can conceivably belong to the constituent category Y if it has the internal structure of an X but appears in a \bar{V} with other \bar{V} constituents as its grammatical dependents. In the case of gerunds, \bar{V} s can be labeled as Ns because they appear in Ns modified by distinctly \bar{N} constituents--determiners.

"Adverbial noun phrases" represent another example of phrases which must be generated under category nodes in the \bar{X} Convention. These adverbials, underlined in sentences (46-48), have the internal structure of noun phrases yet share distributional properties with adverbs, facts which suggest rule (49) should be added to the grammar.

- (46) Elmer lent me his porcupine last Tuesday.
 (47) Hortense will send it to me the first week in July.
 (48) Give me that pocupine this instant.
 (49) $\bar{Adv} \rightarrow \bar{N}$

But the \bar{X} Convention clearly prohibits rule (49). Rather, if noun phrases do function adverbally, they must be adverbs, not adverb phrases. And if adverbial noun phrases are adverbs--if rule (50) proves correct--they should co-occur with other \bar{Adv} constituents,

as sentences (51-52) show they do.

(50) Adv $\rightarrow \bar{N}^9$

(51) Leave $\overline{\text{Adv}}$ [right, $\overline{\text{Adv}}$ [\bar{N} [this instant]]].

(52) Elmer gave himself up $\overline{\text{Adv}}$ [early, $\overline{\text{Adv}}$ [\bar{N} [this week]]].

To follow a popular linguistic custom, I leave you with a constraint on grammar, The Lexical Head Constraint (53), which I believe to be a valid extension of the \bar{X} Convention.

(53) The Lexical Head Constraint

The head category node, X, of a phrase of type X must dominate lexical material at all stages of a derivation.

Although I cannot discuss all the reasons for adopting this constraint in the remaining space, I mention it here because a noun phrase analysis of embedded sentences removes the greatest obstacle from its acceptance. With the exception of embedded sentences (and adverbial NPs; cf. Emonds (1976)), few phrases have ever been analyzed as containing dummy or empty heads.

Without some restriction on the distribution of dummy and empty head nodes, phrase structure rules, the \bar{X} Convention, and the Structure Preserving Hypothesis all are rendered impotent and trivial. In current practice, with proper deployment of empty nodes, a linguist can disguise a phrase of just about any type as a phrase of another sort, skirting these constraints entirely. For example, (54) shows a particle masquerading as a noun phrase.

(54) \bar{N} [\bar{N} [Δ] \bar{V} [\bar{N} [Δ] \bar{V} [Δ] \bar{P} [\bar{P} [up]]]]]]]]

As the result of this lack of proper constraints, linguists have let transformational considerations dictate deep structure. And the seemingly important generalizations that derive from this approach are in fact meaningless. For example, the observation that only NPs undergo NP-Preposing is not a discovery about a language if every phrase which appears in NP-Preposed position is automatically labeled a noun phrase. It is only when deep structure is independently motivated by deep structure considerations, i.e., follows from a highly constrained theory of deep structure, that such facts about the operation of transformations become interesting. Thus, if we find that some transformation applies only to a class of phrases defined in terms of the grammatical dependents of their head constituents, we've found something.

Embedded sentences are not noun phrases, but both embedded sentences and noun phrases belong to the class of phrases \bar{X} sc.

That the members of this class delimited by the relational properties of their head constituents share distributional potentialities which can be captured by phrase structure rules (17) is certainly an interesting fact about English.

*I would like to thank the NELS VIII participants for their comments and suggestions, some of which I have been able to incorporate into this version of the paper.

¹Henceforth, "embedded sentences" will refer only to those embedded sentences which are not constituents of noun phrases with lexical head nouns. Thus we shall not consider relative clauses or sentential complements of nouns like "fact" or "question."

²Where "subject" and "object" are defined structurally: a subject is a NP (or S) immediately dominated by S; an object is a NP (or S) immediately dominated by VP.

³Other considerations which motivated the Rosenbaum-type analysis of embedded sentences include subcategorization features of verbs which take both nominal and sentential objects and sentences to which rules of "extraposition" have applied. For some discussion of Extraposition, see below.

⁴Under the \bar{X} Convention, it would be possible to maintain a structure like (1) for embedded sentences if some evidence could be found for calling "it" the head N of an \bar{N} dominating an embedded \bar{V} . However, as in a Rosenbaum-type grammar, "it" is supposed to occupy the Determiner position in NP and never remains a sister to the embedded sentence (either the embedded sentence is moved from the NP or the "it" is deleted), "it" proves a very strange head indeed.

⁵ \bar{V} is $\{+subj, +comp, +obj, N$ is $\{+subj, +comp, -obj\}$. So,
 $[\bar{+subj}] = \{\bar{N}\} = \bar{X}sc$. Some approximate equivalents: $S = \bar{V}$, $VP = \bar{V}$,
 $NP = \bar{N}$.

⁶Some sort of "internal sentence constraint" will be required under any analysis of embedded sentences; see Grosu and Thomson (1977).

⁷Object moving transformations affect only $\bar{X}sc$ s in the first $\bar{X}sc$ position in \bar{V} .

⁸As the \bar{V} in gerunds apparently does not co-occur with any other \bar{N} constituents, I would prefer to write this rule, " $\bar{N} \rightarrow \bar{V}$,"

were this formulation not prohibited by (15). I would suggest some revision in (15), but it is not entirely clear to me what is at stake. An \bar{X} is the "highest" or maximal node of type X; an X is a category node. What is an \bar{X} ? Perhaps Ns do not exist, recursion taking place under N nodes. My uncertainty on these issues has led me to bite the bullet in this paper and leave (15), and thus (25), as stated.

⁹I would prefer to write, " $\overline{Adv} \rightarrow \bar{N}$," but will not for the reasons put forth in f.n. 8.

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