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THE GLOBAL NATURE OF THE NUCLEAR STRESS RULE

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In a recent paper, Bresnan claims to have shown that the Nuclear Stress Rule applies within the syntactic cycle, rather than to surface structure. Given this result, she claims to have found evidence for the existence of deep structure, for the lexicalist hypothesis, and against McCawley's 1970 analysis of English as a VSO language. B's claims are analysed here in detail. It is shown that her claims are without a basis in fact: the Nuclear Stress Rule is a global rule which applies to surface structure, but it has a global environment referring to other levels.*

Bresnan 1971 has presented evidence that indicates the following:

- (1) The Nuclear Stress Rule (NSR) must either
 - (a) be ordered before Question Formation (QF) and Relative Clause Formation (RCF), or
 - (b) be a global rule with an environment ordered before QF and RCF.

B claims to have shown 1a, as well as the following:

- (2) Question Formation and Relative Clause Formation are cyclic rules.
- (3) NSR applies within the syntactic cycle.
- (4) Evidence for the existence of deep structure and for the lexicalist hypothesis is provided by 3.
- (5) McCawley's 1970 analysis of English as a VSO language is disconfirmed by 3.

I would like to provide evidence for the following:

- (6) The evidence for proposition 1 is by no means clear; at the very least there are grave difficulties with 1a, though some form of 1b seems to be viable (cf. §6 below).
- (7) B's argument for 2 does not hold; there is still no evidence for it.
- (8) Since 3 depends on 2, there is no evidence for 3.
- (9) Since 4 depends on 3, there is no evidence for 4. Moreover, even if 3 were true, B's argument for 4 would not hold.
- (10) Since 5 depends on 3, there is no evidence for 5.

1. B notes that NSR gives results like the following in simple sentences:

- (11) a. Sam *réad* some.¹
b. Sam read some *bóoks*.

Therefore, by her account, it will stress the following sentences correctly if it applies before QF:

- (12) a. What did Sam *réad*?
b. Which *bóoks* did Sam read?

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¹ [For typographical simplicity, Bresnan's superior numerals 1, 2, 3 are replaced in this paper by the acute, circumflex, and grave accents respectively.—Ed.]

She also notes that, if NSR is assumed to apply before RCF, the following is predicted:

- (13) I looked over the books Sam read.

B claims that, if NSR applies before RCF, the underlying object of *read* will receive primary stress. Then when it is deleted by RCF, the next candidate for primary stress will automatically be the head noun of the relative clause. So far, so good. But B assumes that the stress indicated in 13 is the only stress possible for that sentence. The fact is that 14 is also permissible, and even required if there is a breath-group break after *over*:

- (14) I looked over the books Sam read.

There are many other parallel cases where stress can or must be similarly assigned:

- (15) a. Bury the man you killed.

- b. Sam read the book I gave him.

- c. Teddy is the only capitalist I would ever vote for.

- d. Sam finally met the man who Sheila used to date.

- e. Sue is the girl to date.

The stress patterns in 15, some of which are optional, do not follow from B's account. If she were completely correct, such cases should be impossible. In fact, they not only occur, but are sometimes obligatory. The following cases, which are the only possibilities B would predict for non-contrastive stress, can occur only if the stress is contrastive:

- (16) a. Bury the man you killed.

- b. Sam finally met the man who Sheila used to date.

- c. Sue is the girl to date.

Here 16a presupposes that you killed something else, and might well be followed by *not the chimpanzee, stupid!*; 15a contains no such presupposition. Again, 16b presupposes that Sheila used to date at least one being who was not a man, but 15d does not make this presupposition; and 16c is similar.

The examples in 16 also raise serious difficulties, since they must somehow be blocked on the non-contrastive reading and be permitted only on the contrastive reading. The ramifications of such difficulties will be discussed in §6 below. For the moment, let us assume that proposition 1 can be kept in some form or other.

2. The most crucial part of B's paper is in her Appendix II, which begins as follows (276):

I have shown that it is possible for the NSR to be ordered within the transformational cycle; but I have not actually shown that it is necessary, since I have assumed without explicit justification that Relative Clause Formation and Question Formation are cyclic transformations.

She then attempts to show that these rules are cyclic. She claims that if she can do this, it will follow that NSR is cyclic, since it can not be postcyclic if it precedes cyclic rules, and can not be precyclic since it must follow rules like Passive. Actually, if B could show Proposition 2, all that would follow would be the disjunction: either 3 applies—i.e., NSR is cyclic—or 3' applies—NSR is a

global rule with a cyclic environment that applies postcyclically.² B fails to note that 3' is an important possibility: if 3' rather than 3 turned out to be the case, her subsequent arguments might vanish, depending on the exact statement of the global rule. Let us put this possibility aside for a moment, and concentrate on B's arguments for 2.

Her first argument is not really in support of 2, but rather against one possible alternative to 2. The possible alternative is this:

- (17) a. NSR applies after all cyclic rules but before any postcyclic rules.

- b. QF and RCF are postcyclic.

Note that this is only one of many possible alternatives to 2; to show that 17 is incorrect is not to show that 2 is correct. She bases her argument against 17 on the following examples:

- (18) a. Away ran Fido.

- b. *Awáy ran Fido.

- (19) a. Seldom does John sing.

- b. *Séldom does John sing.

B assumes that the rules that move *away* and *seldom* to the front of these sentences are postcyclic. Given this assumption, she correctly notes that 18 and 19 indicate that NSR would have to apply after these rules. Therefore 17a cannot hold; that is, some postcyclic rules must precede NSR. There are two important things to show about B's argument. First, it only disproves 17a,

² Global rules are discussed in Lakoff 1969, 1970a. Transformational rules involve corresponding nodes in adjacent phrase-markers in a derivation. Global rules involve corresponding nodes in non-adjacent phrase-markers in a derivation. One way of thinking about a global rule is that it involves the tracing of the 'history' of a node throughout a derivation. Once one sees that global rules are necessary, many of the old-style transformational arguments for rule ordering go out the window. The reason is this: in transformations, all the environments for the application of a rule may be stated as holding only at the same point in a derivation where the rule itself applies. In such a concept of grammar, it is only necessary to show that a part of the environment for the application of rule A must occur before the application of rule B to prove that rule A must apply before rule B. With global rules, this is no longer the case, since the possibility is left open that only the relevant environment of rule A must be stated at a stage of the derivation prior to the application of rule B, and that the actual application of rule A may follow rule B.

