

tial separation from each other? Could it be that children simply know *instinctively* what to do?

BIBLIOGRAPHY

- BEVER, T. G. "A Survey of Some Recent Work in Psycholinguistics." In W. J. Plath (Ed.), *Specification and Utilization of a Transformational Grammar*. (Contract AF 19(628)-5127), Bedford, Mass.: I.B.M. Corp., 1968.
- . "The Cognitive Basis for Linguistic Structures." In J. R. Hayes (Ed.), *Cognition and the Development of Language*, New York: Wiley & Sons, 1970.
- CHOMSKY, N. *Syntactic Structures*. The Hague, Netherlands: Mouton & Co., 1957.
- FODOR, J., BEVER, T. G., and GARRETT, M. *The Psychology of Language: Psycholinguistics and Generative Grammar*, New York: McGraw-Hill, in press.
- LANGENDOEN, T. and BEVER, T. G. "Can a Not Unhappy Person be Called a Not Sad One." to appear in S. Anderson and P. Kiparsky (Eds.), *A Festschrift for Morris Halle*, New York: Holt, Rinehart & Winston, 1973.
- KATZ, J. J. *Semantic Theory*, New York: Harper & Row, 1972.
- KATZ, J. J., and BEVER, T. G. "The Fall and Rise of Empiricism." In T. G. Bever, J. J. Katz, and D. T. Langendoen (Eds.), *Integrated Theory of Linguistic Skill*, Chandler Press (in press).
- MILLER, G. A. *Language and Communication*. New York: McGraw-Hill, 1951.
- . *The Psychology of Communication: Seven Essays*. New York: Basic Books, 1967.

From: Gilbert Harman (ed.)

On Noam Chomsky:
Critical Essays

Anchor Books, Garden City
NY (1974)

Excerpts from *Constraints on Variables in Syntax**

JOHN ROBERT ROSS

2.0. In a paper written for the 1962 Ninth International Congress of Linguists, "The logical basis of linguistic theory" on pp. 930-31, while discussing the relative clause transformation and the question transformation, Chomsky makes the following statement:

The same point can be illustrated by an example of a rather different sort. Consider the sentences:

- (6) (i) who(m) did Mary see walking toward the railroad station?
(ii) do you know the boy who(m) Mary saw walking to the railroad station?

(7) Mary saw the boy walking toward the railroad station.

(7) is multiply ambiguous; in particular it can have either the syntactic analysis (8i) or (8ii)

- (8) (i) NP - Verb - NP - Complement
(ii) NP - Verb - NP

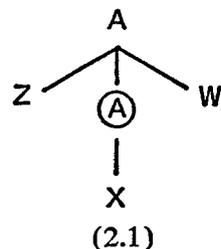
where the second NP in (8ii) consists of a NP ("the boy") with a restrictive relative clause. The interpretation (8ii) is forced if we add "who was" after "boy" in (7); the interpretation (8i) is forced if we delete "ing" in (7). But (6i,6ii) are not subject to this ambiguity; the interpretation (8ii) is ruled out, in these cases. Once again, these are facts that a grammar would have to state to achieve descriptive adequacy. (Notice that there is a further ambiguity, where "Mary" is taken as the subject of "walk," but this is not relevant to the present discussion.)

The problem of explanatory adequacy is, again, that of finding a principled basis for the factually correct description. Consider how (6i) and (6ii) must be generated in a transformational grammar for English. Each must be formed by transformation from a terminal string S underlying (7). In each case, a transformation applies to S which selects the second NP, moves it to the front of the string

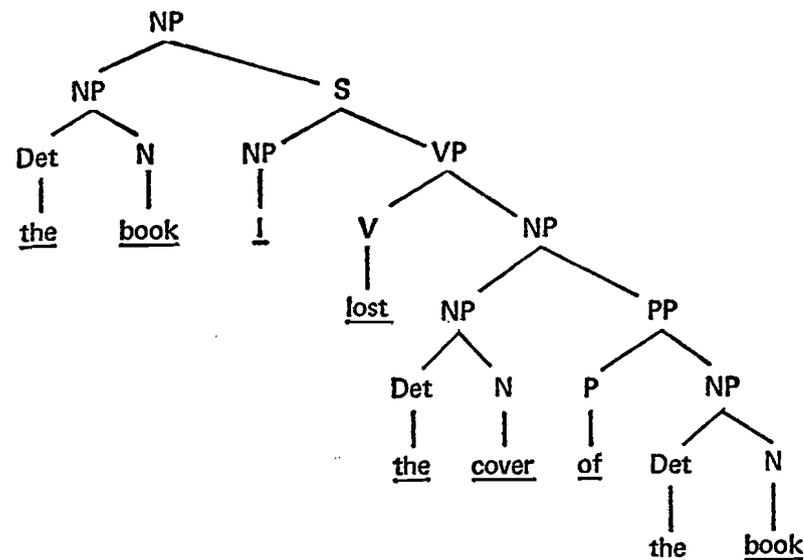
*I have excerpted these passages from John Robert Ross, *Constraints on Variables in Syntax*. (MIT dissertation, 1967; Copyright © John Robert Ross. All rights reserved.) I hope that this important work will eventually be published in its entirety. G. H.

S, and replaces it by a *wh*-form. But in the case of (7) with the structural description (8ii), this specification is ambiguous, since we must determine whether the second NP—the one to be prefixed—is “the boy” or “the boy walking to the railroad station,” each of which is an NP. Since transformations must be unambiguous, this matter must be resolved in the general theory. The natural way to resolve it is by a general requirement that the dominating, rather than the dominated, element must always be selected in such a case. This general condition, when appropriately formalized, might then be proposed as a hypothetical linguistic universal. What it asserts is that if the phrase X of category A is embedded within a larger phrase ZXW which is also of category A, then no rule applying to the category A applies to X (but only to ZXW).

It is the principle stated in this last sentence which I will refer to as the *A-over-A principle*. In terms of tree diagram (2.1), the principle asserts that all transformations which refer to A must apply to the topmost instance of A in (2.1), not the dominated A, which I have circled.



2.1. Chomsky, in the course of revising the paper quoted above for separate publication as the monograph *Current Issues in Linguistic Theory*, realized that the A-over-A principle was too strong. On page 46, in footnote 10, he gives the examples “who would you approve of my seeing?” “what are you uncertain about giving to John?” and “what would you be surprised by his reading?” where in each case the question word, *who* or *what*, itself an NP, has been moved out of another NP ([_{NP} *my seeing something*], [_{NP} *giving something to John*], [_{NP} *his reading something*]). Other examples of this sort are not difficult to construct, and there are even cases where the relative clause transformation can move either a dominated NP or any one of an unbounded number of NP’s which dominate it.



(2.2)

The relative clause rule, when applied to (2.2), will produce either *the book, the cover of which I lost*, or *the book which I lost the cover of*, the second of which would be ruled out by the A-over-A principle. The example can be made more complicated by embedding the NP in ever larger NPs, and as far as I know, this process can be repeated without limit. Thus if the structure underlying (2.3)

(2.3) The government prescribes the height of the lettering on the covers of the reports.

is embedded as a relative clause into an NP whose head noun is *reports*, the relative clause rule must produce (at least) four relative clauses: *the reports, the height of the lettering on the covers of which the government prescribes*; *the reports, the lettering on the covers of which the government prescribes the height of*; *the reports, the covers of which the government prescribes the height of the lettering on*; and *the reports which the government prescribes the height of the lettering on the covers of*. The problem of how to formulate the relative clause rule so that it will produce all four of these is an important and difficult one which I will discuss in some detail later (cf. § 4.3 below); but for the purposes of the present

discussion it is enough to note that the A-over-A principle would exclude all but the first of these four clauses. Many other examples of the same kind, which show that the principle as originally stated is too strong, can be found, so it would appear that it must either be modified somehow, or abandoned and replaced by some weaker principle. I have not been able to find any successful modification, and therefore, I have pursued the latter course.

2.2. Of course, it was not merely to handle certain restrictions on question and relative clause formation that the A-over-A principle was proposed. And it is incumbent upon anyone who wishes to modify or replace this principle to take into consideration all cases which it dealt with satisfactorily. As far as I know, the following is a complete list of all cases which the principle handled convincingly. In all of these, I have been able to construct an alternative explanation which still allows the generation of such sentences as were demonstrated in §2.1 to be improperly excluded by the A-over-A principle. For ease of reference, I will repeat here several examples which I have already discussed, so that all cases which seem to support the A-over-A principle are grouped together.

A. Elements of relative clauses may not be questioned or relativized. Thus, the sentence *I chased* [_{NP} *the boy who threw* [_{NP} *a snowball*] *at our teacher*] can never be embedded as a relative clause in an NP whose head noun is *snowball*: sentence (2.4) is ungrammatical.

(2.4) *Here is the snowball which I chased the boy who threw at our teacher.

It is easy to see how the A-over-A principle would exclude this: in the source sentence the NP *a snowball* is embedded within a larger NP *the boy who threw a snowball at our teacher*, and the principle dictates that only dominating, not dominated, nodes can be affected by the operation of a rule.

This restriction also applies to elements of reduced relative clauses (i.e., those in which the initial *which is* has been deleted): the NP *bikinis* is impossible to question or relativize in the following sentence: *she reported* [_{NP} *all the girls wearing* [_{NP} *bikinis*]] *to the police*. Thus the following question is impossible:

(2.5) *Which bikinis did she report all the girls wearing to the police?

