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Notes on Jackendoff's Theory of Anaphora

James D. McCawley

I.

Jackendoff (1972) argues for an account of anaphoric devices with the following characteristics: (i) All anaphoric devices are present *as such* in deep structures, rather than being derived transformationally from something else (such as a copy of the antecedent); moreover, distinctions among different kinds of anaphoric devices (e.g. between reflexives and simple personal pronouns) are present in deep structure, rather than, say, reflexives being derived transformationally from nonreflexive personal pronouns. (ii) Transformations are sensitive only to syntactic information, not to semantic information, about their inputs.¹ (iii) Coreference information is treated as semantic rather than syntactic and is thus not part of syntactic structures and plays no role in the application of transformations. (iv) There is a system of semantic interpretation rules (SIRs) that construct from any syntactic derivation the semantic representations that correspond to it. (v) Semantic representation consists of four parts: *functional structure*, which specifies what predicates are predicated of what arguments; a *coreference table*, which specifies what coreference relations hold among the nodes of functional structure;² *modal structure*, which is a specification of the scopes of logical elements (including "world-creating" elements such as *want* and *dream*); and *topic-comment structure*. (vi) The stages of derivations relevant to the construction of the table of coreference are the *cyclic outputs*, i.e. those structures resulting from the application of the cycle of transformations to each of the Ss (and NPs) of the given deep structure. (vii) In the determination of the semantic representation, the cyclic outputs are processed *from bottom to top*, i.e. the application of the SIRs to any particular cyclic output presupposes their prior application to the cyclic outputs of all Ss and NPs contained in the given constituent. (viii) The conception of cycle assumed by

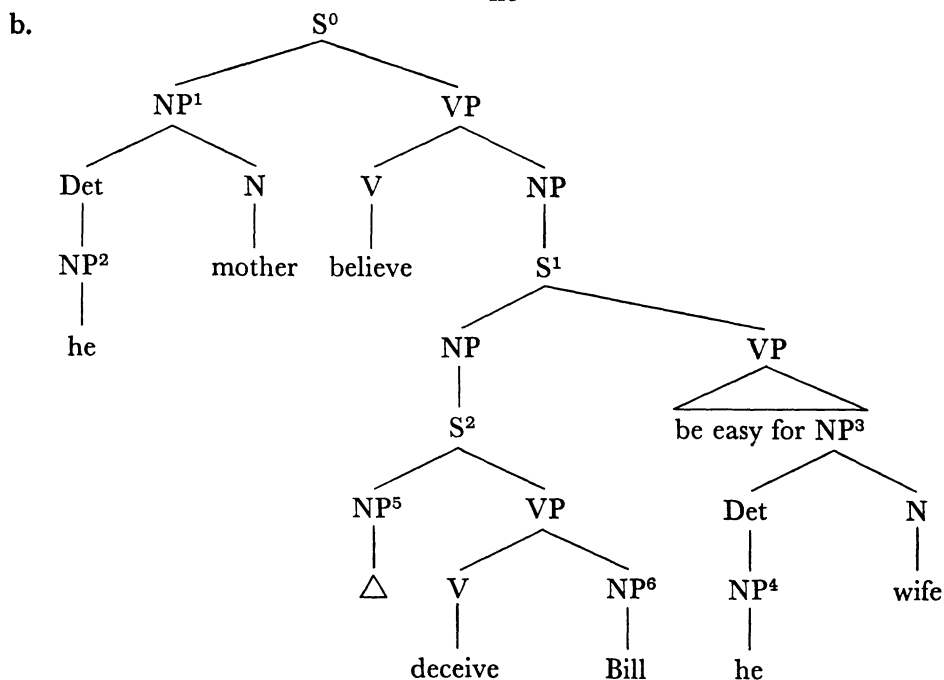
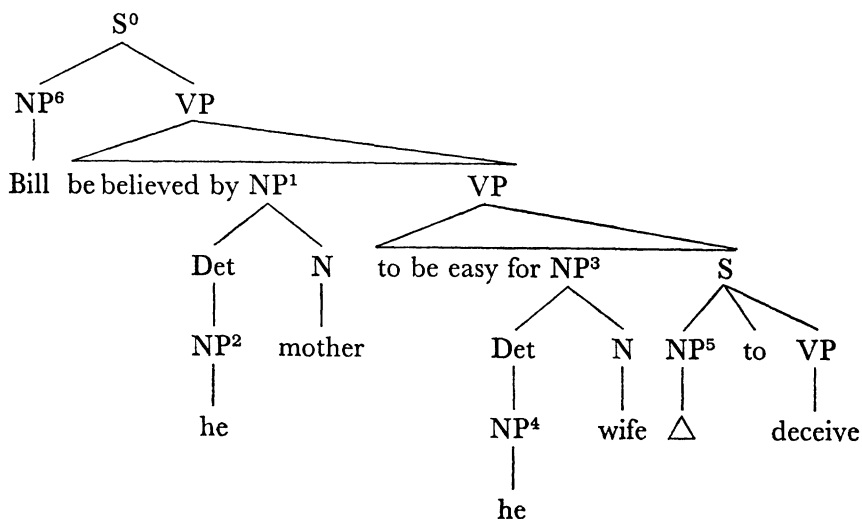
¹ Jackendoff does not distinguish clearly between the claim that transformations may not refer to semantic information and the claim that transformations may not be sensitive to semantic information. It is possible to maintain the former claim while rejecting the latter if one maintains that transformations are sensitive in a predictable way to semantic information. I will take up a specific claim of this type in section 1.5.

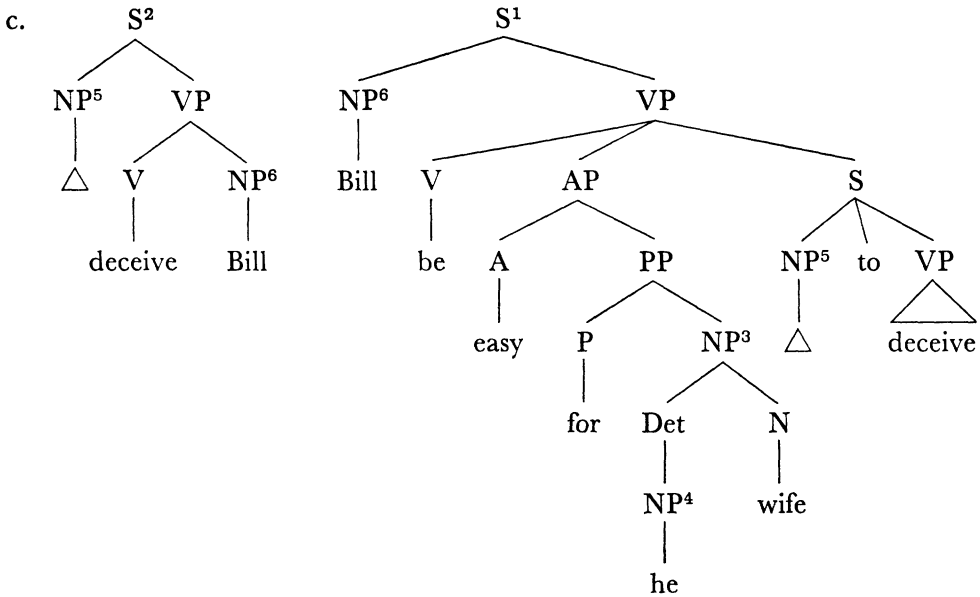
² While Jackendoff does not exhibit his functional structures in tree format, the parenthesized formulas that he writes can be converted mechanically into a tree format, and for sake of clarity I will use such a format below. The following appear to be the principal systematic differences between Jackendoff's functional structures and the semantic structures given in such generative semantic studies as McCawley (1970, 1972) and Lakoff (1972): (a) For generative semanticists, referential indices fill the argument positions (other than sentential arguments), whereas for Jackendoff elements of sense rather than of reference appear in those positions, e.g. where generative semanticists had "LOVE(x_1 , x_2)", Jackendoff might have "LOVE(FRED, SHE)" in the functional structure plus an entry "1 – coref 2" in the coreference table, where "1" and "2" indicate the corresponding nodes of functional structure. (b) For generative semanticists, the "scopes" of quantifiers, modal operators, etc. are indicated directly in the same tree structure that indicates what predicates are predicated of what arguments (specifically, quantifiers are treated as predicates, and the scope of a quantifier is the part of the tree that it commands), whereas for Jackendoff scope relations are indicated in a separate part of semantic structure, the "modal structure". (c) In Jackendoff's semantic structures, there are complex predicates consisting of a predicate *per se* and one or more "modifiers" (which may be a predicate, a clause, or some other element), whereas generative semanticists have generally treated the content of Jackendoff's "modifiers" as either conjoined with the structures they modify or as elements of higher clauses in which the modified item is embedded.

