Lingua 53 (1981) 99–149
North-Holland Publishing Company

THE SYNTAX AND SEMANTICS OF ENGLISH RELATIVE CLAUSES

James D. McCAWLEY

University of Chicago, Dept. of Linguistics

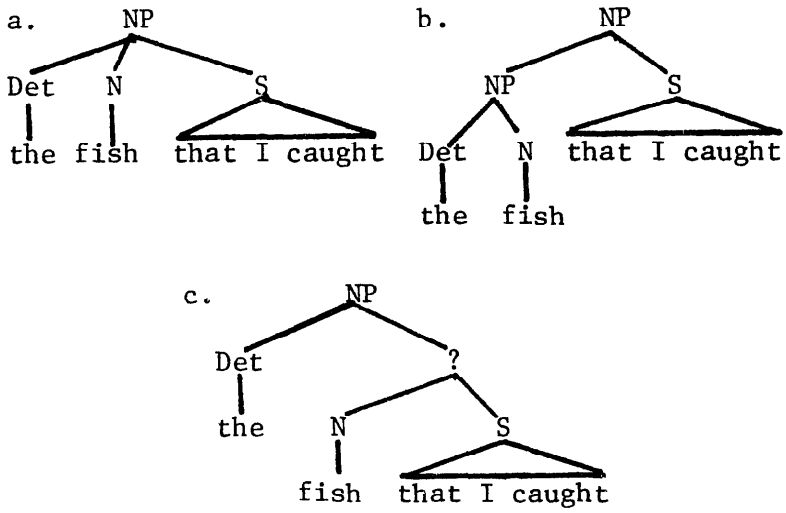
Received June 1980

An analysis of English restrictive relative clauses is developed that accounts for many of the differences between them and three other clause types having the same internal structure, namely nonrestrictive relative clauses, cleft clauses, and 'pseudo-relative' clauses as in *There are many Americans who like baseball*. Section 1 is devoted to establishing the surface constituent structures of sentences involving the various relative and relative-like clauses. In sections 1 and 2 I provide evidence that pseudo-relative clauses are not restrictive relative clauses (nor are they nonrestrictive clauses) and indicate which apparent relative clauses must be classed as pseudo-relative. Section 3 is concerned with the derivation of nonrestrictive clauses. Sections 4 and 5 deal with two different analyses of restrictive relatives, each of which is supported by a sizeable body of data and appears to be irreconcileable with the data that support the other analysis. In section 6 an attempt is made to achieve a synthesis of the two analyses on the basis of a 'core' of grammatical rules proper and a set of 'patches' that serve to extend the speaker's competence to cover cases for which the core rules do not yield admissible derivations. The analyses developed make extensive use of the conception of syntactic category that is developed in McCawley 1977a, 1980b.

1. Surface structure

A great variety of proposals as to the surface constituent structure of restrictive relative clause constructions can be found in the literature. According to Chomsky 1965, the relative clause is a sister of the noun and the determiner (1a); according to Ross (1967) and Lakoff and Peters (1969), the relative clause is a sister of a NP (thus, an aunt of the determiner and the noun) (1b); and according to Stockwell, Schachter, and Partee (1973) and Partee (1975), the noun and relative clause make up a constituent (variously labeled) and thus the relative clause is a niece of the determiner (1c):

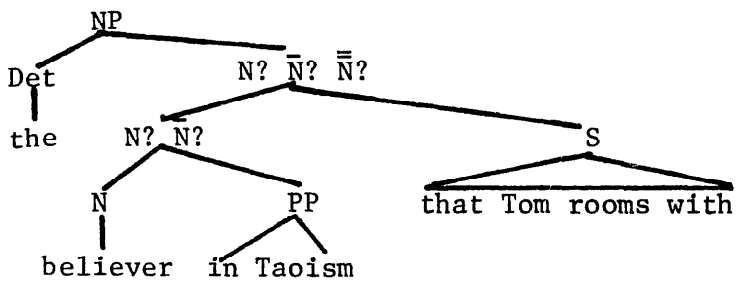
0 024-3841/1981/000-000/$2.50



Nonrestrictive clauses have generally been taken to have a surface structure as in (1b), though Chomsky (1965) and Smith (1964) take both nonrestrictive and restrictive clauses to have a (1a) structure and Emonds (1979) argues for an analysis in which the host NP and the nonrestrictive clause do not even make up a surface constituent.

The trees in (1) exhaust the surface groupings of constituents that have been proposed for restrictive relative constructions, but not the labelings that have been proposed. In particular, proposals embodying the grouping in (1c) have differed as to whether the category of the N + S constituent is treated as identical to that of the constituent (here labeled N) of which the relative clause is an adjunct, and with regard to whether an additional distinction is drawn between simple N and a constituent that consists of an N plus whatever 'object' adjuncts it may have:

(2)



In the conception of syntactic category that I develop in McCawley 1977a, 1980b, category labels are merely informal abbreviations for complexes of

several kinds of information to which transformations may be sensitive. The kinds of syntactic information that play a role in the phenomena considered below are: first, the lexical category (N vs. V vs. A, etc.) of the head of the constituent; second, the logical category (proposition vs. predicate vs. argument) of the corresponding node of logical structure;[1] and third, the distinction between Ss and the items that Chomsky (1970), Jackendoff (1977), and others have labeled $\bar{V}$, $\bar{A}$, and $\bar{N}$; I take the latter basically to be Ss that have lost their subjects, e.g. *eager for adventure* is an $\bar{A}$ because its head is an adjective and it contains the material of a proposition minus the subject of that adjective. I will use the symbols $\bar{V}$, $\bar{A}$, and $\bar{N}$ for such constituents, though warning the reader that the bar does not mean the same thing as it does in 'X-bar syntax', where a category name may involve multiple bars, with the number of bars indicating the number of levels by which the constituent dominates its head. Under this conception of syntactic category, (i) constituents can be unspecified for one or more types of syntactic information, e.g. prior to lexical insertion there is no distinction among $\bar{N}$, $\bar{V}$, and $\bar{A}$, (ii) a given transformation may ignore any or all of the types of syntactic information that transformations may be sensitive to, (iii) a change in any of those pieces of information is a change in category, e.g. removing the subject from an S turns it into an $\bar{N}$, $\bar{V}$, or $\bar{A}$, depending on the lexical category of its predicate (which is the head of the resulting constituent), (iv) there is no reason why $\bar{N}$, $\bar{V}$, or $\bar{A}$ cannot be nested ad libitum – nested constituents can perfectly well have the same head and lack a subject, as I maintain they do in expressions like [[[*slice the salami*]$_{\bar{V}}$ *with a cleaver*]$_{\bar{V}}$ *in the kitchen*]$_{\bar{V}}$, and (v) not every head have a lexical category – for example, tense markers do not belong to any lexical category.

[1] The arguments in which I and other generative semanticists purportedly showed the categories of syntax and of logic to coincide really only showed that logical categories play a role in syntax; they were neutral as to what else might play a role. Those arguments rested on two gratuitous assumptions that I now reject (and have studiously avoided in such recent work as McCawley 1980b): the assumptions that syntactic categories remain constant throughout a derivation and that it is only the deepest level of syntactic structure for which it is appropriate to formulate combinatoric rules.

The notion of 'corresponding node' that is assumed here does not carry with it any assumption that the contributions made to the meaning of a sentence by a surface constituent of it comprise a constituent of logical structure: a surface constituent may contain material that originated outside of that constituent or may lack material that has been extracted from it by a movement transformation, and the corresponding node of logical structure will dominate counterparts of the latter but not of the former material.

Restrictive relative clauses can be attached to what I have just identified as $\bar{N}$s:

(3a) the fear of heights that Myron displayed
(3b) the school of engineering that Alice applied to

Accordingly, I will concentrate on data relevant to the choice among versions of (1a, b, c) in which the 'head noun' is really an $\bar{N}$ in drawing tentative conclusions as to what the surface structures of the relevant constructions are. In the remainder of this section, I will present arguments based on facts about deletion of repeated $\bar{N}$s, conjoining of $\bar{N}$s, Topicalization, placement of parenthetical material, apparent violations of the Complex NP Constraint, and Conjunction reduction of Ss.

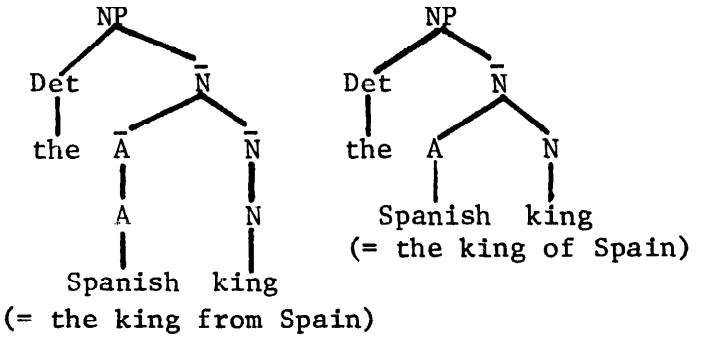
The phenomenon often described as a deletion of a repeated N is really a deletion of repeated $\bar{N}$s, as (4b) shows:[2]

(4a) Tom rooms with two Taoists and Bill rooms with three ∅ (= Taoists).
(4b) Tom rooms with two believers in Taoism and three believers/*∅ in Jainism.

[2] These examples are suggested by sentences given by Baker (1978: 415) and Jackendoff (1977: 58) to show that *one* substitutes for an $\bar{N}$ rather than for an N:

The student of physics was better prepared than the student/*one of chemistry.
The student from Georgia was better prepared than the student one from Montana.

The observation that *one*-pronominalization affects only $\bar{N}$, coupled with the analysis of restrictive clauses developed here, provides an explanation of the much discussed fact that *one*-pronominalization disambiguates such expressions as *the Spanish king*: *the Spanish one* can be only the king from Spain, not the king of Spain. Suppose that postnominal *of Spain* and *from Spain* can both be realized as prenominal *Spanish*, and that the PP in *the king from Spain* is a reduced relative clause but that in *the king of Spain* is simply the object of *king*. Then *the Spanish king* will have distinct surface labelings depending on its source, and *one*-pronominalization will be applicable only to the structure corresponding to *the king from Spain*:



With a restrictive clause, as in (5a), the antecedent of the elided matter must include the relative clause if it includes the head noun, whereas with a nonrestrictive clause, as in (5b), it cannot include the relative clause:

(5a) Tom has two cats that once belonged to Fred, and Sam has one.
(5b) Tom has two violins, which once belonged to Heifetz, and Sam has one.

That is, (5a) implies that Sam's cat once belonged to Fred, whereas (5b) does not imply that Sam's violin once belonged to Heifetz. I assume that there is a deletion transformation in the derivation of sentences like (5) and that the operands of transformations must be syntactic constituents.[3] The input to this transformation must then involve a constituent consisting of the $\bar{N}$ and the restrictive relative for it to be applicable in such examples as (5a). The failure of the deletion to apply to the $\bar{N}$ and S of a nonrestrictive relative clause construction could be attributed either to the $\bar{N}$ and the S not making up a constituent at all or to their making up a constituent of the wrong category. I reject the latter possibility on the grounds that there is no otherwise functional type of syntactic information that would serve to distinguish an $\bar{N}$ + restrictive from a putative $\bar{N}$ + nonrestrictive constituent (recall that here categories are not arbitrary markers but complexes of information of specific types, each of which leads an independent existence). I accordingly conclude that nonrestrictive clauses do not have a (1c) constituent structure. For the moment I remain neutral as to the choice among (1a), (1b), and structures in which a nonrestrictive clause and its host NP do not make up a constituent.

The status of $\bar{N}$ plus restrictive clause as a constituent is confirmed by the possibility of the conjoining found in such sentences as (6):

(6) Several linguists who play chess and philosophers who play bridge were there.

The quantifier here applies to linguists and philosophers together, not to the two types of persons separately: if three linguists who play chess and

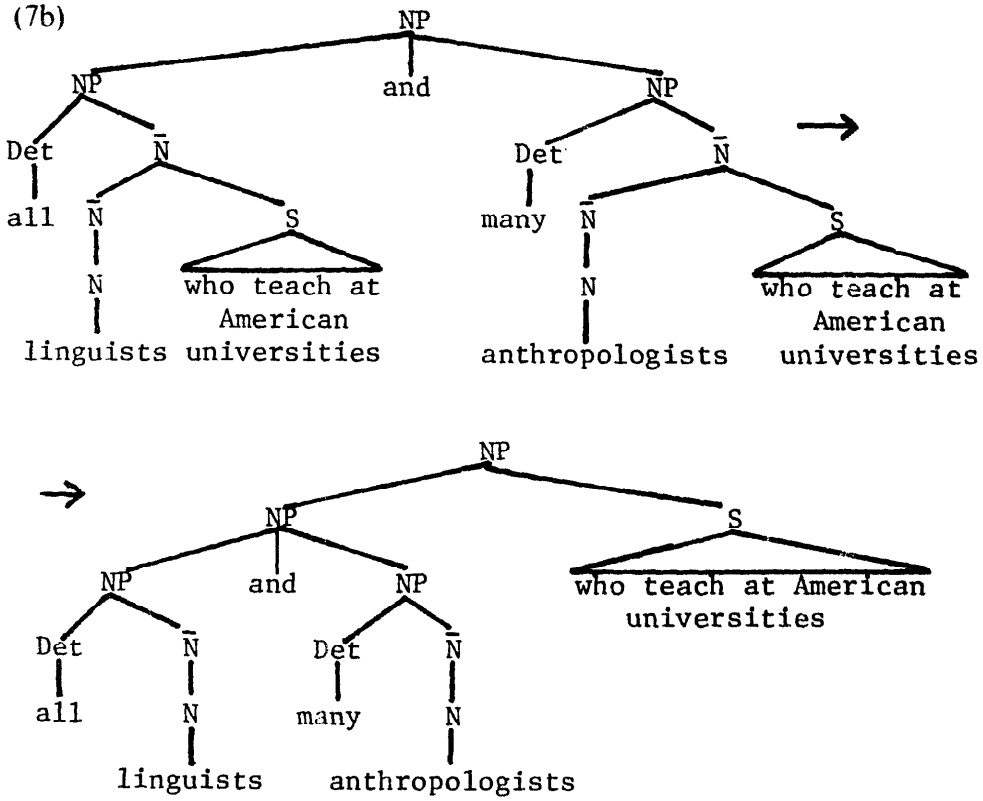
[3] There are some well-known processes deleting nonconstituents, e.g. 'Sluicing' (*Bill thinks that Fred has told someone our secret, but he doesn't know who*). In these cases, following Ross (personal communication), I take the 'operands' to be not the deleted matter but the constituent in which deletion is performed and the constituent that is retained, i.e. the operation is 'delete all of X but Y', and it is not the deleted matter but the material left behind that is required to be a constituent.

two philosophers who play bridge were there, then several linguists who play chess and philosophers who play bridge were there, even though the philosophers were not sufficiently numerous (nor, according to most persons' usage, were the linguists) to constitute several.

