the example sentences changed, would be perfectly applicable to French, point by point. To what extent they are applicable to other languages, related and unrelated, is of course a matter of further empirical study. The definitions and principles that have been formulated here are probably not fully correct in their present form, but they are claimed to represent at least approximations to some aspects of linguistic reality. In particular, it is suggested that a rather abstract view of the relations holding among constituents in a tree structure is relevant in .constraining the application of transformational rules.

13

On the Cyclic Nature
of English Pronominalization

JOHN ROBERT ROSS

In this paper, I will attempt to show that certain facts about anaphoric pronouns in English can be easily accounted for if the rule which introduces them is an obligatory, cyclically ordered transformation.[1] These facts are thus not only interesting for their own sake, but also because they provide direct evidence for the correctness of Chomsky's theory of grammar, for it is only within this theory that cyclically ordered rules are countenanced.

I will assume that structures underlying sentences like (1a) must be converted into those that underly (1b) or those that underly (1c) by a transformational rule of PRONOMINALIZATION.

(1)(a) *After John Adams$_i$ woke up, John Adams$_i$ was hungry.*
   (b) *After John Adams$_i$ woke up, he$_i$ was hungry.*
   (c) *After he$_i$ woke up, John Adams$_i$ was hungry.*

This rule replaces some noun phrase (*NP*) in a structure by a definite pronoun of the appropriate gender and number, when the first *NP* is *in the environment of*

[1]The notion of the transformational cycle was first presented in Noam Chomsky, *Aspects of the Theory of Syntax* (Cambridge, Mass.: M.I.T. Press, 1965). Readers unfamiliar with the general framework of transformational generative grammar, which is presupposed in the present study, should refer to the above mentioned work by Chomsky and its extensive bibliography.

another *NP* which is identical to the first.[2] It is the purpose of this paper to provide a partial explication for the italicized phrase in the preceding sentence.

Notice that PRONOMINALIZATION must be allowed to work in two directions: it must be able to replace an *NP* to the right of an identical *NP* with a pronoun (as in the conversion of (1a) to (1b)),[3] and it must also be able to replace an *NP* to the left of an identical *NP* with a pronoun (as in the conversion of (1a) to (1c)). I will call the former FORWARD PRONOMINALIZATION and the latter BACKWARD PRONOMINALIZATION. Both forward and backward pronominalization can apply to the (a) versions of examples (2)–(6), as is shown by the (b) and (c) versions.

(2)(a) *That Oscar$_i$ was unpopular didn't disturb Oscar$_i$.*
  (b) *That Oscar$_i$ was unpopular didn't disturb him$_i$.*
  (c) *That he$_i$ was unpopular didn't disturb Oscar$_i$.*
(3)(a) *For your brother$_i$ to refuse to pay taxes would get your brother$_i$ into trouble.*
  (b) *For your brother$_i$ to refuse to pay taxes would get him$_i$ into trouble.*
  (c) *For him$_i$ to refuse to pay taxes would get your brother$_i$ into trouble.*
(4)(a) *Anna's complaining about Peter$_i$ infuriated Peter$_i$.*
  (b) *Anna's complaining about Peter$_i$ infuriated him$_i$.*
  (c) *Anna's complaining about him$_i$ infuriated Peter$_i$.*
(5)(a) *The possibility that Fred$_i$ will be unpopular doesn't bother Fred$_i$.*
  (b) *The possibility that Fred$_i$ will be unpopular doesn't bother him$_i$.*
  (c) *The possibility that he$_i$ will be unpopular doesn't bother Fred$_i$.*
(6)(a) *Whether the mayor$_i$ plans to leave wasn't made clear by the mayor$_i$.*
  (b) *Whether the mayor$_i$ plans to leave wasn't made clear by him$_i$.*
  (c) *Whether he$_i$ plans to leave wasn't made clear by the mayor$_i$.*

However, it is not always the case that PRONOMINALIZATION can work in both directions: in the sentences in (7)–(12), which are transformationally related to those in (1)–(6) by a number of rules which I will not describe in detail here, only forward pronominalization is possible.

(7)(a) *John Adams$_i$ was hungry after John Adams$_i$ woke up.*
  (b) *John Adams$_i$ was hungry after he$_i$ woke up.*
  (c) **He$_i$ was hungry after John Adams$_i$ woke up.*[4]

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[2] As Chomsky points out, op. cit., pp. 145–146, the notion of identity that is of interest in linguistics includes identity of reference. The second occurrence of *John Adams* in the sentence *John Adams injured John Adams* is understood to have a different referent than the first, while *himself* in *John Adams injured himself* is understood to have the same referent as the subject. Chomsky suggests that certain lexical items be assigned referential features, say integers, and that rules which require identity between lexical items, such as REFLEXIVIZATION and PRONOMINALIZATION, may only apply to *NP* which have been assigned the same integer. Thus two occurrences of the *NP John Adams* will refer to the same individual if they have identical subscripts (as in (1a)), but *John Adams$_i$* and *John Adams$_j$* can never refer to the same individual, for *i* not equal to *j*.

[3] I will use the locution "sentence *A* is converted (transformed, etc.) into sentence *B*" for the more precise, but cumbersome, phrase: "the structure underlying sentence *A* is converted (transformed, etc.) into the one underlying sentence *B*." No theoretical significance should be attached to this abbreviation.