B. Elements of sentences in apposition to such sentential nouns as *fact*, *idea*, *doubt*, *question*, etc., cannot be questioned or relativized. Thus the sentence *Tom mentioned* [_{NP} *the fact that she had worn* [_{NP} *a bikini*.]] cannot be embedded as a relative clause into an NP whose head noun is *bikini*: sentence (2.6) is ungrammatical:

(2.6) *Where's the bikini which Tom mentioned the fact that Sue had worn?

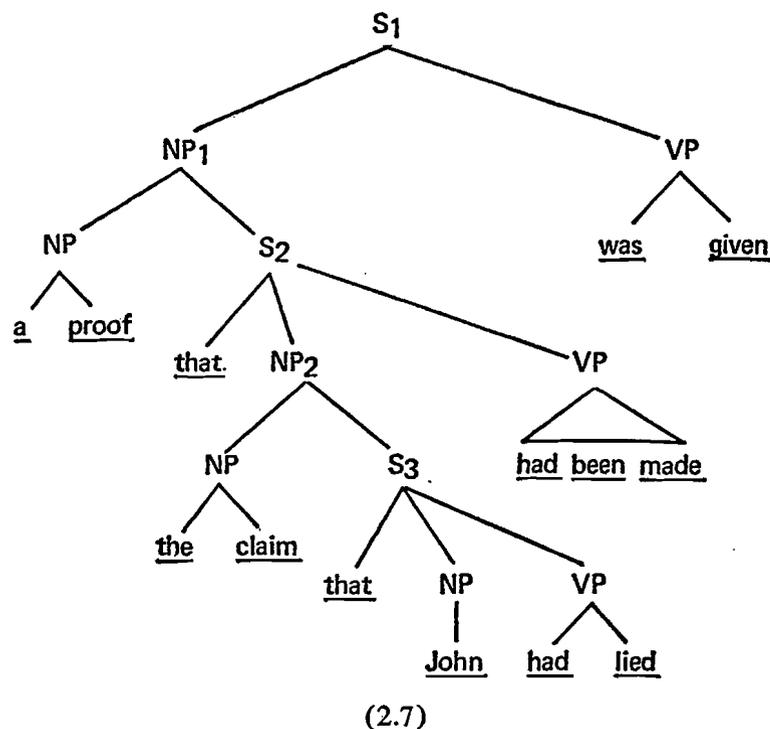
Once again, it is easy to see how the A-over-A principle can be made use of in excluding this sentence.

C. An extraposed clause may never be moved outside "The first sentence up," as was discussed briefly in §1.0 [not reprinted here]. Assuming that an approximately correct formulation of the rule for Extraposition from NP is

Extraposition from NP

$$\begin{array}{ccccccc}
 X & - & [NP - S] & - & Y & & \\
 \underbrace{\quad\quad\quad} & & NP & & & & OPT \\
 & & 1 & 2 & 3 & \Longrightarrow & \\
 & & 1 & 0 & 3+2 & & \\
 & & & & (1.10) & &
 \end{array}$$

we see that unless it is somehow restricted, it will have two results when it is applied on the topmost cycle of the structure shown in (2.7).



Either S_2 (the subscripts have no systematic significance and are merely inserted as an aid to exposition) could be moved to the end of S_1 , which would yield the grammatical sentence (2.8),

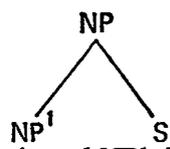
(2.8) A proof was given that the claim that John had lied had been made.

or S_3 could be moved to the end of S_1 , which would result in the ungrammatical (2.9),

(2.9) *A proof that the claim had been made was given that John had lied.

Sentences like (2.9) could be avoided if the A-over-A principle was strengthened somewhat so that if a P-Marker had two proper analyses with respect to the structural index of some transformation, where one proper analysis "dominated" the other, in a sense which is intuitively fairly clear but would probably be difficult to state formally, then the transformation in question would only per-

form the operations specified in its structural change with respect to the "dominating" proper analysis. Begging the question of how these notions could be made precise, it should be clear that the sequence of nodes $[NP\ S]_{NP}$ which is immediately dominated by NP_1 in (2.7) "dominates," in the intended sense, the sequence of nodes $[NP\ S]_{NP}$ which is immediately dominated by NP_2 ; so Extraposition from NP could not produce (2.9) from (2.7), if the strengthened version of the A-over-A principle which was sketched immediately above were adopted.

D. In a relative clause structure, , it is not possible to question or relativize the dominated NP^1 . This is the case discussed by Chomsky in the passage quoted in §2.0 above. An example of the kind of sentence that must be excluded is the following: it is not possible to question (2.10) by moving *someone* to the front of the sentence and leaving the relative clause *who I was acquainted with* behind.

(2.10) He expected $[[\text{someone}]_{NP}$ who I was acquainted with] $_{NP}$ to show up.

Thus (2.11) is ungrammatical:

(2.11) *Who did he expect who I was acquainted with to show up?

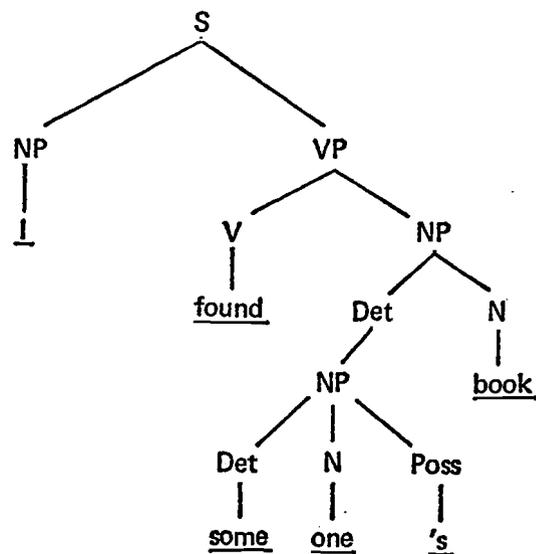
In (2.10), if the NP *someone* is to be questioned, the whole NP which dominates it, *someone who I was acquainted with*, must be moved forward with it, yielding (2.12), or, by later extraposition, (2.13)

(2.12) Who who I was acquainted with did he expect to show up?

(2.13) Who did he expect to show up who I was acquainted with?

It should be obvious how the A-over-A principle would exclude (2.11).

E. A NP which is exhaustively dominated by a Determiner cannot be questioned or relativized out of the NP which immediately dominates that Determiner. Thus, from (2.14) it is impossible to form (2.15):



(2.14)

(2.15) *Whose did you find book?

Only (2.16) is possible:

(2.16) Whose book did you find?

and the A-over-A principle correctly makes this assertion.

F. An NP which is a conjunct in a coordinate NP structure cannot be questioned or relativized. Thus, in (2.17), neither of the conjoined NP's may be questioned—(2.18) and (2.19) are both impossible.

(2.17) He will put the chair between_{NP}[_{NP}some table]_{NP} and [_{NP}some sofa]_{NP}.

(2.18) *What sofa will he put the chair between some table and?

(2.19) *What table will he put the chair between and some sofa?

Once again, the A-over-A principle will exclude these last two sentences.

4.1. The Complex NP Constraint

4.1.1. It is to Edward S. Klima that the essential insight underlying my formulation of this constraint is due. Noticing that the NP

that man could be questioned in (4.3b), but not in (4.3a) (cf. (4.4)), Klima proposed the constraint stated in (4.5):

(4.3) a. I read a statement which was about that man.

b. I read a statement about that man.

(4.4) a. *The man who I read a statement which was about is sick.

b. The man who I read a statement about is sick.

(4.5) Elements dominated by a sentence which is dominated by a noun phrase cannot be questioned or relativized.

If Klima's constraint is used in conjunction with the principle for S-deletion stated in (3.6),

(3.6) *S-pruning*: delete any embedded node S which does not branch (i.e. which does not immediately dominate at least two nodes).

it can explain the difference in grammaticality between (4.4a) and (4.4b), for it is only in (4.3a) that the NP *that man* is contained in a sentence which is itself contained in an NP: when (4.3a) is converted into (4.4b) by the Relative Clause Reduction Rule, the node S which dominates the clause *which was about that man* in (4.3a) is pruned by (3.6).

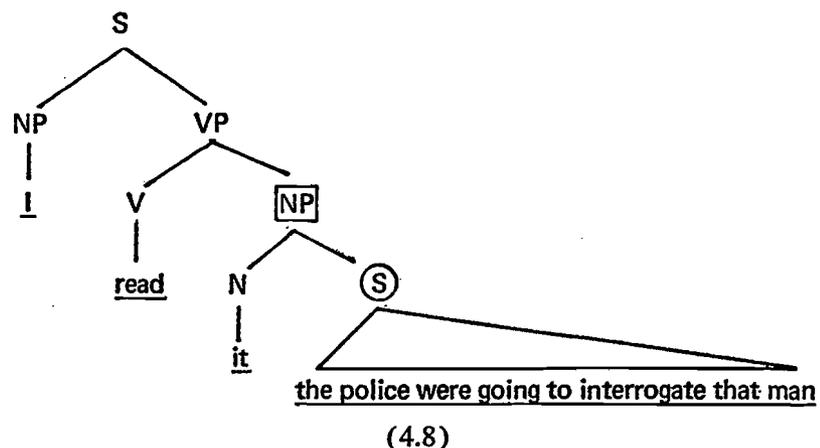
Although I do not believe it is possible to maintain (4.5), for reasons I will present immediately below, it will be seen that my final formulation of the Complex NP Constraint makes crucial use of the central idea in Klima's formulation: the idea that node deletion affects the potential of constituents to undergo reordering transformations. This hypothesis may seem obvious, at the present stage of development of the theory of grammar, but when Klima first suggested it, when the theory of tree-pruning was much less well-developed than it is at present, it was far from being obvious. In fact, this idea is really the cornerstone of my research on variables.

