

TOUGH MOVEMENT, REFLEXIVES AND OTHER PROBLEMS*

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Tough Movement (henceforth TM) is the name for a transformation which is believed to apply to (1) to derive (2):

- (1) It is easy to please John.
- (2) John is easy to please.

Equivalently, TM can be viewed as a relation which holds between (1) and (2).

Sentences of type (1) are often referred to as non-TM constructions, while sentences of type (2) are known as TM constructions (Nanni 1978:2-3). One of the most striking features distinguishing the one type from the other is that TM constructions always contain a 'gap'. In sentence (2) the gap comes immediately after *please*, and the whole sentence can be rewritten as

- (3) John is easy to please_.

where '_' indicates the position of the gap.

Sentences of types (1) and (2) have traditionally been discussed in conjunction with the type exemplified in (4):

- (4) To please John is easy.

The structure in (4) is said to underly types (1) and (2) since type (1) is derived from (4) by extraposition, and type (2) is derived from (1) by Tough Movement (for alternative terms see Bresnan 1972 and Oehrle 1979).

Sentences in (1), (2) and (4) can be expanded by inserting an optional *for*-phrase in the position immediately after the adjective. As a result, the following examples obtain:

- (5) It is easy for Mary to please John.
- (6) John is easy for Mary to please.
- (7) To please John is easy for Mary.

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The first two of the constructions above have been thoroughly examined by Nanni (1978). The construction in (7) might be related to what in her terminology are 'simple predications with *easy*-type adjectives', especially cases like these (Nanni's 1978:73-4 sentences in (5)a. and (6)b., repeated below as (8) and (9)):

- (8) The writing assignments are hard for Bill.
 (9) Mary's rigorous schedule was hard for the family.

Of the three sentences in (5), (6) and (7), only (5) allows the insertion of another *for*-phrase; (6) and (7) are considered ungrammatical when another *for*-phrase is added.

- (10) It is easy for Mary for her sister to please John.
 (11) *John is easy for Mary for her sister to please.
 (12) *To please John is easy for Mary for her sister.

But with one of the *for*-phrases attached to the infinitival phrase in the Complementizer + Subject position, the sentence in (12) is correct.

- (13) For her sister to please John is easy for Mary.

It would be interesting to consider the reason for the ungrammaticality of (11). From the point of view of surface structure relations, (11) can be made grammatical by dropping one of the *for*-phrases, as in (14) and (15):

- (14) John is easy for Mary to please.
 (15) John is easy for her sister to please.

Although (14) and (15) are structurally identical, the *for*-phrases do not function in the same way as they do in (10). The sentence in (10) is unambiguous in the sense that the NP in the first *for*-phrase never functions as the subject to *to please John*, and the NP *her sister* in the second *for*-phrase always functions as Complementizer + Subject in the sentence [_s for her sister to please John _s]. Dropping one of the *for*-phrases in (10) would make it ambiguous, e.g.:

- (16) It is easy for Mary to please John.

If we use Δ to indicate empty positions and indices to mark control relations, (16) can be shown to be ambiguous between the following readings:

- (16a) It is easy for Mary_i [Δ _i to please John].
 i.e., the agent of *to please John* is some unspecified individual
 (16b) It is easy for Mary_i [Δ _i to please John].
 i.e., *Mary* is understood to be the subject of the complement sentence.
 (16c) It is easy Δ _j [for Mary_i to please John].

i.e., the individual who experiences the easiness of the activity described in the complement sentence is left unspecified. Interestingly enough, (16) does not obtain:

- (16d) It is easy Δ _i [for Mary_i to please John].

i.e., the lexically specified subject of the complement sentence cannot control the empty *for*-phrase following the adjective (cf. Nanni 1978:98, and 114, note 5).

The sentence in (10) with the first of the two *for*-phrases omitted would also exhibit the same range of interpretations.

We can now try to elucidate the nature of the constraint which is responsible for the ungrammaticality of (11). Suppose there is a semantic condition to the effect that in TM constructions either the individual indicated in the complement subject NP, or the individual indicated in the *for*-phrase which is outside the complement sentence, must obligatorily be left unspecified. (11) would then have to assume the form of (14) or (15).

Typically, the sentence in (15) has the following range of interpretations:

- (17a) John is easy for her sister_k [Δ _k to please].
 (17b) John is easy Δ _j [for her sister_k to please].

but not

- (17c) *John is easy for her sister_k [Δ _j to please].

or

- (17d) *John is easy Δ _k [for her sister_k to please].

That is, a single *for*-phrase in a TM construction can function as either a prepositional phrase controlling the empty subject position in the complement sentence (as in (17a)), or as Complementizer + Subject in the complement sentence without, however, controlling the empty PP position (that is why the sentence in (17d) is ungrammatical). A TM sentence without a single *for*-phrase is, of course, also possible, e.g.:

- (18) John is easy to please.

which can be interpreted as

- (18a) John is easy Δ [Δ to please].

The examples above show that a TM construction containing a single *for*-phrase must be interpreted in such a way that either the *for*-phrase is outside the complement sentence which contains an empty subject position, but the empty subject position is controlled by the NP in the *for*-phrase, or the *for*-phrase is analysed as a Complementizer + Subject; this subject does not control the missing prepositional phrase (for details see Nanni 1978).

In light of the evidence above, it must be stated that the condition in question is not semantic, but merely syntactic. Thus (17a) is ungrammatical

if the empty subject position is occupied by a pronoun coreferential with *her sister*, as in (19):

(19) John is easy for her sister_k [for her_k to please].

Filling the position with some non-coreferential material gives an equally bad result, as in (20):

(20) John is easy for her sister [for Peter to please].

Since the sentences in (17a) and (19) do not differ semantically, there is no doubt that the condition must be stated in syntactic terms.

Let us now approach the problem offered by reflexives when used in TM constructions. The issue is best illustrated with the following examples from Harada and Saito (1971) (their examples in (2)a, b, (10) and (13) are repeated below as (21), (22), (23), and (24)):

(21) John believes himself to be hard for Bill to understand.

(22) John believes himself to be hard for Bill to talk to Max about.

(23) John considers himself to be hard for Bill to imagine Max talking to Harry about.

(24) John is believed by everybody to have hurt himself.

Since in a TM sentence the gap may occur an unbounded distance from the adjective (Nanni 1978:112), there is no real distinction between (21), (22) and (23). If (22) and (23) are further referred to in the remainder of this paper, it is because of the complexity of structure displayed by the complement sentence. The sentence in (24) obviously does not follow the general pattern.

