

REVIEW ARTICLE

R.S. Jackendoff: Semantic Interpretation
in Generative Grammar, MIT, 1972

This book is one of three recent publications on semantics within the tradition of transformational linguistics; the other two are Katz (1972) and McCawley (1974). Between them they represent the three main approaches to semantics in that tradition. The one of least interest is Katz, which is a lengthy re-statement of the 'standard' theory as originally set out in Katz and Postal (1964) and Chomsky (1965). According to that theory, there is a level of 'deep' structure which is at once the input to the transformational 'component' and the input to the semantic 'component'. Base rules generate deep structures which transformation rules convert into phonologically interpretable surface structures, and these deep structures are paired by semantic 'interpretation' rules with semantic representations. Thus the pairing of semantic representations with surface structures is effected by two distinct blocks of rules, one block operating between deep and surface structure, and the other between deep structure and semantic representation. This kind of theory has been subjected to a considerable volume of criticism in recent literature, and Katz is now its only prominent defender. The main objections to the standard theory concern its inability to handle in a satisfactory way certain crucial issues having to do with the relation between syntax and semantics. The theories of Jackendoff (lexicalist-interpretivist) and McCawley (generative semantics) focus on precisely these issues and offer rival accounts. Both reject the standard account of deep structure, but they differ in what they propose in its place. Whereas in the generative semantics model the notion of a significant intermediate level between surface structure and semantic representation is rejected altogether, and transformations are taken to be part of a unified system of constraints (including global constraints) pairing surface structures with their semantic representations, in Jackendoff's theory an intervening level is retained but it is made to approximate more closely to surface structures than in the standard model. For example, pronouns are taken to be present in deep structure and not to be introduced transformationally. Thus, while generative semantics moves the input to transformations further from the surface, thereby enlarging the range of operation of the transformation rules and

eliminating semantic 'interpretation' rules, Jackendoff shifts it closer to the surface, reduces the role of transformations and correspondingly increases the work of the semantic rules, some of which are made to operate on deep structures, some on surface structures, and others on intermediate stages of derivations. Jackendoff claims superiority for his theory over generative semantics on the ground that it is more tightly constrained, is therefore compatible with a more restricted class of possible grammars, and consequently has more empirical content. I will argue, however, that this claim is without justification, and that where his theory differs significantly from generative semantics (as opposed to being a mere notational variant of it) the generative semantics model is to be preferred.

A well-known difficulty for the standard theory concerns the representation of the relation of anaphora, on which the rules of Equi-NP Deletion (Equi), Pronominalization (Pron) and Reflexivization (Ref) crucially depend. It cannot be represented simply by having different NPs dominating different tokens of the same name. Since more than one person is called 'John', the (a) sentences in the following set can, indeed would most naturally, be taken as referring to two different persons.

- 1) a. John wants John to go.
b. John wants to go.
- 2) a. John said that John was tired.
b. John said that he was tired.
- 3) a. John shaved John.
b. John shaved himself.

Hence if the corresponding (b) sentences were to be derived from the (a) sentences by Equi, Pron and Ref respectively, these rules would have to be both optional and meaning-changing; and this would conflict with the assumption, central to the standard theory, that deep structure is the only level of syntactic structure relevant to semantic interpretation. In order to cope with this difficulty and to preserve the assumption about deep structure and semantic interpretation, Chomsky introduced the device of marking NPs with subscripts, like subscripts signifying identity of reference (coreference) and unlike subscripts difference of reference. In this way, given that Equi, Pron and Ref are made sensitive to subscript identity, their application can be restricted to those trees which contain pairs of NPs interpreted as coreferential. For example, if (1a) and (1b) are

both assigned deep structures resembling (1a), except that in the one the two Nps are differently subscripted and in the other identically subscripted, the correct pairing of surface structures and semantic representations is secured by the fact that it is only the deep structure with coreferentially interpreted NPs that meets the conditions for Equi to apply. The same holds for the sentences of (2) and (3). Thus, for this range of examples, subscripting saves the standard theory.

However, as McCawley has pointed out in a number of publications (see McCawley 1968, 1971, 1972), the subscripting treatment runs into trouble when account is taken of NPs which are not names but quantified phrases. Both (4a) and (4b) are good sentences having different meanings, but the difference in meaning is not due to the second containing coreferential NPs and the first not.

- 4) a. Every barber shaves every barber.
- b. Every barber shaves himself.

Indeed, insofar as it makes sense to talk at all about the reference of quantified NPs, it is the (a), not the (b), sentence which contains coreferential NPs. Consequently, the standard theory should assign identical subscripts to the NPs in the deep structure underlying (4a) and different subscripts to those in that underlying (4b). But in that case it is faced with the unhappy prospect of having either to reformulate Ref (and Equi and Pron, since similar arguments apply to them) so that in some contexts it is triggered by identical subscripts and in others by non-identical ones, or of revising the semantic interpretation of subscripts so that identity signifies coreference in some contexts but not in others. Neither of these ad hoc alternatives can have much appeal to any self-respecting theorist. Moreover, the trouble is not confined to quantified NPs; it also arises with names in sentence-pairs such as (5).

- 5) a. Only John voted for John.
- b. Only John voted for himself.

In (5a) the two occurrences of 'John' can be taken to refer to different people, but they can also be taken to refer to the one person, and in that case the standard theory would subscript them identically, thereby triggering Ref and deriving (5b). However, even when the two NPs in (5a) are interpreted coreferentially, that sentence does not mean the same as (5b). The meaning of (5a), on the coreferential interpretation, is that there was only

one vote for John, namely his own; and this is compatible with there being more than one person who voted for himself. But what (5b) means is that there was only one person who voted for himself, namely John. So, either the standard theory wrongly predicts that, on the coreferential interpretation, (5a) means the same as (5b), or it is obliged to revise Ref (and also Equi and Pron) in some ad hoc way.

There are two alternatives to such ad hoc revisions, both of which involve rejecting the standard account of deep structure. One is the course taken by generative semantics, in which standard deep structures give way to more abstract forms closely resembling the formulas of predicate logic. The generative semantics deep structures (= semantic representations) for (4a) and (4b) would resemble (6a) and (6b) respectively.

- 6) a. For every x and for every y, such that x is a barber and y is a barber, x shaves y.
 b. For every x, such that x is a barber, x shaves x.

That is, (a): given any two people who are both barbers, then the one shaves the other, and (b): given any person who is a barber, then that person shaves that person. This distinguishes the two meanings and also provides a ready way of accounting for the reflexive without raising any questions about the reference of quantified NPs. All that is required is that Ref be formulated in such a way as to make it sensitive to the presence of identical variables in the same clause: 'x shaves x' reflexivizes, 'x shaves y' does not. (A similar account is possible for Equi and Pron). In addition, the device of bound variables used here also allows ambiguities such as that in (7), in which a barber may or may not refer to a particular barber that John has in mind, to be expressed in terms of quantifier scope (see later).

- 7) John is looking for a barber.

Further, if the rules under discussion are made sensitive to identity of variables, and not to markers of coreference, it is possible to account naturally for their operation in contexts such as (8), where the notion of reference, and hence that of coreference, is hardly applicable.

- 8) John dreamt that there was a leprechaun somewhere or other which wanted to tell him that it shaved itself.

In this case, Equi deletes an NP after wanted, Pron inserts it and Ref inserts itself; yet it is only in the loosest possible sense that a leprechaun in this sentence can be said to refer anything, first because there are no leprechauns, and secondly, because even in John's dream there is no particular leprechaun.

