

DEEP STRUCTURE, SURFACE STRUCTURE AND SEMANTIC INTERPRETATION*

In a general way, I will be concerned in this paper with the relation of syntactic structure to semantic representation in generative grammar. I will outline a general framework within which much of the discussion of these questions in the past few years can be reformulated, and alternatives compared as to empirical content and justification, and I will discuss some empirical considerations that suggest a choice among these alternatives that is different, in some respects, from either the theory of grammar outlined in Chomsky (1965) or the proposals of a more "semantically-based" grammar that have been developed in the important work of the past few years. Specifically, these modifications have to do with some possible contributions of surface structure to delimiting the meaning of a linguistic expression.

A grammar of a language, in the sense in which I will use this term, can be loosely described as a system of rules that expresses the correspondence between sound and meaning in this language. Let us assume given two universal language-independent systems of representation, a phonetic system for the specification of sound and a semantic system for the specification of meaning. As to the former, there are many concrete proposals; for example, the system described in detail in chapter 7 of Chomsky and Halle (1968). In the domain of semantics there are, needless to say, problems of fact and principle that have barely been approached, and there is no reasonably concrete or well-defined "theory of semantic representation" to which one can refer. I will, however, assume here that such a system can be developed, and that it makes sense to speak

* This work was supported in part by the National Institutes of Health (Grant MH-13390-01).

of the ways in which the inherent meaning of a sentence, characterized in some still-to-be-discovered system of representation, is related to various aspects of its form.

Let us assume further that the grammar in some manner specifies an infinite class of surface structures, each of which is mapped onto a phonetic representation by a system of phonological rules. I assume further that the grammar contains a system of grammatical transformations, each a mapping of phrase-markers onto phrase-markers. In ways that need not concern us in detail, the system of grammatical transformations determines an infinite class K of finite sequences of phrase-markers, each such sequence P_1, \dots, P_n meeting the following conditions:

- (1) (i) P_n is a surface structure
- (ii) each P_i is formed by applying a certain transformation to P_{i-1} in a way permitted by the conditions on grammatical rules¹
- (iii) there is no P_0 such that P_0, P_1, \dots, P_n meets conditions (i) and (ii).

Let us refer to P_1 as a K -INITIAL phrase-marker in this case. We refer to the members of K as the SYNTACTIC STRUCTURES generated by the grammar. So far, we have described K in terms of the class of surface structures, somehow specified, and the system of grammatical transformations, that is, the grammatical transformations of the language and the conditions on how they apply.

¹ Some of the conditions may be specific to the grammar (e.g., certain ordering conditions on transformations), and others general (e.g., the principle of the cycle, in the sense of Chomsky, 1965). These conditions will define certain permissible sequences of transformations and determine how a permissible sequence maps a phrase-marker P onto a phrase-marker P' . Hence with each such permissible sequence T_1, \dots, T_n we can associate the class of all sequences of phrase-markers P_1, \dots, P_{n+1} such that T_1, \dots, T_i maps P_1 onto P_{i+1} ($1 \leq i \leq n$) in the manner determined. The class K consists of those sequences of phrase-markers which are so associated with permissible sequences of transformations, which terminate with surface structures and which are maximal in the sense of (liii). Each transformation carries out a certain definite operation on a sub-phrase-marker of the phrase-marker to which it applies; given the principle of the cycle, or others like it, the choice of this sub-phrase-marker may be determined by the position of the transformation in question in the permissible sequence of transformations.

Let us assume further that the grammar contains a lexicon, which we take to be a class of lexical entries each of which specifies the grammatical (i.e., phonological, semantic, and syntactic) properties of some lexical item. The lexicon for English would contain this information for such items as *boy*, *admire*, *tall*, and so on. Just how extensive the lexicon must be — equivalently, just to what extent this information is determined by other parts of the grammar — we leave open. We may think of each lexical entry as incorporating a set of transformations that insert the item in question (that is, the complex of features that constitutes it) in phrase-markers. Thus

- (2) a lexical transformation associated with the lexical item *I* maps a phrase-marker *P* containing a substructure *Q* into a phrase-marker *P'* formed by replacing *Q* by *I*.

Theories of grammar may differ in the conditions on *Q*, and more generally, on the nature of these operations.

Suppose, furthermore, that all lexical items are inserted into a phrase-marker before any nonlexical grammatical transformation applies. Thus the grammar meets condition (3):

- (3) Given (P_1, \dots, P_n) in *K*, there is an *i* such that for $j < i$, the transformation used to form P_{j+1} from P_j is lexical, and for $j \geq i$, the transformation used to form P_{j+1} from P_j is nonlexical.²

In this case, let us define P_i to be the POST-LEXICAL STRUCTURE of the sequence P_1, \dots, P_n .

Thus a grammar, so conceived, must have rules specifying the class *K* and relating each member of *K* to a phonetic and semantic representation. In particular, the grammar will contain a lexicon and grammatical transformations. Within this general framework, we can describe various approaches to the theory of transfor-

² In terms of note 1, each permissible sequence of transformations can be analyzed as (L, S) where *L* is a sequence of lexical transformations and *S* a sequence of nonlexical (i.e., true syntactic) transformations.

mational-generative grammar that have been explored during the past few years.

The theory outlined in Chomsky (1965) assumes that in addition to a lexicon, a system of grammatical transformations, and a system of phonological rules, the grammar contains a system of rules of semantic interpretation and a context-free categorial component with a designated terminal element Δ . The categorial component and the lexicon are referred to as THE BASE of the grammar. It is assumed that the grammar meets condition (3), so that a class of post-lexical structures is defined. A general well-formedness condition is proposed for surface structures. The class *K* of syntactic structures consists of those sequences $P_1, \dots, P_i, \dots, P_n$ (P_1 being the *K*-initial structure, P_i the post-lexical structure, and P_n the surface structure) meeting condition (1) where, furthermore, P_1 is generated by the categorial component and P_n meets the well-formedness condition for surface structures.³ Surface structures are mapped into phonetic representations by the phonological rules. Post-lexical structures are mapped into semantic representations by the semantic rules. In this formulation, the post-lexical structures are called DEEP STRUCTURES. The deep structures contain all lexical items, each with its complement of grammatical features. Furthermore, the configurations of the phrase-marker P_1 , which are preserved in the deep structure, can be taken to define grammatical relations and functions in a straightforward manner. It is natural (though I shall argue, only in part correct) to suppose that the semantic interpretation of a sentence is determined by the

³ More specifically, a general principle of lexical insertion is formulated which interprets the features (in particular, the contextual features) of lexical entries as lexical insertion transformations and applies these transformations to P_1 giving, ultimately, P_i . A lexical insertion transformation replaces a particular occurrence of the designated symbol Δ of P_1 by a lexical item. Thus in the notation of (2), *Q* is always Δ and the transformation replaces $Q = \Delta$ by *I*. We may assume, therefore, that the ordering of P_1, \dots, P_i is immaterial—that is, that we consider as syntactic structures equivalence classes defined by the relation among members of *K* that differ only by a permutation of P_1, \dots, P_i .

The transformations are said to have a FILTERING FUNCTION in the sense that the well-formedness condition on surface structures must be met.

Several variants of such a theory are discussed in Chomsky (1965).

intrinsic semantic content of lexical items and the manner in which they are related at the level of deep structure. Supposing this (following, in essence, Katz and Postal, 1964), it would follow that deep structures determine semantic representation under the rules of semantic interpretation.

Thus the deep structures, in this theory, are held to meet several conditions. First, they determine semantic representation. Second, they are mapped into well-formed surface structures by grammatical transformations (without any subsequent insertion of lexical items). Third, they satisfy the set of formal conditions defined by base rules; in particular, the rules of the categorial component define the grammatical functions and order of constituents, and the contextual features of lexical entries determine how lexical items can be entered into such structures.

I will refer to any elaboration of this theory of grammar as a "standard theory", merely for convenience of discussion and with no intention of implying that it has some unique conceptual or empirical status. Several such elaborations have been proposed and investigated in the past few years.

Observe that a standard theory specifies, for each sentence, a syntactic structure $\Sigma = (P_1, \dots, P_i, \dots, P_n)$ (where P_i is the deep and P_n the surface structure), a semantic representation S , and a phonetic representation P . It asserts, furthermore, that S is determined by P_i and P by P_n under the rules of semantic and phonological interpretation, respectively. More generally, the theory is "syntactically-based" in the sense that it assumes the sound-meaning relation (P, S) to be determined by Σ .

It goes without saying that none of the assumptions in the foregoing exposition is self-evident, and that all are open to empirical challenge. Thus, to take perhaps the least controversial, it might be argued that there is no level of phonetic representation, but that syntactic structures are related directly to the organization of peripheral musculature, sensory organs, and neural structures, by operations that are of an entirely different sort than those of grammar. There is no a priori way to demonstrate that this view is incorrect, or to justify the postulation of the level of phonetic

representation, which, in this view, is superfluous. The most that one can hope to show is that an interesting range of phenomena can be accounted for by a theory that incorporates a level of phonetic representation of the sort postulated, that there is no crucial counter-evidence, and that there is no reason to suppose that some alternative form of theory will be more successful. Even stronger doubts can be (and often have been) expressed with respect to the notion of semantic representation. Thus one might argue that nonlinguistic beliefs, intentions of the speaker, and other factors enter into the interpretation of utterances in so intimate — and perhaps so fluctuating and indefinite — a fashion that it is hopeless and misguided to attempt to represent independently the "purely grammatical" component of meaning, the various "readings" of expressions in the sense of Katz and Postal (1964) and other versions of the standard theory, and the relation between such readings and a syntactic structure Σ .⁴

⁴ The literature relating to this subject is too extensive for detailed reference. See, for example Quine (1960) for discussion of the interpenetration of linguistic and nonlinguistic knowledge. Stampe (1968) argues, in part on grammatical grounds, for a "Gricean view" (see Grice, 1957, 1968) that the notion of "reading" or "semantic interpretation" must be understood in terms of the more basic notion, "Agent-means-x-by-y", an approach which calls into question the possibility of developing a coherent notion of "semantic representation" strictly as part of grammar. For conflicting argument, see Katz (1966), Searle (1968).

