positive tag is added. Since the verb is abstract, negative-transportation cannot take place again; if it were a real verb, it might. Therefore, the order tag-question formation, then negative-transportation, avoids the ordering paradox.

Thus, we have given evidence for the existence of three things: a rule of negative-transportation, the presence of an abstract performative verb, and the syntactic cycle.

IX

NEGATIVE'S TRAVELS*

PIETER A. M. SEUREN

I

In this paper I shall argue not only that Negative Raising (NR) is a rule of English syntax, but also that it applies in a number of unexpected cases. The applicability of NR in these cases lends support to the view that operators are verbs in deep structure, and to the theory of semantic syntax in general. Chomsky's claim (1972a, p. 134) that in the semantic representation of sentences, 'such matters as scope of "logical elements" and quantifiers . . . are determined by rules that take surface structure . . . into account', is shown to be false: surface structure reflects not so much the scope of operators as the order in which they have been lowered into the S which forms their scope. It follows, furthermore, that G. Lakoff's constraint on the lowering of quantifiers (1971, section II, paper VII in this volume), must be modified in such a way that it is sensitive to the order in which quantifiers (and other operators) are lowered, and not to their semantic scope. This conclusion places the rules of Quantifier Lowering firmly into syntax.

II

The idea that NR is a rule of syntax was inspired, in the early days of Transformational Grammar, by the semantic similarity of sentences such as:

(1a) I didn't think I had to leave early.
(1b) I thought I didn't have to leave early.

Pairs of sentences such as these have been declared synonymous in the past. This, it seems, is too strong a claim. Yet whatever difference there is between the two sentences of (1) is incomparably less significant than what makes the following two differ:

(2a) I didn't know I had to leave early.
(2b) I knew I didn't have to leave early.

* I am indebted to R. P. G. de Rijk for valuable comments on various details of this paper.

Clearly, the latter two have very different truth conditions, which is sufficient to declare them emphatically non-synonymous. The difference between (1a) and (1b) is a great deal more subtle. Their truth conditions appear to be identical, but their conditions of appropriateness in context are different. (In fact, (1a) is ambiguous between a reading it more or less shares with (1b) and 'it is not the case that I thought I had to leave early'. The latter reading is left out of account here. We shall only consider the former in which, as we shall argue, the negation has been raised out of the embedded S.)

The semantic similarity, however, of pairs such as (1) cannot be an argument for NR. Not only are they not strictly synonymous, but, more importantly, a semantic observation is not *per se* germane to a syntactic argument. More relevant is the observation that some so-called 'negative polarity items' can occur in the object-S of a sentence beginning with, e.g. 'I don't believe that . . .', but not in the object-S of a sentence beginning with, e.g. 'I don't claim that . . .'

Negative polarity items require negation for the sentence to be grammatical: (unstressed) *any*, *ever*, *all that*, *at all*, *need/dare* followed by infinitive, *yet* (as a temporal adverb), *in weeks*, and so on.[1] Their grammar is not very well understood, but it is known that some of these also occur in questions, *if*-clauses, relative clauses with an antecedent in the superlative, the *than*-phrase of a comparative, and a few other contexts. (Accordingly, one might hypothesize that all these contexts have an underlying negative somewhere in their structure.) Some, but not all, negative polarity items occur in a non-negative object-S of negated verbs of the class *know*, *realize*, *claim*, etc., for which it makes a great semantic difference whether the negation is attached to the higher verb or to the complement-S—as in (2). Thus, we have (at least for most speakers):

(3a) I didn't realize that your brother had *ever* composed music.
(3b) I don't claim that I am *all that* bright.

Other items, however, cannot occur in such a context. Most speakers reject:

(4a) *I didn't realize, yesterday, that he had arrived yet.
(4b) *I don't claim that I need live in a palace.
(4c) *I don't claim that John has been around in weeks.

Let us speak of these as the *narrow class* of negative polarity items.

One reason for assuming that NR is a rule of syntax is the fact that *all*

[1] See Baker (1970b), Borkin (1971), and Seuren (1973a, pp. 533–4).

negative polarity items occur freely in contexts such as 'I don't believe that . . .':

(5a) I don't believe he has arrived yet.
(5b) I don't think I need live in a palace.
(5c) I don't think I've seen John in weeks.

We can now say that, in deep structure, the narrow class of negative polarity items requires the negation *in the same S*. Certain verbs, such as *think*, *believe*, *suppose*, *seem*, have the property that they raise the negative element out of their complement-S, leaving the negative polarity item behind.[2] It is thus impossible to have an item of the narrow class in a non-negative complement-S of a negative verb which is not a negative raiser: the sentences of (4) must be ungrammatical.

There is, moreover, the observation made in Seuren (1972a, paper IV in this volume), that NR is blocked by the Complex-NP-Constraint as well as by the Coordinate-Structure-Constraint, both formulated in Ross (1967):

(6a) *I don't believe the rumour that Tom has found the solution yet.
(6b) *I don't think Tom has found the solution yet and is a reliable chap.

This, together with Robin Lakoff's argument[3] in her paper, 'A Syntactic Argument for Negative Transportation' (1969, paper VIII in this volume), makes it difficult to deny that Negative Raising is a rule of syntax. To deny this becomes well-nigh impossible when one observes the grammaticality of:

(7) I don't believe that either Harry or Fred were late.

as opposed to the ungrammaticality of (8a) but not of (8b):

(8a) *Either Harry or Fred were late.
(8b) Neither Harry nor Fred were late.

Leaving the details of this interesting case till section VII, below, we can see at this stage that (7), with the plural *were* in the complement-S, is naturally explained when it is assumed that it is derived from a structure underlying:

(9) I believe that neither Harry nor Fred were late.

[2] This negative element is not always just *not*. It can be, e.g. *hardly*, as in: *I hardly believe that is fair*, or *be unable*, as in *I can't seem to find it*, which means 'I seem to be unable to find it'.

[3] Observations made by Cattell (1973) cast considerable doubt on this argument, which depends crucially on the opposite polarity and the cyclicity of 'Tag-Formation'. Cattell's central observation is: *I'm not sure he'll win, will he?*, where the positive tag cannot derive from a negative, *he will not win*, since *be sure* is not an NR-verb.