Under the global concept of grammar, rule ordering itself is a type of global rule, ruling out certain derivations on the basis of global properties of those derivations—namely, an incorrect relative order of application of the two rules in the derivations as a whole. Thus the trade-off in such cases between (a) a global environment in the rule and (b) a statement of rule ordering without a global environment in the rule is really a trade-off between two types of global rules.

The suggestion that the Nuclear Stress Rule is a global rule was first made by Ross in a joint lecture by him and myself at MIT in March 1967. Ross suggested that a derivational constraint of the sort I had proposed for other phenomena might be able to handle such cases as *John has plans to leave* vs. *John has plans to leave*. He suggested essentially what I will suggest below, that stress is assigned to *plans* in the phonological cycle on the basis of the fact that *plans* was the object of *leave* at an earlier point in the derivation. Unfortunately, not enough was known about global rules at the time to allow Ross to follow up his suggestion.

not 17b. That is, it still leaves open the possibility that NSR might be post-cyclic—ordered after certain postcyclic rules, but before QF and RCF. Second, if this argument of B's is correct, then she has provided a counter-example to her own position that NSR is cyclic. After all, if NSR must follow two postcyclic rules, then it cannot be cyclic. The only way B could get out of this would be to give up her argument against statement 17. She could do this in one of two ways: either by giving up her assumption that the rules involved in 18 and 19 are postcyclic, or by claiming that 18 and 19 constitute still another class of exceptions to NSR. Either way, her argument against 17 cannot be maintained, unless she gives up her claim that NSR is cyclic.³

B's only other argument in support of 2 involves rule ordering once more. She considers a rule (278) which she calls 'Right Conjunct Reduction' (RCR), and wants to show that QF and RCR are both cyclic rules. Although she doesn't state the argument very clearly, in essence she is trying to show that, for any S-node, S_i, if RCR and QF both apply in the domain of S_i, then QF must apply before RCR; and for any S_j higher than S_i, if RCR applies in the domain of S_i and QF applies in the domain of S_j, but not S_i, then RCR must apply before QF. If she can show this, she will have shown that both rules are cyclic.

Let us begin with B's claim that RCR must apply before QF. To show this, she considers the rule of (Prepositional-Phrase) Postposing (PPP). She tries to show that PPP precedes QF and that RCR precedes PPP. Assuming transitivity of ordering, she would then have shown that RCR precedes QF, as follows:

- (20) (a) PPP precedes QF.
(b) RCR precedes PPP.
(c) Therefore, RCR precedes QF.

It is step 20a that goes wrong in this argument. B tries to show that PPP must precede QF by showing that it is impossible for PPP to follow QF. She claims (278-9) that the following examples show this:

- (21) a. *To whose results are their results on that virus similar on the phage?
b. *To whose results on the phage are their results similar on that virus?

She argues that such sentences should result from 22 if PPP could possibly follow QF:

- (22) To whose results on the phage are their results on that virus similar?

There is no question that the sentences of 21 are ungrammatical. The question is whether the ungrammaticality is due to a rule-ordering violation, or to some quirk of the example which B happened to choose. The latter seems to be the case. Take the following examples:

- (23) a. The results were published on the virus.
b. *Their results were published on the virus.

³ There is one other alternative I can think of, namely that B really means 'last-cyclic' when she says 'postcyclic'. The difference is that last-cyclic rules may apply before cyclic rules in the cycle on the highest S-node, while postcyclic rules cannot. Such an interpretation would keep B from contradicting herself. It would, of course, invalidate her argument, since it would then be possible for the rule forming *A way ran Pido* to apply last-cyclically before NSR, for NSR to apply to the output of all the cyclic rules, and for Relative Clause Formation and Question Formation to apply postcyclically after NSR. This is just the possibility B tries to argue against.

- (24) a. Their results on the phage were idiotic.
b. *Their results were idiotic on the phage.

Somehow *on the phage* is hard to postpose from *their results* to the end of the sentence, even when no question is involved. I have no idea why this should be, but it seems to show that B's examples were not representative. When one looks at some other examples, it becomes clear that PPP must follow QF, not precede it:

- (25) a. I sent the results on the phage to Watson.
b. *Which results did you send on the phage to Watson?
c. Which results did you send to Watson on the phage?

In 25c, *on the phage* must be postposed to the end of the sentence after QF has moved the whole NP *which results on the phage* to the front of the sentence. But 25b shows that one cannot simply question *which results* and leave *on the phage* behind. Since 20a is false, the argument in 20 collapses: B has failed to show that RCR applies before QF.

As it turns out, B's argument that QF applies before RCR also fails. She uses the following examples (279):

- (26) a. I wonder what strange sights you'll see in my country and what strange sights I'll see in your country.
b. I wonder what strange sights you'll see in my country and I'll see in your country.

She claims that 26b is derived by RCR from 26a, and that therefore RCR must follow QF. There is another possibility, of course. It is not unreasonable to assume that QF may work 'across the board', in the fashion described by Ross 1967. If so, then 26b would work like the sentences in 27, where the NP's are questioned out of the conjoined sentences all at once:

- (27) a. What did John eat and Bill drink?
b. Who did you kick and then later give a dime to?
c. What would Harry like to buy, Bill like to sell, and Max like to photograph?

In fact, there is some evidence favoring the across-the-board position over the QF-followed-by-RCR position. As it happens, across-the-board movement rules apply not only in conjoined structures, but in a certain limited class of subordinate structures as well:

- (28) a. I wonder what you wrote down without telling me?
b. I wonder who you would rather seduce than rape?
c. I wonder which animals you would rather eat than be eaten by?