Sentences such as (7a) do not conflict with the claim that restrictive relative clauses have a (1c) surface structure, since they can be derived by Right Node Raising (henceforth, RNR; see Bresnan 1974 for discussion), which right-adjoins to a conjoined structure a copy of a constituent that appears at the end of each conjunct and deletes the originals of that constituent:[4]

(7a) All linguists and many anthropologists who teach at American universities think that the Bureau of Indian Affairs is imperialistic.

(7b)



[4] Only the relevant derivational step is given in (7b). I assume that the coordinate NP is derived through a application of Conjunction reduction to conjoined Ss.

Thus, apparent instances of the (1b) constituent structure can arise from the (1c) structure via RNR. A more serious potential counterexample to the claimed (1c) constituent structure is provided by examples such as (8), called to my attention by Stanley Peters:

(8a) Two linguists who had met at a conference on language planning were among those arrested.
(8b) Two linguists and one anthropologist who had met at a conference on language planning were among those arrested.

Note that (8b) has only an interpretation in which the relative clause refers to the three scholars jointly (i.e. the three had met at the conference) and thus cannot be derived by RNR: the source under a RNR derivation would involve the uninterpretable *one anthropologist who had met at a conference on language planning*. I have relegated a solution of the problems presented by examples like (8) to an appendix in which I argue that the (limited) class of 'Determiners' (such as *two*) that can figure in examples like (8) are really not 'Determiners' but reduced restrictive relative clauses. I bring up these examples here mainly as an excuse to point out that in the bulk of this paper I use the term 'Determiner' quite uncritically but ultimately rectify that failing.

Topicalization phenomena distinguish between, on the one hand, both restrictive and nonrestrictive relative constructions, and on the other hand, *pseudo-relative* constructions such as the apparent relative clause of *There are many Americans who like opera*. When a NP is topicalized, any restrictive or nonrestrictive clause contained in it must remain with the NP:

(9a) The fish that I caught, Bill ate.
(9a′) *The fish, Bill ate that I caught.
(9b) Stella, who I love, many people can't stand.
(9b′) *Stella, many people can't stand, who I love.

When the predicate NP of a cleft construction or the NP of a pseudo-relative construction is topicalized, the result is less acceptable if the cleft or pseudo-relative clause is carried along into topic position; moreover, the unacceptability of the examples in question (10a, b) considerably exceeds the awkwardness of parallel examples (10a″, b″), in which a simple NP following *be* is topicalized:

(10a) *Bill who I talked to, it may have been.
(10a′) ?Bill, it may have been who I talked to.
(10a″) ?Bill, it may have been.
(10b) ??Many Americans who distrust politicians there have always been.
(10b′) ?Many Americans there have always been who distrust politicians.
(10b″) ?Serious problems there have always been.

These facts suggest that combinations of determiner, $\bar{N}$, and restrictive or nonrestrictive clause are syntactic constituents and are of a category that can undergo Topicalization,[5] and that in cleft and pseudo-relative constructions, the NP and the apparent relative clause either do not make up a constituent at all or are a constituent of the wrong category for Topicalization to be applicable. The facts in (9), however, are consistent with an analysis sketched in section 3 in which *Stella, who I love* is not a constituent.

The constructions under discussion also differ with regard to how natural or awkward it is to insert parenthetical material between the $\bar{N}$ and the apparent relative clause. The insertion of parenthetical expressions before a nonrestrictive relative clause is generally somewhat awkward, and insertion before a restrictive clause even more so:

(11a) ?Tom cooked twice-cooked pork, as you know, which I always enjoy.
(11b) *Tom cooked a dish, as you know, that I always enjoy.

However, there is no awkwardness at all in insertion of parentheticals before a cleft or pseudo-relative clause:

(12a) It was Sam, as you know, that Lucy was talking to.
(12b) There are many Americans, as you know, who distrust politicians.
(12b′) ?Rothbard and Royko are two Americans, as you know, who distrust politicians.

Here (12b) is contrasted with a sentence of similar form in which a restrictive relative appears where (12b) had a pseudo-relative.

[5] Ross's (1967) arguments that only NPs undergo Topicalization rest on gratuitous assumptions about the notion 'syntactic category' that I reject in McCawley 1977a, 1980b.

This difference in behavior between restrictive relatives and pseudo-relatives provides a basis for identifying (13a–c), but not (13c'), as containing pseudo-relatives:

(13a) Paul has a brother, as you know, who lives in Toledo.
(13b) Nixon is the only President, as you may have heard, who ever resigned.
(13c) I've never met an American, of course, who doesn't like pizza.
(13c') ?I've never met a person, of course, who won a Nobel Prize.
(13d) I bet you've never heard of an American, I'm sure, who doesn't like pizza.

On the basis of a far from thorough search for pseudo-relatives, I conjecture that pseudo-relatives are restricted to VP-final position in existential and negative existential clauses. In saying this, I assume that, as argued in McCawley 1974, *only* can be analyzed as *no ... other than*, so that (13b) is a variant of *No President other than Nixon ever resigned* and its pseudo-relative is thus in a negative existential clause. The pseudo-relative construction of (13c, 13d) requires a verb such as *see*, *meet*, *hear of*, or *run into* that indicates the basis of the negative existential judgement, e.g. (13c) conveys 'Judging from my personal contacts, no American doesn't like pizza', and even those verbs do not support pseudo-relative constructions when, as in (13c'), they cannot be interpreted as simply indicating the source of evidence for the existential or negative existential proposition.

The acceptability and frequency of occurrence in spontaneous speech of apparent violations of the complex NP constraint (CNPC; see Ross 1967) are further respects in which the constructions treated here contrast with one another. The CNPC marks as deviant any derivation in which material is moved out of a clause embedded in a NP that has a lexical head noun:

(14a) Alice is dating a man who works for General Electric.
(14a') *Which company is Alice dating a man who works for?
(14a'') *Ralph Nader has denounced the company that Alice is dating a man who works for.
(14b) Muskie repudiated the report that American troops have been sent to Zaire.
(14b') *Which country did Muskie repudiate the report that American troops have been sent to?
(14b'') *Carter is expected to visit the country that Muskie repudiated the report that American troops have been sent to.

If pseudo-relative clauses were restrictive relatives, questioning or relativizing constituents of pseudo-relative clauses should result in the same sort of unacceptability as is found in (14a′, a″, b′, b″), and such sentences should not normally be produced in spontaneous speech. However, the following sentences did occur in spontaneous speech and appear not to have struck the hearers as bizarre:

(15a) Then you look at what happens in languages that you know and languages that you have a friend who knows. (Charles Ferguson, lecture at University of Chicago, May 1971)

(15b) This is the one that Bob Wall was the only person who hadn't read. (unidentified secretary at University of Texas, observed by Susan Schmerling)

Such sentences are often somewhat awkward, but they never sound as bad as similar sentences in which matter is moved out of a restrictive relative:

(16a) Violence is something that there are many Americans who condone.

(16b) ?Violence is something that I've never met an Englishman who condones.

(16c) ?Violence is something that Snead is the only Englishman who condones.

(16c′) *Violence is something that Snead is an Englishman who condones.

Interestingly, it is even easier to relativize or interrogate out of a pseudo-relative clause than out of a cleft clause:

(17a) ??Swahili is the language that it's Bert who knows.

(17b) ???Which person was it Lucy who was talking about?

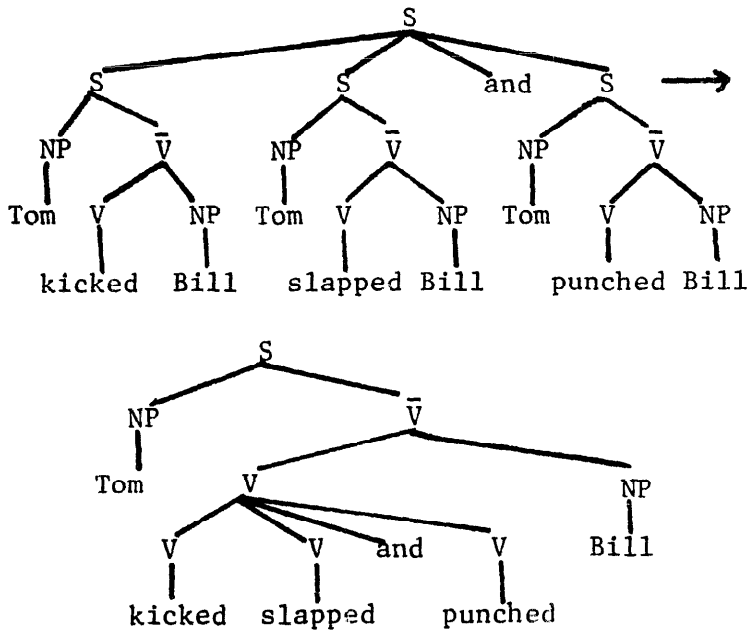
I will offer no analysis of cleft clauses in this paper.[6] I have included them in this discussion only as a control, since cleft clauses have the internal structure of relative clauses but clearly are not modifiers of the NPs that precede them. To my knowledge, no one has yet suggested that the predicate NP and the cleft clause even make up a constituent, let alone comprise a

[6] I refer the reader to Higgins (1973) for a sobering survey of problems that cleft constructions present, and to Halvorsen 1978 for an account that covers an impressive proportion of Higgins' facts.

NP. Thus the sequence NP plus pseudo-relative acts even less like a NP than does something that has never seriously been claimed to be a NP.

The examples discussed so far have provided no evidence that either pseudo-relative clauses or cleft clauses make up a constituent with the preceding NP. Facts about conjunction reduction provide some evidence that there is in fact a surface constituent consisting of NP and pseudo-relative or cleft clause, though these facts provide no information about the syntactic category of this constituent. Conjunction reduction factors out the shared material in conjoined items that are identical except for one constituent, creating a coordinate constituent out of the items that differed from one conjunct to another:

(18)



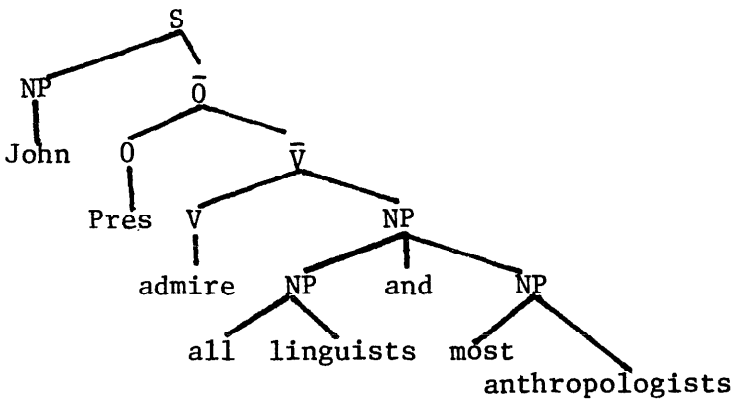
By checking the applicability of transformations that require a NP-VP structure, it is possible to verify that a sentence with a coordinate underlying structure[7] has undergone conjunction reduction and not, say, merely deletion of repeated material. For example, (19a) must have a derived structure as in (19c) and not as in (19d), in view of the possibility of forming

[7] I say 'with a coordinate underlying structure' to exclude from consideration sentences like *The king and the queen are an amiable couple* whose ultimate underlying structures are not themselves coordinate but only have coordinate parts.

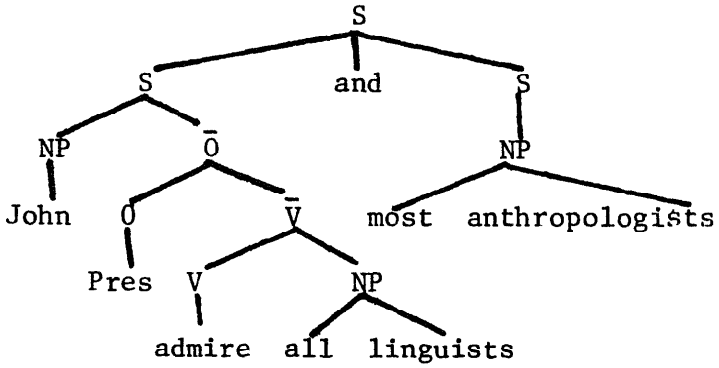
questions as in (19b), which depend on copying of the subject of the sentence and copying or movement of the topmost verb:[8]

(19a) John admires all linguists and most anthropologists.
(19b) John admires all linguists and most anthropologists, doesn't he?

(19c)



(19d)



A conjoined sentence does not have a subject (though each of its conjuncts generally will), and the subjects of the individual conjuncts do not play the

[8] 'O' here is a makeshift to indicate 'has no lexical category'; an 'Ō' is thus a 'bar' constituent whose head (here, 'Pres') does not belong to N, V, A, or P, i.e. it has no 'lexical category'. In McCawley 1980b I argue that rules of gross syntactic combinatorics such as the familiar S → NP VP (i.e. S → NP V̄) should be regarded as constraints on the permissible syntactic configurations in surface structure. Configurations such as [NP Ō]S, [NP N̄]S, [NP Ā]S, and [NP P̄]S occur in intermediate stages of derivations but are avoided in surface structure through the application of such rules as Affix-hopping, *Do*-support, and Copula-insertion.

desired role in question formation, as is seen from examples like the following, in which no conjunction reduction or deletion can have applied:

(20a) Lincoln opposed slavery and Douglas opposed freeing the slaves, didn't *he/??they?

(20b) *Are many Frenchmen alcoholics, and many Americans have at some time been drug addicts?[9]

The possibility of question-formation, tag-formation, and nonrestrictive clause formation show that Conjunction reduction has applied in the sentences of (21).

(21a) There are both many Americans who like opera and many Uruguayans who like hockey, aren't there?

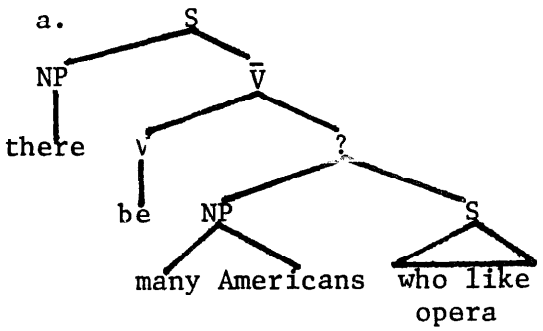
(21b) Are there either many Americans who like opera or many Uruguyans who like hockey?