One particularly instructive member of the narrow class of negative polarity items in English is the so-called punctual *until*, discussed by Robin Lakoff (1969, paper VIII in this volume). In English, an *until*-phrase can occur with a verb indicating a point-event, an extensionless transition from one state to another, such as *arrive*, *stop*, *finish*, only if there is also a negation:[4]

(10a) Fred won't arrive until midnight.
(10b) *Fred will arrive until midnight.

Otherwise, *until* requires a durative verb, such as *sleep*:

(11) I slept until midnight.

Punctual *until* belongs to the narrow class:

(12a) *I didn't realize Fred would get here until midnight.
(12b) I didn't think Fred would get here until midnight.

Notice also the ungrammaticality of:

(13) *I didn't think yet that Fred would get here until midnight.

where *yet* requires a negation originating in the higher clause, and *until midnight* requires the same in the lower clause. The question of punctual *until* will be taken up again in section IV.

III

Although both (1a) and (1b) are good grammatical sentences of English, it seems that NR is an obligatory rule. The two sentences do not have the same origin, and it is only the structure underlying (1a) which is subject to NR.

There is a striking difference between sentences which have undergone NR and those which have not. The former do not allow for the normal form of contrastive stress, whereas the latter do. Comparing the two sentences:

(14a) I don't believe Tom has yet seen the problem.
(14b) I believe Tom has not yet seen the problem.

[4] In fact, the matter is more complex. It is not merely a question of subcategorization of verbs into punctual and non-punctual, but rather of quantification of events. Thus we have, e.g. *He will win the match until he is 40*, where *the match* is interpreted as a match-type whose tokens take place at certain intervals. It would be more appropriate to speak of propositions quantifiable under 'there is/was a single event such that . . .' But these details are not relevant here.

where (14a) has undergone NR (as appears from *yet* in the lower S), we notice that the following are ungrammatical:

(15a) **I* don't believe Tom has yet seen the problem, *Fred* does.
(15b) *I don't *believe* Tom has yet seen the problem, I *know* it.
(15c) *I don't believe *Tom* has yet seen the problem, I believe *Fred* has.
(15d) *I don't believe Tom has yet seen the *problem*, I believe he has seen the *data*.

Yet, analogous sentences based on (14b) are flawless:

(16a) *I* believe Tom has not yet seen the problem, not *Fred*.
(16b) I *believe* Tom has not yet seen the problem, I can't say I *know* it.
(16c) I believe *Tom* has not yet seen the problem, not that *Fred* hasn't yet seen it.
(16d) I believe Tom has not yet seen the *problem*, not that he hasn't yet seen the *data*.

Normally, contrastive stress is 'polar' in the sense that positive and negative sentences are opposed to each other, as in (16). Yet (14a) behaves as though it were a positive sentence, and even so there are restrictions. Thus we might marginally pass (17a), (17c) and (17d), but (17b) is still ungrammatical:

(17a) ?*I* don't believe Tom has yet seen the problem, not *Fred*.
(17b) *I don't *believe* Tom has yet seen the problem, I can't say I *know* it.
(17c) ?I don't believe *Tom* has yet seen the problem, not that *Fred* hasn't yet seen it.
(17d) ?I don't believe Tom has yet seen the *problem*, not that he hasn't yet seen the *data*.

We may begin to see an explanation of these facts when we assume that sentences with some form of contrastive stress have a different underlying structure from those without such stress. For example, for:

(18) *Tom* wrote the letter (not *Fred*).

we can assume an underlying structure corresponding to:

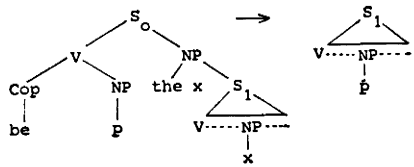
(19) The x (x wrote the letter) be Tom.

There are now two possibilities. Either the relative clause is extraposed, and the variable is replaced by *it*:

(20) It is Tom who wrote the letter.

or a rule is applied which we shall call *Predicate Lowering* (PL). This rule applies to structures such as (19) and substitutes the predicate nominal (*Tom*), which must be an NP, for the variable in the relative clause, whereby all higher structure is erased.[5] Assuming that the predicate nominal already bears, at this stage, nuclear sentence stress, this stress is carried over to the new position, so that (18) results. The rule can be formulated as in (21).[6]

(21) PL:



In the same way we analyse:

(22) *Tom* did not write the letter, (*Fred* did).

where *not* is the highest predicate:

(23) Not (the x (x wrote the letter) be Tom).

This analysis allows for more than one contrastive stress on NP's within the same sentence, as in:

(24) *Tom* wrote the *letter* (not *Fred the postcard*).

This is analysed as:

(25) The x (the y (x wrote y) be the letter) be Tom.

Cyclic application of PL yields (24).[7]

We now begin to see why the sentences of (15) are not well-formed. The *not* in the main clause cannot be, semantically, the highest predicate since *yet* forces us to interpret it as originating in the lower clause. What is re-

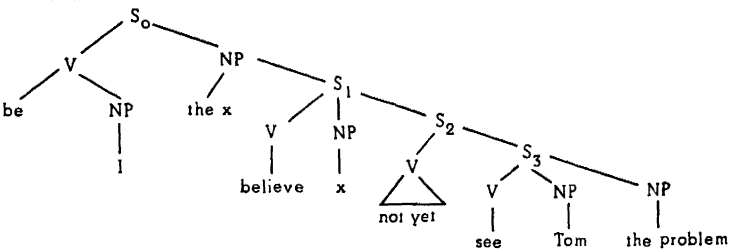
[5] PL is also discussed in my paper (1973a), pp. 544–6, where it is called 'Relative Raising'.

[6] There is a difficulty with PL, in that contrastive stress can be placed on other elements than NP's, even on parts of words. This complication does not invalidate the rule since it is, in principle, possible to regard contrasted elements as quoted bits of structure, which are always NP's. The precise description, however, of the processes whereby metalanguage and object-language merge in surface structure, poses problems which cannot possibly be gone into here.

[7] PL proves to be of value in other areas of the grammar too. See Seuren (1973a, p. 557). Thus it helps to explain certain semantic and phonological features of *wh*-questions. From 'the x (John sold x) be *what*?' we get 'John sold *what*?' by PL, and 'What did John sell?' by *wh*-Preposing.

quired, therefore, is not a positive contrast, as in (15), but a negative contrast, as in (17). (17a), for example, can be considered to have as its origin something like (26).