4.1.2. As I intimated above, however, I find that (4.5) must be rejected, in its present form. For consider the NP *that man* in (4.6): as (4.7) shows, it is relativizable,

(4.6) I read [_{NP}[_Sthat the police were going to interrogate that man]_S]_{NP}.

(4.7) the man who I read that the police were going to interrogate and yet the *that*-clause which contains it would seem to be a noun

phrase, as I have indicated in the bracketing of (4.6). Presumably, the approximate deep structure of (4.6) is that shown in (4.8),



and unless some way is found of pruning the circled node S or the boxed node NP in (4.8), condition (4.5) will prevent the relativization of *that man*. There is abundant evidence that the first alternative is not feasible:

- (4.9) a. I read that Bill had seen me.
 b. *I read that Bill had seen myself.
- (4.10) a. Evidence that he was drunk will be presented.
 b. Evidence will be presented that he was drunk.
- (4.11) a. That Bill_i was unpopular distressed him_i.
 b. That he_i was unpopular distressed Bill_i.

The Reflexivization Rule does not “go down into” sentences; thus the fact that (4.9a) is grammatical, while (4.9b) is not, is evidence that *that*-clauses are dominated by S at the time that reflexivization takes place. Similarly, the fact that *that*-clauses may be extraposed, as is the case in (4.10b), indicates that they are dominated by the node S at the time that this rule applies. Finally, the fact that backward pronominalization into *that*-clauses is possible (cf. (4.11a)) also argues that they must be dominated by the node S. So it seems implausible that the circled node S should be deleted by some principle which supplements (3.6), and there is no independent support for such an additional pruning principle in any case. Therefore, the only other way to save (4.5) is to claim that the boxed node NP must be

deleted in the process of converting (4.8) into the surface structure which underlies (4.6).

Can the node NP be deleted? In § 3.2 [not reprinted here], I discussed briefly Kuroda’s proposal to generalize the notion of tree-pruning in such a way that any non-branching node whose head had been deleted would be pruned. While it is *possible* to propose such a generalized version of (3.6), there is as yet no syntactic evidence which indicates that node deletion *must* prune out occurrences of NP or VP. The complex problems involving case-marking with respect to *amīcī* and *eius* on the one hand and *meus* on the other, which I discussed in § 3.1.3 [not reprinted here], might be solvable if use were made of some principle of NP deletion, but this has yet to be worked out in detail; and unless some other evidence can be found for NP pruning, invoking it to delete the boxed NP in (4.8) is merely *ad hoc*. For there are many pieces of evidence which show that *that*-clauses are dominated by NP at some point in their derivation.

- (4.12) a. That the defendant had been rude was stoutly denied by his lawyer.
 b. What I said was that she was lying.
 c. Bill told me something awful: that ice won’t sink.
 d. Muriel said nothing else than that she had been insulted.

That-clauses passivize (4.12a), they occur after the copula in pseudo-cleft sentences (4.12b), after the colon in equative sentences (4.12c), and after *than* in sentences like (4.12d): in all of these contexts, phrases can occur which are unquestionably noun phrases (e.g., *Little Willy*, *potatoes*, *flying planes*, etc.), and Lakoff and I argue that the syntactic environments defined by (4.12) can only be filled with noun phrases. If our arguments are correct, then *that*-clauses must be dominated by NP at some stage of their derivation. But it might be claimed that the late rule of *It* Deletion, which deletes the abstract pronoun *it* when it immediately precedes a sentence, could change phrase markers in such a way that the NP node which dominated *it S* would undergo pruning before Question and Relative Clause Formation had applied. Not enough is known about rule ordering at present for this possibility to be excluded, but it should be noted that even if it should prove to be possible to order *It* Deletion before all reordering transformations, thereby accounting

for the grammaticality of (4.7) by providing for the deletion of the boxed NP of (4.8), it would still be necessary to explain why there is no difference in grammaticality between (4.13a) and (4.13b),

- (4.13) a. This is a hat which I'm going to see to it that my wife buys.
b. This is a hat which I'm going to see that my wife buys.

After the verb *see* (*to*), the deletion of *it* is optional (in my dialect), and therefore, by the previous argument, while the *that*-clause in (4.13b) might not be dominated by NP, the *that*-clause in (4.13a) still would be. So unless some additional convention for NP pruning could be devised for this case too, (4.5) would not allow the generation of (4.13a). Again, I must reiterate that there is no known evidence for pruning NP under any other circumstances, so the *ad hoc* character of the explanation which is necessitated if (4.5) is adopted is readily apparent.

But there is an even more compelling reason to reject (4.5) than the ones above: as I pointed out in § 2.4.1 above, it is in general the case that elements of reduced relative clauses and elements of full relative clauses behave exactly the same with respect to reordering transformations. This can be seen from the following examples: NP's which are in the same position as *Maxime* in the sentences of (4.14) cannot be questioned (cf. the ungrammaticality of (4.15)),

- (4.14) a. Phineas knows a girl who is jealous of Maxime.
b. Phineas knows a girl who is behind Maxime.
c. Phineas knows a girl who is working with Maxime.
(4.15) a. *Who does Phineas know a girl who is jealous of?
b. *Who does Phineas know a girl who is behind?
c. *Who does Phineas know a girl who is working with?

nor is this possible even after the relative clauses of (4.14) have been reduced (this is evidenced by the ungrammaticality of (4.16)).

- (4.16) a. *Who does Phineas know a girl jealous of?
b. *Who does Phineas know a girl behind?
c. *Who does Phineas know a girl working with?

It was facts like these which motivated the condition stated in (2.26) above, which I repeat for convenience here.

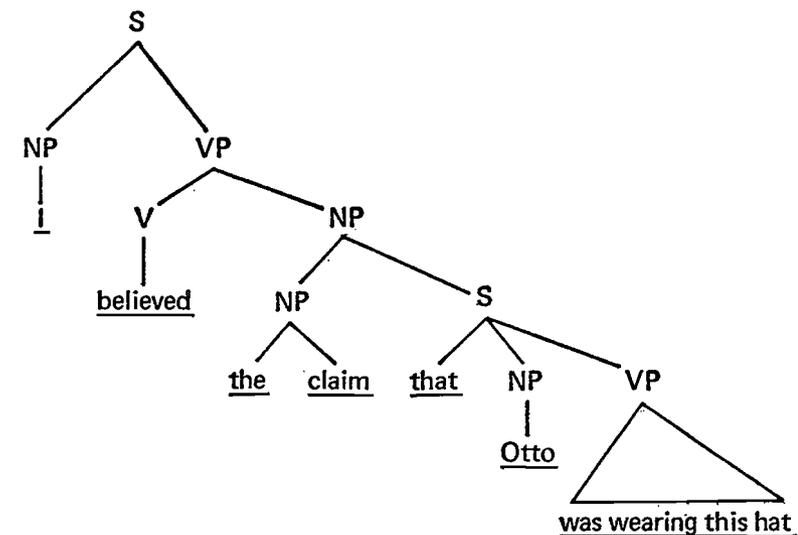
- (2.26) No element of a constituent of an NP which modifies the head noun may be questioned or relativized.

In light of the facts of (4.15) and (4.16), it would appear that it is the grammaticality of (4.4b) which is problematic, not the ungrammaticality of the sentences in (4.16). And there are parallel facts which have to do with Reflexivization, which I will present in § 4.1.6 below, which also support this interpretation. So condition (4.5), which takes the differences between the sentences in (4.4) to be typical, would seem to be a projection to an incorrect general conclusion from a case where special circumstances obtain. In the next section, I will give some evidence which allows the formulation of a broader-based generalization.

4.1.3. The sentences of (4.17), which only differ in that the NP object of *believe* has a lexical head noun in the first, but not in the second, differ as to relativizability, as the corresponding sentences of (4.18) show.

- (4.17) a. I believed the claim that Otto was wearing this hat.
b. I believed that Otto was wearing this hat.
(4.18) a. *The hat which I believed the claim that Otto was wearing is red.
b. The hat which I believed that Otto was wearing is red.

If the analysis proposed by Lakoff and me is correct, the d.c.s. of (4.17a) will be roughly that shown in (4.19):



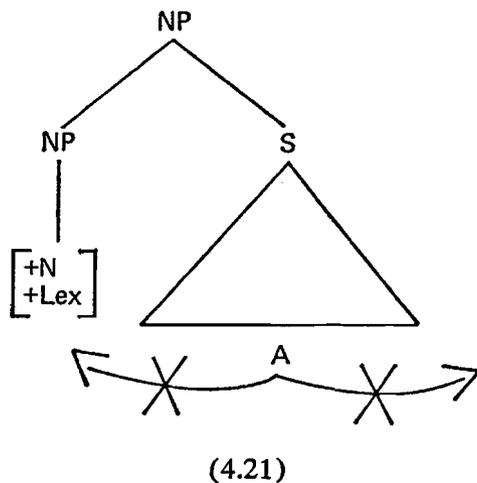
(4.19)

Whether or not we can show it to be correct that abstract nouns followed by sentential clauses in apposition to them have exactly the same $[NP-S]_{NP}$ structure that we argue relative clauses have, it is clear that these constructions are highly similar. Condition (4.20), the Complex NP Constraint, is formulated in an effort to exploit this similarity, to explain the ungrammaticality of sentences like (4.18a) and (4.15) on the same basis.

