On the Interpretation of Missing Complement NPs

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In this paper we shall propose a system of rules to account for the interpretation of the missing NP's in (1).

1. a. John told Bill ___ to mow the lawn.
   b. John wants ___ to mow the lawn.
   c. Mary chose Bill for Karen to represent ___.
   d. Mary chose Bill ___ to represent ___.
   e. John gave Bill Exodus ___ to read ___.

The rules will be based on grammatical relations, and generalize to include the interpretation of both missing subject NP's and missing object NP's. In section 1 we will present the rules of Object Interpretation and Subject Interpretation, and discuss their operation and place in the grammar. In section 2, we will briefly show how attempting to establish control on the basis of word order creates serious problems. Section 3 will compare the strengths and weaknesses of this system to those of Jackendoff's system based on thematic relations. In section 4, the scope of these rules will be discussed, and the constructions in (1) will be shown in the context of similar constructions such as the so-called "backward equi" sentences, sentences with in order to clauses and infinitival relatives. A short conclusion will follow in section 5.

1. Two rules for Complement NP Interpretation

1.1 Complement Object Interpretation

Let us begin by examining some of the data in detail. Consider the sentences in (2).

2. a. John has his mother to consider ___.
   b. Harry chose the war to talk about ___.
   c. Harry gave Fred $10 to buy dinner with ___.

In each of these sentences the missing complement object is marked by "___" and the controlling NP is underscored. Here we say that the miss-

ing object may either be a direct object or the object of a preposition. But in either case, it is the direct object of the matrix sentence which controls it. (2c) shows that this is true whether or not there is an indirect object present. Note that the same control relationship holds when the indirect object is in its position as the object of the preposition to.

3. Harry gave $10 to Fred to buy dinner with ___.

The only cases of complement object deletion where there is no direct object in the matrix clause are sentences like (4) in which the verb is the copula.

4. Mary is pretty to look at ___.

These sentences are discussed at length by Lasnik and Fiengo (1974). In (4), it is the subject which is the controller of the missing object NP. At first glance, the generalization is as follows: the direct object controls the missing complement object when there is a direct object. Otherwise, the subject is the controller.

It is important to note that this generalization seems to hold on passive as well as active sentences. Consider the following sentences:

5. a. John gave Mary Exodus for her husband to read ___.
   b. Mary was given Exodus for her husband to read ___.
   c. Exodus was given to Mary for her husband to read ___.

(We have omitted the by-phrases which play no role in the control of the missing objects.) Both (5a) and (5b) have direct objects, namely Exodus. In (5c), however, the direct object has been made into the derived subject by the passive transformation. As in the case of (3) above, the subject is interpreted as the controller just when there is no direct object. Note again that the indirect object plays no role in the interpretation of missing complement objects.

We will now attempt to show how this generalization about the control of missing objects fits into the grammar. We assume that all of the sentences under discussion have the following underlying structure.

6.
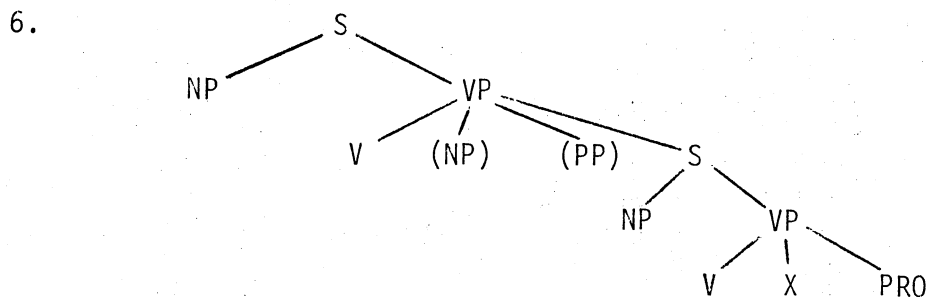
That is, the complement sentence is dominated by the VP of the matrix

clause. Arguments that this is the case can be found in Faraci (1971, 1974). Of central interest to us is the fact that the structure in (6) differentiates these sentences from sentences containing infinitival relatives in which the VP of the matrix does not immediately dominate the complement sentence.

7. a. Carol bought a rack to hang coats on. (From Faraci)
   b. A rack to hang coats on was bought by Carol.

In (7a), (at least on one reading), a rack to hang coats on acts as a constituent. As (7b) indicates, it can act as the object NP in the passive transformation. In sentences with infinitival relatives, the infinitival clause is dominated by an NP, and not by the matrix VP. We shall discuss these sentences further in section 4.

The structure in (6) also excludes sentences with in order to clauses, which, as Williams (1975) points out, are dominated by a node higher in the matrix clause than the VP.

8. John ate early in order to get to the meeting on time.

These sentences will also be discussed further in section 4. Thus only verbal complement sentences are under consideration here.

A second feature of (6) which is worth mentioning in that the item PRO is present. Following Chomsky (1973), we take PRO to be a terminal node of an NP which is not lexically filled. The question we are asking in this paper is, then, how is this NP interpreted? Whether a verb must, can or cannot allow PRO in the object position of its complement is determined in the subcategorization of that verb.[1]

Given the structure in (6) and the generalization regarding the control of missing complement objects, we can now propose a rule of interpretation which applies at the surface structure level. We will see below that the rule is crucially ordered before the rule of complement subject interpretation (Equi). The rule is intended to be a formulation of the generalization which we discussed earlier.