(26)



Negative Raising takes place on the S_1-cycle; Predicate Lowering on the S_0-cycle (into S_1). The result is (17a). The fact that we are less happy with (17a) than with (16a) might well find its origin in the tendency of NR to be restricted to the highest S: as we shall see in section IV, NR is often blocked when there is higher structure.

(17b) must be ungrammatical. It either derives from (with due simplification: see note 6) (27a) or (27b):

(27a) The x (I don't do x Tom has yet seen the problem) be *believe.*
(27b) The x (I do x Tom has not yet seen the problem) be *believe.*

(27a) cannot be well-formed with *yet* separated from its negation although the verb which governs the application of NR, *believe*, is not in the right position to do so. (27b) is well-formed, but the negation cannot be raised out of the complement-S to yield (17b). It can only yield (16b).

Let us now analyse (14b) as:

(28) The x (I believe that x) be *Tom has not yet seen the problem.*

By PL (14b) is generated. Notice that (14b), under unmarked intonation receives nuclear stress on its complement-S, and not on *believe*, whereas (14a) sounds natural with nuclear stress on *don't believe.* A different treatment for (28), whereby the antecedent variable *x* is incorporated into the relative clause, will lead to the 'pseudo-cleft':

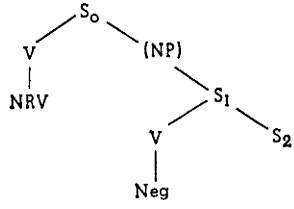
(29) What I believe is that Tom has not yet seen the problem.

It is clear that (28) cannot yield (14a), through NR, since NR should take place on the cycle whose verb is *believe.* But at that stage *believe* has no complement-S: there is nothing but the variable *x* in its complement. The

negation does not come into its complement until the S_0-cycle, when PL applies.

This analysis implies that (1b), or (14b), carries the presupposition that I did, or do, have certain thoughts or beliefs about what is said in the complement-S, a presupposition which is absent in (1a) or (14a). It furthermore allows us to stipulate that NR is an obligatory rule, which applies (barring certain cases: see section IV) to the structure in (30).

(30)

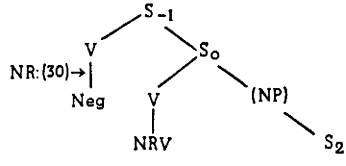


The verb of S_0 is a negative-raising verb (NRV).

IV

Let us now formulate NR in the way shown in (31).

(31)



That is, on the S_1-cycle the negation is not lowered into S_2 when it has a NR-verb immediately above it, as in (30), in such a position that NR applies. On the S_0-cycle, the branch 'V—Neg' is detached and Chomsky-adjoined to the left of S_0, thus yielding the output-structure of (31). (The S_1-node is pruned.) It seems sensible to allow for an optional NP between S_0 and S_1, mainly because it is not quite clear, at the present stage of our knowledge, whether or not the complement-S of NR-verbs is dominated by 'NP'. Unless the negation is raised further, it will now be incorporated into its subject-S on the S_{-1}-cycle.

This formulation of NR puts a slight strain on established theory. It is generally assumed, or implied, that for the application of transformations on a cycle any amount of structure above the cycle in question is irrelevant.

For our rule of NR this cannot be so since, if NR is to apply on the next cycle, *not* is not lowered. To determine whether or not NR will apply on the next cycle, the whole higher tree will have to be considered. For if, for example, there is another *not* immediately above the NR-verb, NR is blocked and the first *not* is lowered in the normal way. If our rule is correct, we must assume that higher tree structure counts with respect to the applicability of certain rules in the cycle. A structural analysis of the S whose cycle is being gone through is not sufficient.

If this puts a strain on established theory, it does not seem to be an unhealthy one. For the principle of 'looking higher up' in the tree to determine the applicability of a rule had already crept in more or less surreptitiously, notably in the form of last-cyclic transformations (or pre-last-cyclic ones operating on the penultimate cycle, as in the case of the rule proposed by Robin Lakoff for the formation of tag-questions: 'In fact, forming the tag on the lower sentence is possible only in case the verb of the higher sentence is a performative verb.' (1969, paper VIII in this volume, p. 180).) Let us therefore simply stipulate that the grammar must allow higher tree-structure to figure among the applicability conditions of certain cyclic rules.

This condition applies not only to the lowering of the negation into its subject-S, but also to our rule of NR, which is sometimes prevented from taking place when there is a higher verb in deep structure. As was noted earlier, when the higher verb is *not*, NR is blocked:

(32a) *I don't not think you've got it yet.
(32b) I don't think you haven't got it yet.

Whether this is due to a surface-structure constraint in English preventing double negations, or whether there is a deeper, semantic reason for it, is unclear at present. The latter is, perhaps, more plausible. Apart from the grammaticality of (65) below, we see that NR is also blocked in a few other cases where there is a higher verb in deep structure. Thus, one feels unhappy about, e.g.:

(33a) *He may not think I'll get here until tomorrow.
(33b) *Often I don't think he has got it yet.
(33c) *He usually doesn't think there is as much as a shred of evidence.

Robin Lakoff, in her article about NR (1969, paper VIII in this volume), quotes and rejects the following sentences:

(34a) *I didn't ever think that John would get here until tomorrow.
(34b) *I never thought that John would get here until tomorrow.

(34c) *At no time did I think that John would get here until tomorrow.

In the light of what will be said in section v, these sentences can be seen to be ungrammatical for the same reason as those in (33): a higher temporal verb (appearing in surface structure as an adverb) blocks NR.

NR is blocked, furthermore, in imperatives:

(35a) *Don't think he has found it yet.
(35b) *Don't think he'll find it until tomorrow.

Although it does not seem possible, at the moment, to formulate precisely the conditions under which NR blocks, we must keep in mind that there are such conditions, and that at least some of these involve tree-structure above the cycle in operation.

Do we have arguments for not lowering the negation when NR applies on the next cycle up? Could we not allow the lowering to take place and then 'scan' the negation out of the lower S again? It seems not. For one thing, the ordinary negation *not* is sometimes reinforced or modified by such words as *just*: *just not*. This *just* is raised along with *not*. From some structure underlying (36a) we get (36b), but not (36c):

(36a) I think he should just not be told until tomorrow.
(36b) I just don't think he should be told until tomorrow.
(36c) *I don't think he should just be told until tomorrow.[8]

Presumably, the *just* of *just not* has been attached, somehow, to *not*, so that NR raises it along with *not*. If, however, the *not* is to be picked up out of an S into which it has been lowered first, the formulation of NR will have to be complicated considerably in order to ensure that *just* is picked up with *not*.