Jackendoff incorporates the principle of the *strict cycle*: that no application of any transformation may be sensitive only to material that is entirely within a clause (or NP) to which the cycle has already applied.³

For example, for Jackendoff, (1a) would have the deep structure (1b) (ignoring auxiliaries and complementizers), and the coreference tables in the semantic representations associated with (1a) would be determined on the basis of the cyclic outputs (1c):

- (1) a. Bill is believed by his mother to be easy for his wife to deceive.





(The outputs from the NP cycles play no role below and are thus omitted.) When the anaphora rules apply to the cyclic output of S^2 , they add “5 – coref 6” to the coreference table, i.e. they mark the understood subject of *deceive* as noncoreferential with *Bill*.⁴ When they apply to the cyclic output of S^1 , they add to the table “5 coref 3” and either “4 coref 6” or “4 – coref 6” (i.e. they mark the understood subject of *deceive* as coreferential with *his wife* and mark the *he* of *his wife* either as coreferential with or as noncoreferential with *Bill*). When the anaphora rules apply to the cyclic output of S^0 , they add “6 – coref 1” and either “2 coref 6” or “2 – coref 6” to the table. Thus, at least four semantic representations will be associated with (1a), containing respectively the four coreference tables shown in (2):

(2) a.	5 – coref 6	b.	5 – coref 6	c.	5 – coref 6	d.	5 – coref 6
	5 coref 3		5 coref 3		5 coref 3		5 coref 3
	4 coref 6		4 – coref 6		4 coref 6		4 – coref 6
	6 – coref 1		6 – coref 1		6 – coref 1		6 – coref 1
	2 coref 6		2 coref 6		2 – coref 6		2 – coref 6

1.1. In this article I will not take up the question of the validity of the arguments that Jackendoff gives in support of this approach. Rather, I will be concerned with what it

³ I do not accept this conception of cycle. See McCawley (1973b, 225) for a brief discussion of distinct conceptions of cycle that have figured in generative grammatical studies.

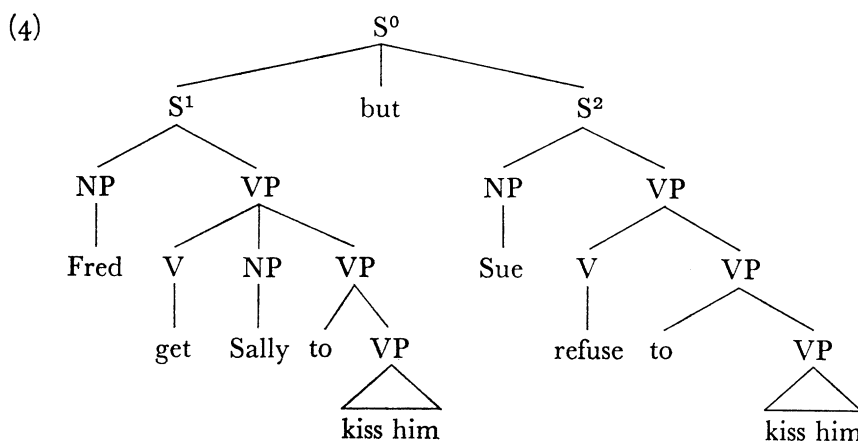
⁴ Note that the operation of the anaphora rule, and indeed of most of Jackendoff’s SIRs, leans heavily on the notion of *corresponding node*. The coreference table is a set of relationships among nodes of functional structure, established on the basis of structural relationships among the corresponding nodes of the cyclic outputs.

would take to make an approach of that type work in the face of certain problematic examples and certain features of Jackendoff's analysis that one might for reasons extraneous to Jackendoff's more basic assumptions wish to avoid.

I turn first to the reanalysis that Jackendoff says is forced on him of sentences that have generally been treated in terms of transformations of "VP Deletion" and of "Gapping", which delete a repeated VP or a repeated V in such sentences as (3a,b):

- (3) a. Fred got Sally to kiss him, but Sue refused to.
b. Mike brought the beer, and Larry the pretzels.

Jackendoff argues (1972, 268) that a VP Deletion transformation is inconsistent with his analysis of anaphora. Specifically, if VP Deletion applied in the derivation of (3a), its input would be (4):



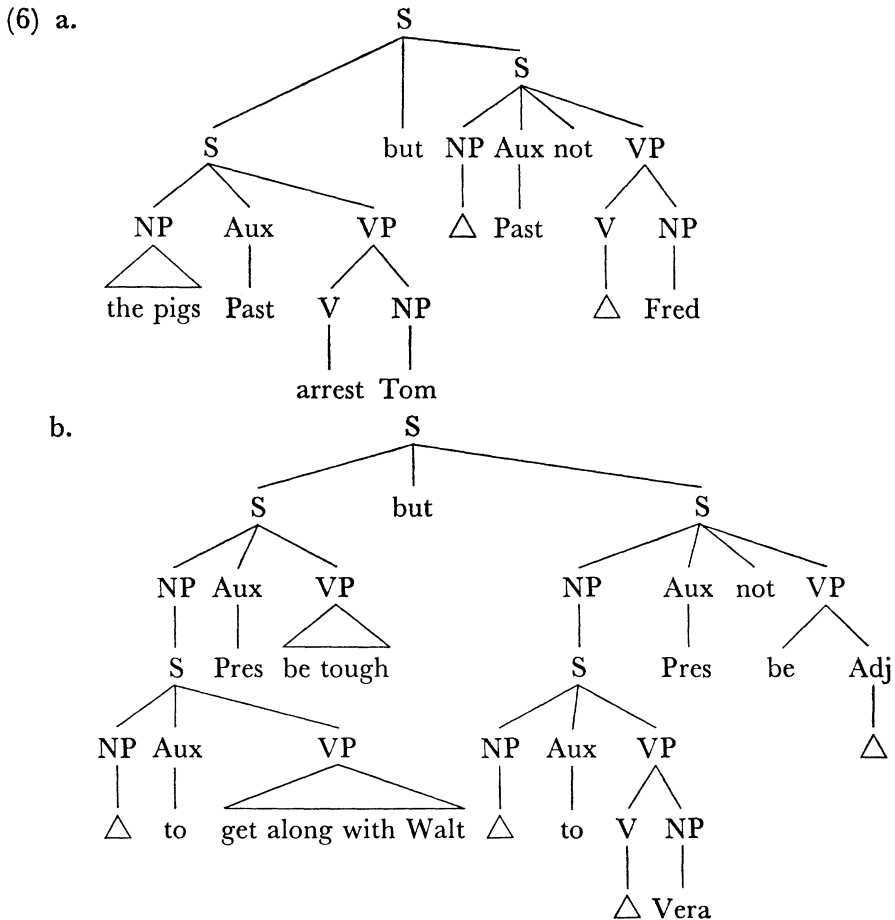
According to the conception of cycle that Jackendoff assumes, any transformation that applies freely to embedded Ss must be in the cycle. Since VP Deletion in fact does apply freely to embedded Ss (e.g. *Bill told me that Marcia thinks that [Fred got Sally to kiss him but Sue refused to]*), under Jackendoff's analysis a VP Deletion transformation would have to be in the cycle. The lowest S that contains both the *Fred* of S¹ and the *him* of S² is S⁰, and thus if all coreference assignments are to be determined on the basis of cyclic outputs, the determination that *Fred* and *him* are coreferential (or are not, as the case might be) would have to be made on the basis of the cyclic output of S⁰. But in the cyclic output of S⁰, VP Deletion would have already applied, and there would thus not be any *him* left in S⁰ for the anaphora rules to mark as coreferential (or noncoreferential) with *Fred*. Therefore there cannot be any VP Deletion transformation.