(4.20) *The Complex NP Constraint*

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

To put it diagrammatically, (4.20) prevents any constituent A from being reordered out of the S in constituents like the NP shown in (4.21),



as the X's on the two arrows pointing left or right from A designate. (Note that (4.20) does not prohibit elements from reordering within the dominated sentence, and in fact, there are many rules which effect such reorderings.)

4.2. *The Coordinate Structure Constraint*

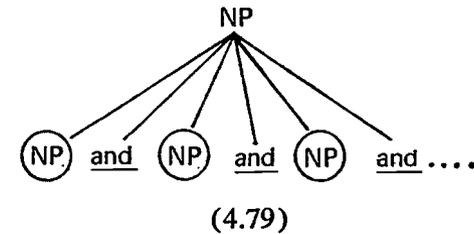
4.2.1. In § 2.2, in Case F, it was pointed out that conjoined NP's

cannot be questioned: this was attested to by the ungrammaticality of (2.18) and (2.19), which I repeat here for convenience.

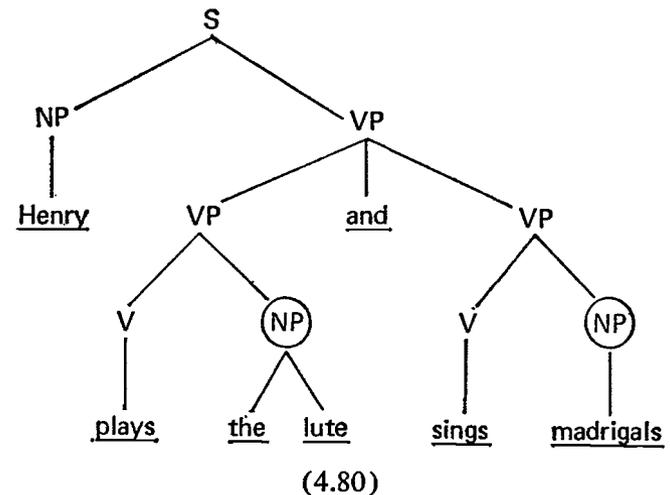
(2.18) *What sofa will he put the chair between some table and?

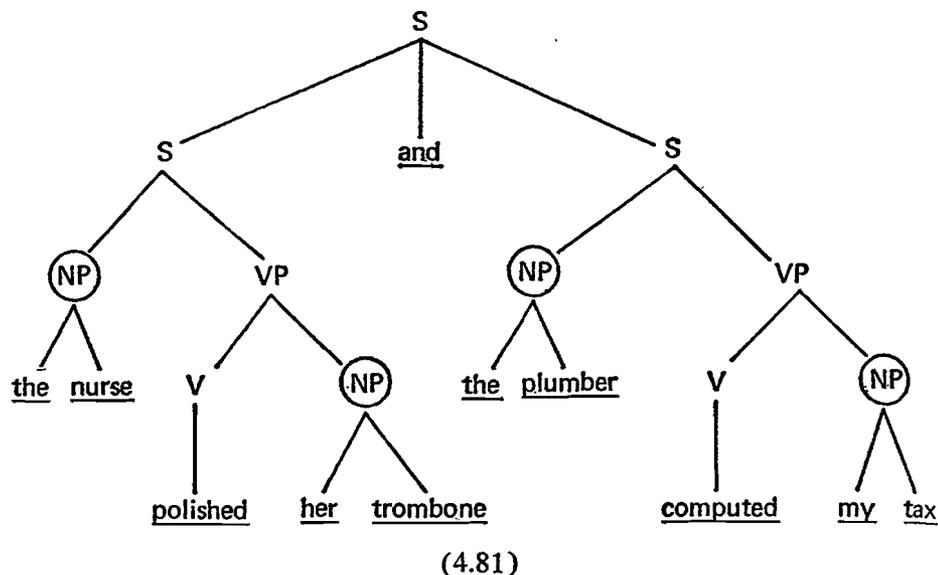
(2.19) *What table will he put the chair between and some sofa?

The impossibility of questioning the circled NP nodes in diagram (4.79) can be successfully accounted for by invoking the A-over-A principle,



but this principle does not prevent the circled NP nodes in diagrams (4.80) or (4.81) from being questioned or relativized.

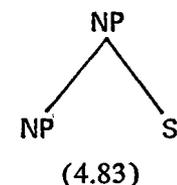




But all of the circled nodes must somehow be restricted from being moved, as the ungrammatical sentences of (4.82) show.

- (4.82) a. *The lute which Henry plays and sings madrigals is warped.
 b. *The madrigals which Henry plays the lute and sings sound lousy.
 c. *The nurse who polished her trombone and the plumber computed my tax was a blonde.
 d. *Which trombone did the nurse polish and the plumber computed my tax?
 e. *The plumber who the nurse polished her trombone and computed my tax was a hefty fellow.
 f. *Whose tax did the nurse polish her trombone and the plumber compute?

I know of no principled way of excluding such structures as those shown in (4.80) and (4.81) from being introduced as relative clauses, i.e., at the node S in (4.83),



so it appears to be necessary to add the following constraint to the meta-theory:

(4.84) *The Coordinate Structure Constraint*

In a coordinate structure, no conjunct may be moved, nor may any element contained in a conjunct be moved out of that conjunct.

4.3. *The Pied Piping Convention*

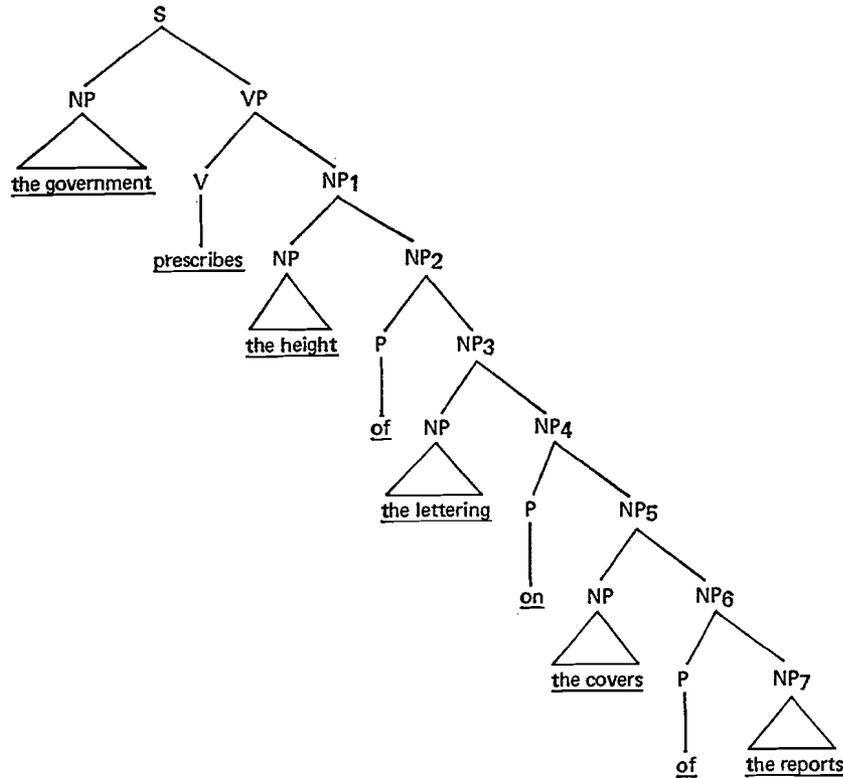
4.3.1. In this section, I will suggest a constraint which can successfully account for the evidence for the A-over-A principle which was presented in case D and case E of § 2.2, and a convention which will provide for the generation of all the relative clauses in the sentences of (4.163). These must all be derived from (4.162), the approximate structure of sentence (2.3), which I have repeated here, for convenience.

(2.3) The government prescribes the height of the lettering on the covers of the reports.

- (4.163) a. Reports which the government prescribes the height of the lettering on the covers of are invariably boring.
 b. Reports the covers of which the government prescribes the height of the lettering on almost always put me to sleep.
 c. Reports the lettering on the covers of which the government prescribes the height of are a shocking waste of public funds.
 d. Reports the height of the lettering on the covers of which the government prescribes should be abolished.