Here it is clear that across-the-board QF must apply, rather than QF followed by RCR. The reason is simple: these sentences do not contain conjoined clauses. But if across-the-board QF is needed for cases like 28, then it will automatically handle cases like 26b. Thus there is no reason to believe that 26b is derived by an application of QF followed by RCR.

B has failed to show either that RCR precedes QF or that QF precedes RCR. She has therefore not even come close to showing that QF is cyclic. Since her claim that NSR applies in the cycle is crucially dependent on showing that both

QF and RCF are cyclic, it follows that she has not provided any valid evidence that NSR is cyclic.

3. Let us suppose that B had been able to show that NSR was cyclic. What then? She claims that, if NSR were cyclic, it would follow that the lexicalist hypothesis is right and that a deep structure exists. If this could be shown, it would be an interesting, though perplexing, result. So far no evidence has been found to support the claim that deep structure exists; on the contrary, there is considerable evidence that it does not exist.⁴ Since B's earlier arguments failed, she has not produced any evidence for the existence of deep structure. But as it happens, even if she had been able to show that NSR were cyclical, her argument for the lexicalist hypothesis and for deep structure still would not hold. Let us examine her argument carefully:

(29) ARGUMENT FOR THE EXISTENCE OF DEEP STRUCTURE.

- a. Prosodic stress rules like NSR require prior assignment of word stress.
- b. Therefore, if NSR is in the syntactic cycle, word stress must be assigned either in the cycle or before the cycle.
- c. Lexical insertion must precede word-stress assignment.
- d. Therefore, lexical insertion must occur either in the cycle or before the cycle.
- e. 'Because the NSR may apply on the first syntactic cycle, and because word-stress assignment precedes prosodic stress assignment, all [sic] lexical insertion must occur on or before the first [sic] transformational cycle' (270).
- f. 'If there is some level in derivations at which all lexical insertion converges, then deep structure, in the sense of Chomsky 1965, exists' (loc. cit.)
- g. By 29e, there is such a level; therefore deep structure exists.

Let us begin by granting 29a-d, and return to them later. Note that 29e is a non sequitur. From 29a-d, all we know is that lexical insertion must occur either in the cycle or before the cycle. All that is required is that, on each cycle, the lexical items must be there in order for word-stress assignment and NSR to apply. This leaves open the possibility that, on each cycle, all the lexical items are inserted after all the syntactic rules. It does not follow from 29a-d, or from anything else B claims, that ALL lexical items in the entire tree must be inserted at one point in the derivation; nor does it follow that they must be inserted before any transformational rules apply. In order to show that deep structure in the sense of Chomsky 1965 exists, she would have to show that all lexical insertion took place before ANY transformational rules applied. Restricting lexical insertion to the cycle does not come even near to showing that deep structure exists.

Incidentally, it should be noted in passing that B's statement 29f is, strictly speaking, incorrect. Suppose that there is some level where lexical insertion converges, and that that level is surface structure. It would certainly not follow

⁴ Arguments that deep structure in the sense of Chomsky 1965 does not exist can be found in McCawley 1968; Lakoff 1969, 1970b, 1971; and Postal 1970a.

that deep structure exists. The crucial clause that needs to be added to 29f is that the level in question be prior to the application of ANY non-lexical transformations. But 29d permits the possibility that lexical insertion occurs in the cycle, after cyclical syntactic transformations. It is partly for this reason that B fails to provide any evidence for the existence of deep structure.

Up to this point we have assumed the correctness of 29a-d, but on close inspection it turns out that all these are suspect. Here 29a is the crucial claim. B realizes that it is controversial, and tries to provide an argument for it: 'One concrete way of rejecting the phonological cycle is to claim that the NSR assigns stress to non-terminal symbols only, and that word stress occurs subsequently. This proposal implies that prosodic stress does not depend in any way on lexical information, but only on syntactic configurations. Yet, as we have seen, the NSR must "know" whether it is applying to a pronoun or to a fully specified lexical noun phrase' (271). She cites examples like those mentioned in §1, above:

- (30) a. Helen detests misogynists.
- b. Helen detests them.

She then correctly points out that 'the derived stress contours of sentences containing anaphoric and non-anaphoric noun phrases differ', and cites this example:

- (31) Jóhnn knows a wóman. Jóhnn avóids the wóman.

The second occurrence of *the woman* is unstressed since it is anaphoric. B describes phenomena such as 30-31 as the 'dependency of stress contour on the stress level of individual lexical items', and concludes that the proposal for assigning stress to non-terminal symbols devoid of lexical items must be wrong. However, her description of the phenomena in 30-31 is misleading. Although the stress level of lexical items may differ, that difference is not due to any LEXICAL properties of the items, as opposed to syntactic and semantic properties which can be represented independently of the lexical idiosyncrasies of particular items. Anaphora, for example, is not a lexical property. It is a syntactic-semantic phenomenon which can, and must, be specified independently of lexical idiosyncrasies. Consider the following:

- (32) Jóhnn knows the wóman. Jóhnn avóids the bltch.

Here we find anaphora even though the anaphoric NP is not identical to its antecedent. Pronouns are, of course, other instances of anaphoric noun phrases, at least when they occur unstressed. Pronouns may, obviously enough, occur stressed under a number of conditions, such as deictic use, contrast etc:

- (33) a. Helen detests thém. [pointing]
- b. Hélen detests Hárry, and hé detests hér. [contrast]

Semantic-syntactic conditions such as deictic use, contrast, anaphora etc. are independent of purely lexical properties, and NSR would have to take account of only non-lexical facts in order to handle such cases. In other words, NSR seems from B's examples NOT to depend on any purely lexical idiosyncrasies. For this reason, her argument against the alternative of having NSR apply independently of lexical items fails; the alternative of having NSR applying before lexical insertion remains open.