The second alternative, the one taken by Jackendoff, denies that there are any syntactic processes of Equi, Pron and Ref, replaces these rules by semantic counterparts, and postulates closer-to-the-surface deep structures. Like the generative semanticists, Jackendoff holds that there are certain processes, previously considered to be purely syntactic, which are in fact dependent on certain aspects of semantic structure. But whereas the generative semantics response to this discovery is simply to treat these processes as transformations which are sensitive to certain elements in semantic representation, Jackendoff holds fast to the purist, but confused (see later) doctrine that "semantic factors must not be mentioned in the structural description of a transformation" (p.46). Accordingly, he relegates Equi, Pron and Ref to the 'semantic component'. In thus restricting the class of possible transformations he claims to be placing tighter constraints on the class of possible grammars, a point to which we return below.

For Jackendoff, the deep structures of (3) and (4) are very close to their surface structures; in particular, the reflexive is present in the deep structures underlying the (b) sentences. However, the reflexive is not marked by the deep structure formation rules as being coreferential, or not coreferential, with other NPs in the structure; this is the function of the rule which Jackendoff introduces as the semantic counterpart of Ref. In (3b), since there is only one NP other than the reflexive, and since that NP is in the same clause as the reflexive and to the left of it, Jackendoff's rule obligatorily marks the reflexive coreferential with the other NP. (Presumably the same is supposed to happen in (4b) though, as we have seen, the reflexive is not coreferential with the subject of that sentence. This is a serious problem for Jackendoff, to which we return below). In the case of sentences such as those of (9), where there are two NPs other than the reflexive, the rule has to determine which NP is coreferential with the reflexive.

- (9) a. The barber told John to shave himself.
b. John showed Fred a picture of himself.

In (9a) it must determine that John is coreferential with the reflexive and the barber is not, while in (9b) it must allow that the reflexive can be coreferential with either of the other two NPs and hence that the sentence is ambiguous. Jackendoff devotes considerable space (Chapter 4) to determining the precise nature of the rule, the conditions under which it operates, and its order of application in relation to other rules. He argues that it is ordered, along with his counterparts of Equi and Pron, at the end of the transformational cycle, and hence that it applies before some transformations and after others, depending on the number of embeddings in the tree. In certain contexts, it applies obligatorily - in particular, when the reflexive is to the right of another NP in the same clause, or when, in certain special cases such as (10), the reflexive is to the right of a suitable NP in a higher clause.

(10) John thinks that there is a picture of himself in the hall.

In some other contexts - notably certain constructions in which the reflexive is to the left of the other relevant NP - it is argued to be optional. There is also a consistency condition which marks as ill-formed those sentences in which the reflexive rule marks a reflexive as being coreferential with an NP which, for reasons of number, gender, and such like, cannot have the same reference as the reflexive. Thus in (11) the reflexive rule will mark the men as being coreferential with himself, and then the consistency condition will reject the sentence on the ground of inconsistency.

(11) *The men will shave himself.

Similarly, in (9b), himself can be marked as coreferential with either John or Fred but not both, since this would conflict with the fact that these two names refer to different people.

We need not concern ourselves with the details of Jackendoff's account of his semantic counterpart of Ref, since there is an over-riding objection to it that derives from its dependence on the notion of coreference. We have already seen some difficulties arising in connection with sentences like (4b), and with sentences like (8). His account also runs into trouble with sentences such as (12).

- (12) a. Either John or Fred shaved himself.
b. *John and Fred shaved himself.
c. John and Fred each shaved himself (themselves).

The consistency condition rejects interpretations of these sentences in which the reflexive is marked as coreferential with both of the preceding NPs. But it is not clear how, in Jackendoff's theory, it can be prevented from being marked as coreferential with one of the other NPs in each of these sentences, in which case (12b) would come out as well-formed, and (12a) and (12c) would be assigned interpretations which they do not allow. The fact of the matter is that in (12a) and (12c) the reflexive is not coreferential with either of the other two NPs, and this is a fact which Jackendoff's theory is not equipped to handle. It can, however, easily be handled in a theory using bound variables, by deriving (12a) from (13). (A similar treatment accounts for (12c)).

- (13) Either John is an x such that x shaved x, or Fred is an x such that x shaved x.

What (13) says is that the predicate is an x such that x shaved x (i.e., roughly, is a person who shaved himself) is true of either John or Fred, which is precisely what (12a) means. A reduction transformation applies to (13), under the condition that the same predicate is mentioned twice, and reduces it to (12a). But Jackendoff would have to derive (12a) from something like (14).

- (14) Either John shaved himself or Fred shaved himself.

If the reduction rule applies before the reflexive rule, reducing (14) to (12a), the reflexive rule will then incorrectly mark himself as coreferential with one of the other NPs in the sentence. On the other hand, if the reflexive rule applies first to (14), marking the first reflexive coreferential with John and the second coreferential with Fred, the two VPs will no longer meet the condition of identity for the reduction rule to apply. Moreover, if the reduction rule is so formulated that it can apply to certain non-identical VPs, which VP will it, in this case, delete? The one in which the reflexive is coreferential with John, or the one containing a reflexive coreferential with Fred? Neither alternative will do. If the reflexive rule precedes the reduction rule, this latter rule must have the effect of not only reducing the structure but also of re-marking the reflexive so that it is not coreferential with either of the other NPs, a very strange requirement to place on a transformational component, and certainly one which conflicts with the aim of tightly constraining the transformational component. Alternatively, if the reduction rule applies before the reflexive rule, the latter must somehow be prevented from marking himself as coreferential with either John or Fred in (12a). Either way Jackendoff is in trouble. Nor is the trouble merely the fact that he is obliged to make ad hoc amendments to at least one rule. His

whole theory of reflexives (and of pronouns and deleted NPs) rests on the assumption that they always refer to something. Hence, in his theory, if a reflexive is marked as not being coreferential with some other NP in the sentence, that sentence is either thrown out as ill-formed (which (12a) is not), or the reflexive is taken to refer to something not mentioned in the sentence, which in the case of (12a) is absurd. The mistake lies in the underlying assumption. For there are numerous cases in which reflexives (and the same applies to pronouns and other NPs) do not function referentially. (For an especially interesting case, see Karttunen 1969). No theory which, like Jackendoff's, makes crucial use of the notion of coreference can give adequate recognition to this fact. We return to this point below in discussing the connection between lexicalization and rules such as Ref, Pron and Equi.

Jackendoff's account of the semantic counterpart of Pron follows the same lines as his theory of reflexives, except that, whereas the reflexive rule is in general obligatory, the pronoun rule is usually optional. Again the consistency condition comes into play, rejecting the output of the pronoun rule when, for example, it marks he and Mary as coreferential in (15).

(15) Mary said that he would be late.