(21c) It was either Fred who brought the beer or Tim who brought the pretzels, wasn't it?

(21d) They say that it's Fred who brought the beer and Tim who brought the pretzels, which, in fact, it is.

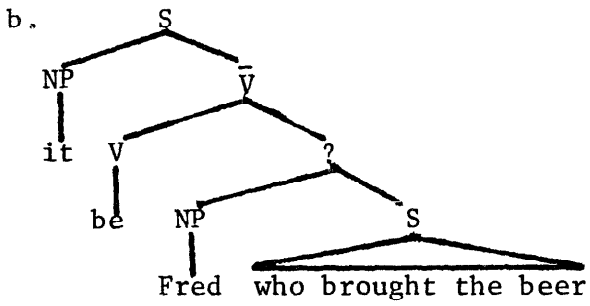
Since the operands of a transformation must be constituents, prior to Conjunction-reduction these sentences must have contained as constituents the items that appear as conjuncts in the output of Conjunction-reduction:

(22a)



[9] *Are many Frenchmen alcoholics and have many Americans at some time been drug addicts?* is not the interrogative of a conjoined sentence but the conjunction of two interrogative sentences.

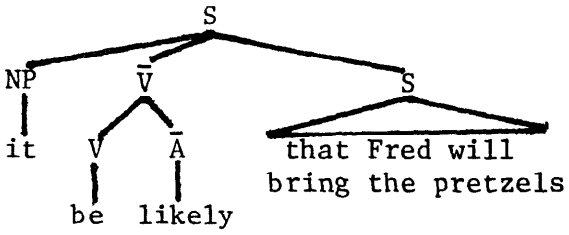
(22b)



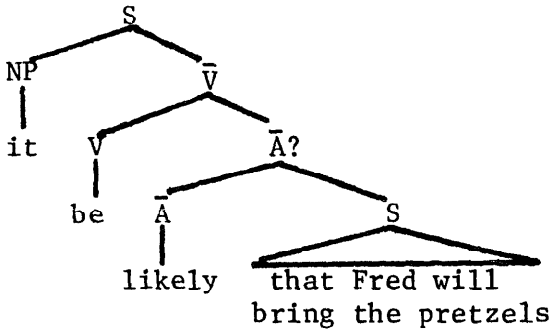
The same type of evidence, incidentally, argues that extraposed clauses are not daughters of the higher S-node, as in the structure (23b) that has hitherto generally been assumed (e.g. Rosenbaum 1967; Ross 1967; Postal 1974), but adjuncts to the original $\bar{V}$ or $\bar{A}$, as in (23c):

(23a) It's likely that Fred will bring the pretzels and possible that Lucy will bring the beer, isn't it?

(23b)



(23c)



In this section I claim to have established that restrictive relatives have a (1c) surface structure (except that the item to which the relative clause is adjoined is an $\bar{N}$ rather than an N and the $\bar{N}$ + S combination is itself an $\bar{N}$) and to have shown that the other constructions considered do not have that surface structure, though my conclusions as to what the surface

structures of the other three constructions are are less specific and less solidly supported; the facts presented can be taken as supporting the claim that all three have surface structures in which the apparent NP and the following S make up a constituent, though in the case of nonrestrictive clauses I have suggested that the argument given can be gotten around and that they may not even make up constituents with their host NP's.

2. Further remarks on pseudo-relative clauses

Linguists have said little about the sentences that I have identified as involving pseudo-relative clauses. In one of the few published discussions of them, Jenkins (1975) argues that they have a [V NP S]$_{VP}$ structure (i.e. the V, the apparent NP, and the relative-like clause are sisters) on the basis of parallels with cleft and perception verb (*I saw Ed leave*) constructions; Milsark (1976) disputes the alleged parallels but adopts an analysis in which (as far as I can tell) it is immaterial whether the apparent NP and the apparent relative clause comprise a constituent. I suspect that pseudo-relatives are regarded as restrictive relatives by a silent majority that have failed to consider any alternative structures. I will devote the bulk of this section to providing further arguments (over and above those of section 1) against that silent majority position (possibly a straw man), according to which (24a) contains exactly the same complex NP as is found in (24b–c):

(24a) There are many Americans who like opera.
(24b) Many Americans who like opera listen to the Met radio broadcasts.
(24c) Norman has interviewed many Americans who like opera.

I will address my arguments to the version of the silent majority position in which there is a transformation of *There*-insertion that derives (24a) from an underlying structure with *many Americans who like opera* in subject position. I am sure that they could be adapted to provide arguments against versions in which that NP is in postverbal position in deep structure. My arguments in this section will concentrate on matters of semantic interpretation.

The principal semantic problem presented by pseudo-relatives arises where, as in (24a), the quantifier expresses a relative rather than an absolute magnitude. *Many* can be paraphrased as 'a large number'. But large by what standard of largeness? In the most obvious interpretation of (24a),

the set of all Americans defines the standard of largeness: (24a) is interpreted as saying that the proportion of Americans who like opera to Americans in general is large, that is, that more Americans than you might expect like opera. Not only does (24b) not allow an interpretation analogous to what I have just described, but it is difficult to say what an analogous interpretation would be, since the paraphrase given for (24a) provides no clue as to where the 'matrix' 'x listens to the Met radio broadcasts' would fit in. In (24b), the standard is provided not by 'Americans' but by 'Americans who like opera' (i.e. more of them than you might expect listen to the Met broadcasts) or perhaps something more nebulous, such as 'sets of persons with a common cultural interest'.

When a quantifier is combined with an $\bar{N}$ and a restrictive relative clause, the restrictive relative is involved along with the $\bar{N}$ in defining the domain over which the bound variable ranges and the standard relative to which quantifiers such as *many* and *few* are interpreted. Pseudo-relative clauses, on the other hand, do not figure in the determination of the domain of the variable or the standard against which *many* and *few* are interpreted. This point is illustrated by the contrast between sentences involving 'stacked' restrictive relative clauses and similar sentences in which a pseudo-relative appears. Stacked restrictive relative clauses make the same contribution to truth conditions (though not to meaning) regardless of their order, e.g. in both (25a) and (25b) the variable ranges over the set of all Americans who both want to reinstate the death penalty and wrote in Spiro Agnew for President:

(25a) Many Americans who want to reinstate the death penalty who wrote in Spiro Agnew for President subscribe to *The Readers' Digest*.

(25b) Many Americans who wrote in Spiro Agnew for President who want to reinstate the death penalty subscribe to *The Readers' Digest*.

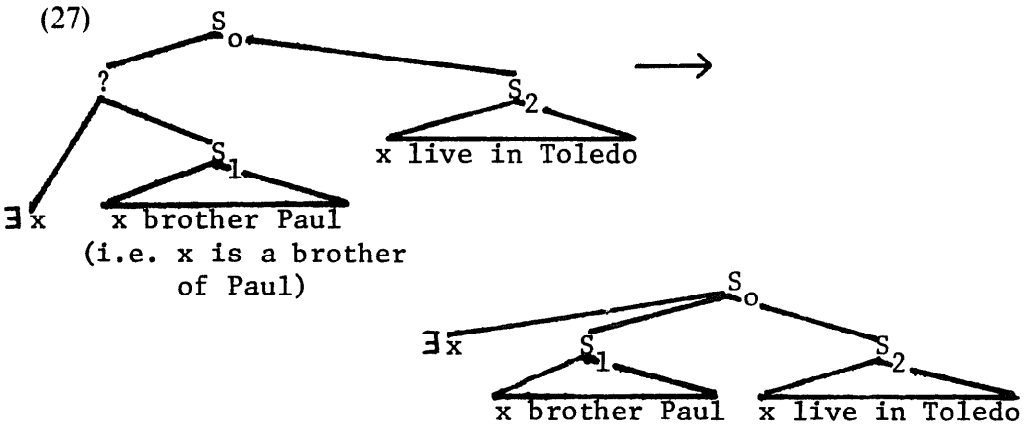
In either case the sentence expresses a true proposition if and only if a large proportion of the members of that set subscribe to *The Readers Digest*. However, there is a vast difference in the truth conditions of (26a) and (26b):

(26a) There are many Americans who want to reinstate the death penalty who wrote in Spiro Agnew for President.

(26b) There are many Americans who wrote in Spiro Agnew for President who want to reinstate the death penalty.

In (26a) one is saying of Americans who want to reinstate the death penalty that a large fraction of them wrote in Spiro Agnew for President. In (26b) one is saying of Americans who wrote in Spiro Agnew for President that a large fraction of them want to reinstate the death penalty. Suppose that 20 million Americans want to reinstate the death penalty, 20,000 Americans wrote in Spiro Agnew for President, and of the latter 20,000 persons, 19,000 are among the 20 million who want to reinstate the death penalty and 1,000 are not. Then, of Americans who want to reinstate the death penalty, only 0.1% wrote in Spiro Agnew for President, which means that (26a) is false, whereas of Americans who wrote in Spiro Agnew for President, 95% want to reinstate the death penalty, which makes (26b) true.

The most natural interpretation of (24a) is identical to that of *Many Americans like opera*. I propose tentatively that pseudo-relative constructions are variants of existential sentences or negations of existential sentences, differing from them to the extent that the 'matrix' to which the existential quantifier expression applies, instead of being realized as the surface main clause, as it 'normally' is, is demoted to the status of a surface subordinate clause having the same surface form as a restrictive relative clause (in particular, allowing the same variant forms as do restrictive relatives: there can be either a true relative pronoun, or the relative marker *that*, or no relative marker at all, with the choice among those options determined by the same factors as in the case of restrictive relatives. The minimum application of brute force that will derive pseudo-relative constructions from the suggested logical structure is a step in which the 'domain expression' of the quantifier is raised to a position as daughter of the next higher S-node, with concomitant reinterpretation of the original main clause (here, S_2) as a S-final adjunct, possibly purely on the basis of constituent order, although I am far from convinced that left-to-right order of the constituents plays any role in the derivational stage in question:



I argue in McCawley 1980a that while quantifiers are normally 'restricted', that is, they combine, as in the first tree of (27), with two propositional functions, one (here, S_1) specifying the domain over which the bound variable ranges, and one (here, S_2) whose truth in that domain is at issue, pure existential sentences such as *There are wingless insects* or *Paul has a brother* involve an 'unrestricted' quantifier that combines with a single propositional function at a time. The step in (27) has thus given rise to a structure that, except for the extra constituent S_2, is identical to what I take to underlie *Paul has a brother*. Suppose that the rules for associating surface forms to the logical structures of pure existential propositions are taken as applying even to structures containing such an extra constituent, with that extra constituent given the only available realization for an S-final S-adjunct with a bound variable, namely that of a relative clause, as in the extraposed relative clause construction. The desired sequence of words is thereby produced, though whether the resulting constituent structure will agree with that argued for in section 1 will depend on whether that structure is parallel to that of the extraposed relative construction, a point on which I have no firm conclusion.

3. Nonrestrictive clauses

It has often been remarked that in uttering a sentence that contains a nonrestrictive clause one performs a separate speech act in the nonrestrictive clause from that which one performs in uttering the host sentence. For example, in (28a) one is both asking the addressee to say whether John has left and either reminding or informing him that John was here a minute ago, whereas in uttering (28b) one is asking the addressee whether the strange-looking man who was here a minute ago has left and is not performing any additional illocutionary act of informing or reminding (though one may in the process perform a perlocutionary act of reminding – you may recall to the addressee's mind the fact that a strange-looking man was here a minute ago):

(28a) Has John, who was here a minute ago, left?
(28b) Have you seen the strange-looking man who was here a minute ago?

This difference between restrictive and nonrestrictive clauses provides the basis of the analysis of nonrestrictives that I will sketch below, the essence

of which is to derive nonrestrictives from separate sentences that correspond to a separate speech act of the appropriate type. The following characteristics of nonrestrictive clauses will follow from that analysis. First, as Larry Martin has called to my attention, when a question contains a restrictive relative there is nothing bizarre about repeating that relative clause in the answer, but it is both very odd and quite rude to repeat a nonrestrictive clause:

(29a) Did you read the exam that I left on your desk?
Yes, I read the exam that you left on my desk.
(29b) Did you read Schwartz's exam, which I left on your desk?
??Yes, I read Schwartz's exam, which you left on my desk.

In the answer in (29b), the speaker purports to remind or inform the other party of what that other party has just reminded or informed *him* of; this involves exactly the same sort of impoliteness that I would commit if I were to give you as a gift the vase that you had just given me as a gift. By contrast, the restrictive relative in (29a) is not a gift the way that an act of informing or reminding is: it is part of the speaker's specification of the information that he wants, and it is as appropriate in the answer as is any other reference to that information. Indeed, omission of just the restrictive relative clause in the answer of (30a) is slightly odd, whereas omission of the nonrestrictive clause in the answer of (30b) is perfectly normal:

(30a) Did you read the exam that I left on your desk?
?Yes, I read the exam. (Cf. Yes, I read that exam.)
(30b) Did you read Schwartz's exam, which I left on your desk?
Yes, I read Schwartz's exam.

This difference is predicted by an analysis in which nonrestrictive clauses correspond to separate speech acts of reminding or informing but restrictive relative clauses do not.

A second difference between restrictive and nonrestrictive clauses is the often cited fact that the latter can modify clauses, while the former must have a noun as head:

(31) Tom told me that Bill is trying to kill him, which I strongly doubt.

So far I have said nothing about the relationship between the two sentences that I claim to be amalgamated in nonrestrictive clause formation. A

minimum condition that they must satisfy is that they contain appropriately identical constituents: an item in the host clause to which the nonrestrictive clause is to be appended, and an item in the nonrestrictive clause from which the surface relative pronoun expression is derived. Two questions arise here: what restrictions are there on the category of the items that figure in this identity condition, and what kind of identity is it that they must exhibit? The 'head' apparently need not be a NP, in view of the following data:

(32a) Sam is *at home*, which is where Sue is.
(32b) Tom played basketball *from 5:00 to 7:30*, which is exactly when the committee meeting was held.
(32c) It appalls me *that Betty was fired*, which I hadn't been expecting.

In one of these cases, namely the extraposed clause of (32c), a quite conclusive proof exists (Bresnan 1974: 616) that the constituent in question is not a NP. Since the items that figure in (32) do not obviously have reference, it might seem that the relevant identity condition could not be coreference and had to be taken to be something else such as linguistic identity (or at least, an appropriately sloppy version of linguistic identity, so that in (32b) *that Betty was fired* and *that Betty would be fired* count as identical). However, I hold that it is appropriate to speak of reference even in the case of expressions like *at home* and *that Betty was fired*, namely to take the sense of such an expression to be its reference, and thus that coreferentiality should still remain in contention for the role of the appropriate identity relation. Whichever identity relation is decided to be the proper one, a source will be available for each of the sentences in (32), e.g. in (32b) one part of the proposed structure will contain whatever underlies *Betty is fired* and the other part will contain either a repetition of that structure or an anaphoric device such as *that* that refers to it.