It should be noted that there is an empirical question here. Logically possible counter-examples to this alternative proposal do exist. Let us consider what such a counter-example would be like, i.e. what sort of condition would be necessary in order for NSR to depend upon purely lexical, not syntactic-semantic, information. One possibility is that, if NSR were to depend upon the length of lexical morphemes, the quality of the vowels, or the like, then one might want to say that NSR depended on purely lexical information that was not syntactic or semantic. This possibility will be discussed in §6, below.

So far we have seen that there is an alternative to 29a in B's argument (but see §6, below). There is also an alternative to 29c, which says that lexical insertion must precede word-stress assignment. Since B is assuming the possibility of a lexicalist theory, containing a lexical component in which all derivational morphology takes place, there is no reason why word-stress assignment should not also take place in the lexical component, prior to lexical insertion. Summing up, the problems in B's argument are as follows: 29a may be false; there seem to be other alternatives, given Bresnan's evidence. 29c is false, since another alternative is possible. 29e does not follow from 29a-d. Thus B's argument fails for many reasons. However, even if it had been sound, the conclusion would not have followed, since the entire argument assumes that NSR is cyclical, which B has not shown.

4. Let us now turn to B's argument for the lexicalist hypothesis:

(34) ARGUMENT FOR LEXICALISM.

- (a) Prosodic stress rules like NSR require prior assignment of word stress.
- (b) Word-stress assignment must apply either to deep structures or in the lexicon.
- (c) Given that deep structure exists, lexical items are inserted before syntactic transformations, and so word-stress assignment precedes syntactic transformations.
- (d) If word stress is assigned prior to syntactic transformations, then it follows automatically that transformationally attached affixes are stress-neutral.
- (e) The lexicalist hypothesis claims that gerundive nominals are transformationally derived, while derived nominals are created by lexical rules and occur in deep structure.
- (f) Therefore, the lexicalist hypothesis predicts that gerundive nominal affixes are stress-neutral.
- (g) The long gerundive affix in English, *-ing*, happens to be stress-neutral.
- (h) Since 34g is predicted by 34a-d plus the lexicalist hypothesis, 34g provides one piece of confirmation for the lexicalist hypothesis, given the correctness of 34a-d.
- (i) If the lexicalist hypothesis is rejected, one would have to mark *-ing* as stress-neutral.
- (j) Such a marking is not needed, given the lexicalist hypothesis.
- (k) Therefore, the lexicalist hypothesis enables one to save an ad

hoc marking, and so the lexicalist hypothesis is superior in this respect to other alternatives.

The argument depends upon 34g. The data used by B are of this type:

- (35) a. Wanda's deriving the answer
- b. Wanda's dérivation of the answer.

35a has a gerundive nominal. Since *deriving* has the same stress as *derive*, the *-ing* is stress-neutral. 35b has the derived nominal *dérivation*, for which the stress is different than for *derive*. If we were to assume 34a-d, then it would in fact be the case that the stress neutrality of *-ing* in 35a is predicted by the lexicalist hypothesis. Moreover, 34i is correct in that any alternative to the lexicalist hypothesis would have to mark *-ing* as stress-neutral. The question to be raised is whether 34j is true, i.e. whether the lexicalist hypothesis can avoid such a marking. The crucial example here is:

- (36) the deriving of the answer.

Note that *deriving* here is not a gerundive nominal, but a derived nominal in the sense of Chomsky 1970. Such nominals fit into the derived nominal category since they take determiners, pronominal adjectives, and following prepositional phrases, as well as being impervious to the same transformations as other derived nominals. What is important about 36 for our purposes is that here *deriving* has the same stress pattern as *deriving* in 35a, and so *-ing* in 36 is stress-neutral. But since 36 is a derived, not a gerundive, nominal, the stress neutrality of *-ing* in 36 is not predicted by the lexicalist hypothesis. To account for 36, the lexicalist hypothesis would have to mark *-ing* as stress-neutral. For this reason, 34j is incorrect; the lexicalist hypothesis does not avoid such a marking. The argument therefore collapses. The facts of 35 turn out not to support the lexicalist hypothesis, but to be neutral. Thus, the argument fails, even if one assumes 34a-d. Of course, it fails for deeper reasons, since these are not obviously valid assumptions.

Incidentally, McCawley has observed (personal communication) that there is a more general principle concerning stress-neutral affixes than the one B proposes—namely, that all inflectional affixes are stress-neutral. This will account not only for *-ing*, but also for tenses, plurals etc.

5. On the basis of her claim that NSR is cyclic, B also claims (271) to show that McCawley's 1970 analysis of English as an underlying VSO language is incorrect. She uses the fact that McCawley proposes that English have VSO order throughout the cycle, becoming SVO by a postcyclic rule. Assuming that NSR is cyclic, B claims that McCawley would incorrectly predict 37a instead of the correct 37b.

- (37) a. *Jésus wépt.
- b. Jésus wépt.

Of course, B's argument against McCawley's proposal fails to hold, since she has not shown that NSR applies in the syntactic cycle.

B's argument for the cyclic nature of NSR fails in part because she does not show that QF and RCF are cyclic rules. It is important to note that, even if someone should show that these rules are cyclic, that would not be sufficient to

show that NSR APPLIES CYCLICALLY. It would show only that (a) NSR applies cyclically, or (b) NSR is a global rule applying postcyclically, but having a partially cyclic environment. B's argument against McCawley's analysis would hold only if she could show (a) and rule out (b) on empirical grounds; (b) alone would not be sufficient evidence against McCawley's analysis. If one is looking for such evidence, one has to do more than show that QF and RCF are cyclic rules, since that will not be sufficient to show that NSR APPLIES cyclically.

6. Let us now consider the difficulties mentioned in §1 above, as well as some others which we have not talked about yet. What is remarkable about B's facts is that they are restricted to a very small class of cases. In fact, the only cases that work by her treatment are direct object NPs which, prior to QF and RCF, have no clause-mates following them. In the following examples, 38 is the typical case that B's analysis covers. The rest are cases where her analysis yields the wrong result. I will use the asterisk to indicate that the sentence with the stress given is incorrect in my idiolect on a NON-CONTRASTIVE, NON-EMPHATIC reading, though it may be all right on contrastive or emphatic readings, or in other idiolects. I will also use the following notation: D = corresponding declarative sentence; B = Brennan's predicted stress; A = actual stress.