Since, however, the rule is optional, it need not mark these two NPs coreferential, and if it does not, the sentence is assigned its correct interpretation. The account of the rule which replaces Equi is also along the same lines, but it requires the introduction of an extra piece of apparatus, to be found in other lexicalist-interpretivist theories such as Emonds (1969) and Chomsky (1970), the notion of empty nodes signified by the symbol \triangle . Reflexives and pronouns show up in surface structure. Therefore, if they are held to be present in deep structure, it can be maintained that they have the same form at that level as in surface structure. But since missing complement-subjects, such as the one in (1b), have no surface form, any theory which holds that they are present in some form in deep structure is faced with the problem of determining what that form is. Jackendoff, in common with most other transformational grammarians, maintains that their presence must be signified in some way in deep structure, for the usual reason that various other grammatical processes are thereby simplified. For example, if the subject of shave in (9a) is taken to be present in the deep structure in the same clause as the reflexive, but deleted under some condition of identity with the main clause indirect object, John,

then the fact that himself in this context refers to John can be explained without giving up the generalization that, with the possible exception of the troublesome case of 'picture' nouns (see (10)), the reflexive rule does not operate across clause boundaries. However, unlike proponents of the standard theory, Jackendoff rejects the idea that missing complement-subjects are to be represented as full NPs in deep structure, roughly for the reasons mentioned in connection with the difficulties associated with (1) - (3). Instead, he represents them as NPs dominating the symbol \triangle , which signifies that, in some not entirely clear sense, the node is 'empty'. It is empty at least in the sense that it is not lexically filled. But it is not empty in any sense which would prevent it from being coreferential with other NPs, and hence having reference. For the function of Jackendoff's semantic counterpart of Equi is precisely to mark \triangle as coreferential with an appropriate NP in the next clause up the tree. For example, \triangle , appearing as the subject of shave in (9a), is marked by the reflexive rule as coreferential with himself and by the counterpart of Equi as coreferential with John, which is what ensures that John and himself are interpreted as referring to the same person. Moreover, though \triangle signifies that a node is empty, it can be operated on in just the same way as any other NP by such transformation rules as Passive and Subject Raising. Thus, in Jackendoff's treatment, (16) derives from (17).

(16) John hopes to be expected by Mary to shave himself.

(17) S_1 [John hopes S_2 [Mary expect S_3 [\triangle shave himself]]]].

The reflexive rule applying to S_3 marks \triangle coreferential with himself. Then \triangle is moved by Subject Raising into the object position in S_2 , and by Passive into the subject position of that clause. In that position it meets the conditions for the counterpart of Equi to mark it coreferential with John in S_1 , thus ensuring that (16) is correctly interpreted. Finally, \triangle is obligatorily deleted, having served its purpose. Note that (18), which would also be derived from (17) if the counterpart of Equi marked \triangle in S_3 as coreferential with Mary in S_2 , is thrown out by the consistency condition because Mary and himself cannot refer to the same person.

(18) *John hopes that Mary will expect to shave himself.

Apart from the obscurity of the notion of empty nodes which can nevertheless be moved by transformations and stand in the relation of coreference with other nodes, Jackendoff's account of missing complement-subjects is open to the objection that it uses

a device - namely, \triangle - which has no role elsewhere in the grammar. It is true, as Jackendoff says (p.182), that this device may have a use in connection with other deletion phenomena such as gapping, VP deletion, and so on, but if so it would have to work differently since in such contexts semantic well-formedness would have to be made to depend on something other than coreference. Moreover, even if \triangle can be used to give a unified account of all deletion phenomena, it is inferior to the generative semantics device of bound variables as a means of expressing connections between deletion phenomena and other areas of grammar. Jackendoff is at pains to draw attention to the similarities between the conditions under which the rules relating to reflexives, pronouns and missing subjects apply. This, however, can easily be expressed in a system using bound variables, since it appears that these are the only rules which operate exclusively on bound variables and not on lexically filled nodes. In addition, as discussed below, bound variables have the added function in the grammar of accounting for ambiguities such as that in (7), whereas Jackendoff is obliged to bring in an entirely new set of devices - what he calls 'modal structures'. Considerations of economy of theoretical apparatus, therefore, strongly favour the generative semantics model. But also, as with his theory of reflexives, Jackendoff's account of missing subjects suffers from its crucial dependence on the assumption that all NP nodes, including empty ones, refer to something. In the sentence (19), there is a deleted subject after want, but it cannot be interpreted as being coreferential with either John or Fred.

(19) John and Fred each want to win.

Yet Jackendoff is obliged to derive (19) from some such structure as (2), in which the first \triangle gets marked coreferential with John and the second with Fred.

(20) John want \triangle win and Fred want \triangle win

The objections raised against the derivation of (12a) from (14) also apply to this case. For the deleted subject of win in (19) is not only not coreferential with either John or Fred; it does not refer to anything. What (19) means is that the predicate want to win applies equally to John and Fred, which can be expressed in a generative semantics model by deriving (19) from the underlying structure (21).

(21) John is an x such that x wants x win and Fred is an x such that x wants x win.

A reduction transformation deletes one of the two identical predicates, and Equi obligatorily deletes the subject of win, thereby creating the complex predicate want to win. Thus a system using bound variables can account in a natural way for data which would require ad hoc amendments to a system such as Jackendoff's.

Of course, this is achieved at the price of relaxing the constraints on transformations and allowing them to operate directly on semantic representations. But this is more than compensated for by the fact that semantic rules and the arbitrary device of empty nodes can be dispensed with altogether. Further, Jackendoff's unwillingness to allow semantic factors to enter into the structural description of transformations rests on the unsupported assumption that there is a clear and non-arbitrary line of demarcation between syntactic and semantic 'factors'. What, for example, is the non-arbitrary basis for the view, shared by Jackendoff and Chomsky (see Chomsky, 1971), that ambiguities having to do with grammatical relations ('Flying planes can be dangerous', etc.) fall on the syntactic side of the line, while those having to do with scope (e.g., (7)) are 'semantic'? Jackendoff claims that by drawing a line between what is to count as syntactic and what is to count as semantic, and by having one set of rules to determine syntactic well-formedness and other to pair syntactic structures with their semantic representations, he can place strong constraints on the class of possible grammars and thereby make strong claims about what is linguistically possible. In fact, no theory is at present in a position to place sufficiently tight constraints on the class of possible grammars or to make very significant universal claims about language; but a theory which seeks to account for both semantic structure and syntactic well-formedness in terms of a unified set of rules, and which employs the single device of bound variables to handle a wide variety of prima facie unconnected phenomena, must be favoured over one which allows two sorts of rules, operating in quite different ways, and a multiplicity of devices such as empty nodes and 'modal structures'.

Let us now turn to Jackendoff's notion of modal structure, which he introduces to account for ambiguities such as those in (7) and (22), where the indefinite NP may be interpreted either as referring to a particular object or as not referring to anything in particular.

(22) John wants to catch a fish.

Jackendoff rightly rejects any account of this sort of ambiguity in terms of binary features such as $\left[\begin{smallmatrix} - \\ + \end{smallmatrix} \text{specific} \right]$, because there are cases, such as (23), where the ambiguity is a three-way one.

(23) John wants a man to ask him for a cigar.

In this case, a man may be either specific or non-specific, and this exhausts the possibilities arising in that position. But with a cigar there are three possibilities. It may be that there is a particular cigar that John has in mind, which he wants a man (specific or non-specific) to ask him for; or that John wants a man (specific or non-specific) to ask him for a cigar which that man, but not John, has in mind; or, finally, that John wants a man (specific or non-specific) to ask him for a cigar, where neither he nor John has any particular cigar in mind. Clearly, it is not sufficient simply to mark a cigar $\left[\begin{smallmatrix} - \\ + \end{smallmatrix} \text{specific} \right]$; it must be specific or non-specific with respect to John or a man. Jackendoff also rejects accounts using bound variables, for two insufficient reasons. First, such accounts need transformation rules of a kind excluded by Jackendoff's arbitrary restrictions on what can count as a transformation. Secondly, the use of the existential quantifier to distinguish the two readings of sentences such as (24a) gives a wrong account, (24b), of the non-referential reading.

(24) a. John is trying to find a book.
 b. John is trying (Ex(x is a book and John find x))

This observation is correct and well known; but it is only an objection if it can be shown that the theorist who uses bound variables is necessarily committed to using the existential quantifier. In fact such a theorist is not so committed, and if the non-referential reading of (24a) is represented as in (25) the objection collapses.

(25) John is an x, such that x try x find a y, such that y is a book.

Equi deletes the subject of find, thereby creating the complex predicate try to find (=look for) whose subject is John and whose object is a book interpreted non-referentially. We return to this sort of account after first considering Jackendoff's alternative theory.