A third difference between restrictive and nonrestrictive clauses is accounted for provided we take coreferentiality to be the appropriate identity relation, namely the fact that in nonrestrictive but not in restrictive clauses the relative marker can be accompanied by a noun of its own:

(33a) Mark belongs to the Knights of Columbus, which *organization* has been condemned by the Jewish Defense League.
(33a') *Mark belongs to a club which organization has been condemned by the Jewish Defense League.

(33b) Tom told me that Bill is trying to kill him, which *claim* I strongly doubt.

The assumption that nonrestrictive clause formation is contingent on coreferentiality between items in disjoint structures provides an explanation for a fourth peculiarity of nonrestrictive clauses, namely Smith's (1964) well known observation that certain quantified NPs, though allowing restrictive clauses, do not allow nonrestrictive clauses. These are the quantified NPs that cannot serve as antecedent of an anaphoric device in a following sentence:

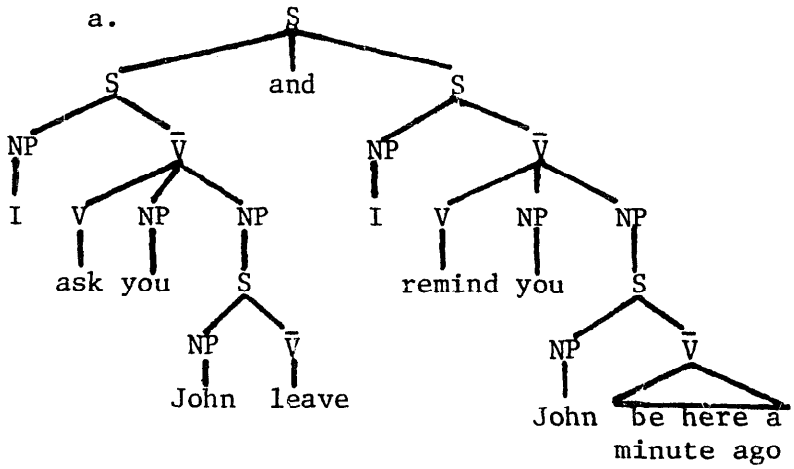
(34a) Each child who was examined by the doctor received a lollipop.
(34b) *Each child, who was examined by the doctor, received a lollipop.
(34c) Each child received a lollipop. *He (*The child) was examined by the doctor.
(34c') Each child that had his picture taken was accompanied by his mother.

The only coreferentiality relations that such a NP can stand in are relations to a NP that it commands, as in (34c'). According to the analysis that I will present in section 4, such sentences have an underlying structure in which a single occurrence of *each* is combined with propositional functions containing multiple occurrences of the variable that it binds; the coreferentiality in (34c') is that between multiple occurrences of a bound variable and can only be found within the scope of the quantifier binding the variable, thus not intersentially, as in (34c) and (I claim) (34b).

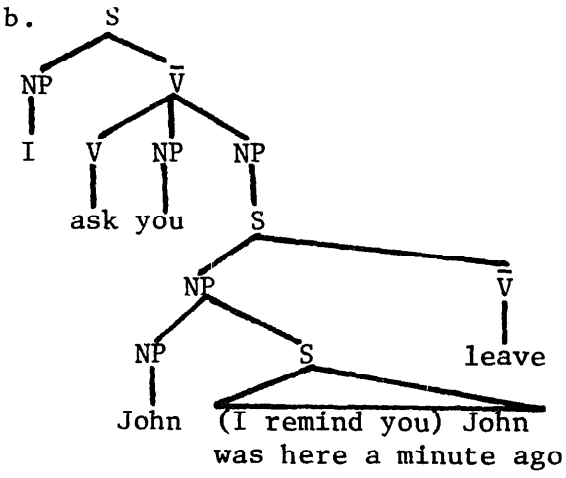
Now to a more detailed description of the derivational step that will form nonrestrictive clauses. My proposal that the nonrestrictive clause be derived from a sentence of the appropriate speech act type (provisionally, reminding or informing), disjoint from the host sentence, requires that the structure underlying the nonrestrictive clause contain information from which it can be determined that it is of the appropriate speech act type. For expository purposes, I will adopt the most straightforward device for indicating speech act type, namely an underlying performative verb; the derivation will be exactly parallel for any alternative device by which one might choose to indicate speech act type. I will also arbitrarily take the two component sentences to be conjoined in underlying structure, noting that nothing I have said or will say conflicts with Lakoff's (1974) proposal that they do not comprise a unitary underlying structure and are put

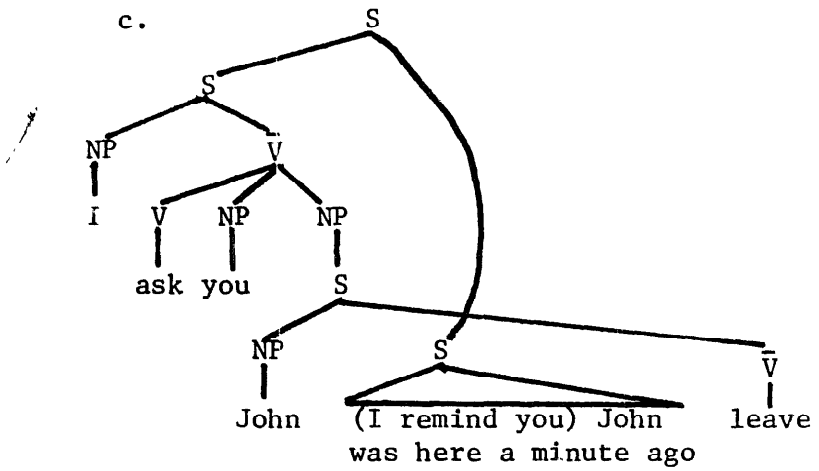
together by a process of *amalgamation*, analogous to the double-base transformations of early transformational grammar. The derivational step giving rise to a nonrestrictive clause construction involves movement of the 'reminder' clause to a position immediately following the constituent that figures in the coreferentiality relation. The most obvious suggestion for the derived constituent structure is that it involves an $[X\ S]_X$ configuration, with the X being the item that figures in the coreferentiality condition, and that is in fact the structure that has generally been assigned to nonrestrictive clause constructions (35b). There is, however, another possibility that deserves to be considered, namely that the movement does not involve any change of constituent structure and thus can give rise to a discontinuous structure, as in (35c):

(35a) a.



(35b) b.





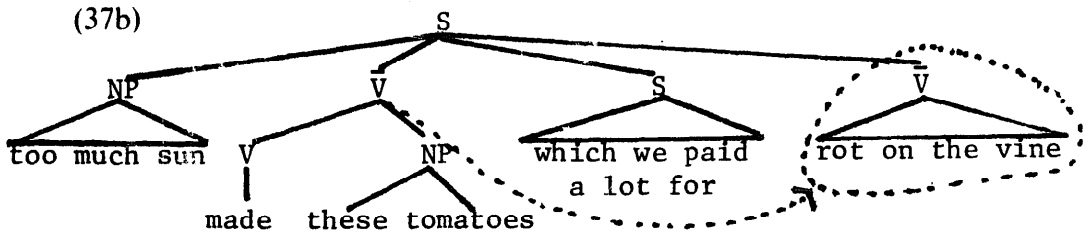
There is in fact reason to treat nonrestrictive clauses as not making up constituents with their apparent heads, namely that VP-deletion ignores any nonrestrictive clauses in the antecedent $\bar{V}$, e.g. in (36) the understood $\bar{V}$ of the second conjunct is *buy a pound of gold*, not *buy a pound of gold, which he expects to sell at a big profit*:

(36) Sam bought a pound of gold, which he expects to sell at a big profit, and so did Fred.

In the one analysis that I have seen in which nonrestrictive clauses are claimed not to be surface sisters of their apparent heads, Emonds (1979) treats nonrestrictive clauses as positioned by a rule that does not move a nonrestrictive clause into its host sentence but rather moves a constituent at the end of the host sentence rightwards over the nonrestrictive clause. This is the same rule by which Emonds positions parenthetical expressions. Since Emonds, following the exceptionless practise of transformational grammarians, does not recognize the possibility of discontinuous structure, he assumes that his parenthetical rule attaches the moved constituent to the root S node, thus detaching it from the $\bar{V}$, as in (37):

(37a) Too much sun made these tomatoes, which we paid a lot for, rot on the vine.

(37b)



The standard position on formation of nonrestrictive clauses is that it can make a VP grow: material is adjoined to the host NP and thus becomes part of any VP containing that NP. Emonds' position is that formation of nonrestrictive clauses (or positioning of parentheticals of any type) can make a VP shrink: if the host NP is in the middle of a VP, material is moved out of the VP. There is in fact no reason to suppose that formation of nonrestrictive clauses or placement of parentheticals causes any change in the constituency of VPs. Exactly the same antecedents for VP-deletion are available as if the nonrestrictive clause or parenthetical expression were not there:

(38a) Thomas Jefferson believed, as you may know, that all human beings were created equal, but Karl Marx, you'll be surprised to learn, didn't. (= didn't believe that all human beings were created equal; ≠ didn't believe, as you know, that all human beings were created equal).

(38a′) *Thomas Jefferson believed, as you may know, that all human beings were created equal, and Karl Marx did, as few people realize, that Slavs were inferior to Germans.

(38b) Tom sent Willie Nelson, who he admires deeply, a fan letter, and Bert did too. (= sent Willie Nelson a fan letter; ≠ sent Willie Nelson, who he admires deeply, a fan letter; ≠ sent Willie Nelson).

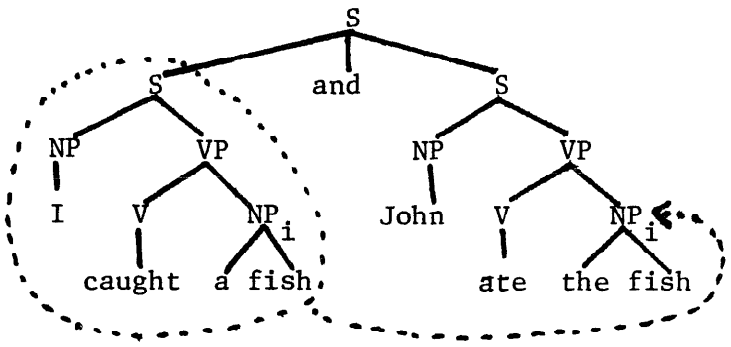
These facts could, of course, be accomodated by invocation of extrinsic rule ordering: parenthetical placement could just be ordered after VP-deletion (and, I conjecture, all other rules to which VP-constituency is relevant). I find the arguments against extrinsic ordering far more convincing than those against discontinuous structure and accordingly take nonrestrictive clause formation provisionally as involving movement of a 'reminder' clause without any concomitant alteration of constituent structure, as in (35c).[10]

[10] I regard it as a virtue of my analysis of nonrestrictive clauses that it renders nonsensical the question of what the truth value of a declarative sentence containing a nonrestrictive clause is. Since the truth value of a performative clause *I assert/state/... that S* is obvious, it is only the complement of the performative clause and not the performative clause itself that it makes sense to ask about the truth value of. Under either the conjoined or the amalgam version of the analysis sketched here, there is no clause of logical structure (except the conjoined performative clause, under the conjoined version) that contains both the host clause and the nonrestrictive clause, and thus there is nothing containing both clauses whose

4. Restrictive relative clauses

In this section I will argue that restrictive relative clauses have an underlying structure in which they are conjoined with something. However, my proposal will be quite different from the familiar analysis, here referred to as the *host-conjunct analysis* (Thompson 1971) in which restrictive relatives are derived from coordinate structures in which there is coreferentiality between a host NP and what is to become a relative pronoun, via a step that adjoins one conjunct to the coreferential NP of the other conjunct:

(39)



Since that analysis makes the formation of restrictive relative clauses contingent on coreferentiality between the host NP and a NP in a different clause, it implies that restrictive clauses should not be possible on NPs that cannot enter into such relations. We have just seen one counterexample (34c′) to this prediction: NPs whose determiner is *each* (or some other things such as *most* or *no*) allow restrictive relative clauses, but cannot stand in the coreferentiality relations that the host-conjunct analysis would make a prerequisite for the formation of relative clauses. An adherent of the host-conjunct analysis can explain (34c′) away by combining that

truth value could ver be at issue. This accords with my intuition that asking the truth value of *The earth, which rests on the back of a giant turtle, revolves about the sun* involves making the same sort of unreasonable demand as does asking what size shoes the Juilliard String Quartet wears: the question makes sense for the parts but not for the whole.

One important type of nonrestrictive clause not accounted for in this section is what Jespersen (1924: 113) calls a 'continuative relative clause', as in *He gave the letter to the clerk, who then copied it.* The nonrestrictive clause here does not appear to correspond to a separate speech act. Such sentences may well be just variant forms of conjoined sentences, a conjecture that is supported by the fact that 'continuative' clauses can appear only at the extreme end of the host clause: **He gave the clerk, who then gave him a receipt, the letter.*

treatment of restrictive relatives with a treatment of quantifiers as originating outside of their surface clauses, as Thompson herself (1971 : 80) proposes. However, there are other counterexamples that it is much harder to explain away.

Consider a quite banal type of sentence that for some reason seems to have escaped linguists' attention, namely that in which a restrictive relative clause appears on a predicate NP:

(40a) Sam is a linguist who has a very good background in sociology.
(40b) Lemon grass is an easily obtained herb that is widely used in Southeast Asian cooking.

Predicate NPs are normally nonreferential. Thus, in (41) a personal pronoun can have only the subject, not the predicate NP as its antecedent, and while pronouns such as *that* can have the predicate NP as antecedent, they refer not to an individual but to a property that the predicate NP predicates of the subject:

(41a) Carter is a politician. I'm glad I'm not *him*. (= Carter)
(41b) Carter is a politician. I'm glad I'm not *that*. (= a politician)

The identity that figures in (41b) is not coreference but 'co-sense'. The nonreferential nature of predicate NPs can perhaps best be seen from such examples as the following, which do not refer to any individual describable as *a linguist* or *Mary's husband* and indeed do not presuppose that anyone is so describable:

(42a) Is John a linguist?
(42b) Is John Mary's husband?