There are still other sorts of consideration that might lead one to question the notion of "reading", as construed in recent work. Thus consider such phrases as *John's picture*. In addition to the readings *picture of John* and *picture that John has*, the phrase might be interpreted as *picture that John created*, *picture that John commissioned*, and no doubt in other ways. On the other hand, *John's puppy* is not subject to the latter two interpretations, though it might mean *puppy to which John (my misnamed pet) gave birth*. On the other hand, it is hardly clear that it is a fact of language that people cannot create (or commission the creation of) puppies in the way in which they can pictures. Correspondingly, it is unclear whether one can assign to these phrases, by rules of grammar, a set of readings that determine how they figure in, say, correct inference. Or consider such a sentence as *I am not against MY FATHER, only against THE LABOR MINISTER*, spoken recently by a radical Brazilian student. Knowing further that the speaker is the son of the labor minister, we would assign to this utterance a reading in which the emphasized phrases are coreferential. On one reading, the sentence is contradictory, but knowing the facts just cited a more natural interpretation would be that the speaker is opposed to what his father

If one were to deny the existence of phonetic representation, he might argue that a generative grammar, strictly speaking, is a system of rules relating semantic representation, deep structure, and surface structure, some entirely new sort of theory relating the generated structures to physical signals or perceptual representations. If one were to deny the existence of semantic representation (readings, in the sense of recent discussions), he might argue that a generative grammar is a system of rules relating deep structures, surface structures, and phonetic representation, proposing further that entirely different principles are involved in determining what a person means by saying so-and-so. Evidently, there is no a priori argument against these views, as there is no a priori necessity for a grammar to define systems of deep and surface structure in the sense of the standard theory. Many of the assumptions in the standard theory are uncontroversial in the sense that they have been adopted, explicitly or implicitly, in those studies that attempt to characterize the notion "knowledge of a language", and in that there is no known coherent alternative or any reason, empirical or conceptual, to suppose them inadequate. One should not, however, demand the kind of justification that in principle can never be provided.

In summary, I have so far outlined a certain general framework and a "standard theory" that develops this framework in a specific direction. Furthermore, the literature contains further elaborations of this standard theory, and many realizations of it with respect to particular languages (that is, fragments of grammars of specific languages constructed in terms of the standard theory). At each level, there are reasonable doubts that can be raised, and alternatives can be envisaged. It goes without saying that the investigation of these doubts and the study of alternatives can only be beneficial, in the long run, and should be actively pursued. It must also be

does in his capacity as labor minister, and would be accurately paraphrased in this more elaborate way. It is hardly obvious that what we "read into" sentences in such ways as these—no doubt, in a fairly systematic way—can either be sharply dissociated from grammatically determined readings, on the one hand, or from considerations of fact and belief, on the other.

kept in mind that at each level of discussion, justification can only go so far — in particular, that it can never be conclusive.

Given alternative formulations of a theory of grammar, one must first seek to determine how they differ in empirical consequences, and then try to find ways to compare them in the area of difference. It is easy to be misled into assuming that differently formulated theories actually do differ in empirical consequences, when in fact they are intertranslatable — in a sense, mere notational variants. Suppose, for example, that one were to modify the standard theory, replacing condition (3) by the condition that lexical items are inserted just prior to a transformation affecting the configuration in which they appear. Making this notion precise, we could devise an apparent alternative to the standard theory which, however, does not differ at all in empirical consequences, although the notion "deep structure" is not defined, at least in anything like the sense above.⁵ Given the central character of this notion in the standard theory, the alternative would appear to be significantly different, though in fact it would be only a notational variant. There would be, in other words, no empirical issue as to which formulation is correct or preferable on empirical grounds. Before the standard theory can be compared with this modification, it is necessary to formulate both in such a way that there is an empirical distinction between them.

Similarly, suppose that one were to counterpose to the "syntactically-based" standard theory a "semantically-based" theory of the following sort. Whereas the standard theory supposes that a syntactic structure Σ is mapped onto the pair (P, S) (P a phonetic and S a semantic representation), the new theory supposes that S is mapped onto Σ , which is then mapped onto P as in the standard theory. Clearly, when the matter is formulated in this way,⁶ there

⁵ We might assume that rules of semantic interpretation of the type proposed by Katz in many publications apply cyclically, in parallel with the rules of the cycle of syntactic transformations, assigning readings to successively "higher" nodes in the process. Thus semantic interpretation would, in effect, match that of the standard theory, though the notion of "deep structure" is not defined.

⁶ As, for example, in Chafe (1967). Chafe also proposes to obliterate the

is no empirical difference between the "syntactically-based" standard theory and the "semantically-based" alternative. The standard theory generates quadruples (P, s, d, S) (P a phonetic representation, s a surface structure, d a deep structure, S a semantic representation). It is meaningless to ask whether it does so by "first" generating d , then mapping it onto S (on one side) and onto s and then P (on the other); or whether it "first" generates S (selecting it, however one wishes, from the universal set of semantic representations), and then maps it onto d , then s , then P ; or, for that matter, whether it "first" selects the pair (P, d) , which is then mapped onto the pair (s, S) ; etc. At this level of discussion, all of these alternatives are equivalent ways of talking about the same theory. There is no general notion "direction of a mapping" or "order of steps of generation" to which one can appeal in attempting to differentiate the "syntactically-based" standard theory from the "semantically-based" alternative, or either from the "alternative view" which regards the pairing of surface structure and semantic interpretation as determined by the "independently selected" pairing of phonetic representation and deep structure, etc. Before one can seek to determine whether grammar is "syntactically-based" or "semantically-based" (or whether it is based on "independent choice" of paired phonetic representation and deep structure, etc.), one must first demonstrate that the alternatives are genuine and not merely variant ways of speaking in a loose and informal manner about the same system of grammar. This is not so easy or obvious a matter as is sometimes supposed in recent discussion.

Perhaps the point can be clarified by reference to a discussion of Katz and Postal (1964, § 5.4). Katz and Postal develop a variant of what I have called the standard theory, and then discuss how a model of speech production might be envisioned that incorporates a grammar of this sort. They outline a hypothetical procedure as follows: select a "message" which is a set of readings, i.e., of semantic representations in the sense discussed above. Select a distinction between syntax and semantics, but this, too, is merely a terminological issue, as he formulates it.

syntactic structure Σ (in particular, what we have here called the deep structure d in Σ) such that Σ maps onto S by the rules of semantic interpretation of the grammar. However this selection is accomplished, we may regard it as defining a mapping of S onto Σ , and in general, of semantic interpretations onto syntactic structures. Then, map Σ onto a speech signal, making use of the rules of phonological interpretation (giving the phonetic representation P) and rules that relate the latter to a signal. Quite properly, Katz and Postal present this schematic description as an account of a hypothetical PERFORMANCE model. In such a model, it makes sense to speak of order of selection of structures, direction of a mapping, and so on. Suppose, however, that we were to interpret this account as an intuitive instruction for using the rules of the grammar to form quadruples (P, s, d, S) , i.e., for generating structural descriptions of sentences. Of course, in this case, the notion of "order of selection of structures" or "intrinsic direction of a mapping" would have no more than an intuitive, suggestive role; the informal instruction would be one of any number of equivalent instructions for using the rules of the grammar to form structural descriptions. To confuse the two kinds of account would be a category mistake. In short, it is necessary to observe the difference in logical character between performance and competence.

Suppose that we were to develop a modification of the standard theory along the following lines. Using the notation presented earlier the standard theory generates syntactic structures $\Sigma = (P_1, \dots, P_i, \dots, P_n)$, where P_1 is a K-initial, P_i a deep, and P_n a surface structure, P_1 being generated by the categorial component, and P_i formed by lexical insertion transformations that replace the substructure Q of P_1 by a lexical item, Q always being the designated symbol Δ . P_i is then mapped onto a semantic representation S . Suppose further that we regard S as itself a phrase-marker in some "semantically primitive" notation. For example, we may think of the lexical entry for "kill" as specifying somehow a phrase-marker *cause-to-die* that might be related to the phrase-marker that serves as the semantic representation of the phrase

"cause to die."⁷ Suppose now that in forming Σ , we construct P_1 which is, in fact, the semantic representation of the sentence, and then form P_2, \dots, P_i by rules of lexical insertion, replacing a substructure Q which is the semantic representation of a lexical item I by I . For example, if P_1 contains $Q = \text{cause-to-die}$, the lexical entry for "kill" will permit Q to be replaced by $I = \text{"kill"}$. Similarly, the lexical entry for "murder" might indicate that it can be inserted by a lexical transformation for the substructure $Q = \text{cause-to-die-by-unlawful-means-and-with-malice-aforethought}$, where the grammatical object is furthermore human; and the entry for *assassinate* might specify further that the object is characterized, elsewhere in the phrase-marker, as a reasonably important person; etc. Similarly, the lexical entry for "uncle" might specify that it can replace $Q = \text{brother of (father-or-mother)}$. And so on, in other cases.⁸

Superficially, this new theory seems significantly different from the standard theory. Thus deep structures are not mapped into semantic representations in the same sense as in the standard theory; rather the converse is true. Furthermore, the rules of lexical insertion operate in a rather different manner, replacing substructures Q , which may be quite complex, by lexical items.