[4] Ungrammatical sentences are prefixed by an asterisk, doubtful ones by a question mark. Note that the string of words in sentence (7c) is only ungrammatical if the pronoun *he* is meant to refer to the same individual as the phrase *John Adams* in the subordinate clause. If *he* refers to someone else (*Washington*, for example) the string of words in (7c) is grammatical. But in the

(8)(a) *Oscar$_i$ wasn't disturbed that Oscar$_i$ was unpopular.*
  (b) *Oscar$_i$ wasn't disturbed that he$_i$ was unpopular.*
  (c) **He$_i$ wasn't disturbed that Oscar$_i$ was unpopular.*
(9)(a) *It would get your brother$_i$ into trouble for your brother$_i$ to refuse to pay taxes.*
  (b) *It would get your brother$_i$ into trouble for him$_i$ to refuse to pay taxes.*
  (c) **It would get him$_i$ into trouble for your brother$_i$ to refuse to pay taxes.*
(10)(a) *Peter$_i$ was infuriated at Anna's complaining about Peter$_i$.*
  (b) *Peter$_i$ was infuriated at Anna's complaining about him$_i$.*
  (c) **He$_i$ was infuriated at Anna's complaining about Peter$_i$.*
(11)(a) *Fred$_i$ isn't bothered by the possibility that Fred$_i$ will be unpopular.*
  (b) *Fred$_i$ isn't bothered by the possibility that he$_i$ will be unpopular.*
  (c) **He$_i$ isn't bothered by the possibility that Fred$_i$ will be unpopular.*
(12)(a) *The mayor$_i$ didn't make clear whether the mayor$_i$ plans to leave.*
  (b) *The mayor$_i$ didn't make clear whether he$_i$ plans to leave.*
  (c) **He$_i$ didn't make clear whether the mayor$_i$ plans to leave.*

The two grammatical sentences in (1) and the one in (7) are derived from exactly the same deep structure—the only difference between them is that in the derivation of the sentences in (1), an optional rule of ADVERB PREPOSING applies to move the *after*-clause to the front of the sentence. The fact that only forward pronominalization is possible in (7), whereas either direction is possible in (1), can be explained by making PRONOMINALIZATION a cyclic rule, ordering it after ADVERB PREPOSING, which may apply or not. If only examples (1)–(12) are considered, it might seem possible to advance an alternative hypothesis: one might argue that PRONOMINALIZATION applies to the deep structure of these sentences, before any other transformational rules have applied, and that it is free to apply either forward or backward. A rule formulated in this way would generate sentences (7c) and (12c), but it might be claimed that the rules of PASSIVE and ADVERB PREPOSING could then be made to apply to such sentences obligatorily to convert them into the acceptable (1b) and (6b), respectively. But, even if we charitably overlook the difficult problem of how the restrictions on these two rules are to be stated (and, incidently, many similar restrictions would be needed for other rules), it is easy to show that this alternative proposal cannot overcome the difficulties posed by sentences like those in (13).

(13)(a) *Sheila$_i$ answered that question, but Sheila$_i$ still did poorly.*
  (b) *Sheila$_i$ answered that question, but she$_i$ still did poorly.*
  (c) **She$_i$ answered that question, but Sheila$_i$ still did poorly.*

If backward pronominalization converts (13a) into (13c), an ungrammatical sentence will result; for *but*-clauses cannot be preposed, as can be seen from the ungrammaticality of (13d),

(13)(d) **But Sheila$_i$ still did poorly, she$_i$ answered that question.*

and there is no other transformational rule which could apply to (13c) to save it from ungrammaticality.

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latter case, *he* would have to have a different subscript, say *j*, from the *NP John Adams*, by the convention adopted in footnote 2 above. That is, in such a case, *he* would not be an anaphoric pronoun for some *NP* occurring elsewhere in the same sentence, but would rather be a substitute for some *NP* in an earlier sentence. In this study, I will only be concerned with pronouns which bear an anaphoric relationship to some *NP* occurring in the same sentence.

These facts suffice to reject the proposal that PRONOMINALIZATION should be ordered so as to precede all other transformational rules: it depends on, and thus must operate after, at least the two rules of ADVERB PREPOSING and PASSIVE. Since the latter rule can be shown to necessarily be in the transformational cycle, PRONOMINALIZATION cannot be a precyclic rule.[5] If it cannot apply before the cycle, it must either apply in the cycle or after all cyclic rules have been applied—rules of this last type are called *postcyclic*.[6] Exactly what rules are precyclic, or postcyclic, and why, is not directly relevant to the problem of PRONOMINALIZATION. What is relevant in establishing the claim that this rule is cyclic is the claim made in the present theory of grammar that transformational rules can only be precyclic, cyclic, or postcyclic. I have already shown that PRONOMINALIZATION cannot be precyclic, and facts I will present below will prove that it cannot be postcyclic. The only remaining possibility is that it is cyclic.

Examples (7)–(12) show that PRONOMINALIZATION cannot always be applied backward; example (14) shows that it cannot always be applied forward.

(14)(a)   *Realizing that Oscar$_i$ was unpopular didn't disturb Oscar$_i$.*
   (b)   **Realizing that Oscar$_i$ was unpopular didn't disturb him$_i$.*
   (c)   *Realizing that he$_i$ was unpopular didn't disturb Oscar$_i$.*

Note that (14) differs from (2), in which both forward and backward pronominalization are possible, only in that the former contains the word *realizing* and the latter

(15)