Jackendoff then proposes the following account, which involves no VP Deletion transformation. Sentences having missing VPs have deep structures with empty nodes in the appropriate places; there is an SIR that assigns interpretations to the nodes of an "empty VP"; and all the empty nodes in a sentence must receive an interpretation if the sentence is to be (syntactically and semantically) well-formed.

Sentences such as (5) have often been used as part of an argument for a VP Deletion transformation:

- (5) a. Tom was arrested by the pigs, but Fred wasn't.
b. Walt is tough to get along with, but Vera isn't.

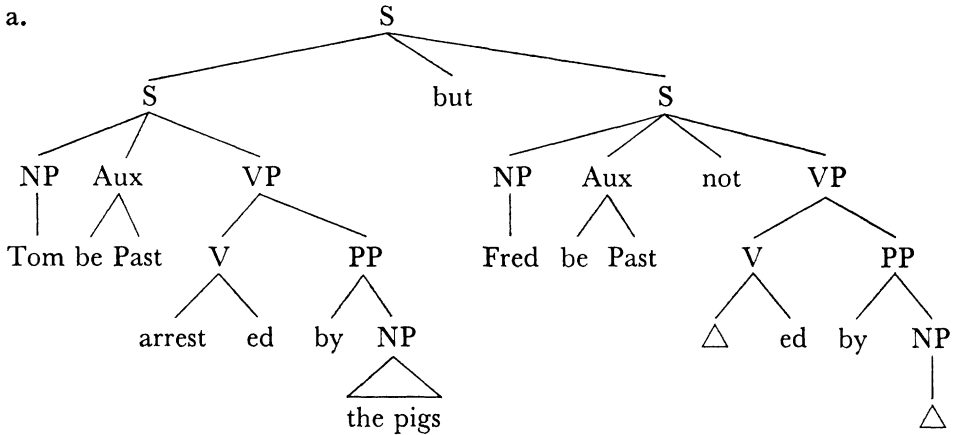
Specifically, it has been argued that the missing constituents in (5) are transformationally derived (via Passive in the case of (5a), and via *Tough* Movement in the case of (5b)), and unless the second conjunct is derived from a full sentence by VP Deletion, Passivization and *Tough* Movement could not take place in the second conjunct. In Jackendoff's analysis, however, Passive can still apply in the derivation of both conjuncts of (5a), and *Tough* Movement in both conjuncts of (5b), without there being any VP Deletion transformation. His deep structures are:⁵



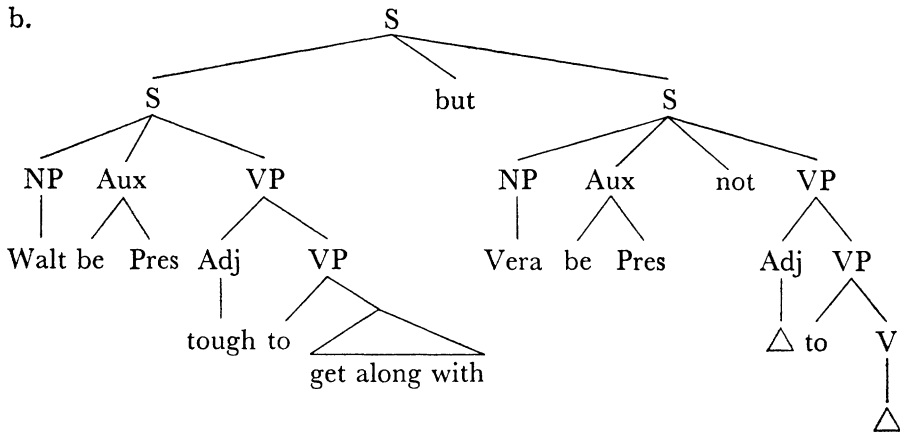
⁵ Jackendoff does not make clear why (6b) contains $[\Delta]_V$ and not, say, $[\Delta]_V [\Delta]_{Adv} [\Delta]_{Prep}$. Since he employs empty nodes in a similar way for sentences involving Gapping (1972, 268), in the deep structure of *Tom can't get along with Walt, nor Fred with Vera* the "shadow" of *get along with* could not simply be $[\Delta]_V$.

Application of Passive in both conjuncts of (6a) and Tough Movement in both conjuncts of (6b) yields (7a) and (7b), both of which contain “empty VPs” to which the SIR proposed by Jackendoff will apply, yielding semantic representations in which the second conjunct of (6a) has the meaning of *Fred wasn’t arrested by the pigs* and the second conjunct of (6b) has the meaning of *Vera isn’t tough to get along with*:

(7) a.



b.



If the two conjuncts did not undergo parallel derivations, e.g. if Passive applied in only one of the conjuncts of (6a), the conditions for the SIR would not be met, and the resulting structure would be ill-formed because of uninterpreted empty nodes. (If Passive applied only in the first conjunct, then the second conjunct would not have an “empty VP”; if it applied only in the second conjunct, then the empty VP that results in the second conjunct would not be “parallel to” the VP of the first conjunct, and the matching of corresponding pieces that the SIR calls for could not take place.)

1.2. Before going into the details of Jackendoff’s SIR for interpreting empty VPs

(henceforth, the *VP-Anaphora* rule), I should point out that the analysis that Jackendoff adopts robs his argument against VP Deletion of whatever force it had. In the analysis that he argues against, empty VPs have no surface realization at all, not even as empty nodes; however, in the analysis that he argues for, empty VPs appear in surface structure as VP nodes dominating empty nodes. Jackendoff has thus conflated two distinct issues: (i) Do understood VPs appear in surface structures as configurations of empty nodes or do they not appear in surface structure at all? and (ii) Is the surface realization of understood VPs, be it an “empty” structure or nothing at all, derived from a “full” constituent that is identical to the antecedent VP? Since the “ $\rightarrow \phi$ ” that appears in the standard notational schemes for transformations was introduced at a time when no distinction was made between empty nodes and no nodes at all, it is a mistake to simply interpret it as meaning ‘delete’ and not ‘turn into empty nodes’. If a distinction is to be drawn between empty nodes and no nodes at all, one must raise the questions of whether empty nodes are ever created by transformation and of whether nodes are ever eliminated entirely by a transformation; that is, the questions of whether a “full” node in deep structure ever corresponds to an empty node in surface structure and of whether a “full” node in deep structure ever corresponds to no nodes at all in surface structure. In the event that it should turn out that both “emptying” transformations and “deletion” transformations are necessary, it will be a trivial matter to adjust the notation for transformations so as to distinguish between them; in the event that only one of them is needed, “ $\rightarrow \phi$ ” should be interpreted correspondingly. However, there is at present no reason to assume that the empty nodes that Jackendoff takes to figure in the surface structures of (3) and (5) are not transformationally derived. An “emptying” of one VP under identity with another would yield a cyclic output containing both empty anaphoric devices and (full or empty) potential antecedents, and thus a grammar with a VP-emptying rule would allow the same kind of interaction with the anaphora rules that provides the rationale for Jackendoff’s rejection of the VP Deletion rule.

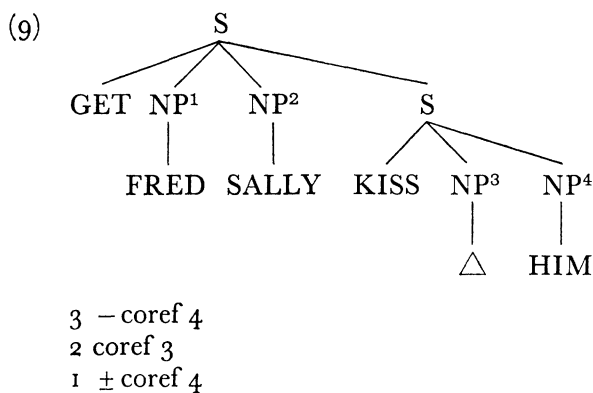
1.3. Jackendoff’s first approximation to the VP-Anaphora rule is (8) (1972, 268):

- (8) Associate with VP^2 the semantic representation of VP^1 if
 - a. VP^2 is \triangle ; and
 - b. VP^2 does not both precede and command VP^1 .