⁷ The relation could not be identity, however. As has often been remarked, "causative" verbs such as *kill*, *raise*, *burn* (as in *John burned the toast*), etc., differ in meaning from the associated phrases *cause to die*, *cause to rise*, *cause to burn*, etc., in that they imply a directness of connection between the agent and the resulting event that is lacking in the latter case. Thus John's negligence can cause the toast to burn, but it cannot burn the toast. Similarly, I can cause someone to die by arranging for him to drive cross-country with a pathological murderer, but I could not properly be said to have killed him, in this case. The point is discussed in Hall (1965).

⁸ Systems of this sort have been developed by McCawley in a number of interesting papers (see bibliography). The specific realizations of such systems proposed by McCawley are genuinely different, on empirical grounds, from the specific realizations of the standard theory that have been proposed for English. However, two questions can be raised: first, are the SYSTEMS genuinely different, or are the genuine differences only in the realizations, which could, therefore, be translated into the other general systems of grammar; are the realizations suggested better or worse than the alternatives, on empirical grounds? I will return briefly to the former question, in a specific case.

We might ask, in such a theory, whether there is any natural break between "syntax" and "semantics". We might, in fact, define certain nonlexical transformations that apply in forming the sequence (P_1, \dots, P_i) , thus violating condition (3) and eliminating the notion "post-lexical structure", hence "deep structure", as defined earlier. Nevertheless, as I have so far formulated the alternatives, it is not at all clear that they are genuine alternatives. It must be determined whether the interpolated "non-lexical" transformations are other than inverses of rules of semantic interpretation, in the standard theory. Furthermore, it is unclear what difference there may be, on empirical grounds, between the two formulations of rules of lexical insertion. Again, before inquiring into the relative merit of alternative systems of grammar, it is necessary to determine in what ways they are empirically distinguishable. To establish that the systems are genuine alternatives, one would have to show, for example, that there is a difference between formulating the lexical insertion operations so that they insert *uncle* in place of the structure $Q = \text{brother of (father-or-mother)}$ (the terms of Q being "semantically primitive"), on the one hand, and on the other hand, formulating the rules of semantic interpretation so that they assign to "uncle" a position in the space of concepts (represented in terms of "semantic primitives") which is the same as that assigned, by rules of composition of the sort that Katz has discussed, to the phrase "brother of (father-or-mother)". If such a difference can be established, the theories might then be compared, in various ways. For example, one might compare the way in which such related concepts as "kill", "murder", "assassinate" are treated in the two systems, or one might inquire into the nature and generality of the various rules and principles that are presupposed. In general, one might try to show that certain phenomena are explicable in a general way in one system but not in the other. Again, this is not so simple a matter as is sometimes supposed, to judge by recent discussion.

Consider next the following modification of the standard theory. We consider a new set of structures C (for "case systems") which represent semantically significant relations among phrases such as

the relation of agent-action in (4) and of instrument-action as in (5):

(4) John opened the door

(5) the key opened the door

Suppose we were to assume, in a realization of the standard theory, that the deep structures of (4) and (5) are identical except for lexical entries. Then these deep structures, it might be argued, do not represent the required relations. For example, as grammatical relations are defined in Chomsky (1965), the subject-predicate relation is the relation that holds between *John* and *opened the door* in (4) and between *the key* and *opened the door* in (5); hence the relations of agent-action and instrument-action are not differentiated. Let us therefore construct the structures C_1 and C_2 of C as follows:

(6) C_1 : ([V, *open*], [Agent, *John*], [Object, *the door*])

(7) C_2 : ([V, *open*], [Instrument, *the key*], [Object, *the door*])

Suppose that the grammar contains a component that generates such structures as C_1 and C_2 and rules that map these onto phrase-markers; for example, the main rule might say that the item specified as Agent takes the position of subject (in the sense of the standard theory), and if there is no Agent, this position is occupied by the Instrument, etc. Formalizing these ideas, we might develop a theory in which C is mapped onto a class of phrase-markers which are K-initial in the sense described earlier, further operations being as the standard theory. However, we drop condition (3) and relate the lexicon and the rules of semantic interpretation directly to C .⁹

⁹ Case systems of this sort are developed in an important paper by Charles Fillmore (1968). As in the case of notes 7 and 8, we may ask (i) whether case systems are genuinely distinct from the standard system, or intertranslatable with it; (ii) whether the specific realizations proposed by Fillmore differ empirically from the specific realizations that have been proposed for the standard system; (iii) if so, how do they compare on empirical grounds? As to the second question, the answer is surely positive. Thus Fillmore's specific pro-

Are case systems, so described, empirically distinguishable from the standard system? It is not at all obvious. Thus consider the example just given. It was argued that if (4) and (5) have the same deep structure, apart from lexical entries (let us put aside the question whether this is correct), then the relations indicated in (6) and (7) are not represented in these deep structures. However, this argument depends on an assumption, which need not be accepted, regarding rules of semantic interpretation. In fact, the rules mapping C_1 and C_2 onto the deep structures of (4) and (5), respectively, can be interpreted as rules of semantic interpretation for these deep structures. Thus one rule (probably universal) will stipulate that for verbs of action, the animate subject may be interpreted as the agent; etc. Various qualifications are needed whether we interpret these rules as rules of semantic interpretation or as rules mapping C onto S ; I see very little difference between them, at this level of discussion, and the same seems to me true in many more complex cases. It might be argued that the case system expresses these facts in a "direct way" whereas the standard system does so only "indirectly".¹⁰ The distinction seems to me meaningless. Without principles of interpretation, a formal system expresses nothing at all. What it expresses, what information it provides, is determined by these principles.

A good part of the critique and elaboration of the standard theory in the past few years has focussed on the notion of deep structure and the relation of semantic representation to syntactic structure. This is quite natural. No area of linguistic theory is more

posals do not permit any transformation (e.g., question or relative formation) to apply prior to such transformations as passive, indirect-object-inversion, and others that have been proposed in standard transformational grammars, and there are other specific differences. A serious discussion of question (iii) would take us too far afield. As Fillmore develops these systems, rules of semantic interpretation relate directly both to C and to the K-initial structures onto which elements of C are mapped, since this operation is not "meaning preserving", in the sense that sentences derived from the same element ccC may, as Fillmore observes, differ in meaning.

¹⁰ Similar arguments, equally specious, have been given in support of the view that grammatical relations must be "directly represented" in underlying structures.

veiled in obscurity and confusion, and it may be that fundamentally new ideas and insights will be needed for substantial progress to be made in bringing some order to this domain. I want to investigate one kind of revision of the standard theory that bears directly on the relation of syntax and semantics, but before doing so, I would like to consider briefly one kind of critique of the standard theory — specifically, concerning the status of deep structure — that seems to me to have been, so far, without consequence, though the general approach is quite legitimate and perhaps hopeful. I have in mind a critique analogous to that developed by Halle and others against the concept of the phoneme, a number of years ago. Halle argued that a generative grammar could provide a level of phonemic representation, in the sense of structural linguistics, only by abandoning otherwise valid generalizations. Analogously, one might ask whether the requirement that deep structures exist in the sense of the standard theory (see p. 65, above) is compatible with otherwise valid generalizations. A negative answer would be highly interesting, and the matter therefore deserves serious investigation. A number of papers have dealt with this matter, but, I think, so far unsuccessfully.

McCawley purports to present such an argument in McCawley (1968b postscript).¹¹ He considers the following expressions:

¹¹ I omit here certain aspects of McCawley's argument that seem to me to impose serious difficulties of interpretation. Not the least of these difficulties is the theory of referential indices that McCawley proposes. To mention just the most serious problem, the idea that every noun phrase must have an intended reference, somehow specified in the underlying structure, seems unreconcilable with the fact that I may perfectly well use noun phrases where I know that there is no reference at all and hence intend no reference (e.g., *if you are looking for the fountain of youth, you won't find it here, he is looking for a man who is taller than himself*, etc.). The idea of trying to incorporate "intended reference" in syntax seems to me misguided. It may clarify matters to point out that in Chomsky (1965), to which McCawley refers in this connection, it is not proposed that reference (actual or intended) be incorporated into syntax, but rather that "referential expressions" be indexed in a way relevant to the operation of certain syntactic rules, and that the rules that assign semantic interpretation to syntactic structures refer to identity of indices in determining sameness of intended reference. This may or may not be a useful idea, but it is very different from McCawley's proposal that the intended reference of a noun phrase be

- (8) $Ax:xe$ (John, Harry) [x loves x 's wife]
- (9) John loves John's wife and Harry loves Harry's wife
- (10) John and Harry love John's wife and Harry's wife, respectively
- (11) John and Harry love their respective wives
- (12) $Ax:xeM$ [x loves x 's wife]
- (13) these men love their respective wives
- (14) that man (x) loves Mary and that man (y) loves Alice
- (15) that man (x) and that man (y) love Mary and Alice respectively
- (16) those men love Mary and Alice respectively

He proposes that (8) and (12) be taken as (approximately) the semantic interpretations of (11) and (13) respectively (where A is the universal quantifier and M is the class of these men). He states further that the transformation which produces (10)¹² is "involved in" the derivation of (11). This transformation, the "*respectively*-transformation", relates (8) to (11), relates (12) to (13), and relates (14) to (16). McCawley furthermore rejects the idea of regarding such sentences as (13) as derived from conjunctions — quite properly: if for no other reason, consider what this proposal would entail for "the real numbers are smaller than their respective squares". Furthermore, (16) "arise[s] from [our (14)] by the *respectively*-transformation", which also maps (17) into (18):

- (17) that man (x) loves Mary and that man (x) loves Alice
- (18) that man (x) and that man (x) love Mary and Alice, respectively

The rule of noun phrase collapsing maps (15) into (16) and (18) into (19):

- (19) that man loves Mary and Alice

specified in the grammar by an index, or in his terms, that the index "be" the intended reference.