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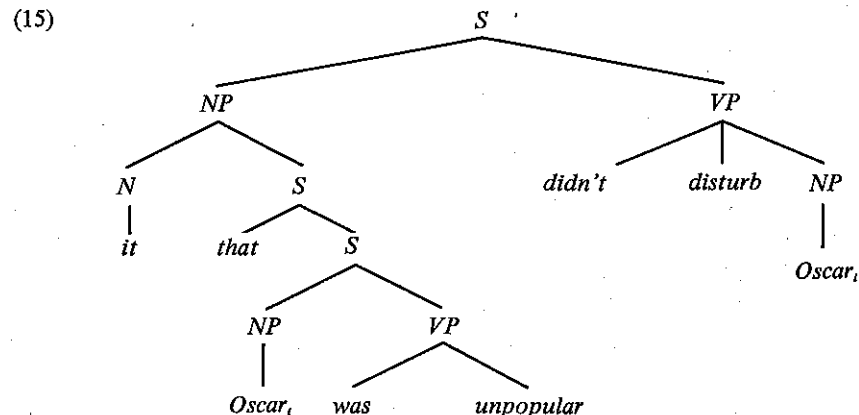
[5] In Chapter 1 of his forthcoming book, *Deep and Surface Grammar* (Cambridge, Mass.: M.I.T. Press), George Lakoff defines more precisely the notion of *precyclic rule* and demonstrates that the theory of grammar must be expanded so that such rules are statable in the grammars of particular languages. These rules operate on underlying structures as a whole, and must be able to apply before any cyclic rules have applied. In the same chapter, Lakoff shows that the rule of PASSIVE must be cyclically ordered.

[6] The necessity of constructing the theory of grammar so that postcyclic rules, as well as precyclic and cyclic ones, may be used in writing grammars for particular languages has been realized for some time. An example of a rule which must apply postcyclically is the rule of RELATIVE CLAUSE REDUCTION, which deletes *who is* or *which is*, converting noun phrases containing full relative clauses (*a man who is from Boston*) into noun phrases with postnominal modifiers (*a man from Boston*). The arguments that show this rule to be postcyclic are complex, and I will not present them here.

does not. Nevertheless, as I will demonstrate below, the presence of this single word is traceable back to a radical difference in the deep structures of (2) and (14). (2) is derived from a structure which, for our purposes, can be adequately represented as in (15).[7]

Contrast (15) with (16), which underlies (14):

(16)
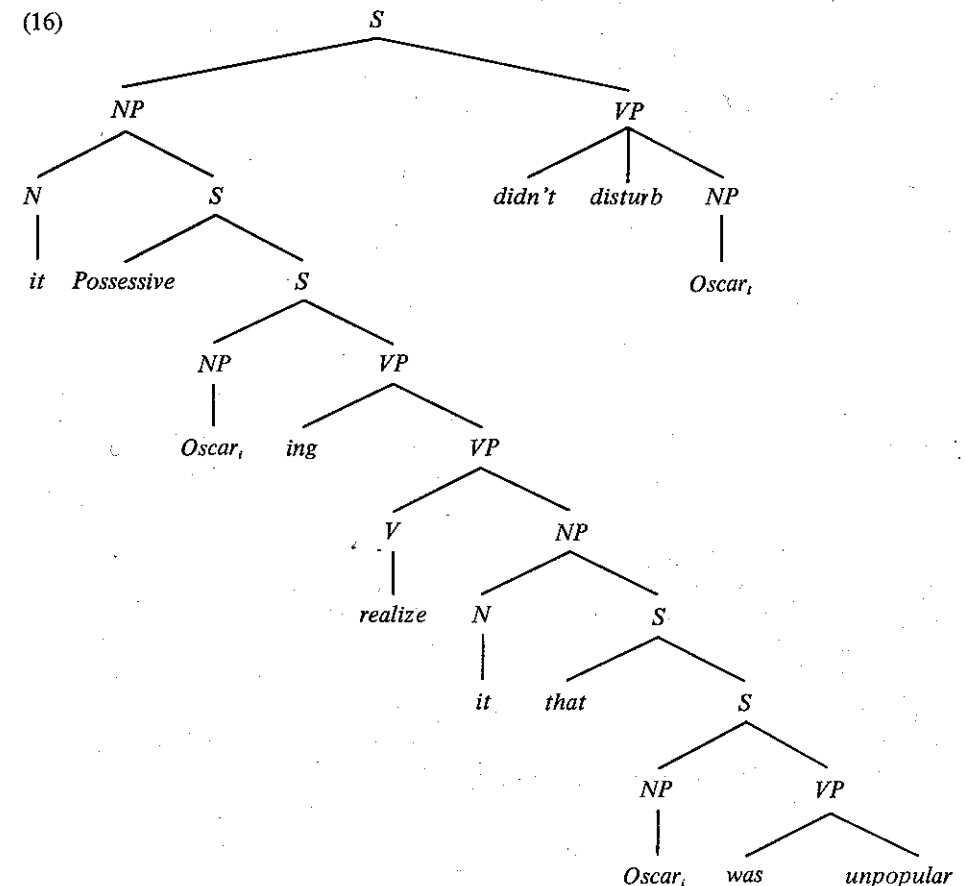
In the course of converting (15) and (16) into (2) and (14), respectively, various transformational rules must apply. These rules have been intensively investigated by Rosenbaum,[8] so I will not state them in any detail here, but merely describe their operation informally. If the optional rule of EXTRAPOSITION were to apply to (15), only forward pronominalization would be possible, and sentence (17) would be produced.

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[7] In (15), and throughout this paper, I have drastically simplified the constituent structures of the sentences under discussion where more detailed representations would not be relevant to the point at hand. In the case of (15) and (16), for example, I have not given the deepest structure, in which the complementizers *that* and *Possessive-ing* would not appear, but have rather assumed that a transformational rule of COMPLEMENTIZER PLACEMENT has already applied to insert them.

[8] Cf. Peter S. Rosenbaum, *The Grammar of English Predicate Complement Constructions* (Cambridge, Mass.: M.I.T. Press, 1967).