Condition (b) is eventually separated out as a general condition on a multipart anaphora rule. Both conditions refer to the state of affairs in the cyclic output of the lowest cyclic node containing both VP^1 and VP^2 . I will comment below on the interpretation of “is \triangle ”, which is not completely obvious, in that Jackendoff takes VPs such as those in (7) as meeting the condition “is \triangle ” despite the fact that they contain such morphemes as *to*, *by*, and *-en*. The substance of the rule is contained in the explication that Jackendoff provides for the word *associate* (1972, 269–270): the

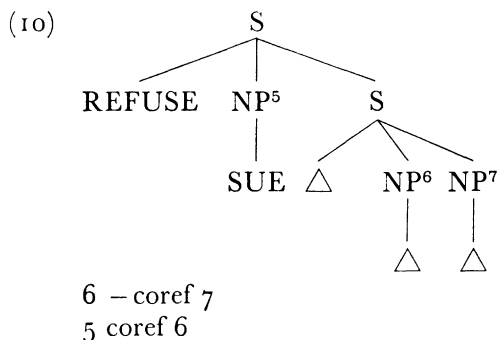
“semantic association” consists of “inserting all semantic material mentioning parts of VP¹ into structurally parallel places in the reading of S²; when an element of S¹ outside VP¹ is involved in a binary relation with an element of VP¹, the corresponding element of S² is substituted for it” (S¹ and S² here refer to the Ss of which VP¹ and VP² are immediate constituents). The rule thus adds nodes to the functional structure and adds relations to other parts of the semantic representation.

Jackendoff illustrates the VP-Anaphora rule with a derivation of the semantic structure of (3a). Applied to the first conjunct of (3a), the SIRs of his earlier chapters yield the structure shown in (9)⁶:



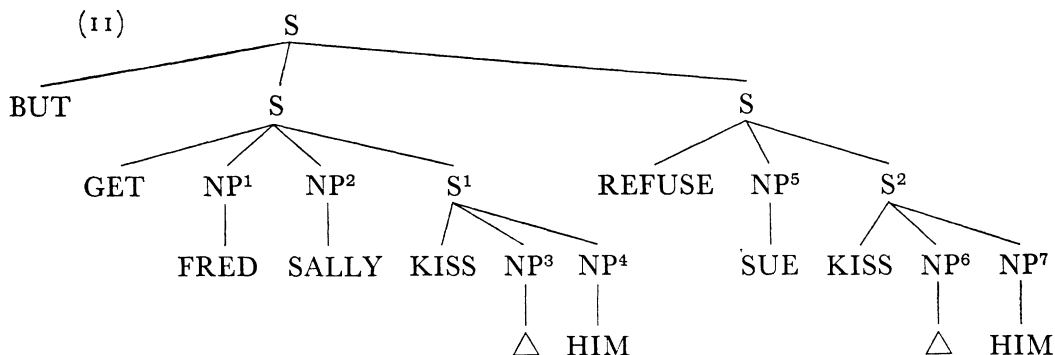
Jackendoff takes up only the case where nodes 1 and 4 are interpreted as coreferential; I will comment below on the other case, which in fact is the more problematic one.

I will argue below that consistency requires that the deep structure of the complement of *refuse* be “(for) [△]_{NP} to [[△]_V[△]_{NP}]_{VP}” rather than the “(for) [△]_{NP} to [△]_{VP}” that Jackendoff actually gives. Assuming the correctness of this point, the result of applying the SIRs to the second conjunct of (3a) would be (10):



⁶ Since in chapter 2 Jackendoff gives a number of functional structures in which a semantically complex predicate is broken up into several semantic pieces, he may very well regard his KISS and REFUSE as mere makeshifts, pending a more thorough semantic analysis.

Application of the VP-Anaphora rule to the whole conjoined structure yields (11):



- a. 3 – coref 4 }
 b. 2 coref 3 } from coreferentiality table of first conjunct
 c. 1 coref 4 }
 d. 6 – coref 7 }
 e. 5 coref 6 } from coreferentiality table of second conjunct
 f. 1 coref 7 added by VP-Anaphora rule

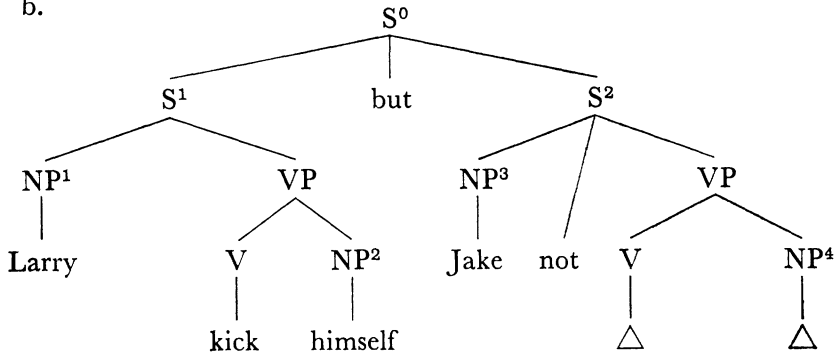
While Jackendoff gives “1 coref 7” as a specification added to the coreference table by the VP-Anaphora rule, his rule is not formulated in such a way that it could add that specification: it is formulated so as to add only relations between elements of VP¹ (i.e. 4) and elements of S² (i.e. 6 or 7). I conjecture that Jackendoff intended a formulation along the lines of: “when an element outside of VP¹ is involved in a relation with an element of VP¹, the relation obtained by substituting the corresponding element of VP² is added to the semantic representation”. This revised rule would add “1 coref 7” (since “1 coref 4” is already in the coreference table, 4 is in VP¹, and 7 is the element of VP² that corresponds to 4). Strictly speaking, this version of the rule would also add “2 coref 6” to the coreference table, thus yielding an inconsistent table implying that Sue = Sally. However, Jackendoff allows the VP-Anaphora rule to be overridden by a principle of “sloppy identity”: “the rule apparently has the option of carrying over the table of coreference intact or substituting . . . the NP in the corresponding position” (1972, 271). This would allow “5 coref 6” to result instead of “2 coref 6”, thus achieving a consistent coreference table in which the understood object of the empty VP is interpreted as referring to Fred.

This treatment raises two problems. First, it is not clear that VP² can be both “parallel to VP¹” and “empty” in cases where VP¹ involves a reflexive. Note that if VP² matches VP¹ constituent for constituent and is completely “empty”, its subject and its empty object will be marked as noncoreferential (as in (10)), since Jackendoff’s coreference rule marks a nonreflexive NP as noncoreferential with its clausemates.

Thus, unless either a distinction is somehow drawn between reflexive and nonreflexive empty nodes or VPs are allowed to count as empty even though containing reflexives (possibilities that I will take up below), (12a) will have the deep structure (12b), and the anaphora rule will assign to (12a) only an interpretation in which *Jake* and Δ are noncoreferential and will thus miss the most obvious interpretation of (12a), that in which the second clause means ‘Jake kicked himself’:

(12) a. Larry kicked himself, but Jake didn’t.

b.



The “sloppy identity” principle will not help here, since it applies only to information added when the VP-Anaphora rule applies to the S^0 cyclic output, whereas “3 – coref 4” is added to the coreference table when the anaphora rule applies to the S^2 cyclic output and thus remains in the coreference table regardless of what the VP-Anaphora rule does. The same problem arises with empty VPs whose antecedents involve other anaphoric devices that are subject to the same constraints as reflexives are. For example, (13) would not be assigned a coherent interpretation (i.e. one in which the understood object in the second conjunct is a reciprocal that refers to Pat and Mike) unless either empty NPs are allowed to bear the feature specifications of reciprocals or VPs containing *each other* plus empty material are allowed to count as empty:

(13) Larry and Jake punched each other, but Pat and Mike didn’t.

Second, the VP-Anaphora rule has false consequences when applied to the interpretation of (3a) in which *Fred* and *him* are noncoreferential. In that case, the VP-Anaphora rule would associate with (3a) a coreference table containing “1 – coref 4” and “1 – coref 7” but containing no information about whether 4 and 7 are coreferential, which means that they could be interpreted either way. However, a reading in which 4 and 7 are noncoreferential is completely impossible. Such a reading is precisely the sort of thing that a constraint against “irrecoverable deletion” ought to rule out; however, for Jackendoff an appeal to recoverability would not be possible, since there is no deletion.