Jackendoff's account turns on the two specially defined notions of scope and dependence. Scope is not determined by semantic structure, as in generative semantics, but by the position of NPs in relation to such verbs as want, look for, ask for, try for, etc.

in close-to-the-surface syntactic structures. An NP is within the scope of a verb of this class if it occupies a position where the sort of ambiguity under discussion arises. Thus, in (22) a fish is within the scope of want but John is not, and in (23), where there are two verbs of the relevant kind, a man is within the scope of want but not of ask for, while a cigar is within the scope of both verbs, and John in the scope of neither. To say that an NP is within the scope of a verb is not to say, as it would if the notion of scope were used in the logical sense, that that NP is to be interpreted non-specifically or non-referentially. In Jackendoff's sense of the term it means simply that the NP is open to interpretation either as referring to a particular thing or as not referring to anything in particular. Thus scope is concerned with the location of NPs subject to the relevant kind of ambiguity, not with specifying how in a particular case an NP is to be interpreted. This latter task is the function of the notion of dependence. An NP within the scope of a verb is said to be dependent on that verb if it is to be taken as not referring to anything in particular; otherwise it is not dependent on the verb. Jackendoff makes somewhat eccentric use of bracketing to distinguish the dependent reading from the independent one. The dependent interpretation of a fish in (22) is represented by (26a) and the independent by (26b).

- (26) a. John, want (a fish).
 b. John, a fish, want ().

The empty brackets after want in (26b) indicate that nothing is dependent on want on that reading. (26a) shows that on that reading a fish is dependent on want.

So far this is just terminology. Does it have any explanatory value? It seems clear that Jackendoff's notion of scope has no explanatory value whatever. At first sight it might appear that the question whether an NP is within the scope of a verb can be settled independently of the question whether that NP is subject to ambiguity. For in the cases so far considered, (22) and (23), NPs within the scope of a verb are all to the right of it. However, it turns out that being to the right of a verb of the appropriate kind is not sufficient to place an NP inside the scope of that verb. Contrast (22) with (27), in which the verb has two objects.

- (27) John asked a man for a cigar.

In this case, only a cigar, not a man, is subject to ambiguity. So a cigar, but not a man, is within the scope of the verb. Nor is it the case that whenever there are two NPs to the

right of a verb of the appropriate class only one is within its scope in Jackendoff's sense. In (28) there are two NPs to the right of expect, and in this case both are subject to ambiguity, and so both must be said to be within the scope of the verb.

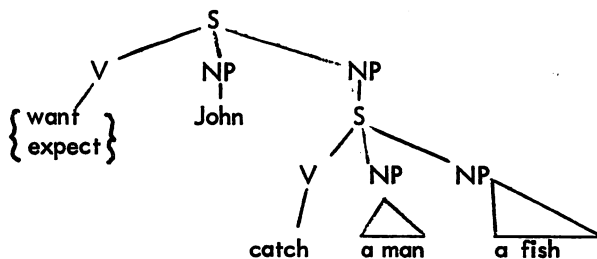
(28) John expects a doctor to examine a patient.

Jackendoff has no systematic way of determining when an NP is within the scope of a verb, other than by first determining whether the NP is subject to ambiguity. He says only that it "is determined by the verb ... The scope of want, for example, is its direct object ... The scope of ask consists of the object of for but not the direct object, as shown by the range of ambiguity" (p.280). We may conclude, then, that to say that an NP is within the scope of a verb, in Jackendoff's sense, is just another way of saying that it is subject to the relevant kind of ambiguity, and hence that it explains nothing.

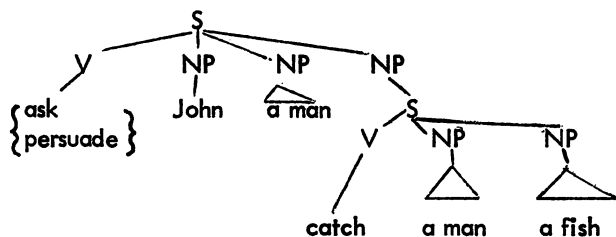
There is, of course, a very simple way of predicting which NP positions are subject to ambiguity, given a certain well-attested account of underlying structure. The verbs want and expect are two-place predicates, whereas ask, persuade, tell etc. are three-place. This can readily be established on both semantic and syntactic grounds. Consequently, want and expect occur in structures roughly like (30a), and ask, persuade, etc. in ones like (30b), which underlie (29a) and (29b) respectively.

- (29) a. John wants (expects) a man to catch a fish.
 b. John asked (persuaded) a man to catch a fish.

(30) a.



b.



The generalization, then, is that NPs within the logical scope of the verb - i.e., NPs which are commanded by the verb but do not command it - are subject to ambiguity, but NPs in the same simplex S as the verb are not. Since a man and a fish are both within the logical scope of the verb in (30a), they are subject to ambiguity. In the derivation of (29a) from (30a), a man is raised by Subject Raising into the main clause, but it can be taken specifically or non-specifically because it originates in the lower clause. In (30b), since a man occurs in the higher as well as the lower clause, it can receive only a specific interpretation. The lower occurrence is deleted by Equi, resulting in (29b). In both sentences, a fish originates in the lower clause and therefore admits of both the specific and the non-specific interpretation. In this way, then, by relying on the notion of logical scope and by taking account of the position in which an NP originates, it is possible to predict systematically which NPs are subject to ambiguity. Thus Jackendoff's notion of scope could be made to have an explanatory function, but only by making it dependent on the notion of logical scope, in which case it would be redundant.

The trees (30a) and (30b) are not, of course, adequate semantic representations of the ambiguous sentences (29a) and (29b). They are only approximations designed to illustrate the central difference in configuration of the structures underlying the two sentences. Since both sentences are ambiguous, they must each be assigned more than one semantic representation - four in the case of (29a), since there are two NPs subject to ambiguity, and two in the case of (29b). This is achieved by introducing variables and binders into trees having the same general shapes as (30a) and (30b). But first let us examine Jackendoff's notion of dependence, which he uses to assign different readings to NPs within the scope of verbs such as want and ask.

There are various classes of verbs which give rise to ambiguity with respect to specificity. In addition to the class to which want and ask belong, there is the class, of which will is the most prominent member, having to do with the future. Thus, in (31) a book may be understood specifically or non-specifically.

(31) John will read a book on Friday.

Similarly, there is the well known class having to do with possibility, and there is also the case of negation, as in (32), where the non-specific reading is strongly preferred.

(32) John didn't catch a fish.

Now, each of these classes has associated with it, in Jackendoff's theory, what he calls a 'modal operator'. In the case of want and ask the operator is unrealized. The reason for this is that these verbs "denote a state of affairs in which the subject is contemplating some yet unrealized situation and has some particular attitude or is taking some particular action toward the realization of this situation." (p.286) In the case of a sentence such as (22), John wants to bring about a certain as yet unrealized situation, namely his catching a fish. But since the situation is unrealized, there are two possibilities: either there is a fish which is identifiable whether or not the desired state of affairs is realized, or "there is an identifiable fish only in the event that John actually catches one. That is, just in case a fish is dependent on want, it is subject to the condition that it has an identifiable referent only in the further instance that the unrealized situation comes to fruition" (p.286). Thus the function of the operator unrealized is to assign this sort of interpretation to indefinite NPs when they are optionally taken to be dependent on a verb within whose scope they fall. The ambiguity arises because dependence is optional; an NP within the scope of a verb may be taken as not being dependent on it, and in that case it is taken to have specific reference independently of the relevant unrealized situation coming to fruition.