9. Complement Object Interpretation

$$W - NP - X - _S[Y - v - PRO - Z]_S]_{VP}$$
$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$$

Control Hierarchy:

1. Direct Object
2. Subject

2 controls 6 where 2 is the highest available NP on the hierarchy.

It should be noted that the <u>control hierarchy</u> is part of the rule, and its scope does not enter into the domain of other rules in the grammar.[2]

Note that (9) is written as an interpretive rule.[3] That the rule mentions conditions which make crucial use of grammatical relations is not new. Other proposed conditions such as Chomsky's (1973, 1976) Specified Subject Condition and Bresnan's (1972) Fixed Subject Constraint also make mention of grammatical relations. The rule (9), with its conditions, is able to account for the interpretation of the missing objects in all of the sentences thus far discussed.

1.2 Complement Subject Interpretation

In this section we will look at a different set of data, trying to capture generalizations about the control of missing complement subjects. Consider the following sentences.

10. a. John told <u>Bill</u> ___ to take out the garbage.
     b. <u>Sally</u> wants ___ to play golf.
     c. Irv persuaded <u>Harry</u> ___ to stop whistling.
     d. I shouted to <u>Christina</u> ___ to open the windows.

Once again, let us describe the control relationships in terms of grammatical relations. In (10a), where there is a direct object and a subject, the direct object is the controller. In (10b), the subject is the only matrix NP, and it is the controller. (10c) is like (10a) in that the direct object controls the missing subject. What (10d) shows is that the indirect object takes precedence over the subject.

The sentences in (10) indicate that the direct object takes precedence over the subject (a and c) and that the indirect object also does (d). But these sentences say nothing about the relationship between the direct object and the indirect object. Let us assume that there is no crucial ordering between the direct object and the indirect object on the control hierarchy for interpreting missing complement subjects. Then on the basis of the control relationships in (10), we can posit a control hierarchy for subject interpretation which has the following relationships:

11. Control Hierarchy for Subject Interpretation (Equi)

     1. Direct Object/Indirect Object
     2. Subject

A rule of the form of (9) which includes the hierarchy (11) will accurately predict control for all of the sentences in (10). An apparent violation of this hierarchy is found with sentences like (12).

12. John gave Bill a dollar to mow the lawn.

From this sentence it would seem that the indirect object should take

precedence over the direct object on the control hierarchy, even though we have already stated that the direct object and indirect object have equal status. But consider (13).

13. John gave Bill a horse to mow the lawn.

Here, there is an ambiguity between the horse controlling and Bill controlling. This ambiguity is predicted by the control hierarchy. Actually, (12) is ambiguous as well, but the direct object reading is obscured by the fact that it doesn't make sense to think of a dollar mowing a lawn. However, I do not know why, at least in my dialect, the direct object reading is preferred in (13). These sentences, then, support the claim that the direct object and the indirect object share a position on the hierarchy for this rule.

The situation becomes a little more complicated when we consider sentences which have both missing subjects and missing objects.

14. a. John had his mother ___ to consider ___.
     b. Judy gave Martha Exodus ___ to read ___.
     c. Andy chose the war ___ to talk about ___.

In (14a) and (14c) the matrix subject controls the missing complement subject. In (14b) the indirect object does. The control hierarchy (11) makes the wrong predictions for (a) and (c), and makes no prediction at all for (b), since direct object and indirect object share the same level on the hierarchy. The problem is that when the Object Interpretation Rule (9) applies, the NP which controls the complement object can no longer be used as a controller for a missing subject. The question is, what is to prevent his mother from controlling both the complement object and the complement subject in (14a).

In his paper "Conditions on Transformations," Chomsky (1973) proposes a rule of interpretation (RI) which is relevant here. The rule states that no NP - X - NP sequence can have the two NP's coreferential. The rule accounts for the ungrammaticalness of the sentences in (15).

15. a. *Martha$_i$ told Mary$_j$ that she$_i$ likes her$_i$.

     b. *Martha$_i$ told Mary$_j$ that she$_j$ likes her$_j$.

The rule prevents both Martha and Mary from being the antecedent of both pronouns in the embedded clause even though each matrix NP both precedes and commands both of the pronouns.[4] It further provides for disjoint reference in sentences like (16).

16. a. Max saw him.
     b. Mary saw her.

Actually, Chomsky's RI is a little too strong, since it rules out reflexives. If we substitute the reflexives himself and herself for him

and her, respectively in (16), we find that the two NP's in each sentence are obligatorily coreferential. We could similarly reconstruct the sentences in (15). It is necessary, then, to revise RI to account for these reflexives. (17) is an approximation.

17. In a sequence $NP_1 - X - NP_2$, NP_1 and NP_2 must have different indices, unless NP_2 is a reflexive pronoun.

The constraint (17) rules out both sentences in (14), and also accounts for the disjoint reference in (16).