The second of these two problems appears to demand that there be an additional step in the “semantic association” of VP¹ and VP²: not only must corresponding constituents be assigned the same semantic markers, but also corresponding NPs must be marked as coreferential except to the extent that the “sloppy identity” principle allows NPs of VP² to be made coreferential with something else. But a generalization is being missed here: the identity of sense between the missing VP and its antecedent is covered by a different clause of the VP-Anaphora rule than is the identity of reference between the NPs contained in those two VPs. This generalization is missed because, in Jackendoff’s semantic representation, “functional structure” and coreferentiality information are segregated into separate compartments. If coreference were indicated by referential indices *contained in* the functional structure, the rule covering identity of sense would automatically cover identity of reference of the included NPs.⁷

Regarding the first problem, one might suggest that it is simply an artifact of my assumption that (12) demands (14a) rather than (14b) as its deep structure within Jackendoff’s framework:

- (14) a. Larry Past kick himself, but Jake Past not [\triangle]_V [\triangle]_{NP}
- b. Larry Past kick himself, but Jake Past not [\triangle]_{VP}

If (14b) were the deep structure, there would be no empty NP to be marked non-coreferential with *Jake* when the anaphora rule applied to the second conjunct; then, when the VP-Anaphora rule applied to the whole structure, it could simply supply the meanings of *kick* and *himself* in interpreting the \triangle . However, if (as Jackendoff states) Gapping must be described by means of the same kind of interpretive rule as he proposes for missing VPs, the same problem can arise in cases where that solution is not available:

- (15) a. An Arab bought himself a watch, and a Turk a camera. [= . . . and a Turk bought himself a camera]⁸
- b. Tom and Sally gave each other watches, and Dick and Jane lollipops. [= . . . and Dick and Jane gave each other lollipops]

The empty matter here does not form a constituent, and thus no use of \triangle ’s can avoid assigning to (15) deep structures containing an indirect object NP that would be either nonempty or obligatorily marked as noncoreferential with the subject of its clause. Since the empty material has to match the antecedent material constituent-for-constituent in these cases, it would have to do so in all cases, since otherwise there would be a spurious proliferation of deep structures; for example, it would be possible to derive (3a) both from a deep structure with [\triangle]_{VP} and from one with [\triangle]_V [\triangle]_{NP}.

⁷ This assumes, of course, that a “sloppy identity” principle will apply under any alternative.

⁸ Of necessity, any examples relevant to the point that I am making here will violate the “No Ambiguity Condition” of Hankamer (1973), as these examples do. I take these examples to be in fact counterexamples to Hankamer’s condition. See Channon (1975a, 1975b) for criticism of the No Ambiguity Condition.

1.4. Let us now turn to some possible solutions to these problems. Consider first the possibility of allowing empty nodes to bear feature specifications such as [+ Reflexive] and thus allowing (12a) to have a deep structure in which the second conjunct has an object NP that is both empty and reflexive. If empty nodes are constrained only by the requirement that they be interpreted, then that proposal has the egregiously false implication that all reflexives are optionally omissible, e.g. that (16b) would be fully grammatical and would have the same interpretation as (16a):

- (16) a. John pinched himself.
 b. ??John pinched.

In any sentence in which a nonempty reflexive allows a coherent semantic interpretation, an “empty” reflexive would allow exactly the same semantic interpretation, according to Jackendoff’s anaphora rules, and sentences like (16b) thus could not be excluded on the grounds of having uninterpreted constituents.

One might then propose distinguishing between two kinds of empty nodes: one that would figure in identity-of-sense anaphora and would be required not just to be interpreted but rather to be interpreted by a rule that matches parallel structures; and another kind that would not figure in identity-of-sense anaphora and would only be required to be interpreted. Only the former kind would be allowed to bear features like [+ Reflexive]. The former kind of empty nodes would be a ghostly intermediate stage between true emptiness and ordinary “full” constituents; indeed, their emptiness would be the only clear distinction between them and “full” constituents. A proponent (if such exists) of a theory that made a three-way distinction between completely empty nodes that were required only to be interpreted, feature-bearing empty nodes that were required to be interpreted by identity-of-sense anaphora rules, and “full” constituents, would be obliged to show that that three-way distinction was necessary. However, I doubt that any such justification could be adduced that did not amount to fiat. For example, one might by fiat exclude “emptying transformations” and then argue that there is no alternative to having feature-bearing empty nodes in the deep structure of (12): there must be an object NP node in the second clause when the VP-Anaphora rule applies; that node must be underlyingly empty, since there are no emptying transformations; and it must be [+ Reflexive], since otherwise (as argued above) it would be assigned the wrong interpretation. However, such a justification of feature-bearing empty nodes rests on the fiat exclusion of emptying transformations. If emptying transformations are allowed, then there is an alternative, conforming in all significant respects to Jackendoff’s approach, in which no distinction is drawn between full constituents and feature-bearing empty constituents: the deep structures of both clauses of (12a) would contain *kick himself*, the anaphora rules would mark both reflexives as coreferential with the subjects of their clauses, an emptying transformation (applying in the S⁰ cycle) would replace the terminal nodes of the second VP by empty nodes, and the VP-Anaphora rule would apply as before, though with no

contradictions arising, since the coreference table would now contain “3 coref 4” rather than “3 – coref 4”.

I turn now to another possible solution, namely a broadening of the interpretation of the notion “empty”. Recall that in Jackendoff’s treatment of (3), the “empty VPs” that the VP-Anaphora rule interprets are not completely empty: they contain the “grammatical morphemes” *to*, *by*, and *-en*, which must ultimately be deleted.⁹ Perhaps by making this deletion explicit, a solution to the problems raised by (12)–(13) and (15) can be found: perhaps the VP-Anaphora rule is applicable even in the case of constituents that contain a (nonempty) reflexive or reciprocal pronoun, and those pronouns are ultimately deleted the same way that *to*, *by*, and *-en* are. However, it is not clear that those deletions will not amount to a degenerate form of VP Deletion. Note that reflexives and reciprocals in the company of empty nodes do not always delete:

- (17) a. Bill nominated Fred, Sam Pete, and Jake himself.
- b. Dick and Jane denounced Mabel, and Bob and Carol each other.

For that matter, neither does *to*: note that *to* is deleted in (5b) but not in (3a). What the items that would have to be deleted have in common is that each is inside a VP that is parallel to but not in contrast with some other VP that precedes or commands it. As far as I can determine, the simplest rule that would delete reflexives and grammatical morphemes where Jackendoff’s account would require that they be deleted is the same as the VP Deletion transformation, except that the deleted VP is not required to be identical to its antecedent but only nondistinct from it (i.e. the difference between empty and full constituents would not count), though stressed reflexives must be taken as distinct not only from unstressed reflexives but even from each other, as in (18):

- (18) Bill nominated Fred, Sam himself, and Jake himself. [= . . . Sam nominated himself and Jake nominated himself]

As far as I can see, the only alternative to having a VP Deletion or emptying transformation (either in its full glory or in a degenerate form) that duplicates part of Jackendoff’s anaphora SIR, namely the condition that “anaphoric device may not both precede and command antecedent”, is to make the deletion/emptying more general than is required and rule out derivations where too much is deleted on the basis of their having uninterpreted empty nodes. If that alternative is adopted, then there is no reason for the emptying to be of anything less than the maximum conceiv-

⁹ Jackendoff invokes the familiar rule of “Agent Deletion” (1972, 269) to eliminate the *by* in (7a). However, the same kind of objection can be raised to that proposal as Jackendoff raises against VP Deletion: for Jackendoff, Agent Deletion would have to be in the cycle; thus, the *by* Δ , which would have to be present in the stage to which the VP-Anaphora rule applied if the sentence were to be interpretable, would have already been deleted; and thus the VP-Anaphora rule would be unable to apply. More importantly, the items deleted by Agent Deletion do not stand in the coreference relations that NPs in “empty VPs” do. For example, *Steve was mugged, and so was Bert* is noncommittal as to whether the same mugger perpetrated both acts, in contrast with *Steve was mugged by him, and so was Bert*.

able generality: a rule that optionally turns any nodes whatever into empty nodes. Of course, under that proposal, there would be no reason to have the profusion of deep structure empty nodes that Jackendoff has: the nodes involved in empty VPs could just as well be derived from copies of the corresponding nodes in the antecedent VP.