This account, like Jackendoff's treatment of pronouns, reflexives and missing complement-subjects, relies heavily on the assumption that, in some sense, all NPs have a reference. In his discussion of a fish in (22), he tacitly recognizes that, interpreted non-specifically, it has no actual reference, but he insists on accounting for this in terms of hypothetical reference - the reference it would have if the relevant unrealized situation were achieved. But this is a confusion. It is true that if John were to catch some fish or other there would then be something to which the phrase a fish could be used to refer. But this is quite different from saying that that phrase as used in (22) acquires a reference by virtue of John's catching a fish. The claim that, "in the non-specific reading, there is an identifiable fish only in the event that John actually catches one", is really a very misleading way of recognising that, in fact, on that reading, a fish has no reference at all. For, although there would be an identifiable fish if John were to catch one, it could not be identified as the fish John wanted to catch, since, ex hypothesi, there is no such thing. So, John's catching a fish does not supply the phrase a fish, as it occurs in the non-specific reading of (22), with the identifiable referent it otherwise lacks; it has no referent, and cannot acquire one as long as it is interpreted

non-specifically. Thus, Jackendoff's remarks about there being an identifiable fish only if John catches one, though true, are irrelevant to the semantic analysis of (22).

Besides this internal weakness, Jackendoff's theory of modal structure is open to the charge of excess baggage, of multiplying theoretical apparatus without necessity. For a theory using the device of bound variables can, by means of that device, handle not only reflexives, pronouns and missing subjects but scope ambiguities as well. Thus (33a) and (33b) express respectively the specific and non-specific readings of (22).

- (33) a. For an x, such that x is a fish, John is a y, such that y want y catch x.
 b. John is an x, such that x want x catch a y, such that y is a fish.

In other words, roughly, (a) it is true of a particular fish that John wants to catch it, and (b) John wants to catch something which is a fish, where the position of the binder, a y, or some y, within the logical scope of want indicates that the want does not relate to any particular fish. Similarly, the four possible readings of (29a) derive from the fact that in the cases of both a man and a fish the variable binder may be either within or outside the scope of the verb. And in (29b) there are only two readings because ask and persuade, being three-place verbs, require that the variable binder associated with a man be in the main clause and therefore outside the scope of the verb; only the binder associated with a fish can be either inside or outside the scope of the verb. The specific reading of (29b) can be rendered by (34a), and the non-specific by (34b), but (34c) is ill-formed, due to the fact that the x in x is a man is not within the scope of its binder, an x, and cannot be moved lower to be within that scope without violating, as in (34d), the requirement that the verb be provided with three argument places.

- (34) a. For an x, such that x is a fish, John asked a y, such that y is a man, that y catch x.
 b. John asked an x, such that x is a man, that x catch a y, such that y is a fish.
 c. *John asked x is a man that an x catch a y, such that y is a fish.
 d. *John asked that an x, such that x is a man catch a y, such that y is a fish.

Jackendoff claims as a merit of his theory the fact that it correctly predicts that in a sentence such as (23) there are three possible readings associated with the position of

a cigar, not two or four as might be supposed. It is therefore worth pointing out that the same correct prediction follows from a theory using bound variables. There are just three possible positions for the variable binder associated with a cigar. It can be right at the top of the tree, outside the scope of both want and ask, or it can be within the scope of want but outside that of ask, or, finally, it can be within the scope of both want and ask; there is no other position it can occupy.

Let us now tackle the question of lexicalization, mentioned earlier as a further area of grammar to which the device of bound variables is relevant. It has been persuasively argued in Seuren (1973) that there are certain referential constraints on the formation of lexical islands, and hence on lexicalization, though these constraints are rather difficult to state. For example, the word regicide means killing the monarch, provided the monarch is understood as not referring to any particular monarch; there is no lexical item meaning to kill the monarch where the NP refers to a particular person. Hence, in a generative semantics model, with prelexical transformations, the lexical item regicide can be substituted for the phrase kill the monarch if, but only if, the NP is non-referential. If the NP is referential, the phrase is not a lexical island, and lexicalization is not possible. Another way of expressing this is to point out that if John and Fred both kill a king, they each commit regicide though each killing has a different object. This is reminiscent of some examples mentioned earlier, such as (12a) and (12c), in which the reflexive has to be understood non-referentially. In such cases, the verb+reflexive constituent forms a lexical island, for which it is possible to substitute a lexical item if the lexicon contains an appropriate one. A similar case is (35a), for whose verb+reflexive constituent English does provide a lexical item, as (35b) shows.

- (35) a. Not only John, but also Fred, killed himself.
b. Not only John, but also Fred, committed suicide.

A condition of kill+ — self being a lexical island and permitting lexical substitution is that the reflexive does not refer. If reflexives always had particular reference, not only would sentences such as (12a), (12c) and (35a) be impossible, but there would also be no lexical items like suicide.

The same point applies to obligatorily deleted complement subjects and to cases of obligatory pronominalization. It might be thought that in all sentences like (36), John,

or any term having the same reference as John, can be plugged into the vacant complement-subject position without change of meaning.

(36) John wants to win.

That this is not in general the case can be shown by an argument parallel to that used to show that the reflexive in (5b) is not coreferential with the object in (5a). Consider the sentences of (37),

- (37) a. Only John wants John to win.
b. Only John wants to win.

Assuming all occurrences of John to refer to the same person, (37a) means that there is only one person, namely John, who wants John to win, and this is compatible with there being any number of persons all of whom want to win. However, this latter is ruled out by (37b), which means that there is nobody other than John who wants to win, though there may be any number of persons wanting John to win. So the position of the missing subject of win in (37b) cannot be regarded as a referential one into which expressions coreferential with the main clause subject can freely be inserted. Of course, there are some such positions - for example, in (36) - where insertion of an expression coreferential with the main clause subject does not change meaning, but the point is that this is not in general true, and the problem is to account for the difference between the two sorts of case. The same is true of reflexives: in some cases, such as (3b), substitution of an expression coreferential with the main subject leaves the meaning unchanged; in others, such as (5b), it does not. Again the problem is to account for the difference. Similarly, in the case of pronouns there are cases where substitution is harmless and others where it has to be blocked. In (38a), John, or any expression coreferential with it, can be substituted for his without affecting the meaning, but in (38b) the situation is quite different.

- (38) a. John washed his face.
b. Only Oedipus married his mother.

It may marginally be possible to interpret (38b) as meaning that nobody other than Oedipus married Jocasta, Oedipus's mother, but the strongly preferred interpretation is that in which the sentence means that nobody other than Oedipus committed incest with his own mother. On this interpretation, his, and hence his mother, must be understood

as having no particular reference. No referential expression, in particular not Oedipus or any expression coreferential with it, can be substituted for the pronoun.