If we consider (17) to be basically correct,[5] then we can account for why his mother in (14) cannot be the antecedent for both of the missing NP's in the complement clause. Assuming that the rules of complement NP interpretation assign indices to PRO, then subject interpretation cannot assign the same index to the subject PRO that object interpretation has assigned to the object PRO. Once object interpretation has occurred, the NP which it designates as the controller is no longer available as a controller for another missing complement NP.

That the choice of a controller for the missing subject depends crucially on whether or not object deletion has applied is one reason for having ordered the object rule first. But this order is needed independently of the problem. Consider the sentences in (18), where there are fewer possible antecedents than there are missing NP's.

18. a. The war was chosen ___ to discuss ___.
     b. Mary is pretty ___ to look at ___.

In both of these sentences, the rule (9) assigns the derived subject the role of controller. Note that there is no ambiguity as to whether the missing subject or missing object is being controlled. By stating that rule (9) precedes subject interpretation, this fact is accounted for since there is only one matrix NP, and condition (14) blocks it from controlling both complement NP's. We can now state the rule of subject interpretation, ordered after rule (9).

19. Complement Subject Interpretation

$$W - NP - X - {}_S[Y - PRO - Z - v - U]_S]_{VP}$$

1   2   3   4   5   6   7   8

Control Hierarchy:

1. Direct Object/Indirect Object
2. Subject

2 controls 5 where 2 is the highest available NP on the control hierarchy.

Returning to (14a) (repeated below), we can see how the two rules inter-
act.

      14.   a.   John has his mother ___ to consider ___ .

First, Rule (9) applies, assigning his mother as the controller of the
missing complement object. Then Rule (19) applies. Although the control
hierarchy gives direct objects precedence over subjects, the direct
object cannot be considered an available controller because of condition
(17). It is therefore not an available NP on the control hierarchy,
and John, the subject of the sentence and the next highest member of
the hierarchy in the sentence, controls the complement subject.

     A further prediction which this system makes is that the object
of a preposition (other than the indirect object) can never be the
controller of a missing complement NP, since such NP's are not members
of the control hierarchies. This automatically prevents the object of
the passive by-phrase from being a possible controller. Consider the
sentences in (20):

      20.   a.   Bill chose the war to talk about.
            b.   The war was chosen by Bill to talk about.

In both (20a) and (20b) the war controls the missing object of about.
But only in (20a) does Bill control the missing complement subject. In
(20b) the complement subject is not controlled, and Bill is only a
possible antecedent. Others include the discussion group, the American
Legion Executive Board, etc. To account for these facts, Lyle Jenkins
(1972) posits a by-phrase constraint which prohibits the object of a
by-phrase from being a controller. But within the framework proposed
here, Jenkins' by-phrase constraint is superfluous, and need not be
mentioned at all in the grammar. It automatically follows from the
claim that control is governed by a principle based on grammatical re-
lations.

     Similarly, we would expect that prepositional phrases which
incidentally occur in the matrix should not be considered as possible
controllers, and that topicalization of a member of the hierarchy should
not preclude its status as a possible controller. Both of these pre-
dictions are correct. (But see section 1.3 for further discussion of
the issue).

      21.   a.   Bill decided with John's help to go to the movies.
            b.   Harry agreed with his boss to work late on Wednesday.
            c.   To Bill, John gave Exodus to read.
            d.   Bill John chose to represent.

In (21a-b) Rule (19) assigns the matrix subject as the controller of
the complement subject in spite of the presence of an intervening prepo-
sitional phrase. The preposing of either the indirect object (21c), or
the direct object (21d) by topicalization, does not destroy its rela-

tional status in the sentence, and the ordinary assignment of control still takes place using the rules (9) and (19).

Promise is a counterexample to the system of rules proposed above. The control hierarchy for rule (19) would cause the object of promise to be interpreted as the antecedent of the missing complement subject.

22. John promised Bill to mow the lawn.

In our theory, then, the lexical item promise must contain a special feature which mentions that the matrix subject is the controller, and that the control hierarchy is inoperative. Of course, the rule then applies in the same manner, and with the same consequences regarding the by-phrase, etc.

23. a. John promised Bill to allow him to go to the movies.
     b. Bill was promised by John to be allowed to go to the movies.

In each case it is the derived subject that controls the complement subject. There will be more discussion of promise in sections 2 and 3.

1.3 Grammatical Relations and Syntactic Structure.

In this section we will discuss two cases for which we must define the relational structure of the sentence independently of syntactic structure. First, let us consider (24).

24. John relied on Bill to mow the lawn.

This sentence clearly presents problems for our claim that the objects of prepositions other than the indirect object cannot control missing complement subjects. A solution which we will have to reject is suggested by Johnson (1974) in reference to so-called "pseudo-passive" constructions.[6] Notice the difference between (25) and (26) in spite of the fact that they apparently have the same syntactic structures.

25. a. John relies on Bill.
     b. Bill is relied on by John.

26. a. John goes to the store.
     b. *The store is gone to by John.

To account for these facts Johnson (1974) proposes a rule of lexicalization which makes rely on a complex verb in (25a) and promotes the object of on to direct object status. This rule will not apply to (26), since it applies selectively. The passive transformation can then be restated as a rule which operates on direct objects, but not on oblique objects. Thus the difference between (25) and (26).