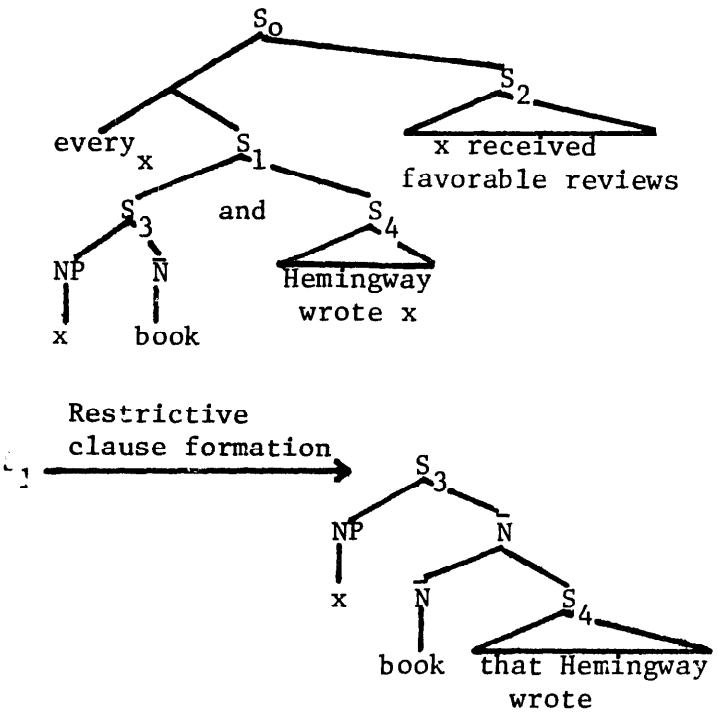
Further, note that the relative pronoun in sentences such as (40) is coreferential with the subject, e.g. (40a) says that Sam has a good background in sociology and does not allow any interpretation in which the relative pronoun refers to the predicate that the predicate noun denotes (e.g. an interpretation involving 'Linguists have a good background in sociology'). I thus regard sentences such as (40) as fatal for the host-conjunct analysis: depending on how broadly one interprets 'coreference', either the host NPs in the source structure demanded by the host-conjunct analysis cannot be

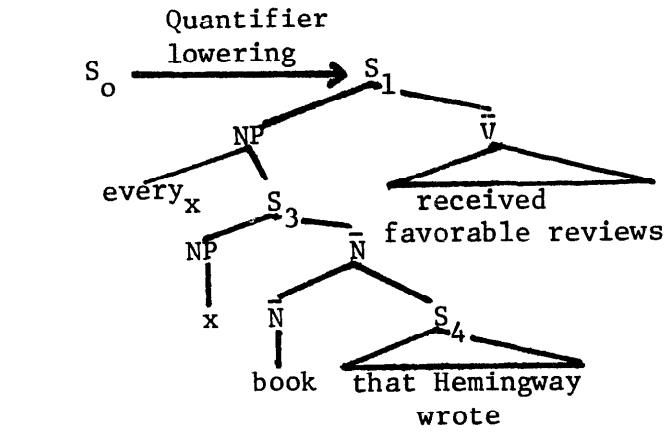
coreferential to anything or they can only be coreferential to the wrong things (namely to NPs referring to 'linguists' rather than to Sam, etc.).

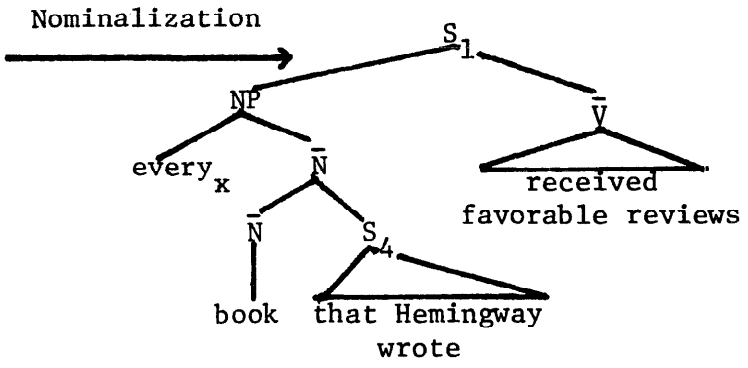
As an alternative to the host-conjunct analysis, I wish to propose a treatment that is specifically designed to handle relative clauses on predicate nouns. Sentences like (40) will be derived from coordinate structures in which the predicate noun appears in one conjunct and *the subject of* that predicate noun is coreferential with something in the other conjunct, e.g. (40a) would be derived from a structure also underlying *Sam is a linguist and Sam has a very good background in sociology*. This proposal, henceforth the *predicate-conjunct analysis*, will be combined with a version of the proposals of Bach (1968), in which nonpredicate NPs are derived from structures containing a clause in which the noun appears in predicate position. The derivation of (43a) will be as sketched in (43b):

(43a) Every book that Hemingway wrote received excellent reviews.

(43b)







The first tree in (43b) is the logical structure of (43a) except that I have treated lexical insertion as having already applied, so as to simplify the exposition. (Prior to lexical insertion, the node labeled $\bar{N}$ in S_3 would be a $\bar{O}$ – a 'bar' constituent whose head has no lexical category.) I assume here a system of *restricted quantification*, i.e. a quantifier is combined with two propositional functions, one (here, S_1) that specifies the domain over which the bound variable ranges, and the other (here, S_2) whose truth in that domain is at issue. (S_0 is true if and only if S_2 is true of all values of x that meet the condition S_1). 'Quantifier lowering' refers here to a transformation that moves a Quantifier + S combination in a structure like that of the first tree onto an occurrence of the bound variable in the 'matrix' propositional function (i.e. here it puts *every* + S_1 in place of the x of S_2).[11]

[11] See McCawley 1972, 1980a for arguments against the almost universally accepted scheme of *unrestricted quantification*, in which all variables range over the same domain, quantifiers combine with one rather than two propositional functions, and the effect of a restricted

'Nominalization' refers here to a transformation that reduces the S of a [Quantifier S]$_{NP}$ combination to its predicate element (here the predicate $\bar{N}$). I have assumed that logical structures involve no copula or predicate article (i.e. I intend the absence of *be* and *a* from S_3 as a serious claim): I take those instances of *be* and articles to be semantically empty (e.g. I hold that *John is a lawyer* is not an existentially quantified version of a propositional function *John is x*) and regard them as inserted simply in order to bring about conformity to the surface constraints that $\bar{N}$s must be in the configuration [Det $\bar{N}$]$_{NP}$ and that in [NP $\bar{X}$]$_S$, X must be V.[12]

These assumptions immediately yield the surface constituent structure that was argued for in section 1: since there is no article on the predicate noun at the stage where Restrictive clause formation applies, it will adjoin the relative clause to the $\bar{N}$ rather than to an Article + $\bar{N}$ composite, and since Chomsky-adjunction is the unmarked form of adjunction, it will create a new node having the $\bar{N}$ as one daughter and the relative clause as the other daughter; through Quantifier lowering and Nominalization, a structure is arrived at in which the quantifier is a sister of an $\bar{N}$ + S constituent.

The analysis proposed here allows the combination $\bar{N}$ + restrictive clause to play the same logical role as would a noun without a relative clause, as in *Every seat was occupied.* I maintain that a restrictive clause in a quantified NP always has the effect of restricting the domain of a bound variable and that the coordinate analysis gives the correct restriction on the bound variable; for example, in (44a) the individuals whose having done fieldwork in Peru is relevant to the truth of the proposition are those meeting the condition 'x is a linguist and x teaches at this university' and in (44b) the individuals whose craziness is relevant to the truth of the proposition are those having the property 'x is a linguist and x specializes in syntax':

domain is simulated through the use of propositional connectives, as in the more familiar rendition of the logical form of *All linguists are insane* as (∀x) (x linguist ⊃ x insane).

The transformation here called 'Quantifier lowering' should not be confused with the transformation of the same name that figures in such works as Lakoff 1970, which presupposes a radically different underlying structure from that given in (43b). For arguments against Lakoff's underlying structure, see McCawley 1972, 1975.

[12] I ignore here the important problem of accounting for the difference between predicate nouns with and without articles in those languages (e.g. German, and especially, modern Greek) that allow both possibilities. See Pentheroudakis 1977 for penetrating discussion of the modern Greek facts.

(44a) No linguist who teaches at this university has ever done field work in Peru.
(44b) Most linguists who specialize in syntax are crazy.

I will devote the remainder of this section to giving arguments that support one important detail of the predicate-conjunct analysis, namely that restrictive relative clause constructions have an underlying structure in which the relative clause is outside of the clause that contains the head noun. Some of the arguments will be neutral as to a choice between the predicate-conjunct and host-conjunct analyses, since both of those analyses share the feature of having the head noun originate in a clause that does not contain the relative clause, though in one case additional factors make it hard to imagine a treatment that conforms to the host-conjunct analysis.

'Clause relators' such as *also*, *either*, and *nevertheless* are anaphoric devices having a clause as antecedent and indicating some relationship between the clause in which they occur and the antecedent clause, e.g. that both clauses are special cases of some more general proposition ('There are a number of parts of the world that Evelyn has never been to' in the case of (45c)) or that the host clause is remarkable, given the antecedent clause:

(45a) Oscar voted for Abe Beame, and Louise voted for him also.
(45b) Tom beats Martha frequently; nevertheless, she still loves him.
(45c) Evelyn has never been to Australia; she's never been to Africa either.

The host clause cannot be a complement of the antecedent clause, e.g. (46) has only an interpretation in which *also* has as antecedent an earlier clause of the discourse – it does not allow an interpretation such as 'Mary is afraid that, besides being afraid, she has no money', in which the *also* refers to the clause in which *she also has no money* is embedded:

(46) Mary is afraid that she also has no money.

In the cases considered so far, the antecedent of a clause relator is a clause and is disjoint from the host clause. There is, however, one class of cases in which the antecedent is not obviously a clause and the antecedent material is in a clause containing the host clause, namely sentences in which the clause relator is in a restrictive relative clause and refers to the head $\bar{N}$ of that relative clause:

(47a) Tom wrote a novel which is also a great corpus for Tennessee dialects.
(47b) Every chess freak who is also interested in card games will want to read this book.
(47c) Mary married a Belgian who nevertheless eats only hamburgers.
(47d) A real shlemiel who isn't very bright either isn't going to do very well.

For example, the most obvious interpretation of (47a) is one in which *also* refers to *novel* ('besides being a novel, it is a great corpus for Tennessee dialects'). Under the predicate conjunct analysis, the apparently disparate class of possible relationships between clause relators and their antecedents becomes uniform: the sentences in (47) contain a coordinate structure (such as 'x is a novel and x is also a great corpus for Tennessee dialects') in which the clause relator is in the second conjunct and the antecedent is the first conjunct, which is the same structural relationship as in the 'ordinary' examples (45). The host-conjunct analysis is at a loss to make sense of sentences such as those in (47), since it provides no clause (such as 'x is a chess freak') that could serve as antecedent for the clause relator.

Ross and Perlmutter (1970) discovered a class of sentences that appear to involve extraposed relative clauses but allow no derivation involving extraposition of relative clauses, since there is nowhere that the relative clause could be extraposed from:

(48a) A man entered and a woman left who had met in Vienna.
(48b) *A man who had met in Vienna entered and a woman left.
(48b') *A man entered and a woman who had met in Vienna left.

No existing analysis of restrictive relatives, not even the one sketched above, covers (48a), and I will in fact maintain that (48a) is related to the normal grammar of restrictive relative clauses by a 'patch', i.e. a mechanism for extending the coverage of a grammar to cases that strictly speaking are not covered by it.[13] The principal contribution of the predicate-

[13] See Morgan 1972 and Reis 1974 for discussion of the notion of 'patch'. Thompson (1971: 94) proposes an underlying structure for (48a) that is similar to (49) in that the extraposed clause is conjoined with a structure 'man entered and woman left' that contains both 'matrix' clauses. However, she gives no indication of how the indefinite articles would be derived nor of how the corresponding quantifier(s) would fit into the logical structure.

conjunct analysis to the analysis of (48a) will be in the plausible underlying structure that it allows one to construct, namely

(49) (∃x, y: ((x is a man) and (y is a woman)) and (x and y met in Vienna)) ((x left) and (y entered)).

This structure involves a device that has not appeared so far in this paper, namely the single quantifier (∃x, y) that binds two variables. In McCawley (1980: par. 14.5) I discuss several examples that require this extended version of quantification. I maintain there that a double (or multiple) quantifier is realized on the NPs corresponding to all the variables that it binds, as in (48a), where both occurrences of *a* are realizations of a single ∃ in logical structure. In (49) the extraposed relative clause appears as a conjunct of a coordinate structure that is outside of the coordinate structure of the 'matrix' sentence (x left and y entered). Normal relative clause formation is not applicable in (49), since there is no predicate noun that 'x and y met in Vienna' can be adjoined to (there is no predicate noun having 'x and y' as subject). (49) provides motivation to develop a patch: there is a coherent semantic structure which the normal rules of grammar are unable to associate with a well-formed surface structure; moreover, there is no obvious close equivalent to (49) that one could substitute for it so as to make the development of a patch unnecessary. The most natural patch to accomplish the expression of (49) would be a derivational step that bypasses normal relative clause extraposition and moves 'x and y met in Vienna' directly from where it is in (49) into the 'Extraposed S' position of the matrix S: such a step puts a clause having the semantic role of a restrictive relative clause into a surface position in which items having that role are allowed to appear and allows *man* and *woman* to be moved into acceptable surface positions by removing the hindrance that the extra conjunct had provided.

Consider finally the class of sentences discovered by Bouton 1970, in which an anaphoric device appears inside its antecedent:[14]

(50) Tom kissed a woman who had ordered him to (do so).

Under the assumptions that the antecedent of identity-of-sense anaphora must be a syntactic constituent and that restrictive relative clauses are inside

[14] Grinder's (1976) thorough and insightful treatment of this phenomenon has greatly assisted me in arriving at the analysis presented here.

their host NPs throughout their derivations, the antecedent of the zero VP or of *do so* in (50) would have to be the entire VP *kiss a woman who had ordered him to (do so)*: that VP is the smallest constituent containing *kiss* and any part of the object of *kiss*, and the relevant interpretation of (50) is one in which Tom was ordered to kiss the woman in question. Under the additional assumption that the anaphoric devices are derived from copies of their antecedents, (50) would then require an infinite deep structure: 'Tom kissed a woman who had ordered him to kiss a woman who had ordered him to kiss a woman who...'. That deep structure has a defect even more fatal than its mere infinite bulk: it would contribute to the meaning of the sentence an infinite number of existential quantifiers that were not part of the meaning of the sentence (she didn't order him to kiss a woman who had ordered him...: she ordered him to kiss *her*).