In each of the three cases - reflexives, missing subjects and pronouns - lexical islands can be created for which lexical items, when available, can be substituted. Thus suicide incorporates a reflexive and, although there may be no English lexical items meaning want to win or marry one's mother, there are the lexical items covet, meaning want to have and therefore incorporating a missing complement-subject, and incest, meaning to have sexual relations with one's kin, and therefore incorporating a pronoun. The incorporated NP in each case has to be understood non-referentially, and in consequence a theory such as Jackendoff's, which is committed to the idea that all NPs have a reference, is incapable of giving a systematic account of the incorporation of NPs into lexical items. It is true, as Seuren points out, that it is necessary to qualify the claim that no referential NPs can be incorporated into lexical items, in order to allow for the existence of items like Churchillian. However, these cases seem to be confined to the special class of proper names. Definite or indefinite NPs can be incorporated into lexical items only if they are non-referential; and in the cases considered here it is clear that the incorporated NPs must be non-referential. A lexicalist-interpretivist theory, such as Jackendoff's, could be modified to take account of lexical islands by simply enlarging the lexicon and allowing it to include such items as want to win or marry one's mother, and listing synonyms where they occur. But apart from the fact that this would rule out the possibility of generating such phrases out of simpler material according to independently motivated rules, it would make it extremely difficult to account systematically for the difference between those cases, like (3b), (36) and (38a), where substitution of an expression coreferential with the main clause subject leaves the meaning unchanged, and those, like (5b), (37b) and (38b), where it does not. For phrases treated as lexical items must be taken to have no syntax. The great advantage of a theory using underlying bound variables is that, on the one hand, potential lexical islands have underlying internal structure, and on the other, the NP positions are occupied by variables which, in themselves, have no reference. The underlying structure makes it possible to formulate logical rules distinguishing between valid and invalid inferences involving the insertion of a referential expression into a position occupied by a variable - i.e., between cases like (38a) and cases like (38b). And since the NP positions are occupied by variables in semantic representation, the obligatory rules of Ref, Pron and Equi can create lexical

islands without violating the constraint against incorporating referential items.

There is a further point to be made about the connection between bound variables and lexical islands. It used to be suggested by Quine (see Quine, 1960, for example) that syntactically complex items in 'opaque' contexts are, in effect, like unstructured lexical items. Thus nine in a context such as (39a) is no more of a syntactically distinct element than the same string of letters within, for example, the word canine, and it is this that accounts for the fact that (39b) cannot be inferred from (39a), though nine is the number of the planets.

- (39) a. John believes that nine is greater than seven.
b. John believes that the number of planets is greater than seven.

Such an extreme theory of opacity is open to one fatal objection: there are potentially infinitely many sentences which can occupy the complement position in sentences such as (39), and therefore our ability to use and understand them cannot be accounted for if they are unstructured. However, with the aid of the notion of lexical islands, which allows that certain items may be syntactically complex and yet have certain of the properties of lexical items, the theory can be modified and the objection avoided; and such a modified theory has much to commend it. The internal structure allows the infinite set of possible complements to be generated from finite material, and the properties shared with lexical items account for the restrictions on the movement of material in or out of opaque contexts, in particular for the fact that there can be no substitution of other items for elements of constructions in such contexts.

There are no doubt various ways in which lexical islands may be formed, but a well-attested way in a generative semantics model is by the operation of a Predicate Raising transformation, which has the effect of raising V nodes out of lower clauses, under certain conditions, and attaching them to higher V nodes, thereby creating complex predicates out of simple ones. Thus, to take McCawley's well-known example, if the simple predicates, cause, become and dead, occur in successive clauses in a semantic representation, then they may all be brought under the one V node to form the complex predicate and lexical island cause-become-dead, for which the lexical item kill may be substituted. Now there are certain conditions that have to be fulfilled if Predicate Raising is to be applicable. We suggested earlier a close connexion with Equi, in that items such as want to have are complex predicates. There are numerous similar examples.

Thus cause to know (=inform), easy to persuade (=gullible), hard to find (=elusive) and try to find (=look for) are all lexical islands. What Equi does is to delete a variable from the position of subject of the lower of the two predicates, thereby allowing the two simple predicates to be combined into a single complex predicate. But if in these cases the structural description for Equi is not met - if the lower subject position is not occupied by a variable identical with a variable in the higher clause - Predicate Raising is blocked. Take the case of want to sit, which is a lexical island resulting from the application of Predicate Raising after Equi has deleted the subject of sit. If want and sit occur in a structure such as John wants Fred to sit, where Equi is inapplicable, Predicate Raising is blocked. That it must be blocked is clear from the fact that if want to sit were allowed to become a complex predicate in this case, it would have to be a transitive verb, which it clearly is not. Contrast this with the case of John wants to beat Fred, where there is a complex transitive predicate resulting from the application of Predicate Raising following on Equi. Notice, however, that not every occurrence of an NP such as Fred between the two simple predicates blocks Predicate Raising. The lexical island cause to know can be formed despite the fact that the two simple predicates are separated by the NP Fred in the structure John caused Fred to know that S (=John informed Fred that S). The difference between this case and the want Fred to sit case is that in the latter Fred originates only in the lower clause as the subject of sit, whereas in the former it originates in the higher clause and the subject of the lower clause is a variable deleted by Equi. In the case where Predicate Raising blocks, Fred originates inside the logical scope of the higher predicate; in the other it does not. We may, therefore, tentatively propose the generalization that Predicate Raising is blocked when a non-deletable NP intervenes between the two simple predicates and is inside the scope of the higher.

This generalization is well supported by a wide variety of data. For example, the French sentence (40a) is a clear case of Predicate Raising having moved the predicate venir out of the lower clause and combined it with the higher predicate faire; and in this case, like the English cause to know, the formation of the lexical island has taken place in a context where the intervening NP is in the higher clause, outside the scope of faire, and where Equi has deleted the subject of the lower clause.

- (40) a. Jean a fait venir le médecin.
 b. *Jean a voulu venir le médecin.
 c. Jean a voulu que le médecin vienne.
 d. Jean a voulu venir.

Contrast (40b) where the improper formation of a lexical island has taken place as a result of venir being lifted out of a clause whose subject is intact. To express correctly what is intended by (40b) it is necessary to say (40c). As (40d) shows, vouloir venir can be a lexical island, but only if Equi has deleted the subject of venir.

However, although the generalization seems correctly to distinguish between the cases where Predicate Raising is possible, and the cases where it is not, it is not adequate, as it stands, to account in general for the formation of lexical islands. It covers only the cases where lexical islands are formed by two simple predicates being brought under the one V node. It does not account for the distinction between cases where NPs may, and cases where they may not, become part of a lexical island and hence, in principle, be incorporated into a lexical item. We have seen a number of examples of lexical items incorporating reflexives, pronouns or missing subjects. There is also the lexical item regicide, incorporating the non-referential NP the king. Other examples of incorporation of NPs into lexical items are the following:

- (41) a. John resembles a gorilla. (=John is gorilla-like).
b. John has eyes like a cow. (=John has bovine eyes).
c. John has a nose like an eagle. (=John has an aquiline nose).

In each case, the NP which gets incorporated has to be understood as not referring to any particular object. Of course, (41a) could be interpreted to mean that there is a particular gorilla that John resembles, and parallel interpretations are possible for (b) and (c). But in that case lexicalization is not possible; the relevant phrases in (41) are lexical islands only if the NPs they contain are not referential. We will see presently that a theory which uses bound variables can account, by means of a single generalization, both for the formation of lexical islands by Predicate Raising, where no NPs are involved, and for the formation of lexical islands containing non-referential NPs.

But first let us notice the explanatory value of treating phrases like resemble a gorilla as lexical islands when the NP is non-referential. It has often been observed that resemble does not passivize. However, some speakers regard a sentence such as (42a) as perfectly acceptable, though (42b) is clearly unacceptable, especially if a gorilla is not referential; and even speakers who are inclined to reject (42a) consider (42b) to be much worse, assuming the non-referential interpretation.

- (42) a. Fred is resembled by John, but not by Tom.
 b. *A gorilla is resembled by John, but not by Tom.

Assuming resemble a gorilla to be a lexical island, the difference can easily be explained. For, on this assumption, (42b) involves the disruption of a lexical island, but (42a) does not. Lexical islands, like relatively fluid idioms, can undergo internal reorganization, but cannot undergo transformations which move external material into the island. Thus (43a) can be transformed into (43b), by WH-deletion and Adj Shift applying to material within the lexical island, but (42b) involves the movement of the external NP John into the lexical island.