Is there any empirical difference between a theory in which there is a “blind” emptying rule plus SIRs that interpret empty VPs (likewise, other constituents, e.g. \bar{N} , that allow anaphoric empty realization) in terms of antecedents to which they can be matched constituent-for-constituent, and a theory in which there is a transformation that deletes a VP under identity with another VP (and a transformation that deletes an \bar{N} under identity with another \bar{N} , et perhaps cetera)? Given Jackendoff’s other assumptions, the derivations corresponding to these two theories would differ somewhat. Because of the principle of the strict cycle, the “blind” emptying would have to apply earlier than its “seeing” counterpart. For example, in the derivation of (3a) from (4), the “blind” emptying would have to apply on the S^2 cycle (since if it were postponed until the S^0 cycle, the principle of the strict cycle would be violated), whereas the “seeing” emptying rule would have to apply on the S^0 cycle, since S^0 is the lowest node that contains both the emptied VP and its antecedent. The only way that that difference could have any empirical consequence would be if there were a rule other than the SIR under discussion that was sensitive to whether the nodes in question were empty prior to the end of the S^0 cycle. There are no obvious examples of transformations that *have to be* sensitive to the difference between full and empty constituents. Whether there are defensible SIRs other than those for the interpretation of empty constituents that must be sensitive to that distinction is not clear to me, since I am relatively unfamiliar with the analytic tradition in which such rules might be proposed. There is at least no obvious empirical difference between the theory with random emptying and the theory with emptying of VPs under identity with an antecedent VP.

1.5. Suppose that these considerations lead a proponent of Jackendoff’s approach to the conclusion that he must at least de facto have a transformation deleting or emptying a VP under identity with another VP and that he might as well formulate the transformation directly in those terms. How much would he then have to give up of Jackendoff’s assumptions and policies? Is a generalization being missed through having both a VP-emptying transformation and an SIR for interpreting empty VPs, or is one of the two somehow predictable from the other and thus strictly speaking not part of the language-particular grammar?

At first, it might appear that the SIR could not be avoided, since it does work that is not done by deletion/emptying under identity; specifically, the SIR ensures that when the antecedent VP is ambiguous, the understood VP is given an interpretation that agrees with the interpretation of the antecedent VP. For example, (19) must be

assigned only interpretations in which the overt occurrence and the understood occurrence of *the hunters* either are both subjects of *shoot* or are both objects:

- (19) John was amazed at the shooting of the hunters, and so was Bill.

A deletion under identity would not by itself rule out spurious readings of (19) in which *the hunters* is the object of *shoot* in one conjunct and the subject of *shoot* in the other. However, in fact this extra work done by the SIR can be made a consequence of the VP-emptying transformation if a suitable revision is made in the familiar constraint against irrecoverable deletions. Suppose that deletions are restricted to deletion of a constant and deletion of an item under syntactic *and semantic* identity with another item. Semantic identity must here be understood as identity of all pieces of semantic structure corresponding to nodes of the two items, including coreference (and “modal” and topic-comment) relations, subject, as usual, to the sloppy identity principle. This condition would block VP-emptying in (19) if one of the two occurrences of *the hunters* is the subject of *shoot* and the other one the object and would thus do the work of the SIR.¹⁰

This version of the recoverability condition is obeyed by all otherwise plausible deletion rules that I know of. For example, in (20), the ambiguous expression is always interpreted the same way in the understood material as in its overt occurrence:

- (20) a. Susan denounced the shooting of the hunters, and Sam did too.
 b. Tom knows a man who denounced the shooting of the hunters, and Bill knows one too.
 c. Frank is more annoyed at the shooting of the hunters than Titus is.
 d. Marcia discussed his shooting with Brenda, and Nora with Nancy.
 [= . . . and Nora discussed his shooting with Nancy]
 e. Tom thought that the shooting of the hunters was appalling, and Oscar thought so too.

In (21), the definite NPs of the understood matter are interpreted as coreferential with corresponding NPs of the antecedent:

- (21) a. Susan wrote a nasty letter to Jack, and Sam did so too.
 b. Tom owns a cat that once belonged to Jack, and Bill owns two.
 c. Frank is more annoyed at Oliver's stupidity than Titus is.

¹⁰ If Perlmutter is correct in his claim (personal communication) that agreement consists in the copying of a pronoun, then deletion of unstressed subject (and object) pronouns in languages in which the verb agrees with the subject (and object) can be treated as a deletion under identity. In that event, deletion of “constants” can be restricted to deletion of semantically empty items and deletion of semantically unmarked items such as the “CAUSE”, “USE”, and “AT” whose deletion figures in the analysis of noun compounds and nonpredicate adjectives given in Levi (1974). Sentences such as *A parent shouldn't spank*, which Cantrall (1974, 30) has offered as counterexamples to the standard version of the recoverability constraint, may be amenable to a treatment involving deletion under identity followed by incorporation of indefinite object: *A parent of someone_i shouldn't spank him_i* → **A parent of someone shouldn't spank* → *A parent shouldn't spank*. Deletion will of course have to be distinguished from zero morphological realization, such as the zero pronoun that has been argued (Kuroda (1965)) to be the only true personal pronoun in Japanese.

- d. His wife wrote to Abby about his drinking, and his mother about his laziness.
- e. Tom thinks that Jack is incompetent, and Oscar thinks so too.

For example, in (21b), the *Jack* of the understood *cat that once belonged to Jack* must be the same Jack that is referred to in the first conjunct; in (21d), the mother's letter is directed to the same Abby as is the wife's letter. Note, incidentally, that the suggested recoverability condition does not imply that the NPs *a cat that once belonged to Jack* and *two* are coreferential in (21b): here the deletion is contingent on identity of \bar{N} s, not of NPs, and it is NPs rather than \bar{N} s that participate in coreference relations.¹¹

There are two points on which the revised recoverability principle conflicts with Jackendoff's premises: it allows transformations to be sensitive to semantic information, and it makes reference to the whole semantic representation in connection with rules that would be involved in arriving at the derivational stages from which the semantic representation is determined in Jackendoff's analysis. However, these two points do not necessarily lead to an analysis drastically different from Jackendoff's. Note that (i) an alternative conception of SIRs is possible, in which they are taken not as rules for constructing a semantic representation out of a syntactic derivation but as conditions that pairs (semantic representation/syntactic derivation) must satisfy in order to be admissible (see section 2.2 for some discussion of this alternative); and (ii) while the revised recoverability constraint gives transformations access to semantic information, it does not allow their formulations to mention semantic information, i.e. whatever semantic constraints it imposes on a transformation are not part of the formulation of the transformation but are predictable from the syntactic conditions for its application. Thus, if it is possible to reformulate Jackendoff's coreference rules as constraints on (semantic representation/syntactic derivation) pairs, they could be combined consistently with deletions and/or emptyings that required not just syntactic but also semantic identity between the controlling item and the deleted/emptied item.

The adoption of the revised recoverability constraint would make it largely a matter of indifference whether the transformations of "VP Deletion" etc. are emptyings or deletions, since no special SIR to interpret the empty nodes in question would now be needed. The only respect in which it might matter whether empty nodes or no

¹¹ Does the revised recoverability principle have the false implication that

(i) Bill bought a car and so did John.

only has an interpretation in which Bill and John bought the same car or that (21a) has only an interpretation in which Susan and Sam wrote the same letter? Whether it does depends on the specific details of the semantic representation of sentences involving logical bound variables. If *a car* is treated as an ordinary NP, capable of standing in the same sorts of coreferentiality relations as might *it* or *Harry*, then it does in fact have that catastrophic consequence. However, if *Bill bought a car* is analyzed as having a semantic structure in which an existential quantifier is external to a clause *Bill buy x*, which has the corresponding bound variable *as* the object NP, the recoverability principle would only require that each clause of (i) be interpreted as having a quantifier that binds a variable corresponding to the surface object. Even if the same index is used to represent the two variables, there is no coreferentiality between the NPs of the two clauses, since each quantifier binds only those occurrences of its variable that are in its scope.

nodes at all appear in the surface representations of understood VPs is that empty surface realizations of understood VPs might play a role in the interpretation of *other* nodes, particularly of anaphoric devices with “missing antecedents” as in examples such as (22) (discussed in Postal and Grinder (1971)):

- (22) a. Frank didn’t buy a car, but Shirley did, and she paid \$3000 for *it*.
 b. Frank bought a car, and so did Shirley, and *they* both cost over \$3000.