It can be seen that if the structure in (4.162) were embedded as a relative clause modifier in a noun phrase whose head noun is *report*, the rule of Relative Clause Formation, as it is stated in (4.135), would only produce the relative clause in (4.163a). If an attempt were made to modify the structural index of (4.135) in such a way

that the new rule would derive either (4.163a) or (4.163b) from (4.162), the revised rule would be that shown in (4.164):



(4.162)

(4.164)

$$W - \left[\text{NP NP} - \left[\text{S X} - \left\{ \begin{array}{l} \phi \text{ - NP} \\ \left[\text{NP NP P} - \text{NP} \right]_{\text{NP}} \end{array} \right\} - \text{Y} \right]_{\text{S}} \right]_{\text{NP}} - Z$$

								OBLIG
1	2	3	4	5	6	7	⇒	
1	2[45]#[3		0	0	6]	7		

Condition: 2 = 5

To derive the relative clause in (4.163c), the further complication of the rule shown in (4.165) would be necessary,

(4.165)

$$W - \left[\text{NP NP} - \left[\text{S X} - \left\{ \begin{array}{l} \phi \text{ - NP} \\ \left[\text{NP NP P} - \text{NP} \right] \\ \left[\text{NP NP P} \left[\text{NP NP P} - \text{NP} \right] \right] \end{array} \right\} - \text{Y} \right]_{\text{S}} \right]_{\text{NP}} - Z$$

								OBLIG
1	2	3	4	5	6	7	⇒	
1	2[4 5]#[3		0	0	6]	7		

Condition: 2 = 5

and deriving the clause in (4.163d) would entail adding a fourth line to the disjunction inside the braces in (4.165). But since there is no upper bound on the length of a branch consisting entirely of NPs, like NP₁-NP₇ in (4.162), in order to give a finite formulation of this rule, which must be able to generate clauses like those of (4.163) to any desired degree of complexity, either some abbreviatory notation, under which the sequences of terms within the paren-

theses of (4.164), (4.165), etc. can be collapsed, must be added to the theory of grammar, or some special convention must be. Of these two, the latter is weaker, for to add a new abbreviatory notation to the theory is to make the claim that there are other cases, unrelated to the case at hand, where rules must be collapsed according to the new notation. No such cases exist, to my knowledge, so I propose the convention given in (4.166) as a first approximation to an appropriate universal convention.

- (4.166) Any transformation which is stated in such a way as to effect the reordering of some specified node NP, where this node is preceded and followed by variables, can reorder this NP or any NP which dominates it.

By the term "specified" in (4.166), I mean that node NP, in a branch containing many NP nodes, which is singled out from all other nodes on this branch by virtue of some added condition on the rule in question (such as the condition on the rule of Relative Clause Formation that the NP to be relativized be identical to the NP which the clause modifies, or the condition on the rule of Question that the questioned NP dominate WH+some). This convention, then, provides that any reordering transformation which is stated as operating on some NP singled out in some such way may instead operate on any higher NP. Thus the formulation of Relative Clause Formation which was given in (4.135), when supplemented by (4.166), will allow for the adjoining to the front of the sentence of the specified NP_i, *the reports*, or NP_s, *of the reports*, or NP_o, *the covers of the reports*, etc., so that all of the clauses in (4.163) will be generated. That (4.166) is too strong, in that it does not exclude the ungrammatical sentences of (4.167) need not concern us here;

- (4.167) a. *Reports of which the government prescribes the height of the lettering on the covers are invariably boring.
 b. *Reports on the covers of which the government prescribes the height of the lettering almost always put me to sleep.
 c. *Reports of the lettering on the covers of which the government prescribes the height are shocking waste of public funds.

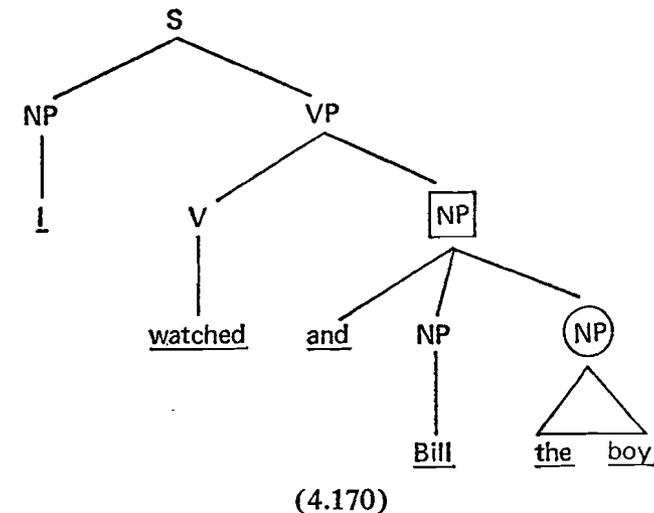
there seems to be a constraint, in my dialect at least, which prohibits noun phrases which start with prepositions from being relativized

and questioned when these directly follow the NP they modify. Thus (4.168) can be questioned to form (4.169a), but not (4.169b).

- (4.168) He has books by several Greek authors.
 (4.169) a. Which Greek authors does he have books by?
 b. ?*By which Greek authors does he have books?

I will not attempt a more precise formulation of this restriction here: instead, I will point out two further inadequacies in the formulation of (4.166).

Firstly, if the structure shown in (4.170) were to be embedded as a relative clause on an NP whose head noun were *the boy*,



the Coordinate Structure Constraint would not allow the formation of (4.171):

- (4.171) *The boy who I watched Bill and was vain.

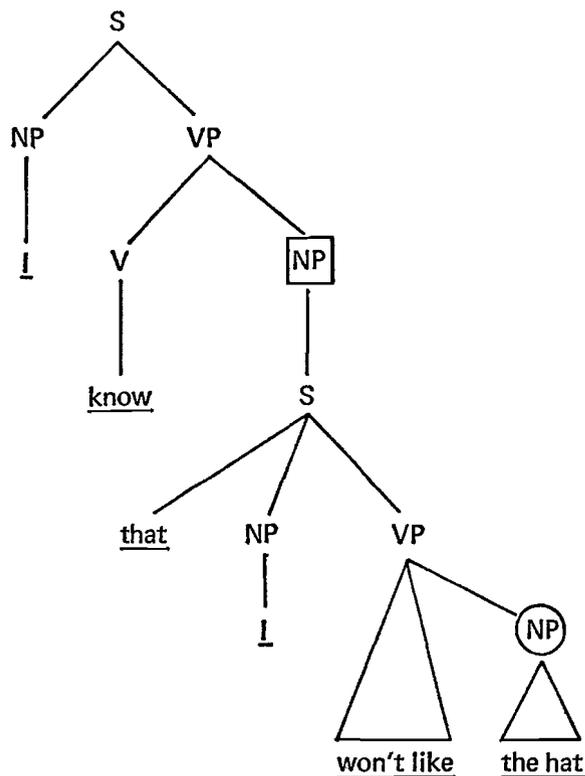
However, the circled node NP is dominated by the boxed node NP, and convention (4.166) would allow this higher node to be preposed, which would result in the ungrammatical (4.172).

- (4.172) *The boy Bill and who(m) I watched was vain.

The ungrammaticality of this sentence indicates the necessity of revising (4.166) in such a way that if an NP dominating the specified

NP is coordinate, neither it nor any higher NP can be moved. I will incorporate such a revision into the final version of the convention, which will be stated in (4.180).

The second inadequacy of (4.166) can be seen in connection with P-marker (4.173)



(4.173)

while it is true that the circled node NP can be relativized, as (4.174) shows,

(4.174) They will give me a hat which I know that I won't like.

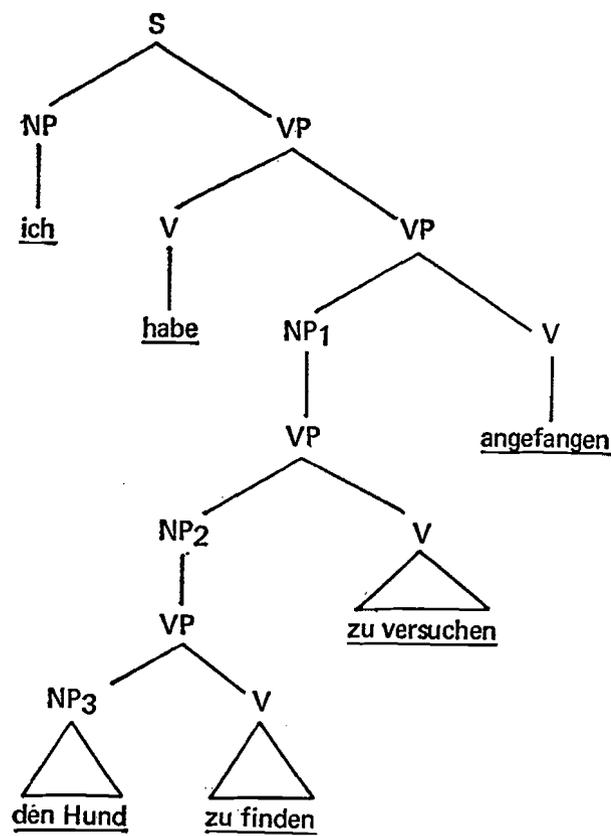
once again, (4.166) would allow the preposing of the boxed node NP, and the ungrammatical (4.175) would be produced.

(4.175) *They will give me a hat that I won't like which I know.

The modification of (4.166) that seems to be required here is that if a branch of a P-marker has an occurrence of the node S intervening between two occurrences of the node NP, only the lower one can be reordered. This restriction does not extend to the node VP, however, as can be seen from the following example.

The approximate structure of the German sentence in (4.176) is that shown in (4.177).

(4.176) Ich habe den Hund zu finden zu versuchen angefangen.
I have the dog to find to try begun
"I have begun to try to find the dog."



(4.177)

If the structure which underlies (4.177) has been embedded as a relative clause on the subject NP of the structure underlying (4.178),

- (4.178) Der Hund ist ein Bernardiner.
 "The dog is a St. Bernard."

the rule of Relative Clause Formation must produce all three of the clauses in the sentences of (4.179).