(17) *It didn't disturb Oscar$_i$ that he$_i$ was unpopular.*

If EXTRAPOSITION is not applied, an obligatory rule of IT-DELETION will delete the head noun of the subject *NP* of (15), the abstract pronoun *it*. The only other rule of interest here that remains to be applied is PRONOMINALIZATION, which can apply in either direction to (15). (18) gives a precise statement of the conditions under which PRONOMINALIZATION operates.

(18) PRONOMINALIZATION

$$\text{SD:} \quad X \; - \; \begin{bmatrix} NP \\ -Pro \end{bmatrix} \; - \; Y \; - \; \begin{bmatrix} NP \\ -Pro \end{bmatrix} \; - \; Z \quad \text{(oblig)}$$
$$\phantom{\text{SD:} \quad} 1 \qquad\quad 2 \qquad\; 3 \qquad\quad 4 \qquad\; 5 \quad ==\Rightarrow$$

$$\text{SC:(a)} \quad 1 \qquad\quad 2 \qquad\; 3 \qquad \begin{bmatrix} 4 \\ +Pro \end{bmatrix} \quad 5 \quad or$$

$$\text{(b)} \quad 1 \qquad \begin{bmatrix} 2 \\ +Pro \end{bmatrix} \qquad 3 \qquad\quad 4 \qquad\; 5$$

Conditions:

   (i) $2 = 4$

  (ii)   The structural change shown on line (a) above, FORWARD PRONOMINALIZA-TION, is subject to no conditions.

 (iii)   The structural change shown on line (b) above, BACKWARD PRONOMINALI-ZATION, is only permissible if the *NP* in term 2 of the structural description (SD) is dominated by (i.e. contained in) a subordinate clause which does not dominate (contain) the *NP* in term 4 of the SD.[9]

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[9]This formulation of the condition on backward pronominalization was arrived at independently by Paul Postal, by G. H. Matthews and Maurice Gross, and by George Lakoff and me. Also working independently, Ronald Langacker has proposed a nearly equivalent condition (cf. his recent "On Pronominalization and the Chain of Command" [in *MSE*]). Although there are cases where Condition (iii) and Langacker's condition, which he defines in terms of the extremely interesting notion of *command*, produce different results, the two conditions are near enough to being equivalent that I will not discuss their differences here.

It is a difficult and as yet unsolved problem as to whether a universal definition of the notion *subordinate clause* can be found. There are many languages in which subordinate clauses behave differently from coordinate ones (cf., for example, German, where verbs occur at the end of the *VP* in subordinate clauses only), but at present it is not known whether the environments which condition this differential behavior are the same in all languages which exhibit it. For the purposes of this paper I will assume that a specification must be made in the grammar of English as to which clauses are subordinate. These clauses include

(a) Clauses starting with *after, before, since, until, although*, etc.—clauses which have traditionally been called adverbial subordinate clauses. That pronominalization can work backwards into such clauses is shown by (1c).

(b) Complement clauses with the complementizer *that* (cf. (2c)), with *for-to* (cf. (3c)), and with *Possessive-ing* (cf. (4c)).

(c) Complement clauses in apposition to abstract nouns like *fact, idea, theory*, etc. (cf. (5c)).

(d) Embedded questions, such as the one in (6c) or the clauses which occur in the object of *wonder* in the following sentences:

I wonder $\left\{ \begin{array}{l} \textit{what he said.} \\ \textit{how he left.} \\ \textit{in what kind of automobile he escaped.} \\ \textit{how to convince Peter.} \\ \textit{etc.} \end{array} \right.$

Restrictive and nonrestrictive relative clauses raise special problems, which I will take up presently.

PRONOMINALIZATION does not, of course, apply on the first cycle in the derivation of either (15) or (16), for in this cycle, the structure being operated on is the one underlying the simple sentence *Oscar was unpopular*, which does not contain two identical noun phrases. In processing (15), the first cycle on which PRONOMINALIZA-TION could be applied is the one on the highest *S*. If forward pronominalization is carried out, sentence (2b) will result. Backward pronominalization is also possible, however, for the clause *that Oscar was unpopular* is a subordinate clause, and if the rule applies in this direction, (2c) results. Comparison of all sentences in examples (1)–(6) with those in examples (7)–(12) will reveal that backward pronominalization is possible in the former group because in these sentences, Condition (iii) on rule (18) is met. Since it is not met in the latter group of examples, only forward pronominalization is possible there.

In processing (16), PRONOMINALIZATION does not apply on the lowest cycle, for the same reasons as above. It is not until the cyclic rules are processing the sentence whose main verb is *realize* that the structural description (SD) of PRONOMINALIZA-TION is satisfied. At this point the input structure to the rule of PRONOMINALIZATION is the one underlying (19).

(19) **Oscar$_i$ realized that Oscar$_i$ was unpopular.*

I have prefixed (19) with an asterisk to indicate that it cannot occur as a grammatical sentence of English if the two occurrences of *Oscar* are taken to refer to the same individual. In other words, PRONOMINALIZATION *must* apply to (19) (and hence, on the cycle in question, to (16) as well).[10] PRONOMINALIZATION can apply forwards to (19) (cf. (20a)), but not backwards (cf. the ungrammaticality of (20b)), because in (19) the conditions under which backward pronominalization could apply are not met: the leftmost identical *NP*, the subject of the entire sentence, is not contained in *any* clause, subordinate or otherwise, which does not contain the second identical *NP*.