The examples above have been constructed in such a way as to call into question some fundamental assumptions of the interpretive theory of pronouns and reflexives as developed by Ray S. Jackendoff (1968, and especially 1969). (Since Harada and Saito (1971) announce Jackendoff (1969) as 'to appear', which never did, and Jackendoff (1972) is a substantial revision and expansion of Jackendoff (1969), we will refer primarily to Jackendoff (1968) while quoting the assumptions.)

In particular, Harada and Saito take a stand on the following points:

(25a) "instead of accounting for the properties of pronouns and reflexives by deriving them from underlying more fully specified noun phrases, I will assume that they are generated as lexical items, inserted into base structures" (Jackendoff 1968:4).

(25b) "noun phrases in general will be unmarked for reference in the base. Rules of semantic interpretation establish relations between pairs of noun phrases, marking them as coreferential or non-coreferential with each other" (Jackendoff 1968:5).

(25c) "coreference is an exclusively semantic property that cannot be referred to by transformations. [...] coreference is an aspect of semantic interpretation that has nothing to do with the functional

structure of the sentence" (Jackendoff 1972:111; this quotation corresponds fairly closely to the statement adduced in Harada and Saito 1971:547 under (1)b.; cf. also Jackendoff 1968:5-6 for part of the statement).

Before continuing with the discussion of TM sentences and reflexives, let us comment briefly on the ideas expressed in (25 a-c).

First, Lasnik (1976:3) argues that, under certain assumptions, "referent of a noun phrase" is not a semantic property. Using the notion of 'command', he develops a much simpler mechanism for establishing coreference relations in sentences than the one offered by Jackendoff.

Second, by having pronouns and reflexives generated as lexical items and inserted into base structures, Jackendoff hoped to avoid, among other things, the problems posed by the so-called Bach-Peters sentences. In recent literature they have been termed 'crossing coreference sentences' (cf. Jacobson 1979). The sentence in (26) (derived from Bach 1970) is an example:

(26) The man who shows he_i deserves it_i will get the prize_i he_i desires.

This sentence is said to violate an important assumption, namely, that "Every sentence and every deep structure terminal string is finite in length" (Bach 1970:121). Thus the underlying form for (26) would be (27):

(27) The man who shows that the man deserves the prize that the man who shows that the man deserves the prize that the man ... (ad infinitum) will get the prize that the man who shows that the man deserves the prize that the man who shows ... (ad infinitum).

The recent study by Pauline I. Jacobson (1979) presents an attempt to show how quantification, scope phenomena and pronominalization interact in the interpretation of crossing coreference sentences. The author arrives at the conclusion that, in some of their occurrences, definite personal pronouns are full NP's. In view of this, there seems to be no reason to argue for a uniform treatment of pronouns, as Jackendoff wishes.

Let us now return to the problem of how base-generated reflexives behave in TM constructions. The relevant points will be illustrated by the examples quoted above, i.e., (21), (22) and (23). Following the standard assumptions concerning the origin of TM constructions, Harada and Saito (1971) maintain that the reflexive in each of the sentences in question would have to be generated in the complement sentence, e.g.:

(28) ... (for) Bill to understand himself.

(29) ... (for) Bill to talk to Max about himself.

(30) ... (for) Bill to imagine Max talking to Harry about himself.

This position of the reflexive, combined with the commonly made assumptions.

concerning reflexive interpretation, i.e., that it is a cyclic and obligatory rule (in this connection see Jackendoff 1968:13, 15, 28; 1972:112, 137-8), causes real trouble since the reflexive rule will mark as coreferential *himself* and *Bill* in (28), *himself* and *Max* or *himself* and *Bill* in (29), etc., whereas the interpretation of the reflexive in the corresponding TM sentences, i.e. (21), (22) and (23) above, is such that the reflexive unambiguously refers to *John*.

To prevent the reflexive rule from applying on the first cycle, Harada and Saito (1971:550-555) propose several solutions which they consider impossible.

The first is the 'dummy node' hypothesis. If it is assumed that complement sentences in *easy*-type predicates are generated with lexically unspecified subjects and, furthermore, there is a general convention which prevents rules of semantic interpretation for pronominal reference from applying, then, for instance, the complement sentence in (28) will be something like

(31) [_S [_{NP} Δ_{NP}] [_{VP} to understand himself _{VP}] _S].

Since the reflexive rule cannot apply, the reflexive will be available for the Tough Movement rule. When tough-moved, the reflexive will be available for the reflexive rule, this time on a higher cycle.

Harada and Saito consider this an impossible solution because, whereas it helps in sentences of type (28), it is insufficient in (29) or (30). In the two latter examples there are other NP's available for reflexive interpretation so that nothing can prevent the reflexive rule from picking, e.g., *Max* in

(29) as the antecedent for *himself*.

There are other reasons, however, why the dummy node hypothesis must be rejected. While it probably eliminates one problem, it generates others. The arguments for the hypothesis are that in *easy*-type predicates whose complement sentences have a structure similar to that in (31), the reflexive rule can be blocked from applying. Also, *easy*-type predicates whose complement sentences have a structure similar to that in (29), except that the subject NP is a dummy node, are disambiguated; that is, of the two possible antecedents for the reflexive in (29) there remains only one, i.e., *Max*, when the subject NP is generated as a dummy node.

Now let us consider the problems generated by the dummy node hypothesis. Suppose, after Harada and Saito (1971:551), that dummy nodes cannot be considered in establishing coreference relations, and by the same token, control relations. Consider the following sentence:

(32) John believes it to be hard for Bill [Δ to understand himself].

Since dummy nodes are assumed not to enter into coreference relations, neither *himself* nor *Bill* can be interpreted as coreferential with Δ. So far, no problems arise. The sentence embedded in 'John believes—' is a non-TM construction and the NP occurring in the *for*-phrase does not have to be interpreted as the

subject of 'to understand himself' (cf. the discussion above, especially the sentences in (16a) and (16b)). A serious problem arises, however, when the reflexive is tough-moved to take the position of *it*. (We wish to remain uncommitted as to the nature of the process called *Tough Movement, It-Replacement*, etc. A few more remarks will be made later in the present paper). Thus (33), in which the dummy node remains uncontrolled, is bad (cf. (17c) above):

(33) John believes himself to be hard for Bill [Δ to understand].

But is it true that dummy nodes cannot serve as antecedents for reflexives? It depends on the theoretical orientation one follows. Transformational grammar makes extensive use of deletion on identity, so that a deleted node (nominal or other) is always analysed as controllable by the node that triggered the deletion. For instance, the following sentences:

(34) John promised Mary to come.