There is a problem with this solution, as Lisa Selkirk has pointed out to me. Adopting Johnson's claim that the object of on is promoted

to direct object would account for the control facts in (24). But to claim that <u>rely on</u> becomes a constituent would be wrong, because of facts involving WH-movement.

27. a. Who did John rely on to mow the lawn.
    b. On whom did John rely to mow the lawn.

That (27b) is grammatical indicates that <u>rely on</u> cannot have been made into a constituent, since rules cannot generally tear items out of lexical constituents. Thus Johnson's claim is too strong.

Our solution to the problem will simply be to adopt half of Johnson's analysis: namely, that the object of <u>on</u> is marked as a direct object even though syntactically, it is the object of a preposition. Although the ad hoc marking of constituents generally says nothing interesting about language, there are several advantages to this solution. First, and central to our endeavor, it accounts for the control facts. Marking the object as a direct object allows rule (19) to apply normally to (24). Secondly, the solution accounts for the fact that (24) and (25) passivize, while (26) does not, if we state the passive transformation as a rule which moves direct and indirect objects. We are able, then, to preserve the advantages of Johnson's solution. Finally, this system is consistent with the pied piping facts illustrated in (27), while it captures the notion that <u>rely on</u> is in some way a semantic unit. That is, syntactically, we are talking about a verb-PP string, while relationally, we are talking about a verb - direct object string.

If it is the case that the direct-objecthood of the object of <u>rely on</u> accounts for both control and passivization, then we would predict that similar verb - PP constructions whose objects are not given direct object status will allow neither object control nor passivization. This seems to be the case.

28. a. Harry agreed in the bar to have another drink.
    b. *The bar was agreed in by Harry to have another drink.

<u>Decide</u> works similarly. In the above case there is both subject control and no passivization. I can come up with no verbs which take object control but do not allow the passive, or vice versa. Thus this prediction seems to be correct.

Another case in which the syntactic structure and relational structure do not seem to coincide is in sentences such as (29).

29. John gave out <u>Exodus</u> to read.

The control hierarchy predicts that the subject of the matrix clause should control the missing subject in the embedded clause. This is not the case; the missing subject is not controlled by either NP in the matrix. What we will propose is that the verb <u>give</u> takes an obligatory indirect object argument which is null in these sentences. There is some evidence that this claim is correct. While the missing complement

subject in (29) is not controlled by the matrix subject, it is not un-controlled in the same sense that other missing complement NP's are uncontrolled. Consider (30), for example.

    30. a. Mary is pretty to look at.
         b. It is difficult to play the french horn.

In both of these sentences the missing complement subject can be replaced by _for one_. That is, there is no implication of a particular class of controllers. This is not the case in (29), which is not synonymous with (31).

    31. John gave out _Exodus_ for (some)one to read.

In fact, the implied subject in (29) is the individual or group who would occupy the indirect object position in the sentence if there were one. The verb _give_, then requires an indirect object argument implicit or explicit. Given this claim, the control hierarchy predicts that the empty indirect object, and not the subject of the sentence controls the missing complement subject, which is correct.

    In both of the examples discussed in this section we have claimed that the relational structure of sentences is not always predictable from the constituent structure. This generally must be assumed anyway, in order to account for the special status of indirect objects. Simple dative sentences such as (32) are actually strings consisting of NP - V - NP - PP.

    32. Martha gave the sandwich to Susan.

As far as the syntactic structure is concerned, there is no difference between (32) and any other sentence which has a direct object followed by a prepositional phrase. But if there is a dative movement rule, then it must differentiate those PP's whose objects are indirect objects, from those whose objects are not. In any case, the control rules pro-posed here certainly must be sensitive to that difference. Conversely, indirect objects, although they are a single relational entity, can occupy two distinct positions in the syntactic structure without changing any of the control facts.

    A similar case can be made for the direct object. As we saw above, the objects of certain prepositions must be considered direct objects in order to account for the control of complement subjects and peculiar facts about the passive. While the relational structure of a sentence is generally predictable from the syntactic structure (and vice versa), this is not always the case.[9] That these two structures are not completely isomorphic leads to interesting questions about their independent roles and their interaction in the grammar. The rules proposed here make use of both. The structural descriptions of rules (9) and (19) make crucial use of the syntactic structure, while the conditions of application rely on the relational structure. Similarly, if as has been suggested, the

passive rule also relies on grammatical relations, then it too would
make use of both structures. We leave as an open question the precise
relationship between these two structures within the grammar, and more
specifically the question of why they are generally, but not always iso-
morphic.

2. Word-order Theories

In this section and in the next one, we shall compare the rules
of complement NP interpretation to other hypotheses found in the litera-
ture. The most well-known theory of control based on word order is
Rosenbaum's (1967, 1970) Minimal Distance Principle (MDP). This claims
that a missing subject NP is coreferential with the matrix NP closest to
it on the tree. Closeness, or distance is measured by counting the nodes
in the tree between the missing NP and the controller. Actually, the
MDP is written as a principle of deletion, so coreference is a condition
as well as the MDP. The most notable counterexample to the MDP is the
verb promise. In (23a), the MDP would predict that Bill is the controller.
Therefore, as in our interpretive theory, promise must somehow be marked
as exceptional.