There is, furthermore, the fact that the negation can only be raised out of an embedded S when it is the highest operator. Thus we have (37a) but not (37b):

(37a) I suppose John might not be at home.
(37b) *I don't suppose John might be at home.

Likewise, under unmarked intonation:

(38a) I suppose some people haven't arrived yet.
(38b) *I don't suppose some people have arrived yet.

[8] Note that 'I don't think he should just be told' is grammatical and means 'I think he should not just be told' (but also punished, helped, supported, or what have you).

And a sentence such as:

(39) I don't suppose Fred often falls asleep during meetings.

can only be derived from 'I suppose Fred doesn't often fall asleep during meetings', and not from 'I suppose Fred often doesn't fall asleep during meetings'. The fact that the negation can only be raised when it is the highest operator of the complement-S makes it very implausible that it should be lowered first on its own cycle. The result would be that the negation merges somehow with the remainder of the complement-S, and the rule of NR would have to contain a scanning procedure which would be equal, in principle, to the converse of the set of rules lowering operators (Chomsky's 'surface structure interpretation rules').

In this connection, punctual *until*, which was mentioned at the end of section II, poses a problem. Sentence (10a) *Fred won't arrive until midnight*, is grammatical. It is remarkable, however, that the adverbial phrase *until midnight* cannot be preposed in the ordinary way:

(40a) *Until midnight Fred won't arrive.
(40b) Tomorrow Fred won't arrive.

Yet we do have (41a), though it may sound somewhat pedantic, and not (41b):

(41a) Not until midnight will Fred arrive.
(41b) *Not tomorrow will Fred arrive.

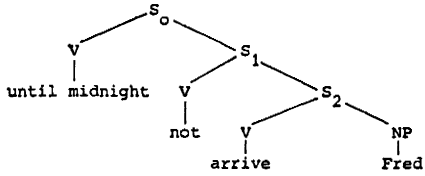
The syntax of English will have to account for these observations. A reasonable explanation can be given if we assume (a) that the semantic analysis of (10a) is also its syntactic deep structure, and (b) that the conditions which determine the position of logical operators in surface structures are not just of a semantic but also of a syntactic nature.

Semantically, the negation is not the operator with the largest scope in (10a) or (41a). It makes no sense to analyse these (synonymous) sentences as 'it is not the case that until midnight Fred will arrive'. With the operators rearranged we get the semantics right: 'until midnight it will not be the case that Fred arrives'.[9] Thus, *until midnight* must be the highest operator, with *not* in its scope. (A further analysis of *until* will probably reveal that it contains, in some form, universal quantification in something like the following way: 'for all moments belonging to the time

[9] It is not quite clear how tense fits into semantic analysis or what role it plays in the various raising and lowering rules of the cycle. Since it does not seem that tense interferes, in any way at all, with the rules discussed here, we shall simply leave it out of account.

extension from now to midnight'.) Let us schematically represent the semantic analysis of (10a) (leaving out tense) as in (42).

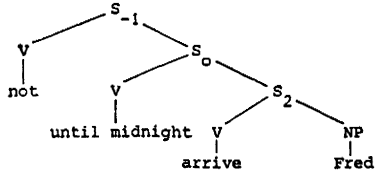
(42)



This analysis, however, gives rise to two problems. First, if it is only in the position of highest operator of an embedded S that the negation can be raised into the main clause (as was shown in the examples (37)–(39)), then how do we explain (12b), *I didn't think Fred would get here until midnight*? It should not be possible to raise the negation out of the complement-S, since *until midnight*, and not it, is the highest operator in that S. Secondly, given the general principle that, in surface structure, those elements which correspond to higher operators *precede* those corresponding to lower operators, we see precisely the opposite with punctual *until* and *not*, as we saw in (40)–(41): *not*, which is the lower operator, must, in surface structure, precede *until*, which is higher, for the sentence to be grammatical.

Both problems are solved at once when we assume that *until* is a negative-raising verb.[10] NR, on the S_0-cycle, will then yield (43).

(43)



If now the verb on the cycle above S_{-1} is again a NR-verb, *not* is not lowered on S_{-1}, but raised again on the higher cycle, so that we get (12b).

The difficulty of the respective positions of *not* and *until* can now also be solved. The principle according to which higher operators precede lower ones in surface structure, has become known as Lakoff's Lowering Constraint.[11] This implies that if in deep structure/semantic representa-

[10] This suggestion was made by my student Nigel Vincent during a seminar on Negative Raising at Cambridge University in 1970.

[11] See G. Lakoff (1971), section II, paper VII in this volume.

tion an operator 0_1 (quantifier or negation) commands another operator 0_2 (i.e. its S also dominates 0_2), then, in surface structure, 0_1 must be in such a position that its *primacy relation* to 0_2 is maintained. This means that in surface structure either 0_1 must command 0_2 but not vice versa (i.e. 0_2 must be in a dependent clause), or else, if this condition is not met, 0_1 must at least precede 0_2.[12]

The fact that *not* must precede *until midnight* in any surface structure corresponding to (42) shows that this constraint cannot stand as it is. We shall reformulate it and say that for every operator 0_i to be lowered the condition holds that, in surface structure, the element corresponding to 0_i must stand in a primacy relation to any other element corresponding to an operator 0_j, which has been lowered earlier in the history of the sentence. We have to do, not with a constraint on the relation between deep and surface structure, but, rather, with a constraint demanding that the order in which, through the various cycles, operators have been lowered be reflected in surface structure. It is thus not possible to maintain, as Chomsky does,[13] that the constraint on the position of operators in surface structure is nothing but a rule of surface-structure semantic interpretation, extraneous to syntax. The case of punctual *until* shows that this constraint is interwoven with syntax.

V

Robin Lakoff (1969, paper VIII in this volume) observes that the following is grammatical:

(44) No one thought that John would get here until tomorrow.

The grammaticality of (44) is surprising since the version of this sentence without NR would seem to be:

(45) Someone thought that John would not get here until tomorrow.

which is grammatical but differs in meaning from (44). This complication is disturbing in view of a semantic description of (44): how are we to

[12] This is a slightly simplified version of Lakoff's constraint: in footnote 3 on p. 164 he mentions the role of stress. We do not have to consider that here, however, since it does not seem to play a part in the problem at hand. Lakoff's formulation of the primacy relation in that footnote is, anyway, still incomplete: it still fails to explain why *I read some poem every morning* is ambiguous (under normal intonation) in a way in which *Every morning I read some poem* is not. (See Seuren (1972a, paper IV in this volume), examples (10) and (11).)