The predicate-conjunct analysis provides a ready solution to this predicament and allows VP-deletion (and the pronominalization that yields *do so*) to be retained as transformations that delete or pronominalize one of two identical constituents. Specifically, if restrictive relative clauses are derived as in the predicate-conjunct analysis, there is a finite underlying structure containing two occurrences of *kiss x*, and one can be deleted or pronominalized under identity with the other:[15]

(51) (∃x: x is a woman and x had ordered Tom (Tom kiss x)) (Tom kissed x).

(Here the predicate-conjunct analysis and the host-conjunct analysis come out equal: all that is necessary in order to avoid the anomalous infinite deep structure is an underlying structure in which the relative clause is not inside the VP that is headed by *kiss*, and both analyses provide that.)

In this section I have discussed phenomena that require a derivation of restrictive relatives from an underlying structure in which they are outside of their ultimate host clauses. Of the two competing analyses fitting this description, the predicate conjunct analysis is superior to the host-conjunct analysis in three respects: (i) it allows for restrictive relatives on predicate nouns, (ii) it yields a demonstrably correct surface structure, and (iii) it

[15] The deleted instance of *kiss x* must be the one in the relative clause, not the one in the host clause, since if the latter were deleted, it would be impossible to perform Quantifier lowering, and no surface structure could be obtained in which the quantifier was in an admissible surface position.

provides antecedents for the clause relators of examples like (47). In the next section I will quickly dispel any impression the reader may have that the predicate-conjunct analysis solves all the puzzles of restrictive relative clauses in English. Facts will be discussed there that appear to demand an analysis grossly at odds with the predicate conjunct analysis. How I am able to maintain the predicate conjunct analysis in the face of those facts will be the topic of the final section.

5. An alternative analysis of restrictive relative clauses

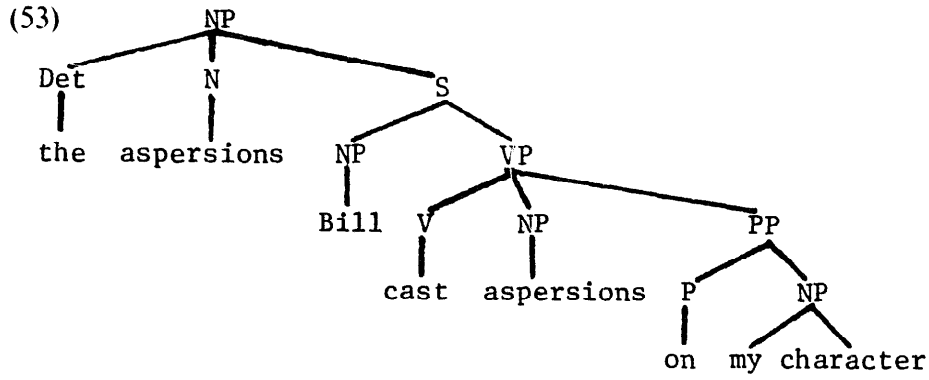
In influential unpublished research, Michael Brame has argued for an analysis of restrictive relative clauses considerably different from any of those alluded to above.[16] For Brame, the head noun of the restrictive relative clause originates inside the relative clause and reaches its surface position by a copying transformation. Brame's original motivation for this proposal was the possibility of relative clause constructions in which part of an idiom appears as the head noun and the rest of the idiom appears inside the relative clause, e.g.:

(52a) The headway that Jack has made on his dissertation pleases his supervisor.
(52b) The aspersions that Bill cast on my character are unfounded.

Under the analysis of restrictive relative clauses given in *Aspects*, such sentences would have a deep structure in which one part of the idiom appeared twice, which means that it would be impossible to have idioms appear in deep structures only as coherent wholes:

[16] Brame's proposal has been discussed at length and elaborated by Schachter (1973), Chiba (1972), and Vergnaud (1974). Brame (1976: 126–7) alludes briefly to his proposal and refers the reader to an unpublished paper of his whose existence I have not yet been able to verify.

(53)



While there is some doubt as to whether some of the examples really involve idioms (e.g. it is not universally agreed that *make headway* is an idiom), there are in fact many cases where an idiom is clearly involved (e.g. *cast aspersions* is clearly an idiom). Under Brame's analysis, sentences like (52b), in which the noun of an idiom is separated from the rest of the idiom, would arise through a transformation that applied to a structure in which the idiom was present as a unit and would break up that unit by copying the noun into head noun position. I emphasize that Brame (likewise, Schachter, Vergnaud, and Chiba) have advocated this derivation for all restrictive relative clauses and not just for those in which part of an idiom appears as head noun.

The published versions of Brame's proposal provide no basis for determining which noun gets copied, in cases where the relative clause has more than one noun in its deep structure. Thus, in such accounts of Brame's approach the same deep structure underlies all of the following:

(54a) the dog that bit the boy in the park
(54b) the boy that the dog bit in the park
(54c) the park in which the dog bit the boy

If one is willing to have underlying structures in which the purported reference of NPs is indicated (which Brame and Schachter evidently are not), the difference among (54a, b, c) can be taken to be purely one of the purported reference of the whole NP, with the noun that is copied being the one in a NP that is coreferential to the whole NP, e.g. in (54b) the purported reference of the whole NP is the same as that of *the boy* in *the dog bit the boy in the park*, and it is then *boy* that is copied. For the purposes of further exploration of Brame's analysis, I will assume that the

copying is in fact sensitive to coreferentiality between the whole NP (the NP whose head is to be created by the copying transformation) and the NP containing the noun that is copied.

There is in fact a large body of data that support Brame's analysis, especially the variant of it in which the copying is sensitive to coreferentiality in the way just outlined. Consider first a type of sentence first investigated by Jackendoff (see now Jackendoff 1972: 133ff), in which a reflexive pronoun, rather than being in the same clause as and following the antecedent, as is normal for a reflexive pronoun, appears before and in a higher clause than its antecedent:

(55) The picture of himself that John found hanging in the Post Office irritated Mary.

This anomalous structural relationship between a reflexive and its antecedent (here, *John*) appears to be possible only when the antecedent is inside a restrictive relative clause and the reflexive is part of the head of the restrictive relative clause construction. The anomaly is immediately explained away by Brame's proposal, provided one takes the copying to affect not simply nouns but $\bar{N}$s: the underlying structure would have a relative clause that yields a normal relationship between reflexive and antecedent (*John found a picture of himself hanging in the Post Office*), and that normal relationship is broken up by the copying of *picture of himself*, which is moved to a position above and to the left of its antecedent.[17] A parallel observation about Equi-NP-deletion is made by Chiba (1972). In examples such as (56), the controller of Equi-NP-deletion (here, *Mary*) does not command the deletion site, as it normally should:

(56) The interest in visiting Las Vegas that Mary displayed surprised Matt.

According to the Brame analysis, *interest in visiting Las Vegas* would get into

[17] Presumably the reason why $\bar{N}$ is the category copied is that it is copied into a position where it combines with a determiner to make up a surface NP. Note that Brame's proposal requires one to give up the popular but wholly unsupported claim that personal pronouns are N's (and thus also are $\bar{N}$'s): if pronouns were $\bar{N}$'s, they could be copied to yield **the her himself that John found in Paris*. This problem is avoided if personal pronouns are taken to be NP's, as they are in Montague grammar, and not $\bar{N}$'s.

See Cantrall 1974 for examples showing that the occurrence of reflexives in English is considerably freer than the statements in this paragraph suggest.

its surface position by copying, prior to which a normal structural relationship between controller and deletion site would prevail (*Mary displayed interest in visiting Las Vegas*).

Brame's analysis, in the version in which copying is sensitive to coreferentiality, not only provides derivations for such sentences as (52) but indeed provides the basis of an explanation of *which* idioms allow $\bar{N}$s in them to be relativized and which ones do not. I maintain that there is an exact correlation between whether an $\bar{N}$ of an idiom can be the head of a relative clause construction as in (52) and whether there is freedom as to what determiner can be combined with that $\bar{N}$:

(57a) the aspersions that Bill cast on my character
Bill cast many aspersions on my character.
Until Bill cast those aspersions on my character, I trusted him.

(57b) the strings that Parky pulled to get me my job
Parky pulled some/many/a lot of strings to get me my job.
Until Parky pulled those strings, I was only an elevator operator.

(57c) *the bucket that John kicked
*Bill kicked a bucket yesterday.
*The prisoners kicked several/many/some buckets yesterday.
*Until Bill kicked that bucket, he was doing remarkably well.

(57d) *the buck that John passed
*Bill has passed several/many bucks.
*Until Bill passed that buck, I respected him.

Other idioms that allow relativization of an $\bar{N}$ of the idiom are *have an axe to grind, have a brush with, take a crack at, have irons in the fire, pull a fast one*, and *have strings attached*; these all exhibit freedom in the determiner position of the $\bar{N}$. The appearance of a quantifier or demonstrative as the determiner of a given NP means that that NP provides a referential index that is available for quantification or replacement by a constant. Under the revised Brame analysis, copying of the $\bar{N}$ is possible if and only if the $\bar{N}$ is associated with a referential index identical to that of the larger NP and no additional impediments are present (such as those which give rise to violations of Ross's movement constraints). The idiomatic nouns having freedom in the determiner position can thus all meet the identity condition for the copying rule. This shows why freedom in the determiner position implies the possibility of relativization. To establish the converse (and thus the exact correlation between relativizability and freedom

in the determiner position that I claim prevails), it would be necessary to show that all idiomatic $\bar{N}$s that contribute a referential index have freedom in their determiner position. This amounts to the claim that there is freedom in the choice of determiner of an idiomatic $\bar{N}$ whenever there is semantic reason for it to be there; I know of no counterexample to this claim, though my investigation of it is far from extensive. To the extent that it can be established, we then have an explanation for an exact correlation between relativizability of an $\bar{N}$ of an idiom and freedom in the determiner of that $\bar{N}$.

Since an idiom may contain more than one $\bar{N}$ and since there is no reason to expect any correlation between freedom in the determiner position of one $\bar{N}$ and freedom in that of any other $\bar{N}$ in the idiom, the above discussion suggests that relativizability should not be a property of the idiom as a whole (thus, it should not be formalizable as an exception feature making certain exceptions to the copying rule) but should be a property of the individual $\bar{N}$s of the idiom. Such in fact appears to be the case. In *There is a fly in the ointment*, *fly* has freedom in its determiner position and can be relativized, but *ointment* has no freedom in its determiner position and cannot be relativized:

(58a) There are several flies in the ointment.
I was in trouble as long as that fly was in the ointment.
the fly that is in the ointment
(58b) *There is a fly in some ointment.
*There are flies in several ointments.
*the ointment that there is a fly in

6. On reconciling the analyses of restrictive relatives

In the last two sections I have presented significant quantities of data in support of each of two radically different analyses of restrictive relative clauses, namely the predicate conjunct analysis and Brame's copying analysis. Neither analysis provides a clue as to how one might account for the facts offered in support of the other analysis, and there is no apparent way to formulate a general analysis of restrictive relatives that the two analyses can be taken as special cases of. In this section I will give a programmatic sketch of what might be called a synthesis of the two analyses, except that it is a synthesis only from an imperialistic point of view: it involves taking

the predicate-conjunct analysis as forming the core of English restrictive relative formation and taking Brame's copying rule as a 'patch' that extends the restrictive relative construction to a class of cases that it would otherwise be inapplicable to.

I will lead into this programmatic sketch by bringing up a class of examples that show Brame's derivation to be inadequate as a general treatment of restrictive relatives: if one takes it to apply in the derivations of all restrictive relative clauses, one loses the main advantage that it was supposed to buy, namely that of allowing one to restrict idioms such as *cast aspersions*, *make headway*, and *pull strings* to appearing in deep structures as units rather than forcing one to admit deep structures in which they appear fragmented or with supernumerary pieces. Lloyd Anderson has called to my attention examples like (59), in which part of the idiom is the head $\bar{N}$ of a relative clause construction and the remainder of the idiom is in the main clause rather than the subordinate clause, which means that under Brame's derivation *pull* would originate in the main clause and *strings* in the subordinate clause, and the two words would not become clause mates until Brame's copying had applied:

(59) Parky pulled the strings that got me my job.

Under the predicate-conjunct analysis, the semantic structure of examples like *the aspersions that he cast on my character* cannot be given surface realizations through the normal derivational steps, though the normal derivation can serve as the basis of a patch in which a copying process exactly like that proposed by Brame extends the grammar to cover these cases. While the logical structures that I have proposed for restrictive relatives involve coordination (as in (60b)), there is no logical anomaly about a structure lacking one of the conjuncts (60c)):[18]

(60a) Every child who was examined was healthy.
(60b) (Every x: x is a child and x was examined) (x was healthy)
(60c) (Every x: x was examined) (x was healthy)

[18] This claim is disputed by Gupta (1977), who argues that the propositional function specifying the domain of a bound variable must provide not merely a "principle of application", as that of (60c) does, but also a "principle of identity". For Gupta, e.g. 'x is clothing' provides the same principle of application as 'one wears x', but adds a principle of identity: one can ask whether x is the same clothing as y. Roughly speaking, a principle of identity makes a predicate a noun (and a 'principle of individuation' makes it a count noun).

English in fact has no sentence that expresses (60c). *Everyone who was examined was healthy* doesn't quite do it, since in (60c) the variable is not restricted to persons (its values might include throats and lungs as well as persons), while *everyone* restricts the values of its variable to persons. Of course, one can usually get by without expressing semantic structures like (60c): one can generally suit one's purposes quite well by adding a conjunct containing a $\bar{N}$ that gives the type of things that the variable ranges over (possibly a conjoined $\bar{N}$: *Every person or organ that was examined was healthy*) and thus circumvent the problem of finding an English sentence that expresses a structure such as (60c). But adding a conjunct to the logical structure will not help if the variable already comes attached to an $\bar{N}$, as in (61a), since adding a conjunct would only give rise to a structure that, from the vantage point of surface structure has a supernumerary noun:

(61a) (All x: Bill cast aspersion$_x$ on my character) (x was unfounded)

(61b) (All x: x allegation and Bill cast aspersion$_x$ on my character) (x was unfounded) → *All the allegations which aspersions Bill cast on my character were unfounded

Using the Brame derivation one can get to a surface structure of a shape appropriate to the semantic structure (61a) through a minimal deviation from normal syntax: since a head $\bar{N}$ is required for surface well-formedness and adding an extra $\bar{N}$ by the usual ploy of coordination still will not yield an appropriate surface structure, the only readily available alternative is to create the required head $\bar{N}$ out of the $\bar{N}$ that provides the obstacle to normal restrictive clause formation. I accordingly propose that the $\bar{N}$-copying that Brame takes as characteristic of all restrictive clause formation has the same character as the nonstandard movement of the relative clause into 'extraposed' position that I posited in the case of examples like (48a): it is a 'patch', whereby a generally valid pattern of correspondence between logical structure and surface structure is extended through the ad hoc elimination of an obstacle to the application of the transformations that normally mediate the correspondence. It is applicable only in cases in which the normal (predicate-conjunct) means of forming nonrestrictive clauses fails to yield a complete derivation.