23. a. John promised Bill to allow him to go to the movies.

Several other problems present themselves when we examine the MDP.
First, sentences such as (1e) (repeated here) indicate that if it is
possible to come up with a principle of control based on word order,
the MDP is not the one.

1. e. John gave Bill Exodus to read.

In this sentence, the two matrix objects are equidistant from the comple-
ment sentence which has two missing NP's. Yet the direct object controls
only the missing object and the indirect object controls only the miss-
ing subject. Ordering Equi before dative movement would not help, since
as we saw above with the sentences in (20), the control rules cannot
apply until after the passive rule.[8] Furthermore, note that the MDP
says nothing at all about sentences with missing complement objects,
and thus cannot account for sentences such as (1e). The system of
rules proposed in section 1 is therefore preferable to Rosenbaum's
system based on distance, since the latter is empirically inadequate.

3. Thematic Relations and Grammatical Relations

Promise is a counterexample to the systems of rules discussed in
sections 1 and 2. To account for sentences with promise as well as the
so-called "regular" cases of Equi, Ray Jackendoff (1972) proposes a
control rule based on thematic relations. According to Jackendoff,
verbs which take infinitival complements are assigned controllers based
on the notions of agent, theme[9], source and goal. For example, if we
consider the direct object of persuade as the goal of that verb, then
we can say that it is the goal which controls the missing NP when the

verb is <u>persuade</u>.

    33. a. John persuaded Bill to go home.
          b. Bill was persuaded by John to go home.

Since each NP is assigned a thematic relation in the deep structure, passivization does not affect the thematic structure of the sentence, and <u>Bill</u> is the controller in both (33a) and (33b). A particular advantage to this system which Jackendoff mentions is that for verbs like <u>get</u> which optionally take a direct object, the assignment of controller is constant, the <u>theme</u> being assigned that role regardless of the syntactic structure.

    34. a. John got to meet President Ford.
          b. John got Bill to meet President Ford.

The application of this principle of assigning control to the verb <u>promise</u> is obvious. For that verb, the <u>source</u> is interpreted as the controller, whether or not there is a direct object.

    35. a. John promised to go.
          b. John promised Bill to go.

<u>John</u> is the source of the promise in each case.

Jackendoff's theory runs into problems exactly where Rosenbaum's theory did, although the former does account for active <u>promise</u> sentences. First, let us consider the passivized <u>promise</u> sentences, such as (36).

    36. Jill was promised by Mary to be allowed to go.

Like the word-order theories, the control is assigned according to the deep structure. But since <u>Mary</u> is the <u>source</u> of <u>promise</u>, Jackendoff's control rule will assign it as the controller of the complement subject. The correct statement seems to be that in active sentences with <u>promise</u>, such as (35), the <u>source</u> is the controller, and with passive sentences, such as (36), the <u>goal</u> is the controller. This presents a difficult problem for this theory. Note once again that we cannot invoke the <u>by</u>-phrase constraint since it could only rule out <u>Mary</u> as the controller, but could not provide a mechanism for assigning <u>Jill</u> as the controller. In the theory outlined in section 1, once we consider <u>promise</u> as exceptional, the interpretation of (36) presents no problems.

Secondly, the theory which incorporates thematic relations has difficulty with sentences which have two complement NP's missing. The system must be expanded to include verbs which allow missing objects. For instance, the lexicon could mark the <u>theme</u> of <u>choose</u> as the controller, not specifying which complement NP must be controlled. In (37), then, we can provide a mechanism for predicting the correct control, particularly if we also invoke condition (17).

    37. a. John chose Bill to represent.
          b. John chose Bill to represent him.

Requiring object interpretation to precede subject interpretation, Bill, the theme, controls the missing object in (37a). Because of condition (17), it can no longer control the subject, and John is assigned that role. In (37b), there is only one missing NP, and Bill controls it.

But a theory of this sort runs into difficulty when there are several matrix NP's. In (1e), once again, after the theme (Exodus) is designated as the controller of the missing object, there is no way of telling which of the two remaining NP's is the controller of the complement subject.

　　　1e.　John gave Bill Exodus to read.

Note that it is impossible to specify two controllers in the lexicon for a given verb. While such a system, assigning the goal as the subject controller for give and the theme as the object controller, works for (1e), it cannot be used for verbs such as choose. The problem is that the controller of the missing subject changes depending on whether or not there is a missing object, as we just saw in (37).

The only way to solve this problem would be to devise a mechanism independent of thematic relations which could choose between the subject and indirect object in (1e), in deciding which NP controls the missing subject. I can think of no such principle outside of a distance principle, which would render the theory vacuous, in that it would make crucial use of the very principle which it has claimed to replace. At this point, then, we will consider these data to pose a serious problem for the theory of control based on thematic relations.