- (38) D: Sàm bought some books.
B: Which books did Sàm buy?
A: Which books did Sàm buy?
(39) D: Sàm collapsed at 10 o'clock.
B: *At what time did Sàm collapse?
A: At what time did Sàm collapse?
(40) D: Jòhn was traveling to some city.
B: *To what city was Jòhn traveling?
A: To what city was Jòhn traveling?
(41) D: Jòhn departed from some airport.
B: *From which airport did Jòhn depart?
A: From which airport did Jòhn depart?
(42) D: The prisoners escaped by a new method.
B: *By which method did the prisoners escape?
A: By which method did the prisoners escape?
(43) D: The prisoners escaped for a reason.
B: *For what reason did the prisoners escape?
A: For what reason did the prisoners escape?
(44) D: Jòhn gave flowers to some girls.
B: *To which girls did Jòhn give flowers?
A: To which girls did Jòhn give flowers?

Only 38 works by B's analysis; the rest fail.⁵ Late in her paper, B suggests a modification of the NSR to handle cases like 44. She suggests that perhaps all primary elements to the right of the verb should retain primary stress when NSR applies, and keep that stress 'until the late application of a rhythm rule' (274),

⁵ In 39 and 42, the D sentences are not exactly parallel to the B and A ones, because the corresponding sentences would be ungrammatical for reasons having nothing to do with

which I will call the 'new rhythm rule'. This solution, involving an additional rule, would account for 44 as well as for such cases as *For what reason did Jòhn give flowers to Mary?* and *To whom did Jòhn give flowers?* However, this is not a general solution at all, since it will still not account for 39-43. What is interesting about 44, as well as 39-43, is that they are predicted by the old, pre-Brennan NSR, applying to surface structure, but not in the cycle. If one tried to keep NSR in the cycle, as B proposes, one would then have to add still another new rule applying to surface structure to give the correct stress in most cases.

I would like to suggest that 39-44 should be handled by the old NSR applying to surface structure, like other phonological rules. To handle the relatively small percentage of cases discussed by B, I would suggest adding not two extra correction rules, but rather a global condition on NSR. Assuming for the moment that QF and RCF are postcyclic rules, we can state the old NSR as 45 and the new NSR as 46. Incidentally, I am assuming, for the sake of discussion, a version of NSR where stress is assigned to syntactic constituents. I do this just to leave open for the moment the alternative that lexical items are inserted after stress contours are determined. Nothing important hangs on this particular formulation, and it can be changed easily enough if the facts warrant it. What is of interest is only the difference between 45 and 46:

- (45) Old NSR (APPLIES TO SURFACE STRUCTURE IN THE PHONOLOGICAL CYCLE).

In constituent A, put /-stress on constituent B if

- (a) B is stressable, and
(b) there is no constituent C, such that C is to the right of B and C bears /-stress.

The statement 'B is stressable' is to rule out cases like anaphoric noun phrases, which are not stressable. Any formulation of NSR will have to distinguish stressable from non-stressable constituents in some way. Since that is not an issue here, I have simply used the fudge 'B is stressable'.

- (46) NSR, FIRST REVISION (APPLIES TO SURFACE STRUCTURE IN THE PHONOLOGICAL CYCLE).

In constituent A, put /-stress on constituent B if

- (a) B is stressable; and either
(b) in logical structure B is a direct object,⁶ and in shallow structure B has no clause-mates following it, or

stress. They would be:

?Sam collapsed at some time.

?The prisoners escaped by a method.

In order to make B's proposal work for 39 and 42, stress would have to be assigned as follows:

*Sam collapsed at some time.

*The prisoners escaped by a method.

Such an assignment of stress makes the sentences considerably worse.

⁶ In generative semantics, a derivation of a sentence consists of a sequence of phrase-markers $P_1, \dots, P_n$, where P_i is the logical structure of the sentence, and P_n is its surface structure. The direct object of a 2-place or 3-place atomic predicate is defined as that atomic predicate's last argument. Thus, in $\text{hit}(x, y)$ and in $\text{give}(x, z, y)$, the variable y is the direct object of hit and give .

- (c) in surface structure there is no constituent C such that C is to the right of B and bears *I*-stress.

Note: The word *or* is taken as imposing disjunctive ordering. Consequently, if 46b holds, 46c does not come into consideration.

The difference between 45 and 46 is that we have added the disjunctive condition 46b, which is a global condition. If QF and RCF are postcyclic, then B's cases will be handled by 46b. All the other cases cited above, namely those like 39-44, will be handled completely by 46c. No new rhythm rule will be needed. And the revised NSR can apply to surface structure, just like all other phonological rules. The effect of 46b is to pick out the correct surface constituent B to which NSR gives stress. The criteria by which B is picked out involve looking back to the corresponding node at an earlier stage of the derivation.

Rule 46 not only handles 39-44, but in addition makes correct predictions in two interesting cases not discussed above. First consider the following:

- (47) D: The girls were intrigued by some books.
 B: *Which books were the girls intrigued by?
 A: Which books were the girls intrigued by?
 (48) D: Those new cars were sold by some dealers.
 B: *Which dealers were those new cars sold by?
 A: Which dealers were those new cars sold by?

In such passive sentences, B's analysis gives the wrong results. This is predicted by 46, which states that B's cases only involve underlying direct objects. In 47-48, the questioned NP's are not underlying direct objects; hence, 46c applies, and 48 is treated just as it would be by the old NSR.

Another contrast predicted by 46 is the following, where B would predict 49c:

- (49) a. Which *umbrellas* were the *mèn* given?
 b. Which *mèn* were the *umbrellas* given to?
 c. Which *mèn* were the *umbrellas* given to?