(20)(a) *Oscar$_i$ realized that he$_i$ was unpopular.*
    (b) **He$_i$ realized that Oscar$_i$ was unpopular.*

After PRONOMINALIZATION has converted (19) into (20a), the cycle of rules which applies to the sentence whose main verb is *realize* is completed, and the rules reapply to the next higher sentence in (16). When the highest sentence in (16) is reached, before any cyclic rules have applied, the structure being processed is the one underlying (21).

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[10]By the same token, the (a) versions of sentences (1)–(14) must also be indicated as being ungrammatical—I have left them unstarred only in the interests of expository simplicity.

There are various problems inherent in claiming that PRONOMINALIZATION is always obligatory. J. E. Emonds has called to my attention such sentences as the following:

Willy washed his car and then he polished $\left\{ \begin{array}{l} \textit{his car.} \\ \textit{it.} \end{array} \right\}$

in which, for most speakers, PRONOMINALIZATION is optional. I do not at present know under what conditions the rule is optional, but in all cases I have found so far, a coordinate structure was involved. However, for the purposes of the present argument, it is not required that the rule be obligatory under all circumstances, for it is sufficient that it is obligatory in such cases as (19).

(21) **Oscar's$_i$ realizing that he$_i$ was unpopular didn't disturb Oscar$_i$.*

For most speakers, (21) is ungrammatical: the noun phrase *Oscar's* must be deleted, producing (14c). The rule which accomplishes this I will refer to as EQUI NP DELETION —it deletes the subject *NP* of an embedded complement clause which contains the complementizers *Possessive – ing* or *for – to*, subject to the constraint that this *NP* be identical to some *NP* in the matrix sentence. Exactly which *NP* of the matrix sentence the embedded subject must be identical to is a complex and exceedingly interesting problem which has been investigated by Rosenbaum.[11]

After EQUI NP DELETION has applied, no more rules of concern to us here apply. In particular, PRONOMINALIZATION cannot apply, for the subject of the *VP was unpopular* is the pronoun *he*, and the structural description of rule (18) requires that neither *NP* be a pronoun.

Thus it can be seen that (14c) can be derived very simply from (16) if PRONOMINALIZATION is a cyclically ordered obligatory rule, constrained in the way stated in (18).

Sentence (14b), which exhibits forward pronominalization, must now be shown not to be derivable under the formulation of the rule given in (18).

(14)(b) **Realizing that Oscar$_i$ was unpopular didn't disturb him$_i$.*

But this is easy to demonstrate, for the only way (14b) could result would be for the input structure for the last cycle of (16) to be the one underlying (22).

(22) **His$_i$ realizing that Oscar$_i$ was unpopular didn't disturb Oscar$_i$.*

If EQUI NP DELETION were now to delete *his*, the subject of the embedded sentence, under identity with the occurrence of *Oscar* which is the object of the main verb, *disturb*, (23) would result.

(23) **Realizing that Oscar$_i$ was unpopular didn't disturb Oscar$_i$.*

If forward pronominalization were to apply now, (23) would be converted into the ungrammatical (14b).

Notice that this derivation of (14b) depends crucially upon it being possible to have derived (22) as a possible input structure to the highest cycle of rules for (16). But it is easy to see that in order for (22) to be the input to the last cycle, PRONOMINALIZATION must have incorrectly applied backwards on the cycle processing the sentence whose main verb is *realize*. In order to derive (24), the subject *NP* of (22),

(24) **his$_i$ realizing that Oscar$_i$ was unpopular*

it is necessary for PRONOMINALIZATION to apply backward to (19) to produce the ungrammatical (20b), and, as I pointed out earlier, this conversion would violate Condition (iii) on rule (18).

It might be argued that (14b) could be blocked equally well if it were assumed that PRONOMINALIZATION were a postcyclic rule, and some condition were imposed upon forward pronominalization, so that (23) could not be transformed into (14b); for if backward pronominalization is applied to (23), (14c) will result. But what condition could be imposed? That forward pronominalization is impossible if the

[11]Cf. Rosenbaum, op. cit., pp. 29–38 n. 8, and also "A Principle Governing Deletion in English Sentential Complementation," IBM Research Paper RC-1519.

leftmost identical *NP* is contained in an object clause of such verbs as *realize* and the rightmost identical *NP* is not contained in it? But this condition is too strong, for it is not in general true that forward pronominalization is blocked "out of" (in the obvious sense) the object clause of verbs like *realize*. Thus a sentence like (25),

(25) **Mary's realizing that Oscar$_i$ was unpopular didn't disturb Oscar$_i$.*

which is derived from a structure exactly like (16), except that *Mary* is the subject of *realize* instead of *Oscar$_i$*, can undergo backward pronominalization (cf. (26a)) *or* forward pronominalization (cf. 26b)).

(26)(a)   *Mary's realizing that he$_i$ was unpopular didn't disturb Oscar$_i$.*
    (b)   *Mary's realizing that Oscar$_i$ was unpopular didn't distrub him$_i$.*

It can therefore be seen that the only cases where a postcyclic rule of forward pronominalization would have to be blocked "out of" the object clause of verbs like *realize* are cases where the deep structure subject of the verb in question was identical to the *NP* in question in the object clause, a fact which is *explained* if PRONOMINALIZATION and EQUI NP DELETION are cyclic rules, as I have assumed above. (Lakoff, op. cit., has demonstrated that the latter rule must be cyclic.)

Notice also that whether PRONOMINALIZATION is postcyclic or cyclic, Condition (iii) on backward pronominalization will have to be stated anyway, for sentences like the (a) versions of (7)–(13) must still be prevented from being transformed into the corresponding (c) versions, and (19) must not be transformable into (20b). But it is only if PRONOMINALIZATION is formulated as a postcyclic rule that some constraint on forward pronominalization becomes necessary in order for a distinction between (14b) and (14c) to be made. Considerations of simplicity therefore dictate clearly that PRONOMINALIZATION must be formulated as a cyclic rule, not as a postcyclic one.