- (4.179) a. Der Hund, den ich zu finden zu versuchen angefangen habe, ist ein Bernardiner.
 b. Der Hund, den zu finden ich zu versuchen angefangen habe, ist ein Bernardiner.
 c. Der Hund, den zu finden zu versuchen ich angefangen habe, ist ein Bernardiner.
 "The dog which I have begun to try to find is a St. Bernard."

In (4.179a), only the specified node, NP₃ in (4.177), has been preposed, while in (4.179b), the phrase dominated by NP₂, which contains NP₃, has been preposed, and in (4.179c), the largest NP, NP₁, had been preposed. Note that these three NP nodes are separated by two VP nodes in (4.177), but that (4.166) still is operative. This then indicates that it is only the node S, as was claimed above, to which reference must be made in revising (4.166).

In (4.180), I have modified the convention given in (4.166) in such a way as to overcome the two inadequacies I have just discussed.

(4.180) *The Pied Piping Convention*¹

Any transformation which is stated in such a way as to effect the reordering of some specified node NP, where this node is preceded and followed by variables in the structural index of the rule, may apply to this NP or to any non-coordinate NP which dominates it, as long as there are no occurrences of any coordinate node, nor of the node S, on the branch connecting the higher node and the specified node.

¹ I am grateful to Robin Lakoff for suggesting this descriptive and picturesque terminology. Just as the children of Hamelin followed the Pied Piper out of town, so the constituents of larger noun phrases follow the specified noun phrase when it is reordered. This choice of terminology from the realm of fairy tales should not, however, be construed by an overly literal reader as a disclaimer on my part of the psychological reality of (4.180).

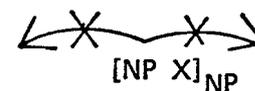
4.3.2.0. The convention stated in (4.180) stipulates that any NP above some specified one may be reordered, instead of the specified one, but there are environments where the lower NP may not be moved, and only some higher one can, consonant with the conditions imposed in (4.180). In other words, pied piping is obligatory in some contexts.²

4.3.2.1. For English, and for many other languages, the following constraint, which has the effect of making pied piping obligatory in the stated environment, obtains:

(4.181) *The Left Branch Condition*

No NP which is the leftmost constituent of a larger NP can be reordered out of this NP by a transformational rule.

In other words, (4.181) prohibits the NP shown in (4.182) from moving along the paths of either of the arrows.

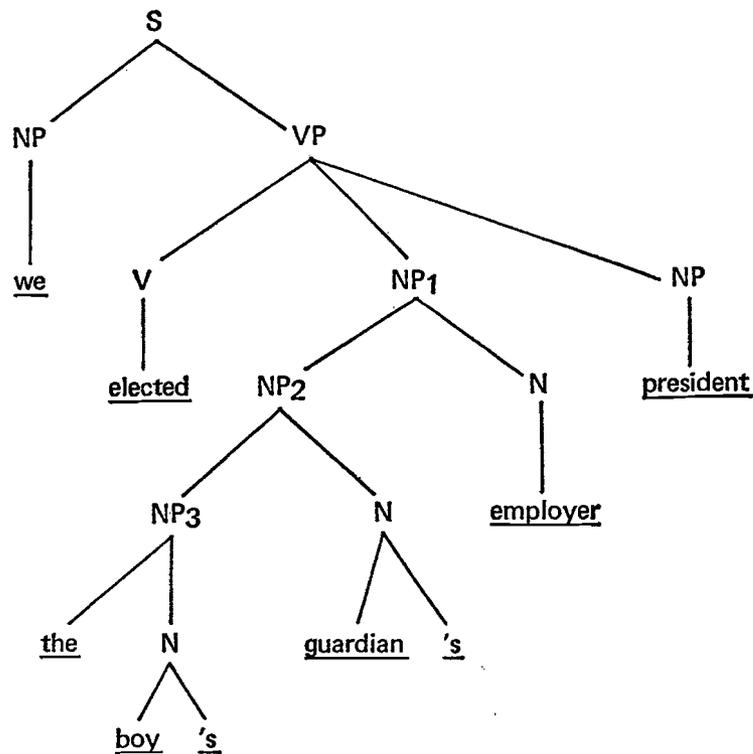


(4.182)

This constraint accounts for the following facts: if the structure shown in (4.183) is embedded as a relative clause modifier of a NP whose head noun is *boy*, only one output is possible—(4.184a)

² There are certain nomenclative *Feinschmeckers* who have taken issue with the formulation of this sentence, pointing out that following the original Pied Piper was obligatory for all the children of the town except one, who was lame, so that the phrase "obligatory pied piping" is a case of terminological coals to Newcastle. These critics suggest that since convention (4.180) describes optional accompaniment, such accompaniment should best be dubbed "fellow traveling," or the like, with the term "pied piping" being reserved for cases of mandatory accompaniment, such as those described below.

While the point they make is valid, I have chosen to disregard it, eschewing an exact parallel to the fairy tale in question in the interests of a less elaborate set of terms.



(4.183)

- (4.184) a. The boy whose guardian's employer we elected president ratted on us.
 b. *The boy whose guardian's we elected employer president ratted on us.
 c. *The boy whose we elected guardian's employer president ratted on us.

Sentence (4.184c) is excluded by (4.181), because the rule of Relative Clause Formation has moved the lowest NP, NP₃, from the left branch of NP₁. In (4.184b), it is NP₂ that has been moved from this branch. Since the Left Branch Condition prohibits both of these operations, only the largest NP which (4.180) allows to be moved, NP₁, can be moved to the front of the sentence, and when this happens, (4.184a) is the result.

Parallel facts can be adduced for non-restrictive relative clauses, which differ from restrictives in being preceded and followed by

heavy intonation breaks. They derive from coordinate sentences in deep structure, and they are formed by a different rule than (4.135). If commas are inserted into the sentences of (4.184), after *boy* and *investigated*, thus forcing a non-restrictive interpretation of the clauses, their grammaticality is unchanged.

Another rule which is affected by this condition is the rule of Topicalization, (4.185), which converts (4.186a) to (4.186b).

(4.185)

Topicalization

X - NP - Y

$$1 \quad 2 \quad 3 \xrightarrow{\text{OPT}}$$

2#[1 0 3]

- (4.186) a. I'm going to ask Bill to make the old geezer take up these points later.
 b. These points I'm going to ask Bill to make the old geezer take up later.

If rule (4.185) is applied to (4.183), once again it will be seen that only NP₁ can be topicalized, as in (4.187a). If either NP₂ or NP₃ is topicalized, as in (4.187b) and (4.187c), respectively, ungrammatical sentences result.

- (4.187) a. The boy's guardian's employer we elected president.
 b. *The boy's guardian's we elected employer president.
 c. *The boy's we elected guardian's employer president.

A rule that was stated in (3.26), Complex NP Shift, which performs almost the same operation as (4.185), except that it moves the NP in the opposite direction, is also subject to the Left Branch Condition. This rule may apply to (4.183) to move NP₁ over *president* (cf. (4.188a)), but neither NP₂ nor NP₃ can be so moved, as the ungrammaticality of (4.188b) and (4.188c) demonstrates.

- (4.188) a. We elected president the boy's guardian's employer.
 b. *We elected employer president the boy's guardian's.
 c. *We elected guardian's employer president the boy's.

Finally, the Question Rule is subject to the condition: if NP₃ in (4.183) is questioned, it cannot be moved to the front of the sen-

tence alone—pied piping must apply to carry NP₁ with it, as (4.189) shows.

- (4.189) a. Which boy's guardian's employer did we elect president?
 b. *Which boy's guardian's did we elect employer president?
 c. *Which boy's did we elect guardian's employer president?

One of the facts which supports the analysis of predicate adjectives which is implicit in diagram (3.25) above is the fact that when adverbs of degree which occur in pre-adjectival or pre-adverbial position are questioned, the questioned constituent, *how*, cannot be moved to the front of the sentence alone, as in (4.190a) and (4.191a), but only if the adjective or adverb is moved with it, as in (4.190b) and (4.191b).

- (4.190) a. *How is Peter sane?
 b. How sane is Peter?
 (4.191) a. *How have you picked up TNT carelessly?
 b. How carelessly have you picked up TNT?

These facts can be explained by (4.181), if *how* is analyzed as deriving from an underlying NP, and the adjective *sane* and the adverb *carelessly* are dominated by NP at the stage of derivations at which questions are formed. Note also that if the degree adverb *that* in (4.192) is questioned, pied piping must apply to move not only *tall*, but also *a man* to the front of the sentence.

- (4.192) Sheila married that tall a man.
 (4.193) a. How tall a man did Sheila marry?
 b. *How tall did Sheila marry a man?
 c. *How did Sheila marry tall a man?

In passing, it should be noted that Case D and Case E of § 2.2, which provide evidence for the A-over-A principle, are special cases of the Left Branch Condition, which will block the derivation of the ungrammatical (2.11) and (2.15).

4.4. The Sentential Subject Constraint

4.4.1. Compare (4.250a) with its two passives, (4.250b) and (4.250c).

- (4.250) a. The reporters expected that the principal would fire some teacher.

- b. That the principal would fire some teacher was expected by the reporters.
 c. It was expected by the reporters that the principal would fire some teacher.