The reason for the difference is clear. In each case, *mèn* is the underlying indirect object, while *umbrellas* is the underlying direct object. Thus, when *umbrellas* is questioned in the first example, 46b applies, since *umbrellas* is an underlying direct object. However, 46b will not apply to *mèn*.

The notion of direct object seems to play an important role in distinguishing those cases that work by the old NSR and those that work like B's examples. Consider, for example, a sentence which is ambiguous in the declarative, where a given NP can be understood either as a direct object or as part of an adverbial:

- (50) The *mèn* are competing for those countries.

Here the verb can be understood as *compete for*, with *those countries* as direct object. In this sense, there would be certain countries up for grabs, with the men trying to win them. Or the verb may be just *compete*, and *for* may mean 'on behalf of', in which case *those countries* would be part of an adverbial and not a direct object. Now consider the following:

- (51) a. Which countries are the *mèn* competing for?
 b. Which countries are the *mèn* competing for?

In 51a, *which countries* can only be the direct object of *competing for*; the sentence has the meaning 'Which countries are the men trying to win?' But 51b may also have the sense 'Which countries are the men competing on behalf of?'; for many speakers it will be ambiguous, as discussed below. The difference between 51a and 51b is predicted by 46. In 51a, 46b applies; while in 51b, 46c applies. B's rule implies that both readings should have the stress of 51a, and that 51b should be impossible.

The facts stated above seem to hold for most of the speakers I have checked with, though not for all. A significant number of speakers allow both the stress assigned by the old NSR and the stress assigned by the revised NSR. For these speakers, 46b seems to be optional. This defines one dialect split with respect to the NSR.

Let us now turn to an even more striking global aspect of NSR. Most of the speakers that I have checked with confirm the facts (with non-contrastive stress) as given below—though as before, there are some speakers who permit both (or cannot tell the difference between) B's prediction and the actual data for most other speakers, which is given in the A sentences.

- (52) D: It is likely that he'll solve some problems.
 B: *Which problems is it likely that he'll solve?
 A: Which problems is it likely that he'll solve?
 (53) D: Sám persuaded Hàry to criticize some books.
 B: *Which books did Sám persuade Hàry to criticize?
 A: Which books did Sám persuade Hàry to criticize?
 (54) D: Sám, persuaded his wife to order some books for him.
 B: *Which books did Sám, persuade his wife to order for him?
 A: Which books did Sám, persuade his wife to order for him?
 (55) D: Probléms are tóugh to sólve.
 B: Which probléms are tóugh to sólve?
 A: Which probléms are tóugh to sólve?
 (56) D: It is tóugh to solve probléms.
 B: *Which probléms is it tóugh to solve?
 A: Which probléms is it tóugh to solve?

Let us apply the term 'Dialect X' to the speech in which 52-56 are valid. For speakers of this dialect, B's predictions do not hold when the direct object NP is questioned out of an embedded sentence.⁷ In such cases, the result is the same as if the old NSR has applied. We can account for such cases by adding another condition to 46b:

- (57) NSR, SECOND REVISION (APPLIES TO SURFACE STRUCTURE IN THE PHONOLOGICAL CYCLE).

⁷ I assume that Dialect X contrasts with a hypothetical Dialect Y in which all the B sentences in 52-56 were unstarred and all the A sentences in 52-54 and in 56 were starred. B's rule predicts only the facts of such a Dialect X, and is incompatible with Dialect X. So far, I have found only speakers of Dialect X. But if there do turn out to be speakers of Dialect Y, B's claim is still falsified by the very existence of the speakers of Dialect X, since it follows from her proposal that such a dialect is impossible.

In constituent A, put *I*-stress on constituent B if

- (a) B is stressable; and either
- (b) in logical structure B is a direct object, and in shallow structure B has no clause-mates following it, and in surface structure B is a clause-mate of its logical predicate P; or
- (c) there is no constituent to the right of B bearing *I*-stress.

By adding, in 57b, that in surface structure B must be a clause-mate of its logical predicate P (B is the direct object of P in logical structure), we have cut down the number of cases to which 57b applies, and we enable 52-56 to be handled by clause 57c, which has the effect of the old NSR. With the added global condition on NSR, the facts of 52-56 can be handled naturally, considering the complexity of the data.⁸

Suppose, however, that someone were to try to keep B's proposal, and to try in addition to handle the facts of Dialect X. First, he would need at least one extra rule to handle 39-44 and 47-51. However, it appears that such an extra stress-change rule would have to be global. At least I cannot imagine how any non-global rule could account for 47-51. Of course, some notational equivalent might be proposed—e.g., putting some special mark on all underlying direct objects, and then stating the additional stress-change rule in terms of such a marking. But whatever proposal one makes, 47-51 require the distinction between underlying direct objects and other underlying constituents.

If one tried to preserve B's analysis and account for 47-51 with a late stress-change rule, one would need still another stress-change rule to account for 52-56. Such a rule would also have to be global, since one would need to know, in the case of questions, just where the questioned NP originated (was it from an embedded sentence or not?) before one knew whether to apply the rule. So far as I can determine, there is no way of accounting for the facts of 47-56 without global rules or some notational equivalent. Given this, 57 would appear to be the best solution. It does not require positing any new rhythm rules or other extra stress-change rules, nor does it require the APPLICATION of any phonological rule to any pre-surface level. All it requires are global conditions on the old NSR, with NSR applying to surface structure as usual. It is a natural alternative compared to what one would have to do to retain B's proposal—namely, put the old NSR in the cycle and add two global stress-adjustment rules; this would contain all the complexity of 57, plus the added mess of trying to readjust the secondary and tertiary stresses correctly. Having the rule apply just once with global conditions avoids readjustment rules and automatically takes care of the secondary and tertiary stress placement.

So far I have spoken only of questions. Let us now turn to relative clauses. What I would like to show is that conditions like 46 and 57 will apply automatically in the relative clause cases, provided that we assume a certain convention, governing identity-of-reference deletions, that is needed on independent grounds.