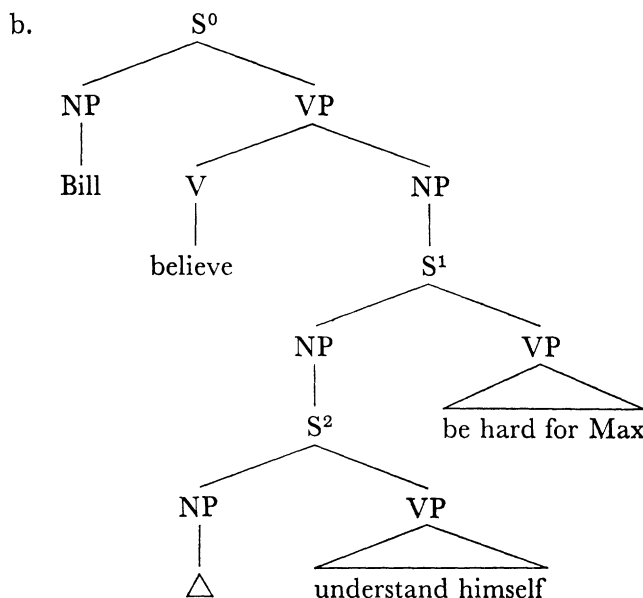
Whether positing a surface empty VP in the middle clause of these examples would facilitate specifying the reference of the pronoun in the last conjunct depends on a detail of these examples that has been largely overlooked, namely that the understood occurrence of *a car* in the middle clause has the dual function of bound variable (thus counting as “identical to” *a car* in the first clause, whether or not that occurrence of *a car* is “referential”) and of constant (thus serving as antecedent for pronouns in subsequent clauses and providing a reference distinct from that of the first occurrence of *a car* when that is “referential”; that is, the last clause of (22b) involves $they_{ij} = it_i + it_j$). Karttunen (1969) touches on this dual function of certain existentially quantified NPs and notes its relationship to the informal practice of mathematicians, who will often write a formula containing an existential quantifier (say, $(\exists e)(\forall x)(xe = ex = x)$) and then proceed to write formulas in which the existentially quantified variable (here, e) is treated as a constant, even though according to standard policies on the use of quantifiers and variables, those formulas are incoherent by virtue of having a variable (e) that is not in the scope of the quantifier that binds it (e.g. the quantifier that binds e is in axiom 2, but e recurs in axiom 3). Karttunen’s paper in fact provides grounds for institutionalizing the mathematicians’ informal practice, that is, for treating existentially quantified NPs that are used “referentially” as bringing into being constants that can serve as the references of anaphoric devices in the subsequent discourse. If that suggestion is adopted, it is not obvious that surface nodes need play any role in the interpretation of pronouns with “missing antecedents”; however, it is sufficiently unclear to me how to incorporate that suggestion into Jackendoff’s scheme that I must leave this matter hanging in the air.

2.

2.1. I now turn to a problem raised by Harada and Saito (1971). Since Jackendoff takes reflexives to be present *as such* in deep structure, the deep structure of (23a) would be (23b):¹²

- (23) a. Bill believes himself to be hard for Max to understand.

¹² Harada and Saito assign to (23a) a deep structure in which the VP of S^1 is *be hard* rather than *be hard for Max* and the subject of S^2 is *Max*. (23b), which conforms to Jackendoff’s remarks about *Tough Movement* (1972, 154–156), presents exactly the same problems for his coreference rule as does the deep structure on which Harada and Saito based their argument.



Since his coreference rule is obligatory and applies to cyclic outputs, it would mark *himself* as coreferential with Δ when it applies to S^2 . Since the Δ would be marked coreferential with *Max* when the anaphora rules apply to S^1 , *himself* would be coreferential with *Max*, contrary to the fact that (23a) only allows an interpretation in which *himself* is coreferential with *Bill*.

Harada and Saito have shown that there is a conflict between requiring reflexives to be present as such in deep structure and having coreference established on the basis of cyclic outputs. There are thus two principal ways in which one might try to revise Jackendoff's theory in order to meet Harada and Saito's objection: either (i) reformulate the coreference rules so that they determine coreference on the basis of some postcyclic stage of derivations (say, shallow structure or surface structure) or (ii) posit a transformation that derives reflexives from something nonreflexive and thus not yet have a reflexive in S^2 when the coreference rules apply to it.¹³

It is not obvious that (i) is a viable alternative. Jackendoff (personal communication) indicates that he favors it, though he has not to my knowledge succeeded in making the appropriate reformulations of the coreference rules. (ii) could involve a much less drastic revision of Jackendoff's theory than might at first appear the case. A transformation deriving reflexives from nonreflexives need not derive them from

¹³ A third possibility, which I will not discuss further, since I do not understand its implications, would be to have the coreference assignment rules apply to cyclic outputs in top-to-bottom fashion; that is, the application of the coreference rule to any S would follow its application to all higher Ss. That proposal would avoid Harada and Saito's problem, since *Bill* would be marked coreferential to *himself* when the coreference rule applied to S^0 , and the rule would be inhibited from marking *Max* coreferential with *himself*, by the clause that makes the rule inapplicable to an anaphoric device that has already been assigned an antecedent.

copies of their antecedents (e.g. it could derive them from corresponding personal pronouns) and need not be sensitive to coreference (e.g. it could randomly and optionally convert personal pronouns into reflexives). The latter possibility would allow a correct assignment of coreference in (23a): the deep structure would be the same as (23b) except for having *him* in place of *himself*; Reflexivization (being optional) could be postponed until the S^0 cycle, when *him* had already been moved into S^0 via *Tough* Movement and Raising; and then the coreference rule would correctly mark *himself* as coreferential with *Bill*. Of course, some condition would still have to be imposed so as to rule out a derivation in which Reflexivization applied on the S^2 cycle, since then *Max* would be marked as coreferential with *himself*, exactly as if the deep structure were (23b). I will postpone further consideration of interpretivism-with-reflexivization until the next section, where that possibility will raise its head again.

2.2. Jackendoff includes in his coreference rule the following peculiar condition on when a reflexive can be marked as coreferential to something (1972, 136):

(24) NP^2 has not yet appeared on the righthand side of the table.

This condition allows Jackendoff to make the assignment of an antecedent to a reflexive obligatory and yet not have more than one antecedent assigned to any particular reflexive. For example, were (24) not imposed, both *Bill* and *John* in (25) would be marked as coreferential with the reflexive, and the coreference table would be inconsistent:

(25) Bill asked John about himself.

This treatment involves two peculiarities in the way that the coreference rule is to apply: (i) it must be sensitive to the absence of information, i.e. the rule applies only when certain entries in the coreference table are as yet blank, and (ii) different applications of an obligatory rule to a particular domain have to take place in random sequence, i.e. one chooses at random whether *Bill* or *John* is to be made coreferential with *himself*, and either choice rules out the possibility of a subsequent application with the other as antecedent, by virtue of (24). Both of these characteristics could be avoided by modifying Jackendoff's system in a way parallel to Stanley's (1967) proposal for modifying earlier generative phonology.¹⁴ Specifically, suppose that SIRs were treated as well-formedness conditions on a pair (semantic representation/syntactic derivation) rather than as directions for constructing a semantic representation from

¹⁴ One of Stanley's motivations for adopting "morpheme structure conditions" was to avoid the spurious economies that are available when a morpheme structure can apply to a segment that is unspecified for one of the features to which the rule is sensitive. No analogue to that argument is possible here, since the examples discussed by Stanley involve the interaction of two rules $[+F] \rightarrow X$, $[-F] \rightarrow Y$, whereas Jackendoff's SIRs appear never to be contingent on a condition "x – coref y".

a given syntactic derivation. Instead of rules such as “If condition *C*, then put *X* in the coreferentiality table”, there would be rules such as “If condition *C*, then *X* is in the coreferentiality table”, which is to say that if one is given a syntactic derivation meeting condition *C* and a coreferentiality table that does not contain *X*, the pair is rejected.¹⁵

If reflexives had to be clause-mates of their antecedents, there would be no problem setting up a coreferentiality assignment rule in the revised framework and otherwise conforming to Jackendoff’s assumptions and policies: “If NP^i is reflexive, then there is an NP^j such that NP^j precedes NP^i , NP^j is a clause-mate of NP^i , and ‘*j* coref *i*’ is in the coreference table.” That rule, incidentally, would make unnecessary the additional rule that Jackendoff is forced to include in his grammar, which requires that every reflexive have an antecedent.¹⁶

A problem arises when one broadens the analysis to cover cases such as Jackendoff’s celebrated example:

(26) That there is a picture of himself in the Post Office bothers Fred.