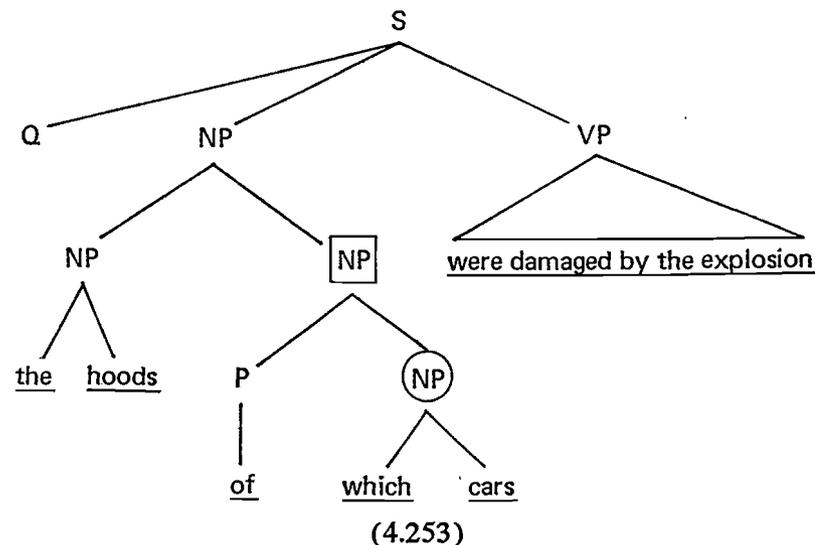
Noun phrases in the *that*-clauses of (4.250a) and (4.250c) can be relativized, but not those in the *that*-clause of (4.250b), as (4.251) shows.

- (4.251) a. The teacher who the reporters expected that the principal would fire is a crusty old battle-ax.
 b. *The teacher who that the principal would fire was expected by the reporters is a crusty old battle-ax.
 c. The teacher who it was expected by the reporters that the principal would fire is a crusty old battle-ax.

How can (4.251b) be blocked? A first approximation would be a restriction that prevented constituents of subject noun phrases from reordering, while allowing constituents of object noun phrases to do so. But such a restriction would be too strong, as can be seen from the grammaticality of (4.252).

- (4.252) Of which cars were the hoods damaged by the explosion?

The approximate structure of (4.252), at the time when the Question Rule applies, is that shown in (4.253).



It can be seen that in converting (4.253) to the structure which underlies (4.252), the boxed NP, a subconstituent of the subject of (4.253), has been moved to the front of the sentence, so the suggested restriction is too strong. But there is an obvious difference between (4.252) and the ungrammatical (4.251b): the subject of the latter sentence is a clause, while the subject of the former is only a phrase. The condition stated in (4.254) takes this difference into account.

(4.254) *The Sentential Subject Constraint*

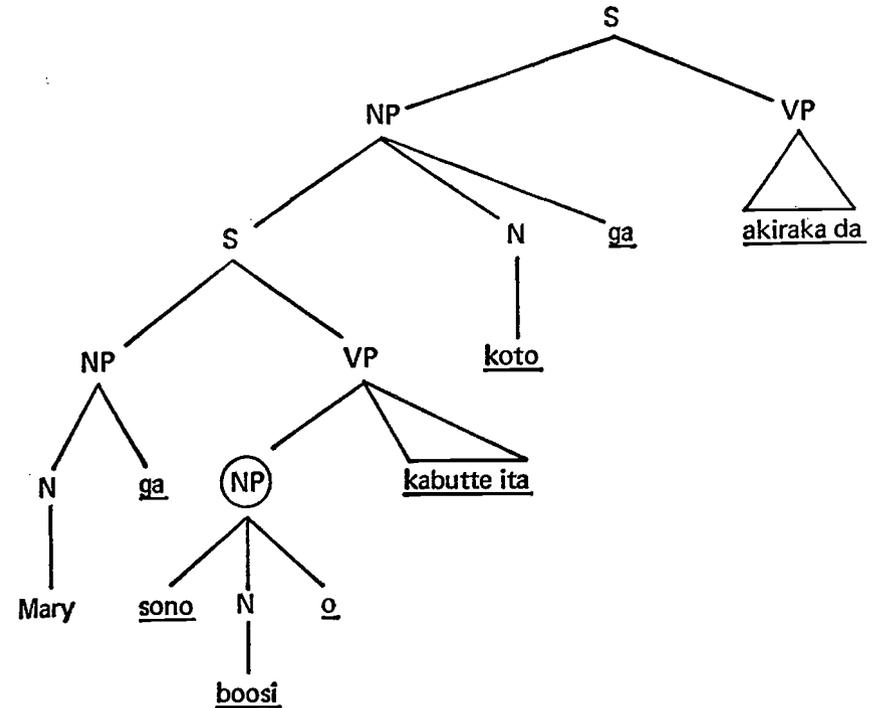
No element dominated by an S may be moved out of that S if that node S is dominated by an NP which itself is immediately dominated by S.

This constraint, though operative in the grammars of many languages other than English, cannot be stated as a universal, because there are languages whose rules are not subject to it. In Japanese, for instance, although the circled NP in (4.256), which is the approximate structure of (4.255), falls within the scope of (4.254), it can be relativized, as the grammaticality of (4.257) shows.

- (4.255) Mary ga sono boosi o kabutte ita koto
 Mary that hat wearing was thing
 ga akiraka da.
 obvious is
 "That Mary was wearing that hat is obvious."

- (4.257) Kore wa Mary ga kabutte ita koto ga
 this Mary wearing was thing
 akiraka na boosi da.
 obvious is hat is.
 "This is the hat which it is obvious that
 Mary was wearing."

That the languages whose rules I know to be subject to (4.254) far outnumber those whose rules are not so constrained suggests that a search be made for other formal properties of these latter languages which could be made use of to predict their atypical behavior with respect to this constraint. At present, however, whether or not (4.254) is operative within any particular language can only be treated as an idiosyncratic fact which must be stated in the conditions box of the language in question.

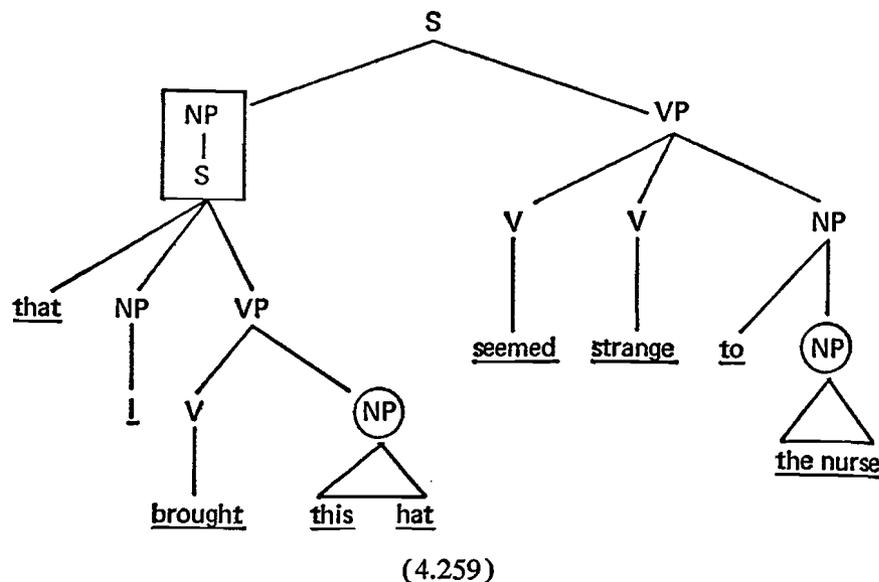


(4.256)

4.4.2. George Lakoff has pointed out to me that on the basis of only the facts considered so far, it would be unnecessary to state the Sentential Subject Constraint, for it is a special case of (3.27), the output condition which makes sentences containing internal $[_{NP}S]$ unacceptable. Thus, since (4.251b) contains the internal clause *that the principal would fire*, and since this clause is dominated exhaustively by NP, condition (3.27) would account for its unacceptability. But the two arguments below seem to me only to be accountable for if condition (4.254) is assumed to be operative in the grammar of English.

Firstly, consider sentence (4.258), and its associated constituent structure (4.259).

- (4.258) That I brought this hat seemed strange to the nurse.