There is a further point which is closely related to these considerations: compare (27) with the superficially very similar (5), which I repeat here for convenience.[12]

(27)(a)   **The knowledge that Fred$_i$ will be unpopular doesn't bother Fred$_i$.*
    (b)   **The knowledge that Fred$_i$ will be unpopular doesn't bother him$_i$.*
    (c)   *The knowledge that he$_i$ will be unpopular doesn't bother Fred$_i$.*
 (5)(a)   **The possibility that Fred$_i$ will be unpopular doesn't bother Fred$_i$.*
    (b)   *The possibility that Fred$_i$ will be unpopular doesn't bother him$_i$.*
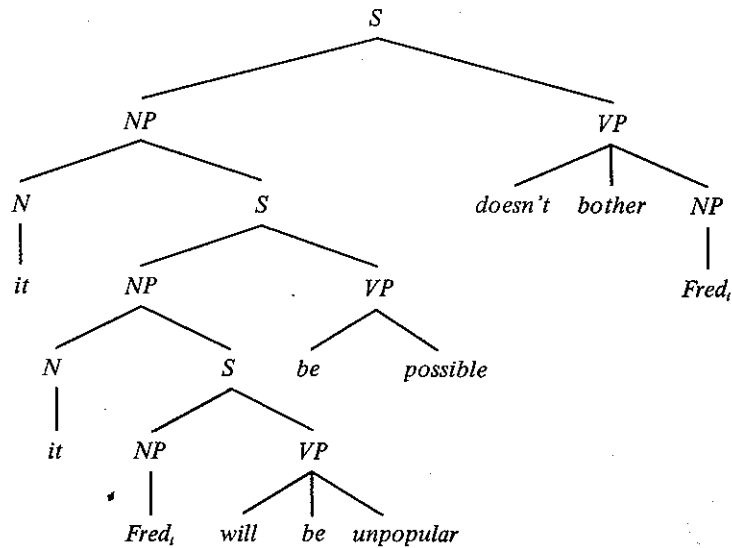   (c)   *The possibility that he$_i$ will be unpopular doesn't bother Fred$_i$.*

The deep structure of (5), to which either forward or backward pronominalization can apply, is roughly that shown in (28), on the next page.

On the first cycle of rules to apply to (28), when the sentence *Fred$_i$ will be unpopular* is being processed, no rules of relevance to the present discussion apply. On the second cycle, the complementizer *that* is adjoined to the node *S* which dominated the first-processed sentence. PRONOMINALIZATION cannot apply, for the structure up to the second highest occurrence of the node *S* does not contain two identical *NP*. On the third cycle, when the entire sentence is being operated on by the cyclic rules, the verb *bother* selects some abstract complementizer which converts its

[12]In this repetition of (5), I have starred (5a), as I indicated was necessary in footnote 10.

(28)

S
NP
VP
N
S
doesn't bother NP
it
NP
VP
Fred_i
N
S
be possible
it
NP
VP
Fred_i will be unpopular

sentential subject into an abstract *NP* which has a substantivized adjective as its head noun: *the possibility that Fred_i will be unpopular*. Many details of this substantivization transformation are as yet unclear, but I am reasonably confident that they can be worked out in such a way that my main claim, that the deep structure of the abstract subject of (5) is approximately that shown under the highest *NP* of (28), will not have to be drastically revised. Following this substantivization, PRONOMINALIZATION can apply in either direction, for the *that*-clause in apposition to the noun *possibility* is a subordinate clause (cf. footnote 9 above).

Now let us return to (27), where, as was the case in (14), only backward pronominalization is possible. It is immediately clear that if the abstract subject of (27), *the knowledge that Fred_i will be unpopular*, is derived from some putatively intransitive adjective (say, *known*), on analogy to the derivation of *possibility* from *possible*, the fact that forward pronominalization is excluded for (27) will remain unexplained for if the deep structures of (27) and (5) differed only in that one word, PRONOMINALIZATION would affect them identically. Similarly, it is easy to see that the subject of (27) could not derive from a phrase-structure expansion of *NP* like *NP → Det N S*,[13] i.e. from a *NP* like the one shown in (29),

(29)

NP
Det   N   S
the   knowledge   NP   VP
Fred_i   will be unpopular
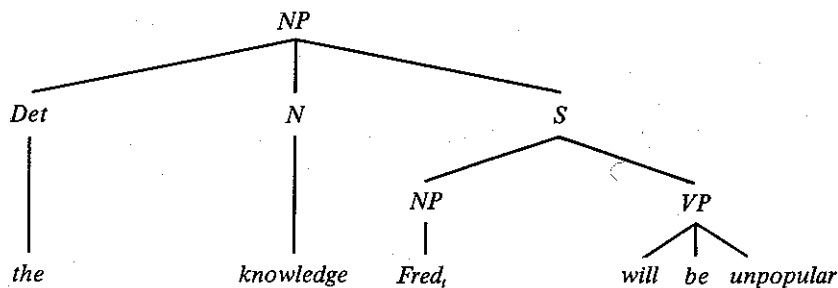
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[13]Chomsky proposes this rule in his discussion of the base component, op. cit., p. 100.

for there is nothing in the structure of (29) to prevent forward pronominalization from taking place "out of" the *that*-clause in apposition to *knowledge*, and it is not in general the case that such pronominalization must always be blocked with *knowledge*, as (30b) demonstrates.