Thirdly, in Jackendoff's theory, each lexical item must mention which NP is to be designated as the controller. This seems to me to miss the generalization that control works in the same way for most of the verbs in the language. In our theory, the principle of control is strictly rule-governed, and control need not be mentioned in the lexicon at all (except for the lexical exception promise). This strikes me as an advantage, since it is far more general.

On the basis of the evidence presented above, the theory based on grammatical relations seems preferable to the one based on thematic relations. While the former has one (or perhaps two if we consider vow) lexical exception, the latter makes incorrect predictions for passive sentences, runs into trouble with sentences which have more than one missing complement NP, and relies more heavily on adding information to the lexicon. Finally, it should be noted that this is in no way an indictment of theories which incorporate thematic relations into their semantic representation. But grammatical relations seem to better predict the control of complement NP's.

4. Other Cases of Complement NP Deletion.

Rules (9) and (19) are written to include in their structural descriptions only complement sentences dominated by VP. However, there

are many cases of infinitival and gerundial complements which do not originate from VP's. In this section we will briefly discuss the status of some of these.

4.1 Backward Equi

First, consider the sentences below:

38. a. To take 3 exams in one day could cause an ulcer.
    b. To take 3 exams in one day would upset John.

Neither of the two rules proposed in section 1 operates on these sentences. In (38a), the one NP in the matrix, an ulcer, does not control the complement subject. In (38b), on the other hand, the direct object John is interpreted as the subject of the complement sentence. We can account for this fact by claiming that there is no rule in sentence grammar which assigns a controller to a missing NP for sentences such as (38). The controller must be inferred from the discourse. We also find:

39. To go to the movies with you would be my pleasure.

In (39), the controller is inferred from the determiner of the object of the matrix sentence, which bears no grammatical relation to the verb. Note further that for all of these cases, the corresponding poss-ing complement could replace the infinitival complement without changing the facts regarding control.

One generalization which can be made about control in these sentences is that when there is a controller, it is always in some sense a goal. In (38a) it is impossible to construe an ulcer as a goal, and the missing complement subject is uncontrolled. John can be interpreted as a goal in (38b), and it is also the controller. In some sense even my in (39) is a goal, since one could preserve meaning by substituting a pleasure for me for the final NP in the sentence. In addition, as (38b) and (39) show, it seems that control is obligatory when there is a goal in the matrix. The syntactic and relational structures of the sentence are not considered in finding a controller in these cases. The rule of construal differs radically from the rules discussed in section 1, which account for cases in which the antecedent precedes and assymetrically commands the PRO.

As is well-known, subject complements of this type can be extraposed, yielding (40) from (38).

40. a. It could cause an ulcer to take 3 exams in one day.
    b. It would upset John to take 3 exams in one day.

Let us assume that the structures of (40) are represented in (41).

41.