Appendix: More on the constituent structure of restrictive relative clause constructions

Let us return to the problem that sentences such as (8), repeated here, raise for my claims about constituent structure:

(8a) Two linguists who had met at a conference on language planning were among those arrested.
(8b) Two linguists and one anthropologist who had met at a conference on language planning were among those arrested.

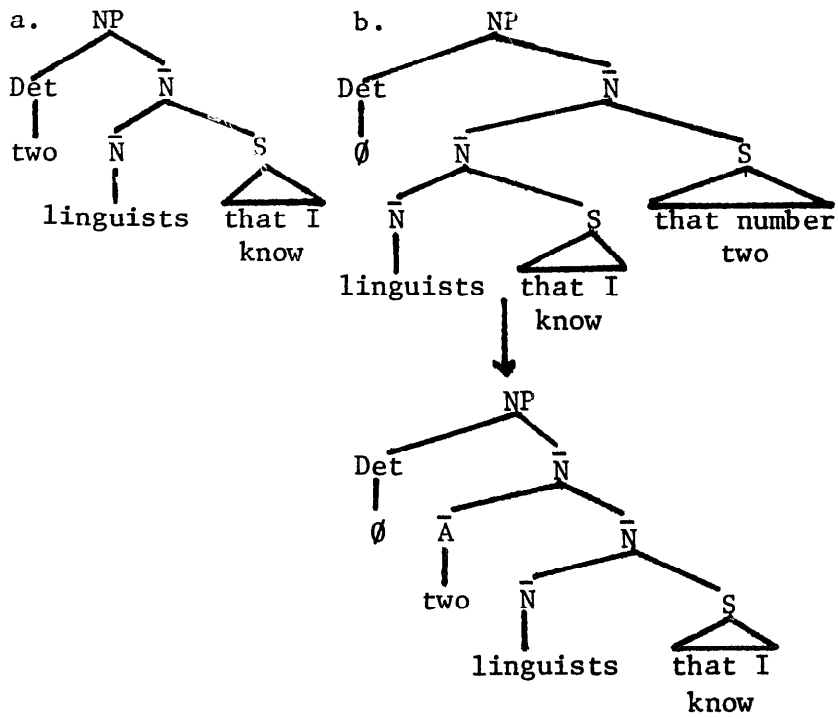
The impossibility of deriving (8b) by Right node raising, coupled with the fact that in (8a) *who had met at a conference on language planning* is predicated not of each of the two linguists but of the pair as a whole, argues that the NP in (8a) has a constituent structure [[two linguists] S] and thus appears to contradict my claim that restrictive relative clauses have a [Det [$\bar{N}$ S]] structure. The sort of relative clause found in (8) is only possible when the noun is definite or existentially quantified, not when it has a universal quantifier or has a quantifier (such as *most* and *few*) that strictly speaking is neither universal nor existential:

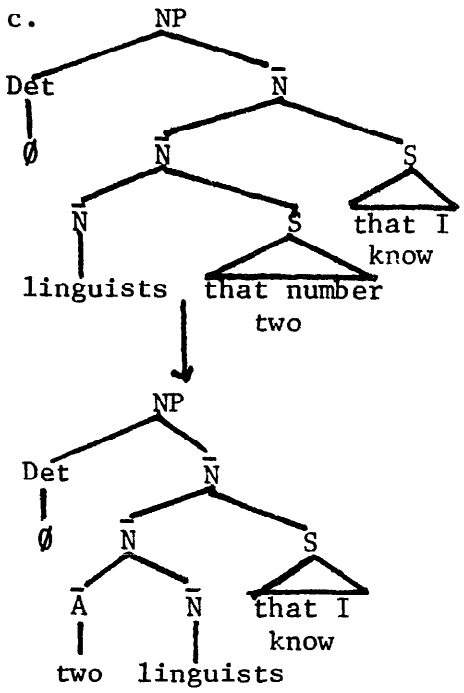
(62a) *All linguists who met at the conference were among those arrested.
(62a′) (All of) the linguists who met at the conference were among those arrested.
(62b) *Most anthropologists who met at the conference were among those arrested.

A distinction among the items that have popularly been classed as 'determiners' must thus play a role in the resolution of the apparently conflicting implications of the data considered so far regarding the internal structure of NPs. It is now time for me to be more critical than I have been so far in my use of the term 'determiner'. While I have applied that term here to *the*, *a*, numerals, *all*, *most*, and many other things, the derivational step that I have assumed that puts items into 'Determiner position', namely Quantifier lowering, applies only to quantifiers (more precisely, to items that bind a variable and are combined with two propositional functions of that variable), and it is not obvious that all these items *are* quantifiers, though clearly all have something to do with quantifiers.

I have in fact argued (McCawley 1977b, 1980a) that numerals (including 'vague numerals' such as *several* and *about 50*) are not quantifiers but are surface manifestations of clauses in which a quantity specification is predicated of a set, e.g. *Two boys left* is analyzed along the lines of 'For some set M consisting of boys and having two members, the members of M left'. The following properties of this informal paraphrase will be of significance in the more formal analysis that it will be developed into below: (i) the numeral is not a quantifier but part of a predication, (ii) there is an existential quantifier, but it binds a set variable rather than an individual variable, and (iii) the domain of that set variable is defined by an expression of the general shape that was argued above to underlie a restrictive relative construction ('M consists of boys and M has two members') except that neither conjunct appears to involve a predicate noun. Suppose that I can rework the informal paraphrase into something that has the requisite predicate noun and that the numeral is taken as assuming its surface position via steps of Relative clause formation, Relative clause reduction, and Ā-preposing. Then the surface constituent structure need not be that of (63a) but could be as in (63b) or (63c), depending on the relative positions of the two relative clauses that would then figure in *two linguists that I know*:

(63)





The analysis developed in McCawley 1977b, 1980a involves a two-place predicate 'M number n' whose first argument takes sets as values and whose second argument takes numbers; this predicate can be realized as the verb of *They number two* or the prepositional phrase of *They are two in number*, though it most often has no overt realization. Because of the syntactic and semantic parallelism between true numerals and such vague expressions of quantity as *several*, *many*, *dozens of*, *about 50*, and *nearly a million*, I reject as misguided any attempt to analyze numerals *directly* into logical primitives in the way that logic textbooks commonly suggest (e.g. an analysis of *Two boys left* along the lines of 'There are a boy_x and a $\text{boy}_{y \neq x}$ such that x left and y left'). Rather, I hold that the gross logical structures of (64a) and (64b) are parallel, with both involving an existentially quantified set variable, both involving the proposition that the members of the set left, and the difference between them residing in the quantity property that is predicated of the set variable:

(64a) Two boys left.
(64a′) $(\exists M\colon [(\forall x\colon x \in M)\ (x \text{ boy}) \wedge M \text{ number } 2])\ (\forall x\colon x \in M)\ (x \text{ left})$
(64b) About 40 boys left.
(64b′) $(\exists M\colon [(\forall x\colon x \in M)\ (x \text{ boy}) \wedge (\exists n\colon M \text{ number } n \wedge n \text{ close-to } 40)])$
$(\forall x\colon x \in M)\ (x \text{ left})$

Note that the possibility of analyzing *about 40* as 'a number that is close to 40', as in (64b'), depends on the possibility of having a bound variable range over numbers, and admitting a predicate 'M number n' makes just that possible.

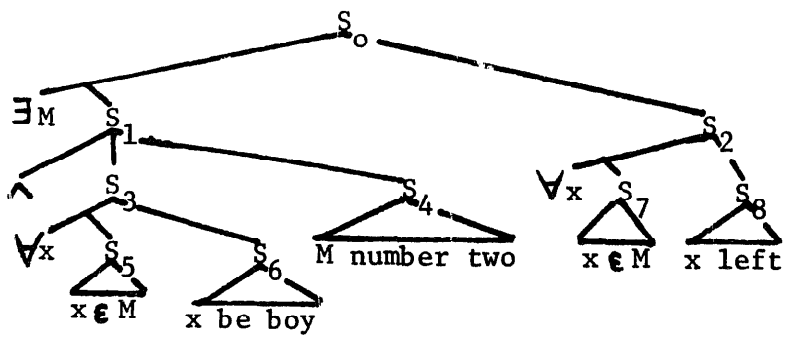
I assume that, like all other English Ss, those involving the predicate 'number' will at some stage of derivations receive an [NP $\bar{X}$]$_S$ constituent structure, that when 'number' is deleted the remaining numeral (here, *two*) becomes the head of that $\bar{X}$, that English numerals are of the lexical category A, so that the $\bar{X}$ here is an $\bar{A}$, and that relative clause reduction and $\bar{A}$-preposing are applicable, just as they are in other [NP $\bar{A}$] clauses in which the $\bar{A}$ ends with an A. The one thing remaining to be established before Relative clause reduction can be taken to apply in the derivation of *two boys* is that Restrictive relative formation can apply to 'M number 2' so as to make a relative clause out of it for Relative clause reduction to apply to. As (64a') stands, Restrictive relative formation is not applicable, since M, the only NP that could underlie the relative pronoun, is not the subject of the S ($\forall$x: x $\in$ M) (x boy) that 'M number 2' is conjoined with.

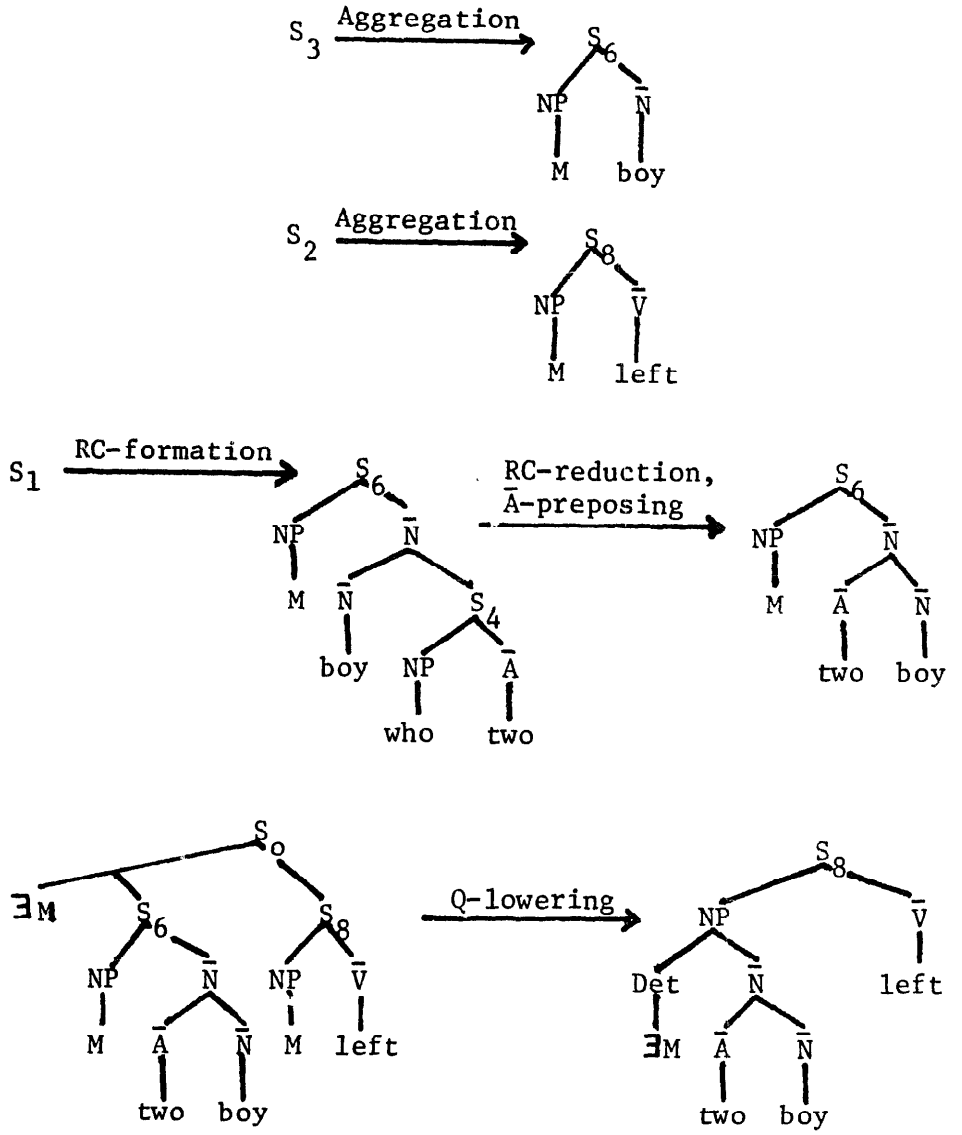
It is possible to conjoin $\bar{V}$s that denote properties of a set as a whole with $\bar{V}$s that denote properties of the individual members of that set, as in (65):

(65) Those odd chaps in the next room are linguists, are three in number, and met at a conference on language planning.

In order to account for this and other facts in McCawley 1980a: par. 14.1 I posited a transformation (christened *Aggregation*) that applies to a clause of the form ($\forall$x: x $\in$ M)Fx, turning it into the result of substituting M for all occurrences of x in F. The result of applying Aggregation to both of the substructures of (64a) to which it is applicable is ($\exists$M: M boy $\wedge$ M number 2) (M left). In the latter structure, 'M number 2' is now conjoined with something whose subject is M, and thus the conditions for Restrictive relative formation are met. The following derivation for (64a) is then available:

(66)





Steps of number agreement in (66) have been omitted. I presume that the plural number on *two boys* has the same source regardless of whether that NP appears in predicate position, as in *They are two boys* (essentially identical to S_1 in (66)), or in argument position, as in (64a).[19]

(67a) now has a straightforward derivation, with logical structure (67b)

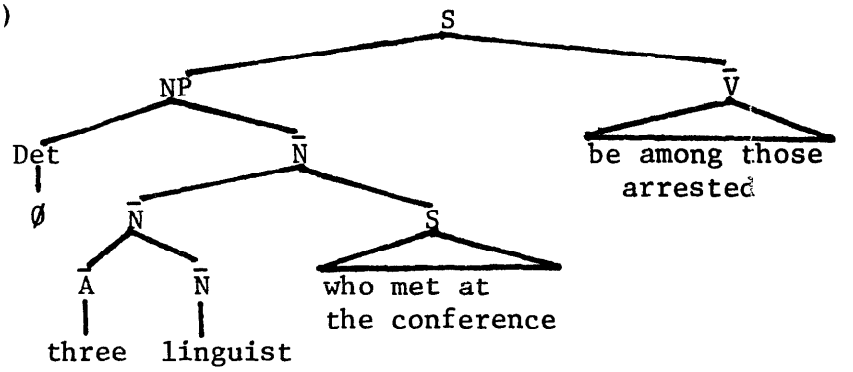
[19] Similarly, I treat colors as filling the second place of a 2-place predicate 'x is y in color'. Color words are freer than number words with regard to their occurrence alone in predicate position: *His shirts were blue/?three.*

and derived structure (67c), via steps paralleling (66) except for an extra application of Restrictive relative formation:

(67a) Three linguists who met at the conference were among those arrested.