(30)(a) *Ann's knowledge that Fred_i will be unpopular doesn't bother Fred_i.*
   (b) *Ann's knowledge that Fred_i will be unpopular doesn't bother him_i.*
   (c) *Ann's knowledge that he_i will be unpopular doesn't bother Fred_i.*

I propose that (27) be derived from the deep structure shown in (31), which is different in no essential respects from (16), the deep structure of (14):

(31)

S
NP
VP
N
S
doesn't bother NP
it
NP
VP
Fred_i
Fred_i
V
NP
know
N
S
it
NP
VP
Fred_i will be unpopular
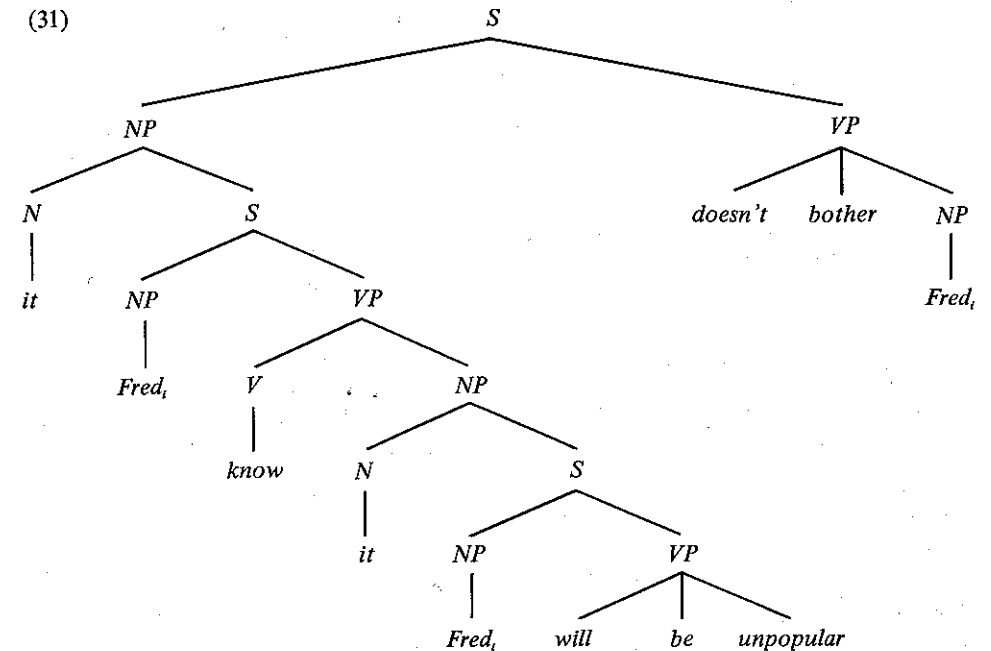
In processing (31), no rules which are of concern to us here apply on the lowest cycle. On the second cycle, after the complementizer *that* has been adjoined to the most deeply embedded *S*, the structural description for PRONOMINALIZATION is met, so the rule must apply. Since backward pronominalization cannot apply (the subject *NP* of *know* is not dominated by a subordinate clause which does not dominate the subject *NP* of *will be popular*), the rule obligatorily converts the latter *NP* into a definite pronoun, producing the sentence *Fred_i knows that he_i will be unpopular*.

On the highest cycle of (31), the verb *bother* specifies that it is possible to adjoin to the second highest sentence the abstract complementizer which triggers the same substantivization transformation which applied in the derivation of (5). After this complementizer has been adjoined, but before the substantivization transformation has applied, EQUI NP DELETION deletes the subject of *know* under identity with the object of *bother*. Then the substantivization rule applies, ending

the derivation; PRONOMINALIZATION cannot apply for the same reason it could not apply on the highest cycle of (16).

Thus it can be seen that the derivation of (27) is not parallel to the derivation of the superficially similar (5), but is rather parallel to the derivation of (14), and that the explanation for the impossibility of forward pronominalization in (5) is the same as it is in the case of (14). In both instances it was the assumption that PRONOMINALIZATION is cyclic that made possible an explanation of the facts of extremely similar constructions.

I have postponed until this point the discussion of the interaction between PRONOMINALIZATION and relative clauses because the facts are not so clear-cut as they are in the case of the other types of subordinate clauses listed in footnote 9, and because I suspect there may be dialectal variation in this area. For me, the (c) versions of (32) and (33), where backward pronominalization has applied, differ in acceptability.

(32)(a) *Girls who Sam_i has dated like Sam_i.
   (b) Girls who Sam_i has dated like him_i.
   (c) ?*Girls who he_i has dated like Sam_i.
(33)(a) *Girls who Sam_i has dated say that Sam_i is charming.
   (b) Girls who Sam_i has dated say that he_i is charming.
   (c) Girls who he_i has dated say that Sam_i is charming.

That (32c) is worse, for me, than (33c) seems to be due to the fact that in the latter, the rightmost occurrence of the *NP* Sam_i is contained in a clause which does not contain the leftmost occurrence of this *NP*. The same obtains in the case of non-restrictive relative clauses, as can be seen in (34) and (35).

(34)(a) *Agnes, who Sam_i has dated, likes Sam_i.
   (b) Agnes, who Sam_i has dated, likes him_i.
   (c) *Agnes, who he_i has dated, likes Sam_i.
(35)(a) *Agnes, who Sam_i has dated, says that Sam_i is charming.
   (b) Agnes, who Sam_i has dated, says that he_i is charming.
   (c) ?Agnes, who he_i has dated, says that Sam_i is charming.

For some reason which I cannot explain, (35c) is less acceptable for me than (33c). Nonetheless, in order to capture the clearer differences between (32c) and (33c), and between (34c) and (35c), it seems that the following provision, which was worked out by Edward Klima and me, must be appended to Condition (iii).