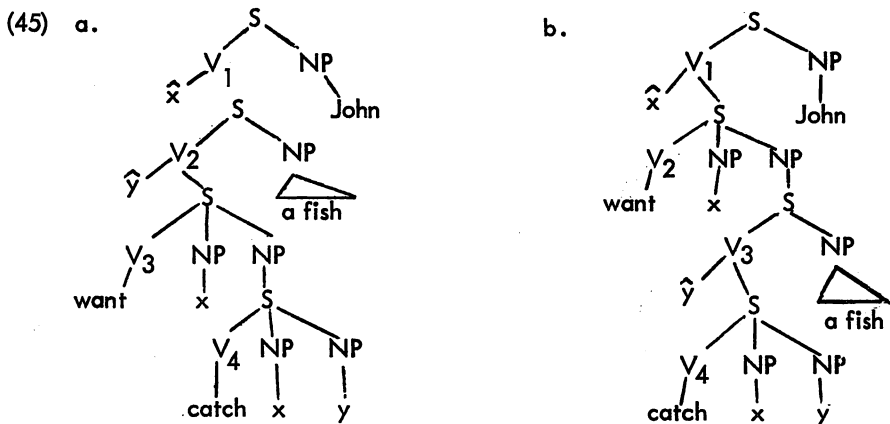
- (43) a. John resembles a gorilla which is bald-headed.
 b. John resembles a bald-headed gorilla.

Another instructive case concerns the verb expect. It has been observed that sentences such as (44a,b) allow both specific and non-specific interpretations of someone, whereas (44c) does not; it allows only the specific interpretation. However, (44d), where the underlying subject has been deleted, allows both interpretations.

- (44) a. John expects that someone will come.
 b. John expects someone to come.
 c. Someone is expected by John to come.
 d. Someone is expected to come.

Again, if we assume that expect plus its complement is a lexical island when someone is interpreted as having no specific reference, these observations have a ready explanation. The difference between (44a) and (44b) is that in the latter the complement subject has been raised, an operation which involves only material internal to the island. So, if either of these two sentences admits of a non-specific interpretation of someone, the other should also. However, (44c), the result of passivizing the main clause of (44b), would violate the constraint against the movement of external material into lexical islands, if someone were to be understood non-referentially. Consequently, it can only be derived from a structure in which someone is not part of a lexical island, i.e., in which it has specific reference. In (44d), on the other hand, the non-specific as well as the specific interpretation is possible, due to the fact that when the underlying main clause subject is deleted passivization does not have the effect of moving external material into a lexical island.

So, if certain constructions - for example, verb-plus-complement, where the complement contains non-referential NPs - can be argued to be lexical islands, this explains the restrictions on the operation of certain movement transformations such as Passive by virtue of the general constraint on movement of external material into lexical islands. Is there any independent motivation for the claim that such constructions are in fact lexical islands, i.e., sub-trees dominated by V nodes? This is where we make use again of the already well-established apparatus of bound variables. Formulas such as (33a) and (33b), proposed as semantic representations for the two readings of (22), are actually semi-formal versions of a more strictly formal notation using predicate abstracts as variable binders, along the lines of Thomason and Stalnaker (1973). This is true of all the formulas cited in this paper. Thus (33a), the specific reading, and (33b), the non-specific reading of John wants to catch a fish, are specifications of how to read (45a) and (45b) respectively.



Similar semantic representations can be constructed for the two readings of (44a,b). (See Lakoff (1970) for a similar use of predicate abstracts).

Now in semantic representations such as (45a,b), there are large sub-trees dominated by the node V. The question, then, is not how a number of nodes may be brought under a single V node, but which of the sub-trees dominated by V are prevented by some constraint from being genuine lexical islands. And here an obvious generalization emerges. Bound variables cannot occur as such in surface structures; they have to be either replaced by full NPs, deleted, pronominalized or reflexivized, and this results in the deletion of binders such as \hat{x} and \hat{y} . In (45a,b), the subject of catch is deleted by Equi, and the other variables are replaced by the full NPs John and a fish.

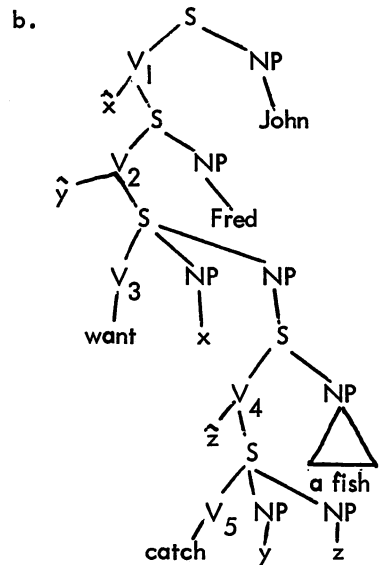
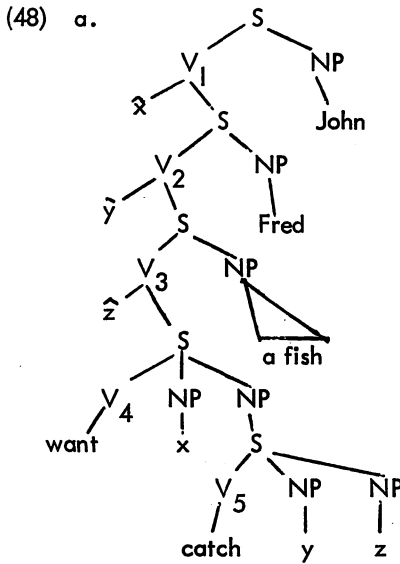
In both cases, John originates outside the scope of want, the highest verb of the potential lexical island, and, since the subject of catch is deleted, it is moved only into the position of subject of want, where it is still outside the scope of that verb. It would be inside the scope only if it were moved into a position - for example, subject of catch - where it was commanded by, but did not command, want. As the subject of want it is commanded by that verb, but it also commands it. The crucial difference between (45a) and (45b) concerns a fish. In (45a) this NP originates outside the scope of want but, in coming to occupy the position of object of catch, it is moved inside the scope of want. But in (45b) a fish both originates and finishes within the scope of want. The generalization, therefore, is that potential lexical islands - i.e., sub-trees dominated by V - are actual lexical islands provided the elimination of the bound variables does not involve movement of material from outside to within the scope of the highest verb. The sub-tree dominated by V_2 in (45a) is not a lexical island because elimination of y involves movement of a fish into the scope of want, but the sub-tree dominated by V_1 in (45b) is a lexical island. Notice, however, that though V_2 in (45a) is not a lexical island, because of the position occupied by y, there is nothing to prevent catch from being raised onto want by Predicate Raising to form the two-place predicate want to catch, for the variable x occupying the position of subject of catch, and intervening between the two simple predicates, is eliminated without material being moved from outside to within the scope of the higher of the two verbs. Thus, the one generalization concerning the elimination of bound variables covers lexical islands formed by Predicate Raising as well as lexical islands containing non-referential NPs.

As a further illustration of the operation of this principle, consider the representation of the specific and non-specific readings of a fish in (46).

(46) John wants Fred to catch a fish.

Semi-formally, the two readings may be represented respectively by (47a) and (47b), corresponding to the formal representations (48a) and (48b).

- (47) a. John is an x, Fred is a y, a fish is a z, such that x wants y catch z.
 b. John is an x, Fred is a y, such that x wants y catch a z such that z is a fish.