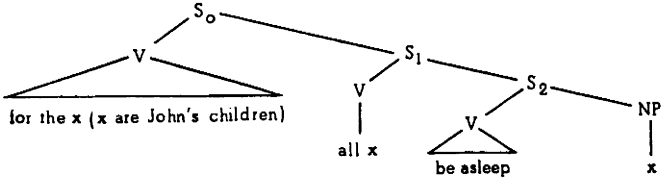
[13] Chomsky (1972a, pp. 134, 185).

account, in the simplest possible way, for the fact that we know what (44) means? It is clearly preferable not to have NR interfere with meaning in irregular ways. The non-raised version of (44) will have to be:

(46) Everybody thought that John wouldn't get here until tomorrow.

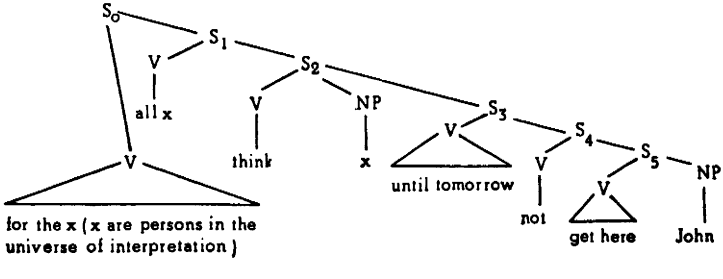
Before we can specify the semantic structure of (44) or (46), a particular complication must, at least provisionally, be cleared away. As is well known, the use of the words *all* or *every* carries with it the presupposition that the set denoted is not empty. Let us speak of an existential presupposition. This fact was noted by Strawson, who wrote (1952, p. 173): 'Suppose someone says "All John's children are alseep". Obviously he will not normally, or properly, say this, unless he believes that John has children (who are asleep).' It is far from clear how this presupposition is to be adequately represented in a semantic analysis. For the sake of convenience, and without any serious claim to adequacy, I shall introduce an operator limiting the interpretation of the proposition to the set quantified over and simultaneously carrying the existential presupposition. In these terms, Strawson's sentence is analysed as (47).

(47)



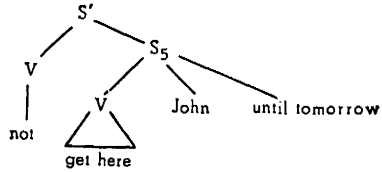
The sentences (44) and (46) now receive the analysis given in (48).

(48)



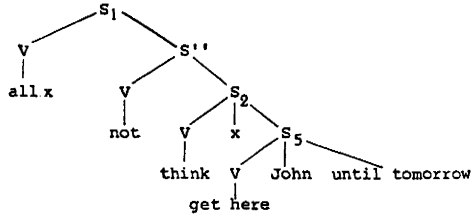
On the S_4-cycle, *not* is not lowered since *until* on S_3 is a NR-verb. On S_3, *not* is raised and *until tomorrow* is lowered into S_5, so that the complement-S of S_2 comes out as in (49).

(49)



On the newly created S′-cycle, *not* is again not lowered, this time because of the NR-verb *think*. Thus, on S_2, NR applies again, as shown in (50).

(50)



If *not* were now to be lowered in S″ we would get the ungrammatical:

(51) *Everybody didn't think John would get here until tomorrow.

and not (44). In order to get (44), let us assume that the universal quantifier ('all x') is a negative raiser. It is one, however, in a special sense: part of the negative-raising process is that the verb itself is changed into the existential quantifier 'some x'. Of course, 'for all x—not' is logically equivalent to 'not—there is an x'. What is proposed here is that in natural language the latter is preferred to the former, and that this is a special case of NR.

The evidence for this includes the following. There is a strong reluctance to accept sentences where the universal quantifier precedes the negation:

(52a) *Fred always doesn't take the bus.

(52b) *Every student does not accept this.[14]

[14] The sentences of (52) can only be grammatical when there is a strong presupposition, for (a), that it happens at least sometimes that Fred does not take the bus, and for (b), that at least some students don't accept this. The latter sentence is, moreover, interpretable with heavy stress on *every* and a rising intonation at the end of the sentence. Under this type of contour, the sentence is roughly equivalent to 'not every student accepts this'.

The raised version is definitely better:

(53a) Fred never takes the bus.
(53b) No student accepts this.

Notice that the non-raised version is much better when the universal quantifier is again preceded by a negation:

(54a) {Fred doesn't always not take the bus.
Not always does Fred not take the bus.}
(54b) Not every student doesn't accept this.

This follows from the hypothesis that (53) is derived from (52) through NR: see (32) in section IV. It is not clear in what other way the ungrammaticality of (52) could be explained in the light of perfectly grammatical sentences such as:

(55a) Fred usually doesn't take the bus.
(55b) Many students don't accept this.

A further argument can be derived from textual pronominalization. In general, when an element has been introduced into a universe of interpretation by means of an existential quantifier, it can be referred to in a following sentence by means of a definite pronoun:

(56) Yesterday I ate some bread. *It* was stale.

This is, generally, not possible when the existential is under a negation: in that case no element is introduced into the universe of interpretation:

(57) Yesterday I ate nothing. !*It* was delicious.[15]

There are, however, cases where definite pronominalization after a negated existential is entirely natural. In these cases the pronoun tends to be plural and/or reinforced by *all*:

(58a) Nobody is asleep. *They* are *all* out in the garden.
(58b) Nobody laughed. *They* just sat there.
(58c) I didn't understand anything. *It* was *all* in French.

I would surmise that in these cases the negated existential is derived, through NR, from the universal quantifier followed by negation. It is regular that back-reference is made to a universally quantified element, often by a plural pronoun:

(59) Everybody is asleep. They are tired.

This, of course, follows from the existential presupposition carried by the universal quantifier in natural language (but not necessarily in logic). We

[15] The shriek is used to indicate lack of textual coherence.