¹² That is, the "transformation which produces the sentence (145): *John and Harry love Mary and Alice respectively*", which differs from (10) in deep structure, according to him, only in that where (10) has *John's wife* and *Harry's wife*, (145) has *Mary* and *Alice*

Presumably, then, McCawley intends that the *respectively*-transformation, which is "involved in" the derivation of (11) from (8), in fact maps (9) into (10) exactly as it maps (14) into (15) and (17) into (18). Combining these various comments, McCawley seems to have in mind the following organization of operations:

$$\begin{array}{rcl}
 & I & R \quad R' \\
 (20) & (8) \rightarrow (9) \rightarrow (10) \rightarrow (11) \\
 & I' & \\
 & (12) \rightarrow (13) & \\
 & R \quad C & \\
 & (14) \rightarrow (15) \rightarrow (16) & \\
 & R \quad C & \\
 & (17) \rightarrow (18) \rightarrow (19), &
 \end{array}$$

where *I* and *I'* are two rules, apparently entirely distinct, relating expressions with quantifiers to phrase-markers of the usual sort; *R* is a transformation forming sentences with *respectively*; *R'* is a subsequent transformation that forms noun phrases with *respective*; and *C* is the rule of noun phrase collapsing.

Having presented this material, McCawley argues as follows. In a standard theory the relation of (8) to (11) and the relation of (12) to (13) must be regarded as semantic (since it involves "a relationship between a representation involving quantifiers and bound variables and a representation involving ordinary noun phrases"), whereas the relation between (14) and (16) (or (17) and (19)) is syntactic, namely, it is expressed by the transformation of conjunction-reduction. McCawley then concludes, without further argument, "that *respectively* can not be treated as a unitary phenomenon in a grammar with a level of deep structure and that that conception of grammar must be rejected" in favor of a "semantically-based" theory. This argument is held to be analogous to Halle's argument against the level of phonemic representation.

Even if we accept McCawley's analysis *in toto*, no conclusion follows with respect to the concept of deep structure. His argument is based on an equivocation in the use of the notion "*respectively*-transformation", and collapses when the equivocation is removed.

Thus if we use the term "*respectively*-transformation" to refer to the relation of (8) to (11), (12) to (13), (14) to (16), and (17) to (19), then this "transformation" does, as he says, relate semantic to syntactic representations in the first two cases, and syntactic representations to syntactic representations in the latter two. But in the analysis he proposes, namely (20), the "*respectively*-transformation" carries out four totally different operations; hence it does not express a "unitary phenomenon". If, on the other hand, we use the term "*respectively*-transformation" to denote *R* of (20), then it does express a "unitary phenomenon", but it no longer relates semantic to syntactic representation in one case and syntactic to syntactic representation in the other. In fact, (20) can be formulated in the standard theory, if we take *I* and *I'* to be inverses of rules of semantic interpretation, and *R*, *R'* and *C* to be syntactic transformations. Therefore McCawley's analysis, right or wrong, is simply a realization of the standard theory, once equivocations of terminology are removed. Consequently, it shows nothing about the level of deep structure. Furthermore, it does not treat the phenomena in question in a "unitary" manner, since no relation is proposed between *I* and *I'*.¹³

I have analyzed McCawley's argument in some detail, both because it is now often referred to as demonstrating the impossibility of incorporating the concept of deep structure in a generative grammar, and because this analysis illustrates clearly some of the difficulties in constructing a genuine alternative to the standard theory.

McCawley observes, quite correctly, that it is necessary to provide some justification for the hypothesis of an "intermediate" level of deep structure: "there is no *a priori* reason why a grammar could not instead¹⁴ consist of 'say' a 'formation rule' component which

¹³ A very different interpretation of these phenomena, in a somewhat-modified version of the standard theory, is presented in Dougherty (1968a). Dougherty's version of the standard theory is close enough to it so that his analysis can be compared on empirical grounds with McCawley's, which is, so far as I can see, entirely within the standard theory (if we drop the matter of indices as intended referents).

¹⁴ The word *instead*, however, begs a number of questions, for reasons already

specifies the membership of a class of well-formed semantic representations, and a 'transformational component' which consists of rules correlating semantic representations with surface syntactic representation...". The same might be said about "surface structure", "semantic representation" and "phonetic representation". There is only one way to provide some justification for a concept that is defined in terms of some general theory, namely, to show that the theory provides revealing explanations for an interesting range of phenomena and that the concept in question plays a role in these explanations. In this sense, each of the four concepts just mentioned, along with the notion of grammatical transformation and a number of others, receives some justification from the linguistic work that is based on grammars of the standard form. Of course, there is no a priori reason why the standard theory should be correct, so far as it goes in specifying the form of grammar; in fact, I will argue later that it is not. I fail to see what more can be said, at the level of generality at which McCawley develops his critique.

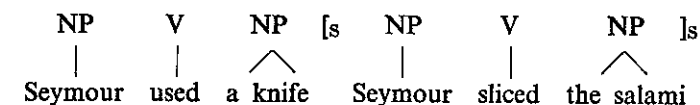
Lakoff has approached the same question — namely, whether deep structures can be defined in the sense of the standard theory without loss of significant generalization — in a more tentative way, in an interesting paper on instrumental adverbs (Lakoff, 1968). He considers such sentences as (21) and (22)

noted. Thus in describing the standard theory one might refer to the deep structures as "well-formed semantic representations", associating each with the class of readings into which it can be mapped by rules of semantic interpretation. Similarly, one might regard McCawley's "semantic representations", which, he proposes, be represented as phrase-markers, as nothing other than the deep structures of the standard theory, the "formation rules" being the rules of the categorial component that form K-initial structures and the lexical rules that form deep structures from them by lexical insertion. McCawley in fact assumes that mutually deducible sentences may have different "semantic representations" (in his sense), these being related by "logic", a concept not further specified. To formulate his proposal in the standard theory, we might then take "logic" to incorporate the rules of semantic interpretation (which express the "logic of concepts", in one traditional use of this term). In this respect too he fails to differentiate his theory from the standard theory. McCawley discusses some of these questions in (1968a), but inconclusively, I think, in part for reasons mentioned above on p. 72-73.

- (21) Seymour sliced the salami with a knife
 (22) Seymour used a knife to slice the salami

and gives a number of arguments to show that despite differences of surface structure, the same grammatical and selectional relations appear in these sentences. He argues that the two must have the same, or virtually the same representations in deep structure if selectional features and grammatical relations are to be stable in terms of deep structures, in anything like the sense of the standard theory. He suggests at various points that (22) is much closer to this common deep structure than (21); consequently, instrumental adverbs do not appear in deep structure, and the grammatical relations and selectional features must be associated, for both (21) and (22), with deep structures of roughly the form (22'):

(22')



Alternatively, the concept of deep structure, in the sense of the standard theory, must be abandoned.

Lakoff's argument is indirect; he does not propose underlying structures or grammatical rules, but argues that whatever they are, they must meet a variety of conditions in an adequate grammar, these conditions suggesting either a deep structure such as (22') or the abandonment of the notion deep structure. He points out that if (22') underlies (21), deep structures must be quite abstract, since (21), which contains only one verb, is based on a structure with an embedded sentence and hence with two verbs. In either case, it would be fair to conclude that a departure from the standard theory is indicated.¹⁵

¹⁵ In the case of the double verb, what is a departure from more familiar formulations is that in this proposal, the verb *slice* in an embedded underlying sentence becomes the main verb, and the main verb *use* is deleted. On the other hand, it has been suggested many times, in realizations of the standard theory, that items that are in some sense relatively "empty" of semantic content (such as *be*, *have*, *use*, etc.) may be deleted from embedded sentences.

However, the argument is weakened — I think, vitiated — by the fact that a number of structures are omitted from consideration that seem highly relevant to the whole matter.¹⁶ Thus alongside of (21) and (22), we have such sentences as (23)-(26):

- (23) Seymour used the knife to slice the salami with
- (24) Seymour used this table to lean the ladder against
- (25) Seymour used this table to write the letter on
- (26) Seymour used this car to escape (make his getaway) in

Such facts as these suggest that underlying (22) is a structure such as (27):

- (27) Seymour used a knife [_SSeymour sliced the salami with a knife]_S
Seymour used this table [_SSeymour leaned the ladder against this table]_S

¹⁶ There are also quite a number of relevant factual questions that might be raised. Thus Lakoff assumes that (21) and (22) are synonymous. This is not obvious; compare *John carelessly broke the window with a hammer*, *John broke the window carelessly with a hammer*, *John carelessly used a hammer to break the window*, *John used the hammer carelessly to break the window*. The differences of meaning suggest a difference in the meaning of the sentences from which the adverb is omitted. Similarly, consider the many sentences in which *use* and *to have* the sense appropriate to this discussion, but which do not correspond to sentences with instrumental adverbs: e.g., *John used his connections to further his career*, *John used the classroom to propagandize for his favorite doctrines*, *John used the mallet over and over again to reduce the statue to rubble*. Or consider such sentences as (A): *John used this hammer and that chisel to sculpt the figure*. Believing (A), one would be entitled to give a positive answer to the question *did John use that chisel to sculpt the figure?* but not to: *did John sculpt the figure with that chisel?* The matter is even clearer if we consider *John used this hammer and that chisel in sculpting the figure*, which Lakoff considers synonymous with (A) — see p. 12 of his paper.

See Bresnan (1968), for other relevant arguments.

A full analysis would have to bring much other evidence to bear — e.g., such sentences as *Seymour sliced the salami without (using) a knife*, which are not paired with anything like (22), and which suggest that insofar as the deep structures are common, it may be that *use* is embedded below *slice* in (21), rather than conversely, as Lakoff suggests.