(35) Bill wanted to come.

are surface realizations of:

(34a) John promised Mary [John come].

(35a) Bill wanted [Bill come].

The correctness of

(36) John promised to vote for himself.

is explained on the basis of the properties of the string prior to deletion, i.e.,

(36a) John promised [John vote for himself].

No such proliferation of forms to be later deleted is possible within the framework of Montague grammar, especially in the post-Montague developments which are often referred to as 'extensions' of Montague grammar. Montague grammarians do not work in isolation from generativists. However, the conceptual framework developed by Richard Montague enables the Montague grammarian to arrive at slightly different solutions to a common body of problems than those offered by the generativist.

Let us consider an example or two. Working within the generative framework, Lawrence Solan proved in his 1978 paper that it is impossible to establish control relations on the basis of word order, and showed how rules for complement NP interpretation have to rely on control hierarchy in determining the antecedents for missing NP's in complement clauses. Bach (1979), working within the framework of Montague grammar, has arrived at the following generalization (his statement in (14) repeated below as (37)):

(37) A predicative phrase must agree with the object of a transitive verb

phrase and the subject of an intransitive verb phrase in number, gender, and person.

By 'predicative phrases' Bach understands expressions like *to go* in 'persuade to go', *a friend* in 'consider a friend', *white* in 'paint white', or *in the drawer* in 'keep in the drawer'. The expressions in inverted commas are examples of *predicative transitive verbs* (Bach 1979: 518). *Predicative intransitive verbs* can be exemplified by the following: 'promise Mary to come', 'strike us as incompetent', etc. The import of the statement in (37) can be fully appreciated when the following sentences are taken into consideration (Bach's sentences in (15)–(18) repeated in a slightly modified form in (38) and (39) below):

- (38) Mary persuaded the men to like $\left\{ \begin{array}{l} \text{themselves/each other.} \\ * \text{herself.} \end{array} \right.$
- (39) John promised the men to like $\left\{ \begin{array}{l} \text{himself.} \\ * \text{themselves/each other.} \end{array} \right.$

(38), which contains a predicative transitive verb, requires that the predicative phrase *to like themselves/each other* agree with the object. (39), on the other hand, contains a predicative intransitive verb and requires that the predicative phrase *to like himself* agree with the subject.

Such a formulation of control relations avoids, of course, the problem of dummy nodes. However, while interpreting the sentences in (38) and (39), it is tempting to posit empty nodes as "go-betweens" for the controlling NP's (*the men* in (38) and *John* in (39)) and the predicative phrases, especially those parts of them which display the agreement in question (i.e., the reflexives and/or reciprocals). This proposal is particularly appealing when cases of free control are taken into account. (It follows that the examples in (38) and (39) exhibit cases of obligatory control, which means that the agent of 'to like themselves/each other' in (38) or that of 'to like himself' in (39) cannot be analysed as unspecified). Thus in (40):

- (40) To leave early is hard for Joan.

either *Joan* or some other individual is understood as the agent of 'to leave early'. Employing the notation used earlier in the paper, the relevant readings can be represented as follows:

- (40a) Δ_1 to leave early is hard for $Joan_1$.
- (40b) Δ_j to leave early is hard for $Joan_j$.

In contrast to cases of obligatory control, the sentence in (40) represents a case of free control, with the NP *Joan* being a possible controller. This last part of the statement is important since (41) would be considered ungrammatical if *Joan* could not serve as a possible controller:

- (41) To vote for herself is hard for Joan.

Obviously, the sentence is bad on the reading when some individual other than Joan is taken to be the agent of 'to vote for herself'.

In light of the discussion above, it follows that the proposal made by Harada and Saito (1971) to the effect that certain structures contain empty nodes which prevent the cyclic and obligatory rule of reflexive interpretation from applying on a given cycle should be regarded as untenable. This is because in cases of obligatory control, empty nodes must receive unique interpretation, and delaying this interpretation cannot result in altering control relations. In cases of free control, on the other hand, the operation of delaying the relevant interpretation is at best spurious. (Towards the end of the present paper it will appear that Harada and Saito's proposal is incompatible with the practices of Jackendoff's interpretive theory of pronominal reference).

The second hypothesis that Harada and Saito consider is the proposal made by Bresnan (1970) concerning the structure of what Nanni (1978) calls *easy*-type predicates. They test the validity of that part of Bresnan's statement which says that certain adjectives can be subcategorized for PP (realized as, for instance, a *for*-phrase) plus VP. Since VP's are generally assumed not to form cycles, reflexive interpretation does not take place if the VP happens to contain a reflexive. In the meantime, Tough Movement applies, and consequently the reflexive rule, as required, applies on a higher cycle.

Harada and Saito reject this possibility on the grounds that, whereas the proposed solution would work in (21) above, repeated below as (42)

- (42) John believes himself to be hard for Bill to understand.

which is derived from (43):

- (43) John believes Δ to be hard [_{PP} for Bill _{PP}] [_{VP} to understand himself _{VP}].

it does not work for (23), repeated below as (44):

- (44) John believes himself to be hard for Bill to imagine Max talking to Harry about.

which is in turn derived from (45):

- (45) John believes Δ to be hard [_{PP} for Bill _{PP}] [_{VP} to imagine Max talking to Harry about himself _{VP}].

The solution does not work for (45) since the VP itself contains a cycle on which the reflexive rule must apply.

We would like to add that the solution does not work even for (42)–(43) since, as was remarked above, TM constructions are considered bad if they contain a *for*-phrase which does not control the complement VP.

In short, the two hypotheses discussed above lead to a paradox which

consists in the fact that in order to generate reflexives in their appropriate positions, the complement S's in the pre-TM version must be analysed as containing no overt lexical material which could serve as the antecedent for the reflexive. This requirement is met by generating S's with dummy subjects, or simply VP's. Reflexive interpretation is delayed until a higher cycle which now contains the reflexive as a result of Tough Movement. However, the newly created TM construction must be rejected in case a *for*-phrase intervenes between the adjective and the complement S, since there is no way the NP in the *for*-phrase can be interpreted as controlling the dummy subject of the complement S or as serving as the subject of the complement VP. No such problems arise, of course, when no *for*-phrase is present, as in (46):

- (46) John believes Δ to be hard Δ [_s Δ to understand himself_s] (a)
 [_{VP} to understand himself_{VP}] (b)

since the sentences in (47a, b), which are parallel to those in (18) and (18a) above, are correct:

- (47) John believes himself to be hard Δ [_s Δ to understand— —_s] (a)
 [_{VP} to understand — —_{VP}] (b)

Before going on to the question of specifying coreference relations between reflexives and their antecedents, let us discuss another problem of a strictly syntactic nature offered by base-generated reflexives. Up to now we have discussed cases of base-generated reflexives in *easy/difficult*-type predicates which occurred in the context 'NP believes—', specifically 'John believes—'. Suppose that the construction in question occurs in the context 'John wants—'. It might appear at first sight that the resulting construction is parallel to those already discussed. Thus, for instance,

- (48) John wants himself to be hard for Bill to understand.

seems similar to (21) above.