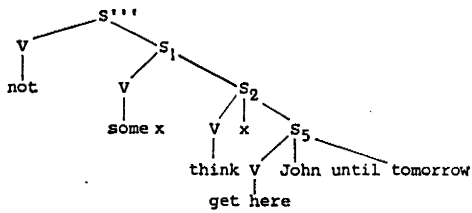
can say that, whenever such existential presupposition is present in a sentence containing a negated existential, NR has applied. We can thus set up, for a sentence such as:

(60) There are no nude models in the show.

two deep structures which are logically equivalent but for a presuppositional difference (which determines appropriateness in context). On the one reading there is no existential presupposition, and the text could continue, for example, in the following way: 'The authorities are too frightened of nudity.' On the other reading NR has applied to an underlying 'All nude models are not in the show', and there could be a sequel such as 'They are all on strike'.

We thus assume that *not* is not lowered on the S″-cycle of (50), and that NR applies, for the third time, so that *not* now finds itself just underneath the S_0 of (48), having travelled up from almost the bottom:

(61)



Now, 'some x' is lowered into S_2 (in a way analogous to PL in section III), and *not* is lowered on the S‴-cycle, whereby it must maintain its primacy relation to *some* by staying to its left. The grammar thus yields:

VI

It is not only the abstract verbs *until* and *all* which are to be included in the class of negative-raising verbs. There are others too. Thus it seems that the epistemic necessity operator *must* is a negative raiser.[16]

Quite clearly, epistemic *must* does not like negation in its scope:

(62) *Fred must not be insane.

In proper English one says, instead:

(63) Fred can't be insane.

[16] The personal modals *must* and *can*, as in *You must go* or *Paul can run fast*, are not considered here. Their grammar and semantics are far from clear. The term 'epistemic' covers all cases where *must* is interpretable as 'it is necessary that'.

which corresponds to 'it is not possible that Fred is insane'. Again, there is no objection to the negation in the scope of the necessity operator when the latter is again in the scope of a higher negation. Given that the negative of *must* is *need*:

(64) Fred needn't be insane.

which stands for 'it is not necessary that Fred is insane', we notice that a second, lower, negation is possible:

(65) Fred needn't not be insane.

These syntactic facts would seem erratic unless it is assumed that epistemic *must* is a negative-raising verb, which changes to the possibility operator *can* in the process.[17]

Another negative-raising verb is *cause*. It changes into its logical counterpart *allow*: there is a logical equivalence between 'cause not-p' and 'not-allow p' (in the widest sense of *allow*). As with *must* and *all*, we see that *cause* does not like a negation in its scope, unless *cause* itself is in the scope of a higher negation. Instead of:

(66a) *The accident caused Fred not to become a pianist.
(66b) *The accident made Fred not become a pianist.

we prefer:

(67a) The accident did not allow Fred to become a pianist.
(67b) The accident prevented/stopped Fred from becoming a pianist.

But with a higher negation, the sentences of (66) improve a great deal:

(68a) The accident did not cause Fred not to become a pianist.
(68b) The accident did not make Fred not become a pianist.

Or, instead of (69a) we prefer (69b):

(69a) *By opening the door only three inches I caused the dog not to escape.

[17] French has sentences such as *Ça ne doit pas être gai* (That can't be very nice), where the negation is attached to the higher verb *doit* (must), as appears from its position. Clearly, however, the semantic position of the negation is with the lower S. In French, apparently, epistemic *devoir* (must) does raise the negation, but without changing to *pouvoir* (can) in the process. Likewise, in English, *until* is not changed into *before*, as it usually is in other languages. Dialectally, English *must* can behave like French *devoir*; one then finds *Fred mustn't be insane* as an equivalent to (63).

(69b) By opening the door only three inches I did not allow the dog to escape.

This, incidentally,[18] helps to solve the following problem. The verb *allow* occurs as a performative verb, as in:

(70) I hereby allow you to go.

which corresponds to something like 'by saying this, I allow you to go'. Unlike other performative verbs, however, *allow* can be negated and still be performative:

(71) I hereby do not allow you to go.

which corresponds to 'by saying this I do not allow you to go'.[19] This seems anomalous, since normally, performative verbs cannot be negated:

(72) *I hereby do not assert that the President is guilty.[20]

We can say:

(73) I hereby deny that the President is guilty.

where *deny* stands for 'assert that not', and is used performatively. The grammaticality of (71) is readily explained when we assume that *not allow* is derived from 'cause not', so that we have 'I hereby cause you not to go' underlying (71).

VII

The conjunctor *and* also appears to be a negative raiser. But its case is a little more complex. As is widely known, the reduced form of (74a) is (74b), and not (74c):

(74a) He doesn't like tea and he doesn't like coffee.
(74b) = He doesn't like tea or coffee.
(74c) ≠ He doesn't like tea and coffee.

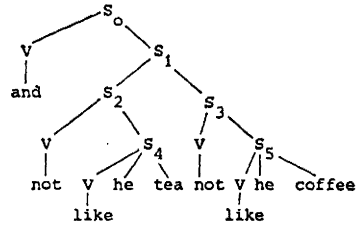
[18] This part of the argument was developed in discussions with my student Augustine Fagan, at Oxford, while I supervised his thesis.

[19] Note that in *I do not, hereby, allow you to go, allow* is not performative, and *hereby* is not token-reflexive. It is analysed as 'it is not the case that, by saying what I have just said, I am allowing you to go'.

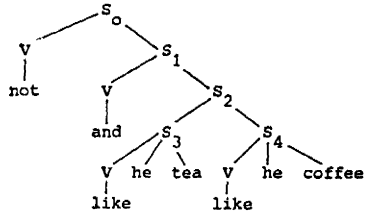
[20] The sentence *I do not, hereby, assert that the President is guilty* is grammatical, but *assert* is not performative here, nor is *hereby* token-reflexive.

Let us represent the deep structure of (74a–b) as (75), but that of (74c) as (76).

(75)



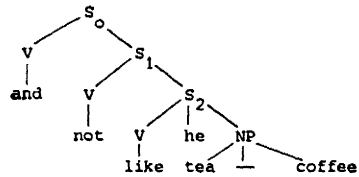
(76)



They differ truth-conditionally in that, if he likes one of the two but not both, then (75) is false but (76) true.