I do not see how these questions can be resolved without undertaking an analysis of these structures which does propose rules as well as underlying structures, and in this sense, goes well beyond the approach to these questions that Lakoff presents.

The latter might then be compared with such sentences as *Seymour used the knife for a strange purpose, ... in a strange way*, etc. To form (23)-(26), a deletion operation will delete the final NP in the embedded sentence of (27) (an operation analogous, perhaps, to the one used in deriving *meat is good to eat*). The preposition *with*, furthermore, can optionally be deleted, giving (22) from (23). In (24), *against* cannot be deleted, but the corresponding prepositions can optionally be deleted (in some styles at least) in (25) and (26), giving (28) and (29) which do not correspond at all to (30) and (31), respectively:

- (28) Seymour used this table to write the letter, this is the table that Kant used to write the *Critique*, etc.
- (29) Seymour used this car to escape (make his getaway)
- (30) Seymour wrote the letter with this table
- (31) Seymour escaped (made his getaway) with this car [rather, "in this car"]

Very likely, a still more satisfactory analysis can be given, taking other data into account — see note 16. However, the relevant point here is that a wider range of data than Lakoff considered suggests an underlying structure such as (27) for (22); and if this is the case, then the major problems that Lakoff raises dissolve, as can be seen by checking case by case.¹⁷ In particular, deep structures

¹⁷ In some cases, an explanation can be suggested for facts that would require arbitrary stipulation were the underlying structure to be taken as (22') — e.g., the fact that the complement of *use* may not contain an instrumental adverb — see p. 21 of Lakoff, *op. cit.* Many of the interesting phenomena that Lakoff notes still demand explanation, of course, but this fact does not help choose among the alternatives, since no explanation or even satisfactory descriptive account is offered in either case.

It is perhaps worth mentioning that the rather similar analysis of manner adverbials presented in Lakoff (1965) is also quite unpersuasive on factual grounds. Lakoff argues that the manner adverbials too are derived from "higher predicates", with sentence (i), for example, serving as an approximate source of (ii):

(i) John is reckless in hanging from trees

(ii) John hangs from trees recklessly

However, (i) is clearly ambiguous, having either the approximate sense (α) or (β):

(α) John is reckless in that he hangs from trees

for (21) and (22), though not identical in this analysis, would nevertheless express the required selectional and grammatical relations in a unified way. And none of Lakoff's general conclusions with regard to deep structure follow if this analysis, or something like it, is correct.

Turning to a somewhat different matter, let us consider once again the problem of constructing a "semantically-based" theory of generative grammar that is a genuine alternative to the standard theory. Reviewing the observations made earlier, the standard theory has the general structure indicated in (32), where P_1 is the K-initial phrase-marker, P_i the deep structure, and P_n the surface structure of $\Sigma \varepsilon K$, and where P is a phonetic and S a semantic representation:

$$(32) \quad \Sigma = (P_1, \dots, P_i, \dots, P_n)$$

$\begin{array}{cc} & \\ & \\ S & P \end{array}$

S is determined from P_i by rules of semantic interpretation, and P from P_n by phonological rules. Only operations of lexical insertion apply prior to P_i , and none apply subsequently; P_1 is generated

(β) John is reckless in the way he hangs from trees

Sentence (ii) has only the interpretation (β). But (β) itself no doubt derives from something of the form (γ), in which the embedded sentence would be something like (δ), which contains a manner adverbial—in place of *in that way* one might have *in a reckless way, in a way that is reckless, recklessly*.

(γ) John is reckless in the way in which he hangs from trees

(δ) John hangs from trees in that way

Hence it appears that rather than (i) underlying (ii), it is more likely that something like (α) and (γ) underlie (i) and only (γ) underlies (ii), where (γ) contains an embedded structure like (δ) with an inherent manner adverbial.

Notice that in (iii) and (iv) the interpretation is along the lines of (α), in (v) it is along the lines of (β), and in (vi) it is ambiguous as between (α) and (β):

(iii) clumsily, John trod on the snail

(iv) John trod on the snail, clumsily

(v) John trod on the snail clumsily

(vi) John clumsily trod on the snail.

The examples are discussed in Austin (1956-7). Such sentences as *John stupidly stayed in England* are unambiguously interpreted along the lines of (α), and, correspondingly, the analogue to (v) is ungrammatical. These facts can be accommodated by an approach that takes (α) and (γ) as approximating the underlying sources, but they do not appear consistent with Lakoff's analysis.

by the categorial component of the base. Each element of Σ is formed from the preceding one by a transformation, the exact effect of each transformation being determined, by general conditions, by the position of this operation in the sequence of transformational operations that generates Σ . The grammar generates quadruples (S, P_i, P_n, P). As emphasized earlier, there is no precise sense to the question: which of these is selected "first" and what is the "direction" of the relations among these formal objects. Consequently, it is senseless to propose as an alternative to (32) a "semantically-based" conception of grammar in which S is "selected first" and then mapped onto the surface structure P_n and ultimately P .

Consider once again a theory such as that proposed by McCawley in which P_1 is identified with S and condition (3) is dropped so that "deep structure" is undefined. Let us consider again how we might proceed to differentiate this formulation — let us call it "semantically-based grammar" — from the standard theory. Consider such expressions as (33)-(35):

(33) John's uncle

(34) the person who is the brother of John's mother or father or the husband of the sister of John's mother or father

(35) the person who is the son of one of John's grandparents or the husband of a daughter of one of John's grandparents, but is not his father

If the concept "semantic representation" ("reading") is to play any role at all in linguistic theory, then these three expressions must have the same semantic representation. But now consider the context (36):

(36) Bill realized that the bank robber was —

and the sentences S_{33} , S_{34} , S_{35} formed by inserting (33), (34), (35), respectively, in (36). Evidently, the three sentences S_{33} , S_{34} , S_{35} are not paraphrases; it is easy to imagine conditions in which each might be true and the other two false. Hence if the concept "semantic representation" (or "reading") is to play any serious role in linguistic theory, the sentences S_{33} , S_{34} , S_{35} , must have

different semantic representations (readings). Many such examples can be constructed. The basic point is that what one believes, realizes, etc.,¹⁸ depends not only on the proposition expressed, but also on some aspects of the form in which it is expressed. In particular, then, people can perfectly well have contradictory beliefs, can correctly be said to fail to realize that *p* even though (in another sense) they know that *p*, to be aware that *p* but be unaware that *q* where *p* and *q* are different expressions of the same proposition, etc. Notice that there is nothing in the least paradoxical about these observations. It is the function of such words as *realize*, *be aware of*, etc. to deal with such situations as those just described, which are perfectly common and quite intelligible.

Given these observations, let us return to the standard and semantically-based theories. In the standard theory, (33), (34), and (35) would derive from three different deep structures, all mapped onto the same semantic representation. To assign a different meaning to *S*₃₃, *S*₃₄, *S*₃₅, it is necessary to define *realize* (i.e., assign it intrinsic lexical semantic properties) in such a way that the meaning assigned to "NP realizes that *p*" depends not only on the semantic interpretation of *p* but also on the deep structure of *p*. In the case in question, at least, there is no contradiction in this requirement, though it remains to meet it in an interesting way.

In the case of the semantically-based theory this alternative is of course ruled out. In fact, within the framework of this theory it is impossible to accept all of the following conditions on K-initial structures (semantic representations, in this formulation):

- (37) At the level of K-initial structures:
- (i) (33), (34), (35) have the same representation
 - (ii) *S*₃₃, *S*₃₄, *S*₃₅ have different representations
 - (iii) the representation of (36) is independent of which

¹⁸ Similarly, what one can prove, demonstrate, etc. The observation is due to Mates (1950). Scheffler (1955) discusses the matter more generally, and argues that no analysis of synonymy can suffice to explain the possibilities for substitution *salva veritate* in indirect discourse. There has been considerable discussion of these matters, but nothing, so far as I know, to affect the point at issue here.

expression appears in the context of (36) at the level of structure at which these expressions (e.g., (33)-(35)) differ

In the semantically based theory, these three conditions lead to a contradiction; by (37ii), the sentences *S*₃₃, *S*₃₄, *S*₃₅ differ in semantic representation (representation at the level of K-initial structures) whereas (37i) and (37iii) imply that they must be represented identically at this level, the differences of surface form being determined by optional rules that map semantic representations onto linguistic expressions. In the standard theory, the contradiction does not arise. The analogues of (37) are simultaneously satisfied by: (i) rules which assign the same semantic interpretation to (33)-(35); (ii) rules which make reference to the deep structure of the item appearing in the context of (36) in determining the meaning. Condition (37iii) then poses no problem.

To reject (37i) or (37ii) is to abandon the semantically-based theory (or to deny the facts), since K-initial structures will no longer have the properties of semantic representations. Therefore it is necessary to reject (37iii), and to assume that the representation of (36) at the level of K-initial structures (semantic representations) depends on not just the meaning but also the form of the expression that appears ultimately in the context of (36). But to make this move¹⁹ is in effect to accept the standard theory in a confusing form; differences in deep structure will determine differences of semantic interpretation. In any case, then, the semantically-based alternative collapses.

As far as I can see, an argument of this sort can be advanced against any variety of semantically-based grammar (what is sometimes called "generative semantics") that has been discussed, or even vaguely alluded to in the linguistic literature. One has to put this tentatively, because many of the proposals are rather vague. However, at least this much is clear. Any approach to semantically-based grammar will have to take account of this problem.

Do considerations of this sort refute the standard theory as well?

¹⁹ Assuming, that is, that it is possible to give it an intelligible formulation.