It has been argued in the literature that *want* takes the *for*-complementizer (Bresnan 1972; Bach 1979). The complementizer is present in (49) (one of Bresnan's 1972: 39 sentences in (100)):

- (49) I want very much for you to help me.

but deletes when it immediately follows the verb, as in (50) (another of Bresnan's 1972: 39 sentences in (100)):

- (50) I want you to help me.

No problems arise when the TM construction containing a reflexive occurs in the environment 'John wants—' as in (48). If, however, some material

intervenes between the verb and its complementizer and, consequently, the latter does not delete, the resulting sentence is ungrammatical, as in (51):

- (51) *John wants very much for himself to be hard for Bill to understand.

The explanation for this is that the reflexive occurs in the wrong position; the position after the *for*-complementizer can be occupied by a pronoun or a noun phrase, but not by a reflexive.

If the position is occupied by, for instance, the pronoun *him*, it can be interpreted, on one reading, as referring to *John*. Therefore, the following sentence is possible:

- (52) John_i wants very much for {him_i to be hard for Bill to understand.
 }him_j

(The sentence in (52) has been modelled on Bach's (1979) sentence in (56). Also see Bach's comment on p. 525).

To conclude, if reflexives are allowed to be base-generated in a fairly unrestricted fashion, two undesirable situations may arise: (a) reflexives occur in inappropriate contexts (as in (51)) or (b) the wrong form of the reflexive occurs in the right environment (e.g., 'John killed myself' instead of 'John killed himself'). The structures in (a) could be excluded by a filter which would asterisk a string like

- (53) [_s Complementizer [_s [_{NP} reflexive NP] ..._s]_s]

to indicate that it is ungrammatical (we derive the idea of filtering out ungrammatical constructions from Chomsky and Lasnik 1977). Structures that obtain in (b) will be discussed later.

Finally, we wish to gloss over the problem of coreference relations. Bach confesses that it is not clear to him "what exactly is intended when linguists talk about 'coreference'" (Bach 1979: 524, note 11). An intuitive characterization of referential identity as proposed by Jacobson (1979: 47) might be in order: "two NP's are referentially identical if, in any given context, they pick out the same object" (for a formal characterization of referential identity, see Section 10 in Jacobson 1979). Two NP's which have this property can be called *coreferential* (this follows from, for instance, Culicover's (1976: 145) definition of *coreferentiality*).

Generally, there is no consensus in the literature concerning the source of coreference relations. Here are some of the approaches to the problem taken by various linguists.

(A) Certain noun phrases are generated in such a way that their determiner position is empty. Subsequently, a copying transformation applies and fills the empty position with a pronominal copy of the appropriate antecedent. This procedure guarantees that, for instance, the following sentences contain the right pronouns (Helke's 1971: 30 sentences in (1), (2) and (4) repeated below as (53), (54) and (55)):

- (53) The poor girl lost her mind.
 (54) We nodded our heads.
 (55) I blinked my eyes.

This approach is extended to cover reflexives as well. Here it is *self* that functions as the head noun and, again, the pronominal copy of an appropriate antecedent is inserted in the empty determiner position, giving for instance (56) (= Helke's 1971 : 45 sentence in (24)):

- (56) The poor girl hurt herself.

(B) Two or more noun phrases are analysed as corresponding to different occurrences of the same variable. This is the approach advocated by Barbara Partee (e.g., 1975) for ordinary pronouns and reflexives which have quantified NP's as their antecedents. Thus, in (57) (equivalent to Partee's 1975 : 19 sentence in (13)):

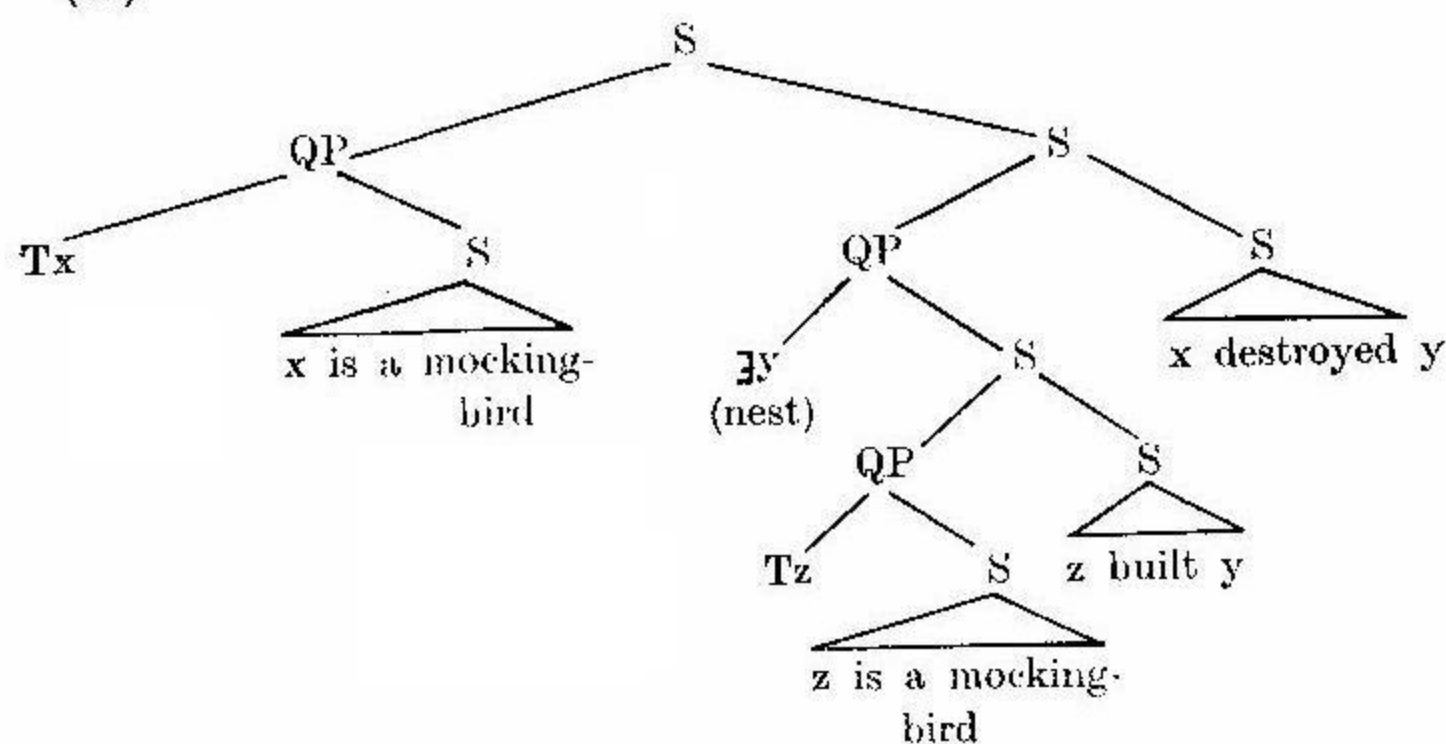
- (57) No prudent man will drive when he is drunk.