Let us assume that in (75), on the S_2 and S_3-cycles, *not* is not lowered if full Conjunction Reduction is going to take place on S_1, and that, in that case, the result is (77),

(77)



where the empty node between *tea* and *coffee* has been added to indicate the position that will be filled by the conjunctor after its lowering. If, now, on the S_1-cycle, *not* is lowered to its normal position in S_2, i.e. in front of the verb *like*, there will be trouble on the S_0-cycle, when *and* is to be lowered: *and* will then lose its primacy relation to *not*, ending up on the right of *not*, thus violating the lowering constraint. (77) would thus not be expressible

in surface structure. If, however, we accept that *and* is a NR-verb, thereby changing to *or*, there is no difficulty.

Again, of course, $\wedge$ ($\sim$p, $\sim$q) is logically equivalent to $\sim \vee$(p, q).[21] But what is remarkable is that *and* is a NR-verb and *or* is not, in natural language. Let us take the sentence:

(78) He (either) doesn't like tea or he doesn't like coffee.

Its deep structure is identical to (75) but for the highest verb, which is *or*. We can reduce this to a parallel form of (77), i.e. with *or* for *and*, and we will find ourselves in the same predicament: *or* will have to violate the lowering constraint. If *or* were a NR-verb we could apply NR, while changing *or* into *and*. We would thus get (74c). The objection is, however, that (74c) is not the natural reduced form of (78). Whereas the transition from (74a) to (74b) is natural and effortless, it is not from (78) to (74c). That the two are, in fact, logically equivalent is not immediately apparent to a non-logician.[22] Some training in truth-tabling is required to see that they are. As it is, (78) does not have a reduced version.[23]

That *and* and *or* are not just conjunctors but are indeed operators (as is proposed by McCawley (1972)), appears from the fact that they are sensitive to the lowering constraint. Take (79a):

(79a) Fred didn't come back and David didn't come back.
(79b) =Fred and Dave didn't come back.
(79c) $\neq$Fred or Dave didn't come back.

Here, the natural reduced form is (79b), not (79c).[24]

We are thus in a position to explain, up to a point, both the semantics

[21] The 'Polish' notation is used here: '$\wedge$(p, q)', rather than the more commonly used 'Italian': 'p $\wedge$ q', since the former expresses more clearly the operator character of the conjunctor. See McCawley (1972).

[22] In fact, it is not necessarily apparent to all logicians either. R. P. G. de Rijk has pointed out to me that in intuitionistic logic (developed by L. E. J. Brouwer and A. Heyting), where the equivalence holds between $\wedge$($\sim$p, $\sim$q) and $\sim\vee$(p, q), one can argue from $\vee$($\sim$p, $\sim$q) to $\sim\wedge$(p, q), but not vice versa. (I am not using intuitionistic notation.) Applied to our examples, this logic would establish an inference from (78) to (74c), but not the other way around. An analogous situation obtains with respect to the quantifiers: $\exists x \sim P(x) \rightarrow \sim\forall x\ P(x)$, but not vice versa, although $\forall x \sim P(x) \longleftrightarrow \sim\exists x\ P(x)$. I can only leave open the question of whether this surprising symmetry between natural language and intuitionistic logic (which was developed without any view to natural language) deserves further study.

[23] Another interesting case where *and* turns into *or* is the conjoining of comparatives: *She is richer than Fred and she is richer than Harry* becomes: *She is richer than Fred or Harry*, which is a further argument for an underlying negation in the comparative. (See Seuren (1973a).)

[24] *And* also seems to raise other operators than *not*, thereby again changing to *or*. Thus, e.g. *Mary may be in Paris and Mary may be in Madrid* reduces to: *Mary may be in Paris or Madrid* But *Mary may be in Paris and Joe may be in Paris* gives: *Mary and Joe may be in Paris.*

and the syntax of (74) and (79) by assuming that *and* is a NR-verb and that *and* and *or* are operators and fall under the lowering constraint. The applicability conditions for NR on *and* differ from those on the other NR-verbs considered in that for *and*, the application of NR depends crucially on the demands made by the lowering constraint: NR applies only when non-application would violate this constraint.

It should be recognized that to propose an explanation such as is proposed here is a far cry from explaining the full range of syntactic and semantic phenomena connected with NR. Thus, no account is given for the precise function of *both* vis-à-vis *and*. It seems that, in certain cases, *both* is the scope indicator in surface structure, rather than *and*, as in:

(80a) Both Fred and Dave didn't come back.
(80b) =Fred and Dave both didn't come back.
(80c) ≠Fred and Dave didn't both come back.

Then, the correspondence between (80a–b) and:

(81) Neither Fred nor Dave came back.

calls for an explanation.

We can, however, shed some light on the observations (7)–(9) made in section II above. The two sentences:

(82a) I don't believe that either Harry or Fred were late.
(82b) I don't believe that either Harry or Fred was late.

are both grammatical, but they differ in meaning. (82b) is relatively unproblematic: its semantic analysis includes the structure:

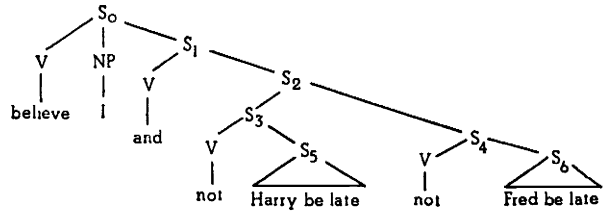
(83) not (I believe (or (Harry be late, Fred be late)))

But (82a) is more interesting. Any syntax of English will have to explain why this sentence is grammatical although:

(84) *Either Harry or Fred were late.

is not. Any grammar of English will have to relate this sentence in a systematic way to a semantic analysis containing at least the structure in (85).

(85)

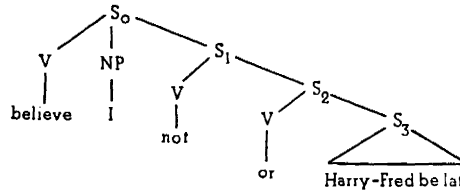


The latter requirement seems, in principle, fulfilled by the proposals put forward earlier. If there were no negative-raising verb above S_1, S_1 would become (86a) or (86b):

(86a) Harry and Fred were not late.
(86b) Neither Harry nor Fred were late.

The S_0-verb *believe*, however, seems to have a very strong magnetic effect on lower negations. What happens is that *not* in S_3 and S_4 is not lowered into S_5 and S_6, respectively, but raised over *and* on the S_1-cycle, after Conjunction Reduction on S_2, as in (87).

(87)



Lowering of *or* and further raising of *not* yields:

(88) I not believe Harry or Fred be late.