(67b) (∃M: (((∀x: x ∈ M) (x linguist) ∧ M number 3) ∧ (M met at the conference)) (∀x: x ∈ M) (x among those arrested)

(67c)



A parallel derivation is not possible for sentences like (62a), in which a universal quantifier appears on the N̄: a universal quantifier is not predicated of a set of individuals, and thus a universal quantifier would render the logical structure in (67b) incoherent if it were to replace the numeral there.[20]

[20] Recall that I reject Lakoff's claim that quantifiers are predicated of sets of individuals. If they are predicates, they are predicated not of sets of individuals but of sets of propositions, as proposed in McCawley 1972.

As my proposals stand, they allow a second derivation for (67a), namely one corresponding to a logical structure in which the positions of 'M met at the conference' and 'M number three' are the reverse of what they are in (67b), yielding a surface structure in which *three* is a sister of *linguists who met at the conference*. Whether such a surface structure is possible can be tested by checking whether the putative [N̄ S] constituent can undergo and condition N̄-deletion. The most obvious possible example is in fact quite odd:

*Three linguists who met at the conference were among those arrested, and two ∅ left before the police arrived.

On the other hand, in appropriate contexts, certain examples of this sort are reasonably normal, e.g.

After Mike interviewed three unemployed philosophers who had discovered by accident that they lived in the same building, Walter interviewed three linguists that had met at an LSA meeting and Barbara interviewed four. Walter interviewed a group of three linguists that had met at an LSA meeting and Barbara interviewed a group of four.

I tentatively conclude that neither the alternative logical structure for (67a) nor the derivation that my proposals allow of an alternative surface structure for (67a) should be excluded.

The only way that the proposals of this appendix allow conjuncts to be grouped together in a logical structure for (8b) is as in (68):[21]

(68) $(\exists M_1, M_2: ((\forall x: x \in M_1)(x \text{ linguist}) \wedge M_1 \text{ number } 2) \wedge ((\forall x: x \in M_2)(x \text{ anthropologist}) \wedge M_2 \text{ number } 1) \wedge (M_1 \cup M_2 \text{ met at } \ldots))\ (\forall x: x \in M_1 \cup M_2)$ (x was among those arrested)

For Restrictive relative formation to convert '$M_1 \cup M_2$ met at a conference on language planning' into a restrictive relative clause, the S to which it is conjoined must have the form '$M_1 \cup M_2$ $\bar{N}$'. Such a structure will be obtained if, after steps parallel to those in (66) have derived 'M_1 is two linguists and M_2 is one anthropologist', Conjunction-reduction applies, in the generalized form that covers *respectively* constructions, which, as argued in McCawley 1968, gives as the reference of a derived conjoined NP the union of the references of the conjuncts:

(69) (M_1 two linguists) and (M_2 one anthropologist)
$\rightarrow [(M_1 \cup M_2)_{NP}$ (two linguists and one anthropologist)$_{\bar{N}}]_S$

Restrictive relative formation can now apply to adjoin '$M_1 \cup M_2$ met at a conference on language planning' to the predicate $\bar{N}$ of (69); Quantifier lowering then inserts the resulting expression in place of $M_1 \cup M_2$ in the matrix clause, yielding the desired surface structure.

Much of the machinery developed in this section is in fact needed in order to account for the use of *and* in examples like (6), repeated here:

(6) Several linguists who play chess and philosophers who play bridge were there.

My discussion of (6) has hitherto focused on the problems presented by the relative clauses that it contains and has not touched on the question

Perhaps the difficulty of finding plausible examples having that structure reflects a garden-path effect, in which an [$\bar{N}$ S] constituent is preferentially parsed in such a way that the S is predicated of the same entity as the $\bar{N}$, and accordingly *linguists who met at the conference* would be given the incoherent interpretation in which *who met at the conference* is predicated of an individual variable.

[21] To maximize the uniformity of the analysis, I have formulated (68) with a constituent corresponding to 'there is a 1-member set of anthropologists' rather than 'there is an anthropologist'.

of how to analyze the conjoining. To focus on that question, let us consider a parallel example without any relative clause:

(70) Several linguists and philosophers were there.

The problem presented by (70) is that of how to derive the conjoined $\bar{N}$ *linguists and philosophers* without resorting to any ad-hoc conversion of *or* to *and* such as would be required according to the most obvious proposal for the logical structure of (70):

(71) $(\exists M\colon (\forall x\colon x \in M)\ ((x \text{ linguist}) \vee (x \text{ philosopher})) \wedge (M \text{ several}))\ (\forall x\colon x \in M)\ (x \text{ there})$.

This problem is solved by setting up a logical structure involving a set union and invoking generalized Conjunction-reduction as in (68)–(69):

(72) $(\exists M_1, M_2\colon ((\forall x\colon x \in M_1)\ (x \text{ linguist}) \wedge (\forall x\colon x \in M_2)\ (x \text{ anthropologist})) \wedge (M_1 \cup M_2 \text{ several}))\ (\forall x\colon x \in M_1 \cup M_2)\ (x \text{ there}) \rightarrow$
$(\exists M_1, M_2\colon ((M_1 \cup M_2)\ (\text{linguist and anthropologist}) \wedge (M_1 \cup M_2 \text{ several}))) \ldots \rightarrow$
$(\exists M_1, M_2\colon ((M_1 \cup M_2)\ (\text{several (linguist and anthropologist)}))) \ldots \rightarrow$
(several (linguist and anthropologist)) be there.

The *and* is then derived from one of its standard sources: set union. The derivation of (8b) will be parallel to (72) except for prior applications of Relative clause formation.

In addition, this treatment of numerals provides an explanation of restrictions on the numerals and quantifiers that can occur in analogs to the Ross-Perlmutter example:

(73a) A man entered and a woman left who had met in Vienna. (= 48a)
(73b) Two men entered and three women left who had met in Vienna.
(73c) The man entered and the woman left who had met in Vienna.
(73d) The two men entered and the woman left who had met in Vienna.
(73e) *Two men entered and the woman left who had met in Vienna.
(73f) *Two men entered and all women left who had met in Vienna.

In the analysis proposed in section 4, (73a) involves a double existential

quantifier (binding one variable ranging over men and another variable ranging over women). There is no reason why the variables bound by the double quantifier could not be set variables combined with extra conjuncts, as in (64), which would immediately yield a derivation of (73b). *The* can serve as a double quantifier, in which case it is given a realization on all the $\bar{N}$s involved, i.e. the two *the*'s of (73c) are realizations of the same occurrence in logical structure of the definite description operator. Any of the relevant $\bar{N}$s in a structure in which *the* is combined with two variables could be combined with a numeral, and thus (73d) is possible. Since *the*, if used as a multiple quantifier, is realized on all the relevant $\bar{N}$s, no derivation of (73e), on which it occurs on only one of them, is possible. (74f) is excluded since *all* is not a numeral but a quantifier and hence could figure in the Ross-Perlmutter construction only if it were used as a multiple quantifier and accordingly were realized on all the relevant $\bar{N}$s, not just the second one, as in (73f).[22]

References

Bach, Emmon, 1968. Nouns and noun phrases. In: E. Bach, R. T. Harms (eds.), Universals in linguistic theory, 90–122. New York: Holt, Rinehart, and Winston.

Baker, C. L., 1978. Introduction to generative-transformational syntax. Englewood Cliffs, N.J.: Prentice Hall.

Bouton, Laurence, 1970. Antecedent-contained pro-forms. Papers from the Sixth Regional Meeting, Chicago Linguistic Society, 154–167.

Brame, Michael, 1976. Conjectures and refutations in syntax and semantics. New York: Elsevier/North-Holland.

Bresnan, Joan W., 1974. The position of certain clause-particles in phrase structure. Linguistic Inquiry 5, 612–616.

Cantrall, William, 1974. Viewpoint, reflexives, and the nature of the noun phrase. The Hague: Mouton.

Chiba, Shuji, 1972. Another case for 'Relative clause formation is a copying rule'. Studies in English Linguistics 1, 1–12.

[22] This paper has benefited from valuable comments that I have received from persons too numerous to list, if I could even remember them all, who have heard earlier versions of parts of it in places as diverse as Edinburgh, Seoul, Melbourne, Prague, and Poznań. However, I single out for a special expression of gratitude Judith N. Levi, whose detailed and incisive criticism of the penultimate version of this paper enabled me to make major improvements in it. I am also grateful to the anonymous referees of an anonymous journal for valuable suggestions. Earlier versions of portions of this paper appeared in *Grammarij* 9 (Nijmegen Working Papers) and in Proceedings of the Eighth Annual Conference of the Northeastern Linguistic Society (University of Massachusetts at Amherst, 1977).

Chomsky, Noam A., 1965. Aspects of the theory of syntax. Cambridge, Mass.: MIT Press.
Chomsky, Noam A., 1970. Remarks on nominalization. In: R. Jacobs, P. Rosenbaum (eds.), Readings in English transformational grammar, 184–221. Waltham: Ginn. (Also in Chomsky 1972, 11–61.)
Chomsky, Noam A., 1972. Studies on semantics in generative grammar. The Hague: Mouton.
Emonds, Joseph, 1979. Appositive relatives have no properties. Linguistic Inquiry 10, 211–242.
Grinder, John, 1976. On deletion phenomena in English. The Hague: Mouton.
Gupta, Anil, 1977. The logic of common nouns: an investigation in quantified modal logic. Univ. of Pittsburgh (Ph.D. thesis).
Halvorsen, Per-Kristian, 1978. The syntax and semantics of cleft constructions. Texas Linguistic Forum 11.
Higgins, F. R., 1973. The pseudo-cleft construction in English. Bloomington: Indiana Univ. Linguistics Club.
Jackendoff, Ray S., 1972. Semantic interpretation in generative grammar. Cambridge, Mass.: MIT Press.
Jackendoff, Ray S., X-bar syntax. Cambridge, Mass.: MIT Press.
Jenkins, Lyle, 1975. The existential in English. Tübingen: Max Niemeyer.
Jespersen, Otto, 1924. The philosophy of grammar. London: Allen and Unwin.
Kuno, Susumu, 1973. Constraints on internal clauses and sentential subjects. Linguistic Inquiry 4, 363–385.
Lakoff, George, 1970. Repartee, or a reply to 'Negation, conjunction, and quantifiers'. Foundations of Language 6, 389–422.
Lakoff, George, 1974. Syntactic amalgams. Papers from the Tenth Regional Meeting, Chicago Linguistic Society, 321–344.
Lakoff, George, Stanley Peters, 1969. Phrasal conjunction and symmetric predicates. In: D. Reibel, S. Schane (eds.), Modern studies in English, 113–142. Englewood Cliffs, N.J.: Prentice Hall.
McCawley, James D., 1972. A program for logic. In: D. Davidson, G. Harman (eds.), Semantics of natural language, 285–319. Dordrecht: Reidel. (Also in: J. D. McCawley, Grammar and meaning, 285–319. New York: Academic Press, 1976.)
McCawley, James D., 1974. *If* and *only if*. Linguistic Inquiry 5, 632–635.
McCawley, James D., 1975. Review of Chomsky 1972. Studies in English Linguistics 3, 209–311.
McCawley, James D., 1976. Morphological indeterminacy in underlying syntactic structure. In: F. Ingemann (ed.), 1975 Mid-America Linguistic Conference papers, 317–326. Lawrence: Univ. of Kansas. (Also in McCawley 1979, 113–121.)
McCawley, James D., 1977a. The nonexistence of syntactic categories. Proceedings of the 1977 Michigan State Conference on Linguistic Metatheory, 212–232.
McCawley, James D., 1977b. Lexicographic notes on English quantifiers. Papers from the Thirteenth Regional Meeting, Chicago Linguistic Society, 372–383. (Also in McCawley 1979, 179–190.)
McCawley, James D., 1979. Adverbs, vowels, and other objects of wonder. Chicago: Univ. of Chicago Press.
McCawley, James D., 1980a. Everything that linguists have always wanted to know about logic (but were ashamed to ask). Chicago: Univ. of Chicago Press.

McCawley, James D., 1980b. An un-syntax. In: E. Moravcsik (ed.), Syntax and semantics, vol. 13, 167–193. New York: Academic Press.

Milsark, Gary, 1976. Existential sentences in English. Bloomington: Indiana Univ. Linguistics Club.

Morgan, J. L., 1972. Verb agreement as a rule of English. Papers from the Eighth Regional Meeting, Chicago Linguistic Society, 278–286.

Partee, Barbara H., 1975. Montague grammar and transformational grammar. Linguistic Inquiry 6, 203-300.

Pentheroudakis, Joseph, 1977. Reference and indefinite descriptions in Modern Greek. Chicago: Univ. of Chicago (Ph.D. thesis).

Peterson, Philip L., 1979. On the logic of 'few', 'many', and 'most'. Notre Dame Journal of Formal Logic 20, 155–179.

Postal, Paul M., 1974. On raising. Cambridge, Mass.: MIT Press.

Reis, Marga, 1974. Patching up with counterparts. Foundations of Language 12, 157–166.

Rosenbaum, Peter S., 1967. The grammar of English predicate complement constructions. Cambridge, Mass.: MIT Press.

Ross, John Robert, 1967. Constraints on variables in syntax. Bloomington: Indiana Univ. Linguistics Club.

Ross, John Robert, David M. Perlmutter, 1970. Relative clauses with split antecedents. Linguistic Inquiry 1, 350.

Schachter, Paul, 1973. Focus and relativization. Language 49, 19–46.

Smith, Carlota, 1964. Determiners and relative clauses in a generative grammar of English. Language 40, 37-52.

Stockwell, Robert P., Paul Schachter, Barbara Hall Partee, 1973. The major syntactic structures of English. New York: Holt, Rinehart, and Winston.

Thompson, Sandra A., 1971. The deep structure of relative clauses. In: C. J. Fillmore, D. T. Langendoen (eds.), Studies in linguistic semantics, 78–94. New York: Holt, Rinehart, and Winston.

Vergnaud, Jean-Roger, 1974. French relative clauses. Cambridge, Mass.: MIT (Ph.D. diss.).