the *he* is believed to be neither a substitute for *no prudent man* nor to refer to the entity denoted by *no prudent man*. The expression *no prudent man* is said to bind both occurrences of the variable in (57a) (equivalent to Partee's 1975 : 19 formula in (13')):

- (57a) *x* will drive when *x* is drunk.

(C) Coreference relations may also result from the way two or more definite full NP's refer. In certain syntactic environments two (or more) definite full NP's either pick up the same individual or fail to refer at all. Thus, in Jacobson's (1979 : 46) structure in (34), repeated below as (58), both the *x*-phrase and the *z*-phrase will refer only if there is a unique mockingbird.

(58)



This structure, she believes, underlies the sentence in (58a) (Jacobson's 1979: 43 sentence in (1)):

- (58a) The mockingbird_i destroyed a nest that he_i built.

The pronoun *he*, derived from a full NP, is an example of what Geach (1962: 128 ff.) calls a *pronoun of laziness*.

(D) Special rules of interpretation are set up to mark pairs of noun phrases for coreference (Jackendoff 1968, 1972). And finally

- (E) Coreference relations are assumed to be given in advance.

Since not much can be said about the assumptions in (E), we will leave them out. More attention will be paid to the approach in (D) and to the problem of referential identity as it emerges in (B), and possibly in (A).

Let us start with reviewing some of the problems offered by Jackendoff's approach. The sentences to be considered are these:

- (59) John shot yourself.

- (60) The boy shot herself.

(They are Jackendoff's (1968 : 6; 1972 : 113) sentences in (30) and (4.13) respectively.)

The reflexive rule will mark the pairs *John — yourself* and *the boy — herself* as coreferential. Furthermore, the Consistency Condition states the following (Jackendoff 1972 : 112):

- (61) If the table of coreference marks two NPs coreferential, those NPs must in fact be able to describe the same individual.

It turns out, however, that the pairs in question are not able to describe the same individual. To use Jackendoff's (1972 : 114) own words, "*the boy* describes a male individual, *herself* a female. Obviously, then, they cannot be used to describe the same individual". Elsewhere Jackendoff (1968 : 7) talks about "the obvious general convention that coreferential noun phrases must be able to have the same reference and thus *must agree in number, person, and gender as well as animacy, humanness, abstractness, and myriad other semantic properties*" (italics supplied).

But what is the exact meaning of the interpretive rule which marks pairs of NP's for coreference? The examples above and the relevant comments testify beyond any doubt that two NP's that have been marked for coreference may not be coreferential. The situation is further aggravated by the fact that empty nodes may also be considered for coreference. For instance, in sentence (62) (= Jackendoff's 1972 : 182 sentence in (5.13)):

- (62) Mary told Bill that helping herself could be difficult.

herself is marked coreferential with the empty subject of *helping*, i.e., Δ , before the latter is even interpreted as coreferential with *Mary* (for details see the discussion on pages 183 ff. in Jackendoff 1972).

In light of the discussion above, it would perhaps be more appropriate to talk about the reflexive rule as an operation of co-indexing pairs of NP's in specific syntactic configurations. Two co-indexed NP's may, but do not have to, be coreferential in the sense of picking up the same object or individual, even if they exhibit the required agreement in number, person, gender, etc. This is so because coreference defined as a property of two NP's such that they describe or pick up the same individual is not the result of any marking for coreference or agreements that the NP's may display. An example or two will make the matter clear.

Let us return to the open sentence in (57a):

(57a) *x* will drive when *x* is drunk.

Does it make sense to say that the two occurrences of the variable *x* are coreferential or may be marked as such? Certainly not. Variables do not pick up any individuals by themselves. But what happens if the variable becomes bound by an NP? Let us consider a few examples.

(63) No prudent man (*x* will drive when *x* is drunk) →

No prudent man will drive when he is drunk. (=Partee's 1975:19 sentence in (13).)

(64) John (*x* will drive when *x* is drunk) →
John will drive when he is drunk.

(65) The wretched criminal (*x* will drive when *x* is drunk) →
The wretched criminal will drive when he is drunk.

In (63), *no prudent man* is a non-referring expression and does not pick up any individual. The *he*, which corresponds to the unsubstituted occurrence of *x*, does not pick up any individual independently of the NP *no prudent man*, i.e., it does not pick up any individual either.

In (64), *John* is a proper name and picks up a unique individual. The *he* in the subordinate clause picks up the same individual.

(65) is similar to (64) except that the binding NP is a definite description. Thus in two out of three structurally, but not logically, identical cases the NP's which correspond to different occurrences of the same variable are coreferential. Therefore, we might risk the following statement:

(66) A noun phrase binding a variable *x* and the pronouns that correspond to the unsubstituted occurrences of the variable are coreferential in the sense of picking up the same individual if and only if the binding noun phrase is a referring expression.

It follows that since in (63) the binding NP is not a referring expression, *no prudent man* and *he* are not coreferential. But how can we characterize

the two NP's in positive terms? To generalize the properties of NP's exemplified in (63), we might say that the pronouns corresponding to the unsubstituted occurrences of a variable reflect the referential properties of the binding phrase. But this generalization certainly covers the examples in (64) and (65).