Relativizing either of the circled NP's in (4.259) will produce sentences which are not fully acceptable (cf. (4.260)),

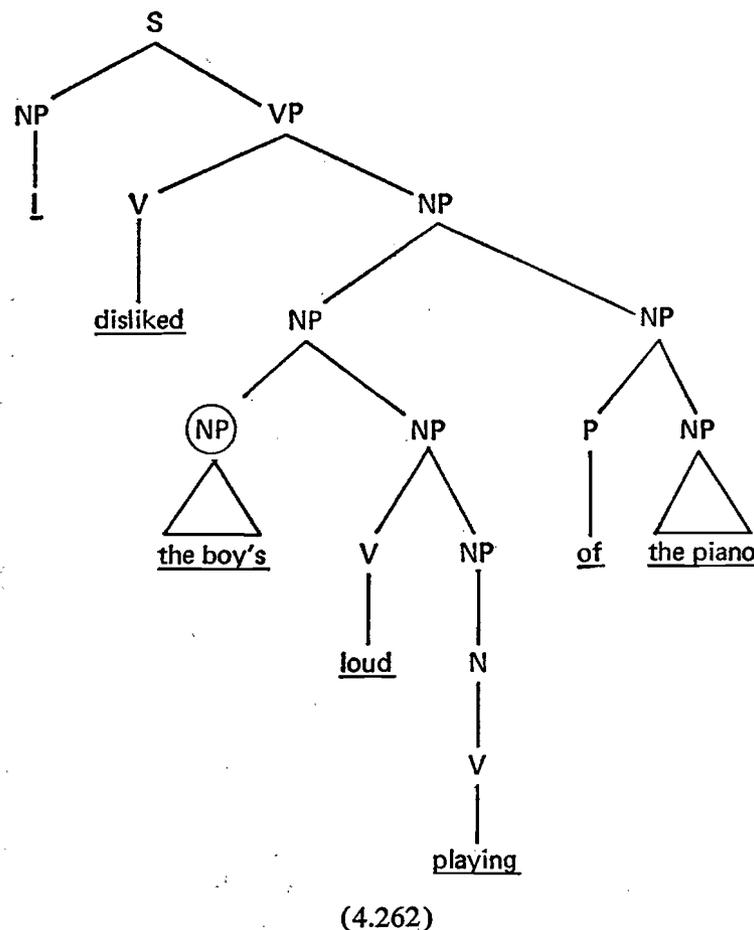
- (4.260) a. *The hat which that I brought seemed strange to the nurse was a fedora.
 b. ?The nurse who that I brought this hat seemed strange to was as dumb as a post.

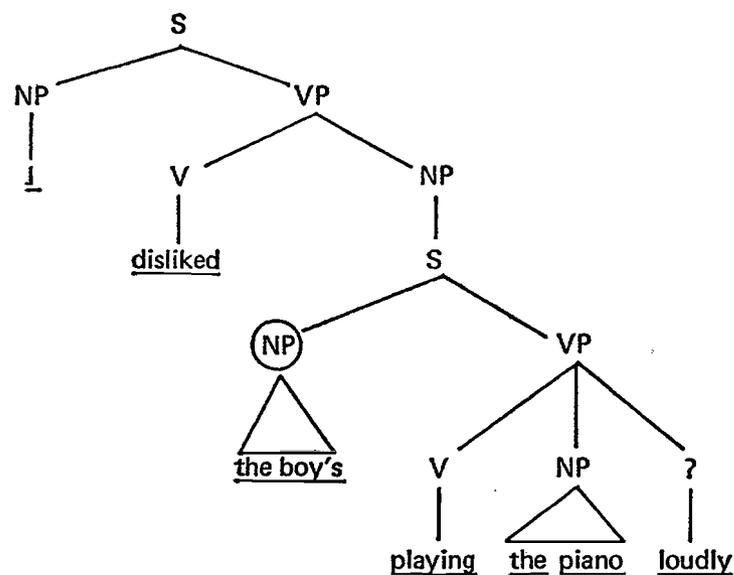
because both relative clauses in (4.260) will contain the boxed NP over S of (4.259) as an internal constituent. Condition (3.27) will be adequate to characterizing both as being unacceptable, but it will not be able to account for the clear difference in status between (4.260a) and (4.260b). The latter sentence is admittedly awkward, but it can be read in such a way as to be comprehensible. The former sentence, however, seems to me to be beyond intonational help. I conclude that (4.260b) should be labeled grammatical but unacceptable, but that (4.260a) must be deemed ungrammatical. To do this, (4.254), or some more general constraint, must be assumed to be operative in English, as well as (3.27).

The second argument for (4.254) concerns the following two sentences:

- (4.261) a. I disliked the boy's loud playing of the piano.
 b. I disliked the boy's playing the piano loudly.

Lees gives a number of arguments which show these to be different. I will assume that the derived structure of (4.261a) is that shown in (4.262), and that of (4.261b) is that shown in (4.263).





(4.263)

I have assumed that the word *playing* in (4.262) has the derived status of a noun, to account for the appearance of the preposition *of* before the object of *playing*, parallel to the *of* which occurs after such substantivized verbs as *construction*, *refusal*, *fulfillment*, etc. (cf. *his construction of an escape hatch*, *our refusal of help*, *her fulfillment of her contract*).

That the latter structure has a clausal object, while the former does not, can be seen from the difference in relativizability of the circled NP's in (4.262) and (4.263). This NP can be relativized in the former structure (cf. (4.264a)), but not in the latter (cf. the ungrammaticality of (4.264b)).

- (4.264) a. The boy whose loud playing of the piano I disliked was a student.
 b. *The boy whose playing the piano loudly I disliked was a student.

Although the circled NP of (4.262) is on a left branch of an NP when the Relative Clause Formation Rule applies, pied piping can be invoked to effect the adjunction of the boxed NP to the node S

which dominates the clause, so a well-formed relative clause will result.

But in (4.263), if the circled NP is moved, the boxed NP cannot pied pipe, because there is a node S which intervenes between the two NP nodes, and under these conditions, pied piping cannot take place, as was pointed out in § 4.3.1 above.

Note that the object NP of *playing, the piano*, is relativizable in both (4.262) and (4.263).

- (4.265) a. ?The piano which I disliked the boy's loud playing of was badly out of tune.
 b. The piano which I disliked the boy's playing loudly was badly out of tune.

But if the action nominal or the factive gerund nominal appears in subject position, as in (4.266), the NP *the piano* can only be relativized out of the action nominal as (4.267) shows.

- (4.266) a. The boy's loud playing of the piano drove everyone crazy.
 b. The boy's playing the piano loudly drove everyone crazy.

- (4.267) a. That piano, { ?which the boy's loud playing of }
 { the boy's loud playing of which }
 drove everyone crazy, was badly out of tune.
 b. *That piano, { which the boy's playing loudly }
 { the boy's playing which loudly }
 drove everyone crazy, was badly out of tune.

How can (4.267b) be excluded? The bottom line of (4.267b) can be blocked on the same grounds as (4.264b): since the subject NP of (4.266b) dominates the node S, pied piping cannot take place. But unless (4.454), the Sentential Subject Constraint, is added to the grammar, the top line of (4.267b) will not be excluded. Note that even condition (3.27) cannot be invoked here, because this condition must be reformulated as shown in (4.268).

- (4.268) Grammatical sentences containing an internal NP which exhaustively dominates an S are unacceptable, unless the main verb of that S is a gerund.

This reformulation is necessary in any case, in order to account for the difference in acceptability between (4.269a)–(4.269c) and (4.269d).

- (4.269) a. *Did that he played the piano surprise you?
 b. *Would for him to have played the piano have surprised you?
 c. *Is whether he played the piano known?
 d. Did his having played the piano surprise you?

Thus it appears that there are two reasons for insisting that both (4.268), the revised version of (3.27), and the Sentential Subject Constraint be included in the grammar of English. In the first place, condition (4.268) is not adequate to distinguish between (4.260a) and (4.260b), and in the second, between (4.267a) and (4.267b). These two facts indicate the necessity of adding to the conditions box of English something at least as strong as (4.254).

4.5. To summarize briefly, in this chapter I have proposed two universal constraints, the Complex NP Constraint and the Coordinate Structure Constraint; also, a universal convention of pied piping; and a variety of language particular constraints, which are to be stated in particular grammars in a conditions box, which the theory of language must be revised to provide. I make no claim to exhaustiveness, and I am sure that the few conditions I have discussed are not only wrong in detail, but in many major ways. Not only must further work be done to find other conditions, but to find broader generalities, so that the structure of whatever interlocking system of conditions eventually proves to be right can be used with maximum effectiveness as a tool for discovering the structure of the brain, where these conditions must somehow be represented.

Review of *Language and Mind**

GILBERT HARMAN

Language and mind. By NOAM CHOMSKY. Enlarged edition. New York: Harcourt Brace Jovanovich, 1972. Pp. xii, 194.

This publication is twice the size of the original edition (Chomsky 1968), which is reprinted with three additional essays and a new preface. One of the new essays is a short, previously unpublished, lecture of 1969, 'Form and meaning in natural language', which is largely concerned with the relevance of surface structure to semantic interpretation. The other two essays have appeared before, 'The formal nature of language' as an appendix to Lenneberg 1967, and 'Linguistics and philosophy' in Hook 1969. There are therefore six chapters, the three essays making up the original *Language and mind* followed by the others in the order mentioned.

I have divided this review into three sections. The first is concerned with an historical question, whether the 'Cartesian revolution' is relevant to the history of linguistics in the way in which Chomsky supposes. Taking note of recent work that challenges C's argument, in particular Lakoff 1969 and Aarsleff 1970, 1971, I suggest that the main lines of C's argument survive these challenges. In § 2 I discuss the form of grammar that C envisions; I sketch an argument against the cyclic application of transformations, and raise a question about semantic interpretation rules. In § 3 I take up C's main thesis, that linguistics should be regarded as part of psychology. I endorse his suggestion that the full grammatical analysis of a sentence can be treated as a description of a hearer's percept; I also discuss the rationale behind his idea that principles of universal grammar constitute part of an innate schematism that plays a role in language learning. Here I attempt to make up for the unsympathetic and uncomprehending analysis in Harman 1967.

1. C begins by recalling the 'illusions of the early postwar years', when it was widely supposed that the basic problems of psychology and linguistics had been solved and that an understanding of all remaining issues could now be achieved with the aid of computers,

* Reprinted by permission of the Linguistic Society of America from *Language* 49 (1973): 453–64.