If the new SIR is to refer to the same stages of the derivation as did Jackendoff’s original rule and if reflexives are to be present as such in deep structures, then any rule of the form “If NP^i is reflexive, then there is an NP^j such that . . . and ‘*j* coref *i*’ is in the coreference table” will reject any semantic representation of (26) except the absurd one in which *himself* is coreferential with *the Post Office*. Even if the condition “. . .” allows NP^j to be in a higher clause than NP^i , the rule will demand that the clause *there is a picture of himself in the Post Office* contain something coreferential with *himself* when it applies to the cyclic output of that clause.

Unless the coreference rule can be made to apply to a postcyclic stage of derivations, the most obvious solution to this problem is to treat reflexives as transformationally derived. If (26) involves, say, *him* instead of *himself* in the deep structure, and the *him* is made into a reflexive in the course of the derivation, but not until after the cycle has applied to the complement clause, then the SIR will require that *himself* be

¹⁵ Both this suggestion and Stanley’s proposal conform to a more general methodological principle that excludes spurious stages in derivations. While the *whole* coreference table may well be psychologically real, I suspect that the various fragments of it that appear in Jackendoff’s step-by-step construction of the table have no more psychological reality than do other fragments of the table that do not appear in his construction. The same consideration favors taking the base component of a transformational grammar to be a set of “node admissibility conditions” (McCawley (1968)) rather than a “phrase structure grammar” and is alluded to in Kiparsky’s (1973) argument that rules of the form “ $X \rightarrow Y/Z$ ” and “ $X \rightarrow W$ ” apply disjunctively.

¹⁶ This proposal solves a further problem presented by (23), that of excluding any reading in which *himself* is coreferential with *Max*. However, it also incorrectly predicts that the following sentences are anomalous:

- (i) a. Which picture of himself did Susan say that John had sold?
- b. How many photographs of himself did Susan say that John had taken?
- c. The picture of himself that John found in the Post Office annoyed him.

The first two examples present no problems for Jackendoff’s original analysis, and the third can be accommodated within his framework by adopting the proposal (originally due to Brame, elaborated in Chiba (1972)) that the head *N* (or rather, \bar{N}) of a restrictive relative clause construction originates inside the relative clause and is copied into its ultimate position.

coreferential with something in the whole *S* (*Fred* being the only real possibility) rather than with something in the complement. One problem arises, however; namely, that if the reflexivization transformation were completely “blind”, i.e. if it simply turned personal pronouns into reflexives without regard for any possible antecedent, the principle of the strict cycle would dictate that it apply on the S^1 (complement) cycle rather than the S^0 (main clause) cycle, and the correct interpretation of (26) could not be derived. Thus, if the principle of the strict cycle is to be maintained, the “static” interpretation of the anaphora rules is possible only if one accepts a “seeing” reflexivization transformation, which turns nonreflexive items into reflexives on the basis of some structural relationship to an antecedent NP.¹⁷

3.

In section 1, I have shown that even under fairly strict adherence to Jackendoff’s assumptions, there is no real alternative to having a transformation that deletes a VP under identity with another VP, and I have argued that the way to incorporate such a transformation into a grammar that does a minimum of violence to Jackendoff’s assumptions is to take SIRs to be conditions on the well-formedness of (semantic representation/syntactic derivation) pairs and adopt a revised version of the recoverability constraint, according to which deletion or emptying under identity is possible only when the deleted/emptied item is syntactically and semantically identical to its antecedent. In section 2, I have shown that such a “static” reinterpretation of Jackendoff’s SIRs forces one either to adopt a Reflexivization transformation or to revise the SIRs so that they refer only to postcyclic stages of derivations; I have also demonstrated that the problem raised by Harada and Saito concerning reflexives that originate in a lower clause also demands either a Reflexivization transformation or a revision of the SIRs so that either they refer only to postcyclic stages of derivations or they apply top-to-bottom.

¹⁷ Note also that the “blind” version of reflexivization does not impose any tighter constraints on how reflexives can be related to their antecedents than does the “seeing” version. While it might be claimed that the blind approach allows only cyclic outputs to be relevant to the reflexive–antecedent relation whereas a “seeing” transformation could in principle be ordered before other transformations of the cycle, that observation merely reflects the historical accident that it was Jackendoff who first saw fit to impose a universal restriction that they refer only to cyclic outputs. Pronominalization transformations do not lend themselves any less than do anaphora SIRs to the imposition of a universal constraint that they be ordered after all (other) cyclic transformations. Actually, it is doubtful that either version of this putative universal can be maintained. Okada (1975) presents detailed arguments to show that the stages of the derivation that are relevant to the interpretation of reflexives and of empty complement subjects are not the cyclic outputs but the outputs of specific transformations of the cycle. Okada also notes that since Jackendoff’s multipart anaphora rule would thus have to be broken up into at least three separate rules (one for empty complement subjects, one for reflexives, and one for nonreflexive pronouns), the constraint that the anaphoric device may not precede and command the antecedent cannot be part of those anaphora rules but must be a separate overall constraint on the anaphora–antecedent relation. This agrees with the conclusion of Lakoff (1968) (the relevant argument is summarized in McCawley (1973a, 233–234)) that some types of anaphoric devices must be derived from copies of their antecedents but other types cannot be, though all anaphoric devices are subject to the constraint that they not both precede and command their antecedents, which means that that constraint is thus not part of the rules that create the former type of anaphoric devices but is a general constraint on anaphora–antecedent relations.

Suppose that it can be shown that the alternatives of postcyclic anaphora rules and top-to-bottom anaphora rules are untenable. (Perhaps such an argument could be constructed on the basis of the examples cited in footnote 16, though I will not attempt to formulate such an argument here.) Would that mean that an “interpretive” approach to anaphora must be rejected in favor of a “generative” approach? I would like to close by maintaining that that question involves an assumption that is detrimental to any quest for an understanding of the subject at hand, namely the assumption that there is substance to the notions “generative account” and “interpretive account”. The various issues discussed in this article (and in Jackendoff’s book) are to at least a large extent independent of each other, and there is no apparent conflict between the points that I have raised above and a number of important details of his treatment of anaphora; for example, the propositions that at least many kinds of anaphoric devices are not derived from copies of their antecedents, that transformations and SIRs form distinct systems of rules, and that there are SIRs that determine possible anaphora–antecedent relationships in the case of those anaphoric devices that are not derived from copies of their antecedents. The terms “generative” and “interpretive” have been applied to various theoretical positions not so much because of any inherent relationship between those positions as because certain positions have been associated (in fact or in popular caricature) with linguists who accept a distinction between “transformation” and “SIR”, and other positions have been associated with linguists who reject that distinction. Actually, a wide variety of combinations of positions on the various issues can be found in the literature; for example, it is easy (McCawley (1975)) to find attestations of all logically possible combinations of answers to the questions (i) Are all anaphoric pronouns derived from copies of their antecedents? and (ii) Are transformations sensitive to coreference? Thus, a “generative” answer to one of the questions at issue need not commit one to “generative” answers to other questions. In fact, the discussion in sections 1 and 2 should make it clear that the following views are mutually consistent: (a) the position that there are SIRs that relate syntactic configurations in cyclic outputs to coreference relations among the various NPs (an “interpretivist” position); (b) the position that transformations are sensitive to coreference; and (c) the position that reflexive pronouns are derived from something nonreflexive by a transformation (“generativist” positions). A theory that combines (a), (b), and (c) must not be rejected merely for being “bastardized” or for violation of an exogamy taboo; it is merely one of a large number of possible theories of anaphora and must stand or fall on its merits. The application of the terms “generative” and “interpretive” to positions on theoretical issues is pernicious in the same way that the application of the terms “right” and “left” to political issues is: it presupposes a somewhat capricious projection of a multidimensional space onto a one-dimensional space and makes the identification of real issues more difficult. I offer this article as a specimen of issue-identification carried out with relative disregard for the application of the labels “generative” and “interpretive”, albeit

with a certain amount of prejudice for many of the positions generally labeled as "generative".

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