⁸ B (274-5) discusses the *Tough*-movement examples at some length. It should be noted that 57 accounts automatically for all the *tough*-movement cases under the traditional analysis given by Postal 1970b. There is no need to resort to B's strange proposal for an embedded VP without an embedded S.

Identity-of-reference deletions involve two coreferential NP's, a vanishing NP and a triggering NP. I propose that the rule of deletion not simply wipe out the vanishing NP, but rather that it superimpose the vanishing NP over the triggering NP, keeping both NP nodes. (For theoretical details on how this can be done, see Lakoff, ms.) The principal motivation for such a convention is the phenomenon of case agreement, discussed in the Appendix, below. If one adopts such a convention, then RCF will work according to it, and the underlying object of *want* in 58 will be superimposed on the head NP of the relative clause *the books*:

- (58) I gave John the books he wanted.

Thus *the books* will meet the conditions of 57b, which will account for the stress in 58.

As was pointed out in §1, relative clauses do not work in quite the same way as questions; for many speakers, stress can go either on the head of the relative clause or on the last stressable element of the relative clause. Apparently 57b is optional for such speakers if constituent B is part of a relative clause.

In §2, I pointed out that B fails to show that QF and RCF are cyclic rules. This, of course, does not mean that they must be postcyclic rules. It only means that there is no evidence one way or the other. Suppose, however, someone were to find evidence showing that QF and RCF were cyclic. How would this affect the analysis proposed in 57? The answer is that it would hardly affect it at all. Only one change would be necessary. In place of 'shallow structure', we would put 'the phrase-marker at the end of the first cycle on B'—or in the notation adopted in my Appendix, below, $P_{\text{end}(B)}$. Such a change would simply give a partially cyclical environment to NSR. Moreover, such a change would be completely consistent with McCawley's analysis of English as a VSO language. Consider Bresnan's proposed counter-example (= 37, above):

- (59) a. *Jésus wépt.
b. Jésus wépt.

57b would not apply to either *Jésus* or *wépt*, since neither is a direct object. Thus only 57c, which is the equivalent of the old NSR, would apply. Since the verb would have been moved into second position by the time surface structure was reached, 59b would result. I do not know of any nasty theoretical consequences that follow from making part of the environment of 57 cyclic in the way suggested above. Since no evidence remains to suggest that QF and RCF are cyclical, I will continue to assume that 57 need not be so changed.

Let us finally return to the question of whether NSR must apply after lexical items have been inserted. Note that the answer to this question can have no interesting syntactic consequences such as B suggests, since NSR can be taken as applying to surface structures, and every theory of grammar ever seriously proposed has had lexical items in surface structure. As it turns out, there is some evidence suggesting that lexical insertion may precede the APPLICATION of NSR, though not necessarily its global environments. Most of the speakers I have checked with confirm the following:

- (60) a. The cars whose engines he fixed.
b. The cars whose engines he guaranteed.

- (61) a. Whose umbrella have I taken?
b. Whose book did the reviewer criticize?
- (62) a. I gave John the book that Ted wanted.
b. I gave John the book that Robespierre wanted.
- (63) a. I pointed out the house Ed mentioned.
b. I pointed out the house that the enemy bombers had destroyed.
- My guess is that the difference between the (a) and (b) sentences somehow involves length. Longer verbs such as *guarantee* and *criticize*, as opposed to *fix* and *take*, seem to contribute to overriding 57b, and therefore to stress placement according to the old NSR. Moreover, the amount of material between the end of the sentence and the questioned NP or head NP of the relative clause also seems to matter:

- (64) a. Which car did he buy?
b. Which car did he guarantee?
c. Which car did the timid little clerk who works in our office buy?

Similarly, long nouns like *umbrella* as opposed to *car* contribute to tipping the scales in the other direction. Since the application of NSR seems to be influenced by the length of lexical items, it would seem that lexical insertion would have to precede the application of NSR. However, I am not at all sure that my proposal about length is correct, so I will refrain from drawing any conclusions.

One final remark should be made concerning dialect variations. I am sure that for a significant number of speakers, the data in 39-44 and 47-56 are correct. I am also sure that a significant number of speakers cannot distinguish between the stress assigned by the old NSR and that assigned by the revised NSR. Beyond this I am not sure of very much about NSR dialects. I hope that someone will undertake a serious study of the matter.

7. We have seen so far that the facts of English indicate that NSR cannot be in the syntactic cycle, as B claims, but must be global and in the phonological cycle. But what if the facts had come out otherwise? Suppose the facts of English did not contradict the cyclic NSR proposal. Then the claim that NSR applies in the syntactic cycle would still not necessarily be correct. There would still be a global alternative:

- (65) ГЛОБАЛЬНЫЙ NSR.
In constituent A, put 1-stress on constituent B if
(a) B is stressable; and
(b) there is no constituent C in A such that
(α) in $P_{\sigma(A)}(B)$, C is to the right of B, and
(β) C bears 1-stress (at the point of application of the rule).

(Recall that $P_{\sigma(A)}(B)$ is the phrase-marker at the end of the first syntactic cycle on B.)

Except for the reference to $P_{\sigma(A)}(B)$, 65 is equivalent to 45, the old NSR, which has surface structure instead. The question would then boil down to this. Should one have the old NSR apply at the end of the syntactic cycle? Or should one have 65, which differs from the old NSR only in mentioning the end of the syntactic cycle, apply to surface structure in the phonological cycle, like other phonological

rules? Moreover, would there be a principled reason for choosing one or the other alternative?

I think there would be a principled reason for choosing 65 rather than having the old NSR apply in the syntactic cycle. When one has a rule apply in the syntactic cycle, one is claiming implicitly that it is conceivable that the output of that rule could create an environment which another syntactic rule, either cyclic or postcyclic, could require for correct application. If one has the rule apply after all syntactic rules, but with a global environment, one is making the claim that no syntactic rule ever crucially depends on the output of that rule for its correct application, and moreover that NO SYNTACTIC RULE COULD EVER CRUCIALLY DEPEND ON THE OUTPUT OF THAT RULE. The latter is a stronger claim. Given that one should always make the strongest claims possible in choosing between alternative grammars, we have a basis for choosing 65.