The example just cited is insufficient to refute the standard theory, since (33)-(35) differ in deep structure, and it is at least conceivable that "realize" and similar items can be defined so as to take account of this difference. Interesting questions arise when the matter is pursued further. Thus is it possible for someone to realize that John is believed to be incompetent by everyone without realizing that everyone believes John to be incompetent, or to realize that Bill saw John but not that John was seen by Bill? Or, suppose that John happens to speak a language just like English in relevant respects, except that it has no word translatable as *uncle*. What, then, is the status of S_{33} as compared to S_{34} and S_{35} ? Or, consider such sentences as *everyone agrees that if John realizes that p , then he realizes that —*, where the space is filled either by p itself or by an expression q distinct from but synonymous with p . No doubt the truth value may change, as q replaces p , indicating that any difference of form of an embedded sentence can, in certain cases at least, play a role in the statement of truth conditions, hence, presumably, the determination of meaning. It remains to be determined whether there is some interesting subclass of such cases in which differences of deep structure suffice to account for the meaning differences, as the standard theory would require. If this could be shown, then the standard theory could still be maintained in a modified form: namely, except for cases in which ANY aspect of form may play a role in determining meaning. Instead of pursuing such questions as this, however, I would like to turn to another set of problems that seem to pose serious difficulties for the standard theory (and, a fortiori, for any variant of "generative semantics"). I have in mind cases in which semantic interpretation seems to relate more directly to surface structure than to deep structure.²⁰

Consider such sentences as (38):

²⁰ The material in the remainder of this paper is drawn in large part from lectures given in Tokyo, in the summer of 1966, and prior to that, at MIT and UCLA. I am indebted to many of those who attended for comments and suggestions. Many of these and related topics are discussed by Kraak (1967), where rather similar conclusions are reached independently. I will not consider here some intricate but quite relevant considerations presented in Partee (1968).

- (38) (a) is it JOHN who writes poetry?
(b) it isn't JOHN who writes poetry

Under normal intonation²¹ the capitalized word receives main stress and serves as the point of maximal inflection of the pitch contour. A natural response to (38) might be, for example, (39):

- (39) No, it is BILL who writes poetry

The sentence (39) is a possible answer to (38a) and corroboration of (38b). The semantic representation of (38) must indicate, in some manner, that *John* is the FOCUS of the sentence and that the sentence expresses the PRESUPPOSITION that someone writes poetry. In the natural response, (39), the presupposition of (38) is again expressed, and only the focus differs. On the other hand, a response such as (40) does not express the presupposition of (38).²²

²¹ The concept "normal intonation" is far from clear, but I will not try to explicate it here. I am assuming that the phonological component of the grammar contains rules that assign an intonation contour in terms of surface structure, along the lines discussed in Chomsky and Halle (1968). Special grammatical processes of a poorly-understood sort may apply in the generation of sentences, marking certain items (perhaps, even syllables of lexical items) as bearing specific expressive or contrastive features that will shift the intonation center, as in *is it John who writes POETRY* or *is it John who WRITES poetry*, etc. I am assuming that no such processes apply in (38). Sentences which undergo these processes are distinct in semantic interpretation, and perhaps in syntactic properties as well. Given the obscure nature of these matters, it is difficult to say anything more definite. The matter is further obscured by the fact that these processes, however they are to be described, may assign an extra-heavy stress and extra-dominant pitch to the item that would serve as intonation center under normal intonation—i.e., in the case where these processes do not apply. Quite possibly, these processes are to be described in general as superimposing a new contour on the normal one. Thus in *It ISN'T John who writes poetry* the word *John* retains its intonational prominence with respect to the following phrase, exactly as under normal intonation.

²² A response such as (40) does not deny the presupposition of (38), but rather its relevance. Again, these matters are far from clear, and deserve much fuller study than they have so far received. There is no reason to suppose that a satisfactory characterization of focus and presupposition can be given in purely grammatical terms, but there is little doubt that grammatical structure plays a part in specifying them. For some discussion of these matters in the case of cleft sentences such as (38), see Akmajian (1968).

(40) No, John writes only short STORIES

In the case of (38), the underlying deep structure might be something like (41):²³

(41) [the one who writes poetry] is John

If so, then it would be natural to try to determine the focus and presupposition directly from the deep structure, in accordance with the standard theory, the focus being the predicate of the dominant proposition of the deep structure. Alternatively, one might propose that the focus is determined by the surface structure, namely, as the phrase containing the intonation center.

Consider next (42):

- (42) (a) does John write poetry in his STUDY?
 (b) is it in his STUDY that John writes poetry?
 (c) John doesn't write poetry in his STUDY
 (d) it isn't in his STUDY that John writes poetry

Again, a natural response might be (43):

(43) No, John writes poetry in the GARDEN

The sentences of (42) have as focus *study* (or *in his study*) and express the presupposition that John writes poetry somewhere, a presupposition also expressed in the normal response (43). To accommodate these facts within the standard theory, we might take (42b) and (42d) to have a deep structure rather like (41), with the predicate of the dominant sentence being *in his study*, say (44):

(44) the place where John writes poetry is in his study

Again, the predicate expresses the focus and the embedded sentence the presupposition. To extend this analysis to (42a) and (42c), we would have to argue that the underlying structure of *John writes poetry in his study* is also something like (44), contrary to what is

²³ Following Akmajian, *ibid.* Alternatively, one might argue that the deep structure is of the form: [*it-one writes poetry*] is John, with the rule of extrapolation giving *it is John who writes poetry*. The difference is immaterial, in the context of this discussion.

assumed in Chomsky (1965) and many earlier realizations of the standard theory, in which the phrase *in his study* is taken to be an adverbial modifier in a deep structure containing only one clause.²⁴

In the case of (42), once again, an apparent alternative would be to determine focus and presupposition in terms of surface structure: the focus is the phrase containing the intonation center, and the presupposition is determined by replacement of the focus by a variable (we overlook, for the moment, a fundamental equivocation in the latter formulation).

To assist in the choice between these alternatives, it is useful to consider some more complex sentences. Thus consider (45):

- (45)

{	was it	{	an ex-convict with a red SHIRT	(a)	}	that he
	it wasn't		a red-shirted EX-CONVICT	(b)		
			an ex-convict with a shirt that is RED	(c)		

 was warned to look out for

The immediately underlying structure might be (46):

²⁴ This and related proposals are developed, on essentially these grounds, in Lakoff (1965). In more recent publications, other evidence has been cited to support an analysis along the lines of (44) for sentences like (42a), (42c). Thus Lakoff (1967) points out that we can say such things as *Goldwater won in Arizona, but it couldn't have happened in New York*, where *it* refers to Goldwater's winning, suggesting that *Goldwater won* is a sentential element in deep structure. However, the force of this argument is weakened by the fact that it would, if followed consistently, also lead us to the conclusion that in simple NVN sentences, the subject and verb constitute a sentence in deep structure (cf. *John turned the hot dog down flat, but it (that) wouldn't have happened with filet mignon; half the class flunked physics, which would never have happened in English Literature*). Not only is this an unsatisfactory consequence in itself, but it also leads to an apparent contradiction since the same argument yields the conclusion that the verb and object constitute a sentence (cf. *John turned the hot dog down flat, but it wouldn't have happened with Bill (as recipient); half the freshman class flunked physics, which would never have happened with the senior class*). Similarly, we would have to conclude that in the sentence *10 ERRORS WERE COMMITTED by the Red Sox and the Yankees in the game yesterday, but it (that) would never happen with any 2 other teams*, the capitalized expression constitutes a sentence in deep structure. I am aware of no strong argument for the analysis of (42a), (42c) with a deep structure like (44), except for the argument involving presuppositions.

(46) the one he was warned to look out for was X,

where X is one of the phrases in the second pair of braces in (45). In this case, both the predicate phrase of (46) and the embedded clause of the subject must be further analyzed to reach the deep structure.

If it is deep structure that determines focus and presupposition along the lines indicated above, then the focus of the sentences of (45) should be (47), which are close or exact paraphrases of one another, and the presupposition should be (48):

- (47) (i) an ex-convict with a red shirt
- (ii) a red-shirted ex-convict
- (iii) an ex-convict with a shirt that is red
- (48) he was warned to look out for someone

Correspondingly, a natural response to any of (45) would be (49):

- (49) No, he was warned to look out for an AUTOMOBILE salesman

This conclusion is quite satisfactory, but there are difficulties when we explore further. Thus consider (50a-c):

- (50) (a) No, he was warned to look out for an ex-convict with a red TIE
- (b) No, he was warned to look out for a red-shirted AUTOMOBILE salesman
- (c) No, he was warned to look out for an ex-convict with a shirt that is GREEN

(50a), (50b), and (50c) are natural responses to (45a), (45b) and (45c), respectively; however, these are the only natural pairings. Thus (50a) could be a response to (45b) only in the sense in which (40) is a response to (38), that is by a denial of the relevance of the presupposition of (45b). In the case of (42), it was possible to maintain the standard theory by a modification of proposed deep structures. In the case of (45), however, this is quite impossible, without great artificiality. On the other hand, the facts just noted

are accounted for directly by the alternative conception of focus and presupposition as determined by the intonation center of surface structure. According to this conception, the focus of (45a) can be taken as any of the phrases (51), and the corresponding presupposition is expressed by replacement of the focus by a variable:

- (51) (i) an ex-convict with a red shirt
- (ii) with a red shirt
- (iii) a red shirt
- (iv) shirt

all of the phrases of (51) contain the intonation center in (45a); hence each, in this conception, can be taken as focus. Correspondingly, any of (52) can be a natural response:

- (52) (i) No, he was warned to look out for an AUTOMOBILE salesman
- (ii) No, he was warned to look out for an ex-convict wearing DUNGAREES
- (iii) No, he was warned to look out for an ex-convict with a CARNATION
- (iv) No, he was warned to look out for an ex-convict with a red TIE

But (50b) and (50c) are not natural responses preserving presupposition in this sense. Similar comments apply to (45b) and (45c).