(36) If term 2 of the structural description is contained in a restrictive or nonrestrictive relative clause, backward pronominalization is only possible if term 4 is contained in some clause which does not contain and is not contained in this relative clause.

Langacker (op. cit., footnote 9) does not impose condition (36) upon the pronominalization rule, and cites as grammatical several examples which seem to be exactly parallel to (32c) and (34c), which is one of the reasons for my belief that there may be dialect differences in this area.

It does seem to me, however, that some version of (36) must be included in the grammar of all speakers of English, for I know of no speakers who find (37a) and (37b) equally acceptable.

(37)(a) *His_i employers like Sam_i.
   (b) His_i employers think that Sam_i is charming.

If the *NP Sam's employers* is derived by means of some rule of AGENTIVE FORMATION from some *NP* containing a relative clause, such as *the ones who employ Sam*, which I believe to be essentially the correct analysis, then condition (36) will differentiate correctly between (37a) and (37b), if the rule of AGENTIVE FORMATION is ordered after PRONOMINALIZATION.

An interesting point arises in connection with the pronominalization of possessive noun phrases. Thus (38a) may be converted into (38b) by the application of forward pronominalization, but backward pronominalization cannot convert it into (38c).

(38)(a) *That $Oscar_i$ was unpopular didn't disturb $Oscar's_i$ mother.
   (b) That $Oscar_i$ was unpopular didn't disturb his_i mother.
   (c) *That he_i was unpopular didn't disturb $Oscar's_i$ mother.

Comparing (38) with (2), where backward pronominalization is possible (cf. (2c)), we see that the only difference lies in the fact that in (38c) the rightmost occurrence of the *NP* $Oscar_i$ is embedded as a possessive modifier of the noun *mother*. It is not the case that possessive noun phrases can never pronominalize other identical noun phrases, as (39b) shows.

(39)(a) *That $Oscar's_i$ mother was unpopular didn't disturb $Oscar_i$.
   (b) That $Oscar's_i$ mother was unpopular didn't disturb him_i.
   (c) That his_i mother was unpopular didn't disturb $Oscar_i$.

But (39b) is produced by *forward* pronominalization, and the ungrammatical (38c) by *backward* pronominalization. Thus it is evident that in yet another respect, the latter kind of pronominalization is more restricted than the former. A third condition, which I am at present unable to formulate, must be imposed on it which will exclude such sentences as (38c).

In the preceding discussion, I have argued that PRONOMINALIZATION cannot be a precyclic rule, applying before all other transformations; for such a rule would have to be able to operate in both directions, so that both the (b) and (c) versions of examples (1)–(6) would be generated. But if it were allowed to apply backwards, such a rule would generate sentences such as (13c), which could not be saved from ungrammaticality by the operation of later rules, and it would entail imposing many complicated and repetitive conditions, otherwise unnecessary, on such rules as ADVERB PREPOSING, PASSIVE, etc.

I have further argued, on the basis of such examples as (14), that if PRONOMINALIZATION were formulated as a postcyclic rule, complex conditions would have to be imposed on forward pronominalization so that ungrammatical sentences like (14b) would not be produced. Furthermore, even if such conditions were formulated and added to the grammar, Condition (iii) on rule (18) would still have to be stated, so that sentences like (20b) and the (c) versions of (7)–(13) would not be generated.

Only if PRONOMINALIZATION is formulated as a cyclic rule, obligatory in most environments (but cf. footnote 10), can the unnecessary conditions be avoided which would be required if it were considered to be either a precyclic or a post-

cyclic rule. Furthermore, if it is a cyclic rule, a natural explanation can be found for the otherwise extremely puzzling differential behavior exhibited by superficially identical structures, such as (5) and (27). The naturalness of this explanation therefore provides evidence of the strongest kind for the only theory of language which contains a formal apparatus which allows such rules as (18) to be stated— Chomsky's theory of generative grammar.

14

On So-Called "Pronouns" in English

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The following is an informal discussion of certain regularities in the syntactic behavior of forms traditionally called "pronouns" in discussions of English syntax. By informal I mean that, although the analysis suggested involves a number of highly complex grammatical rules and a very special conception of the theory of grammar, no attempt has been made here to formulate or present any of the rules in their correct form. Nor is very much said about the theoretical assumptions these require. My aim is the much weaker one of trying to suggest that a class of facts requires that English grammar be formulated in such a way that it can contain such rules.

Our traditional lore about English grammar[1] recognizes a class of forms often called "pronouns" or "personal pronouns" which include *I, we, you, he, she, it, they*. At the start we may ignore for simplicity the various case forms *us, your, him,* etc., as well as reflexives, although these will become crucial later. Very often it was said that such forms "stand for" or "replace" or "are substitutes for" previously mentioned or understood noun forms. Certain modern students of English such as Robert Allen[2] have noted, essentially correctly, that in many ways such forms actually "replace" whole noun phrases (henceforth *NP*'s) rather than nouns, since they cannot occur with articles, relative phrases, and other elements which can occur in the same *NP* with ordinary nouns. Compare

[1]Cf., for example, O. Jespersen, *A Modern English Grammar* (Copenhagen: Munksgaard, 1949), Part VII, pp. 125–126; G. O. Curme, *A Grammar of the English Language* (Boston: D. C. Heath & Company, 1931), Vol. III, p. 557; R. B. Long, *The Sentence and Its Parts* (Chicago: University of Chicago Press, 1961), pp. 338–356.

[2]In a paper read to the Linguistic Society of America several years ago.