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                        S
            ┌─────────┬─────┐
           NP         VP     S
                    ┌──┴──┐  ◿
                    V  (NP) to...
```
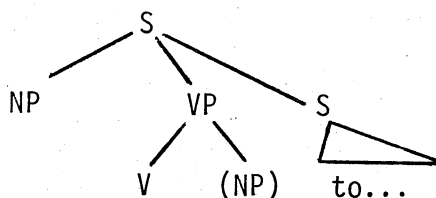
By claiming that the sentences in (40) have this structure we are able to account for why rules (9) and (19) do not apply: their structural descriptions are not met since the complement sentence is not dominated by the VP. As evidence for this structure as opposed to one in which the VP does dominate the complement, consider the sentences in (42).

42. a. To take 3 exams in one day could cause an ulcer before you know it.
     b. It could cause an ulcer before you know it to take 3 exams in one day.
     c. ??It could cause an ulcer to take 3 exams in one day before you know it.

If, as Edwin Williams (1975) argues, before phrases are dominated by a node higher in the tree than the VP, then the distribution of grammaticalness in (42) indicates that the extraposed clause must be dominated by an even higher node (perhaps the $\bar{S}$ node rather than the S node). We take this as evidence that (41) is at least a plausible structure for (40), and that rules (9) and (19) should not be expected to apply.

4.2 A Brief Note on Gerunds

Thus far we have excluded gerunds from our discussion, but the rules proposed thus far apply for them as well. However, it is necessary to distinguish two kinds of gerunds. Wasow and Roeper (1972) differentiate between nominal and verbal gerunds. Only verbal gerunds are dominated by VP or S.

43. (Example (3) from Wasow and Roeper)
     a. I detest loud singing.
     b. I detest singing loudly.

In (43b), I is interpreted as the subject of the gerund. There is no NP interpreted as the subject in (43a). If we accept Wasow and Roeper's claim that only (43b) has the structure of a sentence, then the control facts are easily explained. (43b) has a missing subject, PRO, and meets the structural description of the subject interpretation rule (19). On the other hand, (43a) has no such PRO in the determiner since it is dominated directly by NP. Thus rule (19) cannot apply.

The backward Equi examples are similar. The construal rule discussed in the previous section applies to verbal, but not nominal gerunds as well as to infinitives.

44. a. Singing loudly excites John
    b. Loud singing excites John.

Only (44a), the sentence with the verbal gerund, is subject to the rule. Of course, similar sentences with no _goal_ in the matrix do not receive control of the missing subject by this rule.

4.3 Infinitival Relatives

In section 1 we mentioned that the constructions under discussion should not be confused with the infinitival relative construction.

7a. Carol bought a rack to hang coats on.

As Faraci (1974) points out, (7a) is ambiguous between Carol having bought a rack on which she intends to hang coats, and Carol having bought a rack which was designed for hanging coats on. The second reading is the infinitival relative reading. In sentences with infinitival relatives, the missing object in the relative clause is interpreted as coreferential with the head of the NP. We assume that during the NP cycle WH-movement takes place, binding the object to the head. The object interpretation rule (9), then, is not applicable to strings of this sort since at the time of its application the missing object is not PRO, but rather a bound variable ($\underline{t}$ in trace theory accounts).

It seems that the missing subject is either uncontrolled, or optionally controlled. In (7a), it is not necessarily the case that Carol will be the one to hang coats on the rack, although that reading makes sense. Also, consider the following sentences, some of which are taken from Grimshaw (1975):

45. a. The university should provide a decent library to work in.
    b. The workers provided temporary barracks to sleep in.
    c. John received from Susan a book to read.

In both (45a) and (45b), the missing subject is uncontrolled, whereas it is optionally controlled by _John_ in (45c). Grimshaw (1975) claims that only the _goal_ of the matrix can control the subject of an infinitival relative, which seems to be correct. Neither _the university_ nor _the workers_ can be considered _goals_ of their respective clauses. It is interesting to note that if we were to add Grimshaw's requirement that the goal be the controller on to rule (19), then it would apply to these cases. The addition of a direct object to (7a) would cause the new NP to be the controller.

46. Carol bought Mike a rack to hang coats on.

The facts are as follows: rule (19) applies optionally whenever it chooses the _goal_ as the controller, otherwise the missing subject is uncontrolled.

Whether rule (19) should be amended to include these cases is

questionable. After all, Grimshaw's analysis accounts for the control facts without recourse to conditions of the sort that would be needed. Secondly, certain differences between infinitival relatives and the verb phrase complement sentences discussed above should be brought to light. As Grimshaw points out, none of the sentences with infinitival relatives can be assigned controllers without violating the principle of subjacency (discussed in Chomsky (1973)). In (46), for example, two cyclic nodes, NP and S̄ intervene between the optional controller and the missing NP. In the sentences discussed in sections 1-3, this principle is not violated.

We will not take a stand here on the issue of whether subjacency is a real principle, or whether there are bounded and unbounded rules in the grammar. If the former is true, then rule (19) cannot apply since in the case of infinitival relatives it violates the condition. If the latter is true, and rule (19) is a bounded rule, then the rule cannot apply either, since a cyclic node intervenes.

Thirdly, the generalization about the control of missing subjects in infinitival relatives is very similar to the corresponding generalization in backward Equi sentences. Just in case the structural description for rule (19) is not met, the matrix goal is interpreted as the controller, if there is one. It is not clear how to generalize these two cases formally, since control is obligatory in one case, but optional in the other. Perhaps this is a result of the violation of subjacency in infinitval relatives. In any case, the optionality of control, the fact that a statement of goal control is adequate and the violation of subjacency all argue against attempting to extend rule (19) to include these cases. Finally, we should mention that even with an amended rule (19), there is a small group of verbs which are counterexamples to the relational approach. Consider the sentences in (47):

47. a. John asked Bill for a book to read.
    b. *John asked Bill for Exodus to read.
    c. John asked Bill to read a book.
    d. John asked Bill what to do.

Rule (19) would assign Bill as the controller in (47a) just as it does in (47c). What (47b) shows is that ask for allows the infinitival relative construction, but not the complement object deletion structure which we discussed in section 1. The ungrammaticalness of (47b) can be accounted for by the fact that relative clauses cannot take necessarily referential NP's as their heads.

Two facts seem to minimize this problem, however. First, as (47d) shows, ask sometimes takes subject control, even when the complement is not part of an infinitival relative. Thus, ask must be marked specially independent of the infinitival relative constructions. Secondly, Carol Chomsky (1969) points out that children learn the constructions with ask which have subject control after they learn the constructions which have object control. This indicates that there is, perhaps, some psychological reality to marking ask as a lexical exception under certain circumstances. Beg behaves similarly.