At this point, the post-cyclic rule of Number Agreement will have to come into operation. We know from Morgan (1972) that Number Agreement (or 'Verb Agreement', as he calls it) is a very complex grammatical rule, which does not simply act on the form of the subject at the stage of its application. Morgan defends the view that this rule contains certain global aspects (in the sense of G. Lakoff (1970c, paper VI in this volume)). This is borne out again by our example. The plural *were* in (82a) must somehow be related to the fact that *or* in the subject is derived from *and*, in particular the *and* which simply enumerates and conjoins propositions, and not the symmetrical *and* conjoining NP's, as in:

(89) Fresh air and exercise keeps a man fit.

which is different from:

(90) Fresh air and exercise keep a man fit.

The former behaves, with respect to NR, as though there was no *and* in the subject of the complement-S:

(91) I don't think fresh air and exercise makes a bit of difference for a man's fitness.

The derivation of *or* from an underlying *and* is, however, only a necessary, and not a sufficient, condition for the verb of an *or*-containing subject to take 'plural'. Consider the sentence:

(92) No king or queen has ever stooped so low.

Here, the plural *have* would be grossly ungrammatical. Yet *or* derives from *and* in this case:

(93) And (not (some king has ever stooped so low), not (some queen has ever stooped so low))

Lowering of *and* would violate the lowering constraint, so that NR applies. On the other hand, we observe that the plural *are* in (94) is quite acceptable:[25]

(94) Not all milk or butter are to be exported.

although the semantic structure of (94) is similar to that of (92):

(95) And (not (all milk is to be exported), not (all butter is to be exported))

One is tempted to surmise that the rule of Number Agreement is sensitive not only to structural properties of underlying semantic-syntactic trees (which would make the rule 'global'), but also to the referring or non-referring function of the subject-NP's. It is an intuitively satisfactory thought that verbs take 'plural' when their subjects are interpretable on to a plural set, i.e. refer to more than one element in the universe of interpretation. This would relate syntax even more closely to semantics than has hitherto seemed justified to assume. We must leave this question open here, but it is, anyway, a remarkable fact that in (92), which takes a singular verb, the NP's of the subject, *king* and *queen*, do not refer, whereas the subject-NP's in the other sentences considered are all referring NP's.

VIII

The question of what unifies the class of NR-verbs presents itself naturally. Given our limited knowledge of semantics and cognitive processes in general, we can, on the whole, do little more than speculate. Yet, as far as the abstract verbs are concerned, we detect a semantic relation

[25] Speakers tend to be slightly hesitant about the plural *are* in (94). They often find the singular *is* equally acceptable, and some find it preferable. They all agree, however, that there is a significant difference between the totally unacceptable plural for (92) and the plural of (94). Note, furthermore, that (92) remains singular when embedded under *believe*: *I don't believe that any king or queen has ever stooped so low.*

unifying *all*, *must*, *cause*, and *and*, and opposing them to *some*, *can*, *allow*, and *or*, respectively. Taking *a*, *b*, and *c* to be individuals, and *f* a function, we can say:

(96a) $\forall x\ (f(x)) \rightarrow f(a) \rightarrow \exists x\ (f(x))$
(96b) $\mathrm{Nec}(f(a)) \rightarrow f(a) \rightarrow \mathrm{Poss}\ (f(a))$
(96c) $\exists x\ (\mathrm{Cause}\ (x, f(a))) \rightarrow f(a) \rightarrow \exists x\ (\mathrm{Allow}\ (x, f(a)))$
(96d) $f(a) \wedge f(b) \wedge f(c) \rightarrow f(a) \rightarrow f(a) \vee f(b) \vee f(c)$

That is, for (a): if for all *x* it is true that *x is f*, then *a is f*; if *a is f*, it follows that there is at least one individual *x* such that *x is f*.

For (b): if it is necessary that *a is f*, then *a is f*; if *a is f*, then it is possible that *a is f*.

For (c): if something causes *a to be f*, then *a is f*; if *a is f*, it follows that there is something allowing *a to be f*.

For (d): if it is true that *a is f*, and *b is f*, and *c is f*, it follows that *a is f*; if *a is f*, it follows that *a is f* and/or *b is f* and/or *c is f*.

The negative-raising predicates on the left side of (96) form a group in that they allow us to infer that *a is f* (they allow us to 'descend' to the particular case), whereas the predicates on the right-hand side help to form propositions to which one 'ascends' from the particular case. Or, we might say, the 'descending' is deductive; the 'ascending' inductive.

When NR applies, the left-hand and the right-hand propositions are logically equivalent, and the arrows all point to '$\sim f(a)$':

(97a) $\forall x\ (\sim f(x)) \rightarrow \sim f(a) \leftarrow \sim\exists x\ (f(x))$
(97b) $\mathrm{Nec}\ (\sim f(a)) \rightarrow \sim f(a) \leftarrow \sim\mathrm{Poss}\ (f(a))$
(97c) $\exists x\ (\mathrm{Cause}\ (x, \sim f(a))) \rightarrow \sim f(a) \leftarrow \exists x\ (\sim\mathrm{Allow}\ (x, f(a)))$
(97d) $\sim f(a) \wedge \sim f(b) \wedge \sim f(c) \rightarrow \sim f(a) \leftarrow \sim(f(a) \vee f(b) \vee f(c))$

The fact that the left-hand propositional forms are rejected, in natural language, in favour of those on the right-hand side, makes one suspect that, probably for reasons which have to do with the internal organization of our cognitive system, the latter are easier to process. A further elaboration of these suggestions, however, does not seem realistic at the present moment.

Nor can we attempt to provide semantic analyses for the surface-structure NR-verbs, such as *think*, *believe*, *suppose*, *seem*, in terms which would bring them into line with the abstract NR-predicates. Antinucci and Parisi (1971) relate the epistemic modals to what they call a 'contextual' predicate *believe*. The sentence *That must be John over there* is analysed in terms paraphrasable as 'something causes it to be necessary for me to believe that the person over there is John.' This does not seem the

place for a detailed discussion of their proposals, which are no doubt in need of further refinement and argument. But their intuition that *believe* (and the other surface NR-verbs) have important semantic properties in common with the epistemic necessity operator I find easy to share. It would appear that a great deal is to be gained from a systematic study of the similarities and the interaction of modals, the causative predicate, and the surface verbs which take Negative Raising.