To shed further light on the matter, consider the sentences (53), which are related to (45a) as (42a, c) are related to (42b, d):

- (53) {was he } (warned to (look out for (an ex-convict
he wasn't) (with (a red (SHIRT))))))

The phrases enclosed in paired parentheses are the phrases containing the intonation center (certain questions of detail aside). Each of these phrases can be taken as the focus of the sentence, so that natural responses would include, in addition to (52), the following:

- (54) (i) No, he was warned to expect a visit from the FBI
 (ii) No, he was simply told to be more cautious
 (iii) No, nothing was said to anyone²⁵

In each case, the presupposition can be determined by replacing what is taken as focus by an appropriate variable. There may be no actual sentence expressing just this presupposition, for grammatical reasons, just as there is no cleft sentence corresponding to the choice of focus, in many cases (hence the qualification of p. 91). For example, (45a) can be interpreted with *shirt* as focus (so that (50a) is a natural response), but there is no grammatical sentence *it was SHIRT that he was warned to look out for an ex-convict with a red*. Similarly, there is no grammatical sentence expressing exactly the presupposition of (45a) with the phrase *with a red shirt*, taken as focus.

Observe, in fact, that the focussed phrase need not correspond to a phrase of deep structure at all. This is clear in the case of (53), or, in a simpler case, (55):

- (55) $\left\{ \begin{array}{l} \text{is John} \\ \text{John isn't} \end{array} \right\}$ (certain (to WIN)))

Natural responses would be any of (56):

- (56) (a) No, John is certain to LOSE
 (b) No, John is likely not even to be NOMINATED
 (c) No, the election will never take PLACE

²⁵ For naturalness, question and answer (or denial and corroboration) must not only share presuppositions, but also must use as focus items that are somehow related—exactly how is not clear, but the relation surely involves considerations that extend beyond grammar. Similar considerations arise in the case of natural coordination. For this reason, a pairing of sentences that might be expected on the formal grounds we are discussing may still not be natural, in the intuitive sense we are attempting to explicate. In other words, as in the case of coordination, grammatical (including semantic) considerations can suffice only for partial explication of certain intuitions that clearly involve other cognitive structures as well. Thus—to take a concrete example—if we were to rank sentences in order of naturalness as responses to (55), we would rank (56a) higher than $(\alpha) = \text{No, he is certain to drink BEER}$ or $(\beta) = \text{No, he is EXPECTED to win}$. However, if the present argument is correct, the non-naturalness of (α) as a response to (55) is a matter of pairing of foci, whereas the non-naturalness of (β) is a matter of determination of focus by intonation center.

Hence any of the parenthesized phrases of (55) can be taken as focus, but one, *certain to win*, corresponds to no element of deep structure if, as seems correct, the deep structure is something like (57) (with, perhaps, a specification of negation or question):

- (57) $[_s \text{ John win}]_s$ is certain

Similarly, consider the slightly more complex case (58):

- (58) $\left\{ \begin{array}{l} \text{is John} \\ \text{John isn't} \end{array} \right\}$ believed to be certain to WIN

Evidently, *certain to win* is again a proper choice of focus, in which case what is presupposed is that something is believed of John. If we were to try to construct a cleft sentence corresponding to this interpretation of (58), it would have to be (59), analogous to (60):

- (59) it is certain to WIN that John is believed to be
 (60) it is $\left\{ \begin{array}{l} \text{a homicidal MANIAC} \\ \text{INCOMPETENT} \end{array} \right\}$ that John is believed to be

In all such cases, the cleft sentence is very marginal, or even totally unacceptable, from a strictly grammatical point of view, though it is certainly interpretable, presumably by analogy to properly formed sentences. In these deviant sentences as well there is an alternative natural choice of focus, namely, *to win* (in (58)) and *maniac* (in (60)).

Continuing to restrict ourselves to normal intonation — that is, the intonation defined by processes such as those described in Chomsky and Halle (1968) — consider the following sentences:

- (61) did the Red Sox play the YANKEES
 (62) (i) did the Red Sox beat the YANKEES
 (ii) were the Yankees beaten by the RED SOX

Sentence (61) can be interpreted as a question about whom the Red Sox played, about what they did, or about what happened. Thus possible answers might be any of (63):

- (63) (i) No, the TIGERS

- (ii) No, they flew to WASHINGTON
- (iii) No, the game never took PLACE

Thus (61) can be interpreted as presupposing that the Red Sox played someone (but whom?), that they did something (but what?), or that something happened (but what?) — the most natural interpretation perhaps being the first. The phrases containing the intonation center in the surface structure determine focus and presupposition. In the case of (62), there is no reason to suppose that there is any relevant difference in deep structure between (i) and (ii). The expressions of (63) are possible answers to (62i) and (62ii) but are, of course, differently interpreted in cases (63i) and (63ii).²⁶ It would, for example, be impossible to answer (62ii) by saying: *No, the Red Sox beat the TIGERS*. Or, to be more precise, this would be an answer only in the sense in which (40) is an answer to (38), that is, by failure to accept the presupposition.

Consider next the sentences (64):

- (64) (i) did John give the book to BILL
- (ii) did John give Bill the BOOK

The response *No, he kept it* is natural in both cases, since in each the phrase *give ...* is a possible focus; but (65i) is a presupposition-sharing response only for (64i), and (65ii) only for (64ii):

- (65) (i) No, to someone ELSE
- (ii) No, something ELSE

Thus although there is no relevant difference in deep structure between (64i) and (64ii), they differ in the range of possible focus and presupposition in the way predicted by the position of intonation center. The same observations hold of pairs such as *John didn't argue with Bill about MONEY*, *John didn't argue about money with BILL*, or *I didn't buy that car in Italy five YEARS ago*, *I didn't buy that car five years ago in ITALY*, etc. Similarly, in the case of such

²⁶ In this case, (63ii) seems to me the least natural, presumably, because of the pairing of the concepts *win - lose* in the case of (62i), and because of the pairing of the action *flying to Washington* with the nonaction *being beaten by the Red Sox*, in the case of (62ii). See note 25.

a sentence as *I didn't buy that car five years ago in a country shaped like a BOOT*, there are additional natural responses, conforming to the same principle. The same is true if we consider such sentences as (66):

- (66) (i) the question is not whether I should argue about money with BILL
- (ii) the question is not whether I should argue with Bill about MONEY

In the case of either, a natural response is: *it is whether I should go to England*. But when the focus is taken more narrowly, the sentences are seen to differ in the range of permissible focus and presupposition.

Further support for this general point of view comes from sentences in which, for reasons having to do with particular formatives, the intonation contour shifts. Thus consider (67) and (68):

- (67) I didn't CATCH him
- (68) (i) hard work doesn't mature TEEN-agers
- (ii) hard work doesn't MATURE people

In the case of (67), the focus can be *catch* or *catch him*, as distinct from *I didn't catch BILL*, where it can be *Bill* or *catch Bill*. In the case of (68i), the focus can be *teen-agers* or *mature teenagers* (*No, it matures only adults*, *No, it only makes anyone tired*), whereas in the case of (68ii) it can be *mature* or *mature people* (*No, it harms them*, *No, it only makes anyone tired*). In fact, even in the simplest sentences similar observations hold. Thus *Brutus killed CAESAR* can be used to state what Brutus did or who Brutus killed, whereas *Brutus KILLED him* can be used to state what Brutus did or what Brutus did to him. And so on, in many other cases.

So far I have restricted attention to cases of "normal intonation", this being understood tentatively as referring to cases in which the intonation contour is determined by rules of the sort discussed in Chomsky and Halle (1968), with no expressive or contrastive

intonation marked in specific expressions by other grammatical processes (see note 21). Turning our attention briefly to cases of the latter sort, it appears that similar conclusions follow. Consider, for example, (69), which differs from (66) in that the intonation center is shifted to the negative element.

- (69) (i) the question is NOT whether I should argue about money with Bill
(ii) the question is NOT whether I should argue with Bill about money

Assuming that the intonation is otherwise normal, it still seems to be true, as in the case of (66), that (70i) is a natural response to (69i) but not (69ii), and that (70ii) is a natural response to (69ii) but not (69i):

- (70) (i) No, (it is whether I should argue about money) with MARY
(ii) No, (it is whether I should argue with Bill) about his trip to EUROPE

On the other hand, *No, it is whether I should go to England* is a natural response to either (i) or (ii) of (69). In all these cases, the assertion (69) is corroborated. This observation (and the analogous observation in the other instances discussed above) supports the suggestion in note 21 that in some cases, at least, expressive or contrastive stress superimposes a new contour, preserving the arrangement of focus and presupposition defined by the normal intonation. The factual judgments appear to me quite insecure, however.

Consider next such cases as (71):

- (71) did John give the BOOK to Bill

In this case, as distinct from the case of normal intonation (64i), the natural response is (65ii), not (65i). On the other hand, the sentence *No, he kept it* seems much less natural as a response to (71) than to either case of (64). This observation (and its analogue in other cases) suggests that when expressive or contrastive stress

shifts intonation center, the same principle applies as in normal cases for determining focus and presupposition, but with the additional proviso that naturalness declines far more sharply as larger and larger phrases containing the intonation center are considered as a possible focus. This would be a very natural interpretation of contrastive or expressive intonation, and it seems consistent with a number of relatively clear cases, at least. Hence it may perhaps be proposed as a first approximation to a general interpretive theory for this phenomenon. The same seems to me to be true when extra-emphasis is given to the item that contains the normal intonation center. Again, the factors mentioned in note 25 seem relevant.