In both cases, John and Fred originate outside the scope of want. John replaces x, and therefore does not move inside the scope of want, but Fred, in replacing y does move inside that scope. So in neither case can the V dominating the S whose main verb is want - V_3 in (48a) and V_2 in (48b) - be taken to dominate a lexical island. Moreover, since in neither tree can y, the subject of catch, be eliminated without moving an NP, Fred, from outside to inside the scope of want, Predicate Raising cannot apply to form the predicate want to catch. The only possible lexical island, according to the proposed generalization, is catch a fish in (48b). In (48a) this cannot be a lexical island because a fish is moved from outside to inside the scope of catch, the highest verb in the potential lexical island. But in (48b), a fish both originates and finishes within the scope of catch. Thus catch a fish is a lexical island if a fish is non-referential, i.e., within the scope of want. These are precisely the predictions required for the two interpretations of (46).

The complex V nodes in semantic representations such as (45) and (48) may be thought of as similar to the VP constituents of early transformational grammar, but because of the use of predicate abstracts to bind variables they have more internal structure, and this makes it possible to distinguish VPs which are, and VPs which are not, lexical islands. The relevance of lexical islands to opaque contexts is as follows. It has been observed that certain grammatical processes, such as passivization, block in

contexts such as (42) and (44), if the NP is non-referential. It has also been observed that certain logical operations, such as substitution of NPs on the basis of being co-referential, also block in contexts of the same sort. But it has in general been assumed that the two kinds of blocking are due to different causes. However, if the theory of lexical islands, as sketched above, can be sustained, they may both be explained by a single constraint, the constraint against moving external material into lexical islands. Thus the theory of lexical islands, if correct, provides a further instance to add to the already extensive list of ways, discussed in the literature on generative semantics, in which grammatical and logical phenomena converge. It also lends further support to the already well-supported claim that, in the field of syntax and semantics, the generative semantics model has no serious rivals. This is not to say that the usual forms of theories within the generative semantics mould are entirely free of trouble. They are not; and one difficulty will be mentioned at the end of this paper. However, the device of bound variables is useful in handling such a wide range of problems that it is hard to see what could ever justify abandoning it rather than modifying and improving it.

Besides the issues taken up in some detail here, Jackendoff discusses a number of other topics which there is no space to treat here. There is a chapter on 'thematic relations', a notion very similar to Fillmore's system of underlying case structure, in which Jackendoff purports to explain certain restrictions on the operation of rules such as Passive. There is also a chapter on adverbs, and one on focus and presupposition. Finally, there is a chapter on negation, in which Jackendoff makes a claim for the superiority of his theory over other theories, which must not be allowed to pass unchallenged. In discussing pairs of sentences such as (49a,b) and (50a,b), he claims that a theory, such as his, in which there are semantic interpretation rules operating on surface structures, can capture a generalization which cannot be captured in other theories.

- (49) a. Not many of the arrows hit the target.
b. Many of the arrows didn't hit the target.
- (50) a. Not many of the demonstrators were arrested by the police.
b. Many of the demonstrators weren't arrested by the police.

Jackendoff points out correctly that the (a) and (b) sentences in each pair differ in meaning, and hence that any theory which predicts that both members of each pair derive from a common underlying structure and at the same time holds that transformations cannot change meaning is in serious trouble. There are two ways out of the trouble: deny that

the (a) and (b) sentences have the same underlying structure, or allow that transformations can change meaning. Jackendoff opts for the latter course, distinguishes between sentence-negation and VP-negation, and introduces surface structure semantic interpretation rules sensitive to the surface position of the quantified NP. The significant generalization can then, he claims, be formulated as follows: "S and VP negation differ in meaning exactly when there is a quantifier in the derived subject" (p.332). However, an equally adequate generalization, having regard to only the examples (49) and (50), can be formulated if the (a) and (b) sentences are held to derive from different underlying structures (as, for example, in Lakoff (1971)). The generalization is that the command relation holding between logical operators, such as quantifiers and negation, in semantic representation must be preserved in surface structure, either in its original form or in the form of the surrogate relation of precedence. What this amounts to in the sentences under discussion is that in the course of a derivation logical operators cannot cross over each other. It is this global constraint that prevents the Passive transformation from deriving the passive sentences in (49) and (50) from the same underlying structures as the active. Moreover, this constraint also accounts for the difference in meaning between the two sentences (51a,b), which Jackendoff also discusses, because it prevents them from being derived from the same underlying structure.

- (51) a. I didn't tell many of the stories to any of the men.
 b. I told many of the stories to none of the men.

In Jackendoff's theory, however, the difference in this case has to be accounted for in a different way from the (49) and (50) cases, because in (51) it does not turn on the question whether the quantifier is in the surface subject. Thus the global constraint is superior because it explains more data. Of course, Jackendoff spells out the usual objection to global constraints: a theory which allows such constraints as well as local, i.e., transformational, constraints places too few restrictions on the form of possible grammars and therefore makes too weak an empirical claim about the nature of language. But there are two replies to this. First, such a theory is no weaker in its empirical claims than one which, like Jackendoff's, allows a multiplicity of devices, such as empty nodes, modal structures, surface interpretation rules, and so on. Secondly, the real test of a theory is in the actual proposals it makes, not in the class of possible proposals falling within the general framework of that theory. In fact, the global constraints that have been proposed are of a very restricted kind, and they make concrete and refutable claims which

are testable against data from any language having the relevant transformations. For example, the constraint just mentioned can be tested in any language which has transformations which, if not constrained, would move logical operators over each other.

Finally, a comment of general theoretical import. At one point in discussing modal structure, Jackendoff expressly recognizes the fact that different speakers will often make different judgements about a given sentence. For example, where a sentence is regarded by most speakers as having two interpretations, some speakers will prefer the one reading and others the other. Jackendoff says of this very common observation, "As I have no explanation of this variation, I have chosen to account for it by incorporating the factor d_M into the operation of the modal projection rule" (p.293). That is, Jackendoff assumes that variation in judgements is a theoretically peripheral matter which can be fixed up at some future date without seriously affecting the general theory as he outlines it. This assumption is reminiscent of the assumption of early transformational grammarians that once the syntax was straightened out along the lines of the Aspects model the semantics could simply be tacked onto it without having any serious effect on the syntactic theory, an assumption which later research has shown to be unjustified. Katz (1972) actually erects the assumption about variation in judgements into a methodological principle. He writes (p.55):

We seek to construct a semantic theory that explains the clear cases in the simplest and most revealing way and to allow the theory to stand the challenge of predictive test as further clear cases are brought up. Not all cases will be clear cases. The unclear ones, those about which the intuitions of speakers are too weak or conflicting to determine linguistic properties and relations, have to be decided by the theory itself. This, however, is a familiar feature of explication. The fact that we can allow the theory to decide in some situations confers an enormous advantage on theory construction. It permits the linguist to postpone the obligation to provide a treatment of unclear cases until he has obtained the theoretical machinery for interpolating their treatment from the treatment he has given the available clear cases, thereby preventing unclear cases from standing in the way of further linguistic inquiry.

This view that the 'unclear cases' must be left to the theory, based entirely on the 'clear cases', to straighten out, is extremely common among transformational grammarians. But it is indefensible. The cases about which speakers disagree are just as important as the cases about which they agree, and an adequate theory will not be one which imposes a decision on the so-called unclear cases, but one which correctly predicts the facts, namely, that speakers differ in their judgements about a wide range of cases. It is by no

means clear that variation in speakers' judgements is a matter which can be tacked onto existing theories without necessitating drastic modification of those theories. This is just as much a problem for generative semantics as for any other theory, and the question as to how received theories of the generative semantics kind must be modified to take account of it is one of the central issues in present-day linguistic theory. For relevant discussion, see Bailey (1971), Bickerton (1972), Sag (1973) and Ross (1973a,b).

Note:

1. (30b) is actually a derived rather than a base structure, since the top predicate is presumably derived by Predicate Raising from simple two-place predicates.

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