Helke's approach could be reinterpreted in terms of variables and binding NP's. For instance, the sentence in (53) may be represented as an open sentence (67):

(67) *x* lost *x*'s mind

with the variable *x* being bound by the phrase *the poor girl*. The same procedure applies to (56), i.e., the corresponding open sentence is as in (68):

(68) *x* hurt *x*'s self

and, again, the phrase *the poor girl* binds the variable, yielding (56) ('The poor girl hurt herself'). Since the second occurrence of *x* in (67) and (68) is found in the determiner position of the NP, the shape of the pronoun corresponding to the unsubstituted variable will have to be adjusted to the syntactic environment, i.e., it will be the possessive form of the pronoun. (The problem is a bit complicated when the head noun is *self*, since in Standard English *himself* and *themselves* occur instead of the expected *hisself* and *theirselves*.)

One major difference between Helke's transformational approach and the bound variable approach is that whereas in the latter the various occurrences of the variable mark the position of both the antecedent and the anaphoric pronoun(s), in the former only the position of the would-be anaphoric pronoun is specified and the right antecedent must be picked up by the relevant transformation.

The semantic interpretation of coreference relations will not differ in the two approaches. That is, if a referring expression is copied into the empty determiner position in the form of the corresponding pronoun, the two will undoubtedly pick up the same individual, i.e., will be coreferential, but not otherwise.

Earlier in the paper we refrained from taking a stand on the nature of the process that relates sentences in (1) and (2) above. A number of options are open, each involving a different set of consequences. Rosenbaum (1967: 106–108) proposed a transformation to derive sentences as in (2) from sentences as in (1). Postal (1971:27–31) called it 'tough movement' and he and Ross (1971) argued for the movement nature of the process. Lasnik and Fiengo (1974) present arguments against the hypothesis that movement of an NP from an embedded sentence (or VP) to the matrix subject position is involved and point out the consequences that result from the assumption that the process actually involves the deletion of an NP in the complement VP on identity with the matrix subject NP.

One difficulty which this approach explains in a non-ad hoc way is the fact that the matrix subject position in TM constructions can be filled by proper names, definite descriptions and generic indefinites, but not by other indefinites. It should be emphasized that non-TM constructions are grammatical when they contain non-generic indefinites. Postal (1971:29) proposed to make the *tough*-movement transformation sensitive to the definiteness of the NP which is a candidate for movement. Lasnik and Fiengo consider this constraint to be not general enough since indefinites can be moved into subject position by other transformations, e.g., the passive. If, however, *easy*-type predicates are classed together with certain other predicates as *predicates denoting characteristics*, the ungrammaticality of (69) and (70) (Lasnik and Fiengo's 1974:544-5 examples in (52) b, and (57) a.):

- (69) * $\left. \begin{array}{l} \text{A man} \\ \text{Someone} \end{array} \right\}$ would be easy to kill with a gun like that.
 (70) * $\left. \begin{array}{l} \text{A building} \\ \text{Someone} \end{array} \right\}$ was tall.

is explained on the grounds that pure (as opposed to generic) indefinites cannot be the deep subjects of characteristic-denoting predicates.

From the discussion above it follows that on the Lasnik-Fiengo analysis the underlying structure for (71):

- (71) The man is easy for John to fool.

would be (72):

- (72) The man is easy for John to fool the man.

The second occurrence of 'the man' is deleted on identity with the matrix subject NP 'the man'. The resulting gap is understood as being controlled by the trigger NP, i.e., the individual whom John can fool with ease is specified in the matrix subject NP.

It becomes obvious that prior to deletion, the two occurrences of 'the man' must be such that they may be interpretable as having the same referential properties. Again, we are avoiding the term *coreferential* since in (73):

- (73) No man is easy for John to fool.

the matrix subject NP does not pick up any individual, but still the gap following the infinitive *to fool* is said to be coreferential with the subject NP, i.e., in our terminology, has the same referential properties as the subject NP.

One might argue (as others have argued before) that coreference properties are not available for transformations and that two (formally) identical NP's need not and cannot be interpreted for coreference before they are affected by the relevant transformation(s). But it was precisely this view of the refe-

rential nature of pairs of NP's which resulted in the collapse of the early theory of reflexivization. For instance, the reflexive rule of Lees and Klima (1963:23) specified two NP's, separated by a variable, with the condition that the NP's in question are identical and are within the same simplex sentence. Although both parts of the condition were invalidated by subsequent research, we will concentrate on the identity issue alone.

Various linguists have raised the problem of interpreting pairs of (formally) identical NP's for coreference when, on the one hand, they are proper names or definite descriptions and, on the other, indefinite NP's or other quantified NP's. (We are aware of the fact that if the iota operator is treated as a quantifier (cf. Jacobson 1979:45 in this regard), definite descriptions fall under the name of quantified NP's. Also, proper names can be represented semantically as definite descriptions (see Jacobson 1979:148, not 18), and hence as quantified NP's.) It has been argued that any reasonable semantic theory will assign meanings to (74):

- (74) A man supported a man.

which are not correct for (75):

- (75) A man supported himself.

(Many more examples containing other quantifiers could be quoted without strengthening or weakening the argument.) It follows that a sentence like (74) could not serve as the semantic representation for (75).

Barbara Partee (1975) shows that ordinary pronouns derive from two sources: they arise as bound variables or pronouns of laziness. Following Parsons (1972) she assumes that the pronoun-of-laziness interpretation is possible whenever the antecedent is either a proper name or a definite description. Otherwise, the bound variable interpretation is required. For reflexives, too, the bound variable interpretation is required whenever the antecedent is a quantified NP. The latter interpretation is also possible when the antecedent is a proper name or a definite description. Also, Partee cautiously considers the possibility of having here a pronoun-of-laziness interpretation. Thus the reflexive in (76) (=Partee's 1975:21 sentence in (19)):

- (76) The man in the brown hat shot himself in the foot.

would derive from a full NP as in (77):

- (77) The man in the brown hat shot the man in the brown hat in the foot.

The two approaches would produce no difference in the resulting interpretation.

The discussion so far has shown that when the referential properties of NP's are taken into account, a dividing line can be drawn between, on the

one hand, proper names and definite descriptions and, on the other, pure indefinites. The status of generic indefinites is not clear. Postal (1971:29) cautiously assumes that "generics are structurally definite in some sense even with superficially indefinite forms". Subsequent research has strongly suggested that genericity should be extended to cover not only noun phrases but also verbs and entire sentences (in this connection see especially Lawler 1972 and Nunberg and Pan 1975). Furthermore, it is not only indefinites which can be interpreted generically, but also definite descriptions as well as noun phrases which contain demonstrative pronouns ('this', etc.) or possessive adjectives ('your', etc.) in the determiner position (see Lawler's (1972) sentences in (45), (47), and (51)). Whether a sentence is interpreted generically depends not only on its semantic representation, but also on contingent information and pragmatic inferences. Consequently, it is not immediately obvious whether an indefinite-looking NP is a generic noun phrase or a pure indefinite.