On the basis of these facts we assume that rule (19) does not (and should not) apply to infinitival relatives.

4.4 In Order To Sentences

Another construction which allows missing complement NP's is the in order to construction, discussed by Faraci (1971, 1974). Faraci distinguishes these constructions from the ones discussed earlier, by claiming that the in order to sentences have a structure such as (40) as opposed to what he calls "for-to purpose" sentences which have the structure (6). Once again, then, we would not expect rule (19) to apply, and it does not.

> 48. a. Al skipped school in order to go fishing.
>   b. The police arrested John to please the chief.
>   c. Dick ran away in order to scare his parents.

In each of these sentences, the matrix subject controls the complement subject regardless of whether there is a direct object. In addition, the in order to clauses in (48) can be preposed, while the complement clauses discussed in sections 1-3 cannot.

> 49. a. In order to go fishing, Al skipped school.
>   b. To please the chief, the police arrested John.
>   c. In order to scare his parents, Dick ran away.

When we consider certain passive sentences with this construction, the situation becomes less clear.

> 50. John was arrested by the police in order to teach people a
>   lesson.

(50) is ambiguous between two readings. Either John got himself arrested by the police in order to teach people a lesson, or John's being arrested by the police was intended to teach people a lesson. In the second reading, the entire matrix sentence controls the missing complement subject.

This ambiguity seems to hold for all of the in order to sentences, although it is sometimes obscured by selectional restrictions.

> 51. a. The letter was received in order to avoid a fight.
>   b. Deer have strong legs in order to run fast.

It makes no sense to talk about a letter fighting, so only the sentential reading is obvious in (49a). In (49b), the opposite is the case, with the subject reading being dominant since sentences cannot run.

To state these facts in a rule does not require mention of the subject being the only possible controller. Williams' (1975) generalization that an NP cannot control anything higher in the tree than itself

accounts for why other NP's in the matrix clause do not control the missing NP's in <u>in order to</u> constructions. Rule (52) formalizes the above discussion.

    52.   <u>In Order To</u> Interpretation:

$$U - \begin{smallmatrix} NP \\ S \end{smallmatrix} - W]_{VP} \text{ in order } {}_S[PRO - X]_S$$

        1   2   3   4   5   6

    2 controls 5.

This is an instance in which the generalization could be stated either in terms of structural or relational generalization, since a control hierarchy (with <u>subject</u> as the only member) could have been proposed. But rule (52) appears to be the simplest formulation.

5. Conclusion

In this paper we have proposed a system of rules to account for the control relationships in sentences with infinitival complements. Each rule has a control hierarchy which determines the designation of antecedents for missing NP's in the complement clause. It was argued that this theory is more general than two other theories in the literature: Rosenbaum's distance principle, and Jackendoff's hypothesis based on thematic relations. In addition, we have hypothesized that whether or not an infinitival construction is controlled by these rules depends crucially on where that construction occurs in the tree. Infinitives and gerunds dominated by VP are governed by control rules of the type described here. Those dominated by NP or S are controlled by different principles.

The question of where grammatical relations fit into the grammar has not been answered. In his dissertation, David Johnson (1974) makes the claim that grammatical relations are both necessary and sufficient to describe linguistic generalizations. We claim here that they are necessary, but not sufficient, since our rules make reference to dominance relations in the structural descriptions.

Footnotes

*I wish to express my gratitude to Emmon Bach, Jay Keyser, Steve Lapointe, Jean Lowenstamm, Lisa Selkirk and Edwin Williams for their discussion and comments. The comments from two UMOP readers were also extremely helpful.

[1]This analysis is argued for by Mary Clark (1975). By allowing the subcategorization of the verb to determine where PRO may occur, we can simply state complement NP interpretation rules as obligatory rules whenever there is a PRO present. Thus rule features, or any mention of optional application of the rules need not be mentioned.

[2]As Lisa Selkirk has pointed out to me, rule (9) is not quite right in that the structural description also allows infinitival relatives, which should be excluded. The problem seems to be in translating the tree structure in (6) to labelled bracketings. A finer statement is needed.

[3]A well-known fact about the transformational approach to Equi is that it is difficult to assure that the proper NP's be coreferential (See Postal (1970)). Interpretive rules avoid this problem since they simply bind free variables. However, we are not arguing that it is impossible to translate these rules into transformations.

[4]See Lasnik (1975) for the rule of disjoint reference which operates between clauses.

[5]Actually, (17) does not deal with sentences such as *Himself likes himself, *Nixon likes himself, etc. Note that it does handle (i), if we allow a PRO bound to a reflexive to count as a reflexive.

 (i) John has himself to consider.

It is necessary to consider PRO as a reflexive in order to avoid a violation of the condition. A more precise statement is needed.
 Furthermore, the RI, as Chomsky (1973) states it, is bound by the specified subject condition. Since the SSC cannot be part of the grammar which incorporates rule (9), condition (17) must be bound by a somewhat different set of conditions. The clause-mate condition is a possible candidate.

[6]This problem has received considerable attention in the literature. In particular, Chomsky (1965) and Lakoff (1970) propose other solutions. Johnson (1974) presents a summary and critique of this literature.

[7]It may also be the case that the syntactic and relational notions of subject also differ at times. Consider the following:

 (i) There were three men entering the room in order to see the boss.

As we will see below, the matrix subject is the controller of the missing NP in in order to clauses. In (i), the syntactic subject is there, but the controller is three men. It might be argued that although the rule of there-insertion has moved the original subject, it still maintains its relational status for the purpose of certain rules which refer to grammatical relations. But this solution is not a necessary one, since it can be convincingly argued that three men entering the room in order to see the boss is a constituent.

[8]If, as has been proposed in the literature, there is no rule of dative movement, then the distance principle is in even worse shape. In that case, there would be no way of interpreting sentences like (le).

[9]Jackendoff defines _theme_ as the thing in motion. For example,
in (i) _John_ is the _agent_, _Mary_ is the _goal_ and _the book_ is the _theme_

(i) John gave the book to Mary.

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