It is important to note that none of the rules that really apply in the syntactic cycle—Passive, Dative Shift, Subject Raising etc.—can be reformulated as global rules applying after all other syntactic rules. Each of these rules creates an environment necessary for the correct application of other syntactic rules. This is not true of NSR. No known syntactic rule requires the prior application of NSR in the same sense that, say, Question Formation requires the prior application of Passive. Allowing the possibility that NSR could apply in the cycle makes the implicit claim that there could be a cyclic syntactic rule that applied to elements carrying primary stress on the given cycle, but with other stress in surface structure. I think it is safe to assume that there can be no such cyclic syntactic rule. Certainly no such rule is presently known to exist. Thus, I would propose the following as a principle of grammar:

- (66) The late application of a rule with a global environment mentioning an earlier stage of the derivation is preferable to having that rule apply at that earlier stage without the global environment (all other things being equal, of course).

This will always lead to stronger claims, since it will, when followed, predict less interaction with already existing rules. Actually, we can state a more general principle, from which 66 will follow:

- (67) It is preferable to have a rule apply late rather than early (all other things being equal).

Principle 67 has the following corollary:

- (68) It is preferable for a rule to apply postcyclically rather than cyclically (all other things being equal).

If we adopt 67, then 66 will follow from it (given that global rules are needed anyway). And given 66, we have a basis for choosing 65 over the proposal for having the old NSR apply in the syntactic cycle.

It is interesting that there is a principled basis for choosing, in certain types of circumstances, a rule with a global environment over a corresponding non-global rule plus an ordering statement. Of course, since ordering statements, such as the requirement that a rule apply cyclically, are but another type of global constraint on derivations, this result should not be too surprising.

APPENDIX

As was shown in Lakoff 1970a, case agreement in Greek involves a global rule which mentions corresponding nodes at non-adjacent points in a derivation. In general, an adjective or participle in Greek agrees in case with what might be called its 'cyclical subject', i.e. its subject at the end of the first cycle on that adjective or participle. This concept can be defined easily enough. Let us call such an adjective or participle 'V'. We define the HEIGHT of V, H(V), as follows:

- (69) $H(V) = 1 +$ the number of S-nodes commanded by V in logical structure.

Let us call the phrase-marker at the end of the *n*th cycle ' $P_{(n)}$ '. The 'potential subject' of a predicate V in a P-marker is the leftmost NP which is a peer of V in that P-marker.⁹ The phrase-marker which is the output of the first cycle on a predicate V will be ' $P_{(H(V))}$ '. The potential subject of V in $P_{(H(V))}$ will be called the 'cyclical subject of V'. The rule of Greek case agreement, stated informally, is simply:

- (70) An adjective or participle in surface structure agrees in case with its cyclical subject.

This is a global rule since the global notion 'cyclical subject' (or sometimes, as in the case of preposed object clitic pronouns in French, 'cyclical object') is probably the one universally relevant for agreement rules. Let us now turn to cases in Greek where the cyclical subject of some adjective or participle is deleted under coreferentiality. What we find is that the adjective or participle now agrees with the NP that triggered the deletion of its cyclical subject. If we assume that the deletion rule involves the superimposing of the vanishing NP over the triggering NP, we can leave 70 as it stands and account automatically for all the following examples:¹⁰

- (71) *Ho anēr estin agathós.* 'The man (nom.) is good (nom.)'
 (72) *Nomizō tōn andra einai agathón.* 'I think the man (acc.) to be good (acc.)'
 (73) *Ho anēr nomizetai einai agathós.* 'The man (nom.) is thought to be good (nom.)'
 (74) *Gignōskomen tōn andra nomizomenon einai agathón.* 'We know the man (acc.) to be thought (acc.) to be good (acc.)'
 (75) *Ho anēr gignōsketai nomizomenos einai agathón.* 'The man (nom.) is known to be thought (nom.) to be good (nom.)'
 (76) *Khrēmata edomen tō andrī hōs elégelo einai agathós.* 'We gave money to the man (dat.) who (nom.) was said to be good (nom.)'
 (77) *Khrēmata edomen tō andrī legoménō einai agathō.* 'We gave money to the man (dat.) said (dat.) to be good (dat.)'
 (78) *Ho anēr ethēlei einai agathós.* 'The man (nom.) wants to be good (nom.)'
 (79) *Gignōskō tōn andra ethelonta einai agathón.* 'We know the man (acc.) to want (acc.) to be good (acc.)'
 (80) *Ho anēr gignōsketai ethelōn einai agathós.* 'The man (nom.) is known to want (nom.) to be good (nom.)'
 (81) *Khrēmata edomen tō andrī hōs elégelo ethelēin agathós einai.* 'We gave money to the man (dat.) who (nom.) was said to want to be good (nom.)'
 (82) *Khrēmata edomen tō andrī legoménō ethelēin einai agathō.* 'We gave money to the man (dat.) said (dat.) to want to be good (dat.)'

Whenever a participle or adjective is supposed to agree with an NP that vanishes due to an identity-of-reference deletion, that participle or adjective agrees instead with the NP that triggered the deletion. If the triggering NP later vanishes, then the adjective or participle agrees with the new triggering NP, and so on. If identity-of-reference deletion is conceived of as superimposing the vanishing NP on top of the triggering NP, keeping both nodes, then the original NP node remains in the tree, though it has 'vanished' from its original position. It is for this reason that 70 will work in cases like 82, where two identity-of-reference dele-

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tion rules have applied. The cyclic subject of *agathós* winds up superimposed on *andrī*, which is dative. By rule 70, the adjective turns up in the dative *agathō*.

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⁹ For a discussion of the concept of a 'peer', see Postal 1970b.

¹⁰ I am grateful to Robin Lakoff and Gerda Seligson for these examples.