Research on the phenomenon of genericity invalidates Lasnik and Fiengo's (1974) claim (quoted above) that indefinites cannot be the deep subjects of characteristic-denoting predicates. From the examples quoted in (70) it does not follow that the subject must be expressed by, e.g., a definite NP for the sentences to be correct. Lawler (1972:256, note 1) gives the following example:

(78) A madrigal is polyphonic/*popular.

Although both *polyphonic* and *popular* seem to function as characteristic-denoting predicates, the former is acceptable, the other odd. Nunberg and Pan (1975:415) try to go beyond Lawler's intuition that "generic uses of the indefinite singular allow predication only of essentials, or of innately determined properties" by presenting the following examples (their examples in (11) and (12) repeated below as (79) and (80)):

(79) A Rolls is expensive.

(80) A football hero is popular.

where especially (80) is to be contrasted with **A madrigal is popular*. They argue that, in the examples cited, "the individual comes by the property because of its class membership; whether the property is essential or accidental to the class is immaterial". For (80) they observe that "popularity inheres simply as a result of being a football hero".

We will now leave the problem of what kinds of NP's can be the subjects of characteristic-denoting predicates, including *esay*-type predicates used in TM constructions. The foregoing discussion has shown that the problem is more complex than was thought before.

Let us now consider one final proposal (Chomsky 1977), concerning the treatment of TM constructions, namely, TM constructions as a result of *wh*-movement.

In the previous analyses of TM constructions, the containing sentence

subject position and the 'gap' in the complement clause were related in a direct way: either by a movement transformation, which moved an NP from the complement clause to the (empty) subject position of the containing sentence, or by a deletion transformation, which deleted an NP in the complement clause on identity with the (non-empty) subject NP of the containing sentence. Either operation left a gap in the complement clause which was interpreted as anaphoric with the containing sentence subject NP.

The operation which Chomsky calls *wh*-movement has been designed in such a way as to account for a number of seemingly unrelated phenomena: restrictive and nonrestrictive relatives, direct and indirect questions, comparative formation, topicalization, left-dislocation, and TM constructions. Since it is the latter type of construction that is of primary interest to us, nothing will be said about the remaining types.

The principal difference between Chomsky's recent proposal and the analyses discussed above lies in the fact that on the Chomsky analysis of TM constructions, the gap and the containing sentence subject NP are not related directly. This results from the fact that, unlike any of the two previous transformations, which were allowed to move or delete some material over a variable across sentence boundaries, *wh*-movement can move a *wh*-phrase only within the same S, more specifically, to the COMP(lementizer) position of the S that also contains the *wh*-phrase.

It is not immediately obvious whether the *wh*-phrase is base-generated or introduced transformationally. In his 1973 paper Chomsky talked about *wh*-placement (on a constituent). For instance, sentence (81) (=Chomsky's 1973:243 sentence in (49)):

(81) What did you tell me that Bill saw?

derives from (82) (=Chomsky's sentence in (50)):

(82) COMP you told me [_SCOMP Bill saw something].

by *wh*-placement on *something*, *wh*-movement and auxiliary inversion. Since the source of the *wh*-phrase is of no relevance to our discussion, we will omit it from further consideration.

What is of considerable significance is the fact that a *wh*-phrase can only move to the COMP position and, depending on the syntactic environment, remains there or deletes. Also of importance is the fact that a trace is left in the position from which the phrase was moved. The moved phrase and its trace are treated as bound anaphora. Thus sentence (81) could, on the 1977 analysis, be represented as (83):

(83) What_{t₁} did you tell me that Bill saw t₁.

where t₁ is a trace of the *wh*-phrase *what*, and the two are an example of bound anaphora.

Certainly, *wh*-movement does not suffice to account for TM constructions. An example will make the matter clear. The structure underlying (84):

(84) John is hard for Bill to understand.

can be assumed to be that in (85):¹

(85) John is hard for Bill [_S[COMP for] [_S Pro to understand who _S] _S].

Who will move by *wh*-movement to the COMP position and then delete. This operation is shown in (86):

(86) John is hard for Bill [_S [COMP for] [_S Pro to understand who _S] _S].

↓
∅

The final shape of the sentence in terms of traces is as shown in (87):

(87) John is hard for Bill [_S [COMP for] [_S Pro to understand t _S] _S].

Chomsky (1977:103) takes the complement *S* to be in fact an open proposition which is interpreted by what, following Faraci (1974), he calls a *predication rule* as being about subject John. This approach carries over to TM constructions which contain reflexives, as in (21) above, repeated below as (88):

(88) John believes himself to be hard for Bill to understand.

where the open proposition is about the embedded subject *himself*. (It should be indicated that Chomsky assumes reflexives to be base-generated.) The 'aboutness' relation carries over to the matrix subject John through the application of a rule of construal which relates the reflexive to *John*.

It is fair to admit that on the *wh*-movement analysis of TM constructions many problems which were generated by the earlier theories disappear. Simultaneously, however, a few additional doubts are raised in the reader's mind.

One interesting point was raised by Bach in his *Comments on the Paper by Chomsky* (1977). It relates to the representation of sentences at the level of logical form (LF) in terms of variables. Chomsky (1977:83) suggested that at the level of LF the sentence (89) (=Chomsky's sentence (32)) would have the representation (90) (=Chomsky's representation in (37)):

(89) Who did Mary say that John kissed t.

(90) For which x, x a person, Mary said that John kissed x.

Bach (1977:143) observed that the interpretive rule (as stated by Chomsky 1977:84 in (38)) which turned traces (and other material) into variables would

¹ Chomsky (1977:78, 82, *passim*) takes *Pro* to be a base-generated, nonterminal NP without a fixed index. It may be coindexed with another (terminal) NP by a rule of control. The element *Pro* surfaces as a null string if it is not interpreted for control relations, and consequently, the individual it is assumed to designate is said to be unspecified.

also give some undesirable derivations. Thus the representation for (89) would in fact be one like in (91):

(91) For which x, x a person, Mary said x that John kissed x.

Applying this line of reasoning to the sentence in (86) above, we would obtain representation (92):

(92) John is hard for Bill [_S [COMP x for] [_S Pro to understand x _S] _S].

We believe, however, that the problem of the superfluous *x* in the COMP position could be accounted for by, for instance, setting up a general convention which would delete traces in the COMP position in case a *wh*-phrase either deletes or moves to a higher COMP. The interpretive rule in question would only substitute variables for the trace which marks the original position of the *wh*-phrase, and for the *wh*-phrase itself whenever it does not delete. It follows that the representation for (86) would in fact be (93):²

(93) John is hard for Bill [_S [COMP for] [_S Pro to understand x _S] _S].

One other question imposes itself forcibly: since on Chomsky's assumption *wh*-movement is (successive) cyclic, why cannot the *wh*-phrase be moved to the matrix sentence COMP position and, finally, give rise to a question? This can be illustrated as (94):

(94) [_S [COMP] [_S John is hard for Bill [_S [COMP for] [_S Pro to understand whos] _S] _S].

that is, virtually (95):

(95) [_S [COMP who] [_S John is hard for Bill [_S [COMP for] [_S Pro to understand t _S] _S] _S].

Application of auxiliary inversion (and other processes) would yield (96):

(96) Who is John hard for Bill to understand?

Plainly (96) is ungrammatical.

A solution to this problem is probably to be found in the way the *for*-phrase (*for Bill*, in our example) functions in TM constructions. It was noted earlier that TM constructions are ungrammatical on the reading when the *for*-phrase

² Our proposed convention accounts for only part of the problem raised by Bach, i.e., it eliminates traces as they arise in active sentences. The question of how traces resulting from the application of the passive transformation should be handled remains open. The examples presented in Chomsky (1977) strongly suggest that a convention approximating ours was tacitly followed throughout the work. However, no such convention appears to have been incorporated in Chomsky (1980).

contained in the *easy/difficult* type of predicate does not control the infinitival complement. It would be interesting to see how control relations of this kind are accounted for. Lasnik and Fiengo (1974:555) state that there would be no added cost to the grammar in extending the principle that introduces the linkup between NP's and VP's dominated by S to NP's and VP's not dominated by S. It should be recalled at this point that, unlike Chomsky, Lasnik and Fiengo argue for a VP nature of the infinitival complement in TM constructions. Chomsky, on the other hand, does not deal with the question of how this relation is accounted for.

We might venture to offer a syntactic explanation for the fact that in (94) the *wh*-phrase cannot move to the highest COMP. Although we are not in a position to formalize the control relations that hold between, on the one hand, *John* and the trace left in the complement S by *wh*-movement and, on the other, the NP *Bill* and the element *Pro*, it is clear that such relations obtain with the items in question. Furthermore, let us treat the NP *Bill* in (94) as an instance of a specified subject which is not immediately preceded by COMP. Then, it seems, movement of *who* over the NP *Bill* to the highest COMP position is not an instance of the COMP-COMP movement postulated by Chomsky for English.

The solution above fails when we consider a TM construction from which the *for*-phrase is absent. It appears that the question in (97):

(97) Who is John hard to understand?

is as bad as the one in (96). It seems obvious that there is no way to block the movement of the *wh*-phrase to the highest COMP.

In view of the discussion above, it follows that Chomsky's semantic solution should be favoured. It says that the LF for (96) would be (98):

(98) For which *x*, *x* a person, John is easy for Bill [for *Pro* to understand *x*].

But the embedded sentence is not an open proposition, and the subject *John* cannot be taken to satisfy it. The representation as a whole is simply uninterpretable.

Before concluding, we would like to note how acceptability judgements made by native speakers can differ. This, we believe, will exempt us from at least part of the responsibility we have taken for the statements presented in the present paper.

Thus Chomsky (1977:126, note 4) observes that "in all dialects," '*they* want very much for *them* to win' requires disjoint reference between the italicized positions". It is not clear whether this statement should be taken in an absolute sense or merely in a relative sense. For the statement to be true in its absolute sense would require that the specified positions be always disjoint in reference irrespective of the lexical material that occupies them.

That this is not the case is shown by the example Chomsky gives in the preceding note (i.e., note 3), i.e., "they want very much for each other (themselves) to win". That is, the two positions can (or even must) be interpreted as coreferential whenever the second of them is filled by *each other* or an appropriate form of the reflexive.

As for the relative sense, one might argue that the positions in question can be coreferential or disjoint in reference depending on the nature of the lexical items which occupy them. We might suggest a tentative solution: namely, whenever the two positions are filled by ordinary pronouns, they must be interpreted as disjoint in reference. Chomsky's example would appear to support this solution. We might further expect that with an ordinary pronoun in the right-hand position a coreferential interpretation could be achieved by manipulating the left-hand position, e.g., by filling it with a proper name. The relevant example can be found in Bach (1979:524):

(99) Bill wants very much for him to go.

Bach also observes that, if a nonreferring expression is substituted for *Bill*, *him* cannot be interpreted as coreferential (1979:525).

Returning to Chomsky's example above, it is not easy to explain why the sentence is ungrammatical on the reading when *they* and *them* are taken to be coreferential. The sentence would be considered grammatical with the positions filled by, say, the first person pronoun *I*, as one of Bach's (1979:524) examples indicates (his example in (53) repeated below as (100)):

(100) I want me to go.

It should be emphasized that in its underlying representation (100) is parallel, to Chomsky's example, i.e., *want* is followed by the *for* complementizer which deletes under familiar conditions. Furthermore, (100) is not synonymous with (101) (=Bach's 1979:524 example in (52)):

(101) I want to go.

(100) and (101) get different interpretations when picked up by VP-anaphora, as illustrated by, again, Bach's (1979:523) examples in (63) and (64), repeated below as (102) and (103):

(102) I want to go but Bill doesn't.

(103) I want me to go but Bill doesn't.

In light of the foregoing discussion it appears that our sentence in (51) should not have been asterisked and any arguments which rest on it lose their force.

Another objection which might be raised in connection with the examples quoted in the present paper is that in the *hard*-type predicates containing

a *for*-phrase no distinction is made between, on the one hand, the "hard for NP" interpretation and, on the other, the "hard on NP" interpretation. Since there is nothing in our paper that hinges critically on this distinction, we have chosen to disregard it.

The foregoing discussion does not offer any radical solutions to old problems. Rather, it presents the evolution of ideas as they have emerged in the literature in the past ten years or so, and tries to show how the problems of reflexivization and *tough*-movement are interrelated with problems encountered in other areas of syntax and in semantics.

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