The processes involved in determining contrastive or expressive intonation at the moment do not appear to be germane to this discussion. However, it is worth noting that they cannot be described, at least in any natural way, in terms of deep structure. This becomes most obvious when we consider positions in which there MUST be a contrastive intonation. Thus consider the sentence (72):

- (72) John is neither EASY to please, nor EAGER to please, nor CERTAIN to please, nor INCLINED to please, nor HAPPY to please, ...

In "parallel constructions," in some sense of this notion that has never been made quite clear, contrastive intonation is necessary. But it is evident, in such examples as (72) at least, that it is a parallelism of surface structure, not deep structure, that is involved. The point is even clearer when we consider such sentences as (73):

- (73) John is more concerned with AFFirmation than with CONFirmation

Here, the parallelism requires even a shift in contour within a single word. There are many similar cases.

To summarize these remarks, we seem to have the following situation. Rules of phonological interpretation assign an intonational contour to surface structures. Certain phrases of the surface

structure may be marked, by grammatical processes of a poorly-understood sort, as receiving expressive or contrastive stress, and these markings also affect the operation of the rules of phonological interpretation. If no such processes have applied, the rules assign the normal intonation. In any event, phrases that contain the intonation center may be interpreted as focus of utterance, the condition perhaps being somewhat different and more restrictive when the intonation center involves expressive or contrastive stress, as noted. Choice of focus determines the relation of the utterance to responses, to utterances to which it is a possible response, and to other sentences in the discourse. The notions "focus", "presupposition", and "shared presupposition" (even in cases where the presupposition may not be expressible by a grammatical sentence)²⁷ must be determinable from the semantic interpretation of sentences if we are to be able to explain how discourse is constructed and, in general, how language is used.

In many cases, it seems that we can interpret a sentence in these terms, given the intonation center, in the following way. The focus is a phrase containing the intonation center; the presupposition, an expression derived by replacing the focus by a variable. Each sentence, then, is associated with a class of pairs (F, P) where F is a focus and P a presupposition, each such pair corresponding to one possible interpretation. In terms of these notions we can begin to explicate such notions as natural (presupposition-sharing) response. Thus for a sentence S interpreted as (F, P) to be a natural response to a sentence S' interpreted as (F', P'), it must be the case that P = P'. Furthermore, F and F' must be paired in some "natural" way, where the relevant concept of "naturalness" no doubt extends beyond grammar, in the broadest sense of the con-

²⁷ Note that we are using the term "presupposition" to cover a number of notions that should be distinguished. Thus *it was JOHN who was here* expresses the presupposition that someone was here in the sense that truth of the presupposition is a prerequisite for the utterance to have a truth value. On the other hand, when we replace one of the foci of *John gave Bill the BOOK* by a variable, it is not at all clear that the resulting expression determines a presupposition in the same sense, though it does characterize "what the utterance asserts" and to which utterances it is a proper response, when so understood.

cept "grammar". Further elaborations of these notions are surely in order,²⁸ but this seems in general a fair first approximation. In the present context, I wish only to emphasize that these notions seem to involve surface structure in an essential way, and thus to provide strong counter-evidence to the standard theory, which stipulates that semantic interpretation must be entirely determined by deep structure.

There is one obvious way to preserve the standard theory in the face of considerations of the sort just discussed, namely, to set the rule (74) as the first rule of the grammar, where F and P are arbitrary structures and S' functions as the initial symbol of the categorial component of the base:

(74) $S \rightarrow S' F P$

Continuing to generate a full syntactic and phonological structure in accordance with the standard theory, we would then add a new "filtering rule", namely, that the structure generated is well-formed only if the focus and presupposition, as determined from surface structure, are identical with F and P, respectively. Technically, it would now be the case that deep structure fully determines meaning,

²⁸ For example, the focus must be composed of full lexical items — more generally, items that make a contribution to the meaning of a sentence that is in some sense independent of anything outside the focus. In particular, the syllable containing the intonation center cannot serve as focus when it is part of a larger lexical item (except under the rather different circumstances of contrastive stress, as illustrated by (73)). Similarly, in a sentence such as *Did you call him UP*, the item *up* cannot serve as focus, but only *call him up* or the full proposition; and in *Did you take it for GRANTED*, neither *granted* nor *for granted*, but only *take it for granted* (or the full proposition) can be taken as focus. This is an obvious condition to be placed on the notion of "focus", given the role it plays in explaining how sentences are used and interpreted. The same can be said of idioms in general. Hence determination of focus must involve reference to the lexicon (and, no doubt, an associated idiom list). This seems to pose no special problem. There are, incidentally, many questions that can be raised about exactly how an idiom list should be related to a grammar, but these, so far as I can see, have no bearing on the topic under discussion; nor is there, for the moment, any interesting published suggestion about this matter, to my knowledge, though an approach suggested by Fraser (1968) shows promise. I am grateful to M. Bierwisch for bringing these facts to my attention.

even so far as focus and presupposition is concerned.²⁹ Thus underlying (75i) we would have structures with the phrase-marker for *the book*, *give John the book*, and *Bill gives John the book* as focus and corresponding presuppositions; and underlying (75ii) we would have structures with the phrase-marker for *John*, *give the book to John* and *Bill gives the book to John* as focus with corresponding presuppositions; but not conversely, given the well-formedness condition.

- (75) (i) did Bill give John the BOOK
(ii) did Bill give the book to JOHN

Obviously, this is merely a notational variant of a theory that determines focus and presupposition from the surface structure. In fact, the F and P positions would have to accommodate structures that can only be derived by transformation (as, e.g., in cases such as (55) and (72) and others where the focus is transformationally derived). The rules (74) and the associated filtering condition are redundant, since they are determined, by a general interpretive principle, from the structure generated in the usual way when these extra formal concepts are eliminated. If we were willing to permit such formal devices, then the claim of the standard theory that deep structure fully determines semantic interpretation would be vacuous; if we do not permit them, it seems to be false.

Observe that these considerations do not touch on one aspect of the standard theory, namely, the hypothesis that the grammatical relations that enter into semantic interpretation are those represented in deep structure. In fact, it seems to me that insofar as the standard theory is plausible in its approach to semantic interpretation, it is with respect to this specific hypothesis. Thus it is natural to suppose that the meaning of a sentence is determined by minimal meaning-bearing elements and the relations into which they enter, these relations being specified in part by the lexicon

²⁹ It is worth noting that the proposal discussed earlier to determine the focus as the predicate of the dominant sentence of the deep structure is not very different from this proposal.

itself and in part by the rules of the categorial component. But this narrower hypothesis remains unchallenged by the consideration of focus and presupposition. On the other hand, the attempt to express the latter concepts in terms of deep structure seems to me to have led to considerable artificiality in the construction of grammars, in recent work.

Turning to related questions, it was suggested a number of years ago by Kuroda (1965) that the position of such elements as *even* and *only* is determined by transformational processes, rather than by rules of the base, and that their contribution to the meaning of the sentences in which they appear is determined by their position in surface structure. That their position is determined by transformational processes is suggested by the fact that there are "global" constraints on their occurrence; for example, *only* or *even* can appear in any of the blanks of (76), but it is questionable whether they can appear in more than one of these positions.

- (76) — John — reads — books on politics

In particular, neither *only* or *even* can occur in all of these positions. But constraints of this sort are transformational rather than "phrase-structural" in character. Furthermore, the meaning of the sentence evidently changes as *even* or *only* takes one or the other position. Kuroda suggests, then, that there is a certain category of transformations — which he calls "attachment transformations" — that do affect meaning, in the way indicated.³⁰

More recently, Jackendoff has argued in a number of important papers that many semantic phenomena can be explained most readily in terms of features of surface structure. In particular, he suggests (1968) that the scope of logical elements such as negation and quantifiers is determined by surface structure. Thus consider such sentences as (77):

- (77) (i) not many arrows hit the target
(ii) many arrows didn't hit the target

³⁰ His primary examples have to do with the problem of the *wa-ga* distinction in Japanese. Examples such as (76) are somewhat questionable, as Susan Fischer has pointed out, because they also involve critically the placement of contrastive stress. See Fischer (1968), where a different analysis is proposed.

- (iii) not many arrows didn't hit the target

It might perhaps be argued that (77iii) is ungrammatical, though (as in the case of many deviant sentences) one can, if required, impose a definite interpretation on it. If so, then placement of negation meets the "global conditions" that signify that a transformational process is involved. But, evidently, (77i) and (77ii) are quite different in meaning. Hence if we suppose that the underlying structure is (78) and that (77i) and (77ii) are derived by a *not*-placement rule (and (77iii) not directly generated at all), then the deep structure will not determine the meaning.

- (78) not [many arrows hit the target]

Rather, the scope of negation will be determined by the position of *not* in surface structure. In (77i), it is the proposition that many arrows hit the target that is denied. In (77ii), many arrows are asserted to have failed to hit the target; i.e., it is the verb phrase that is "negated". (Observe that whatever the status of (77iii) may be, the examples (77i, ii) suggest that scope of negation is determined by surface structure unless we were to permit *not* to appear in deep structure in association with the phrase that constitutes its "scope" — a conclusion that violates the standard theory when applied to the examples to which we turn next.)

In support of this analysis, Jackendoff notes the relation of meaning between active and passive forms involving both quantifiers and negation. Thus he considers the following sentences:

- (79) the target was not hit by many arrows
- (80) not many demonstrators were arrested by the police
- (81) many demonstrators were not arrested by the police
- (82) John didn't buy many arrows
- (83) many arrows were not bought by John
- (84) John bought not many arrows
- (85) not many arrows were bought by John

Sentence (79) is a paraphrase of (77i), not (77ii), to which it would be related by the simplest form of the passive operation. Cor-

respondingly, the order of quantifier and negation is the same in the surface structure of the paraphrases (77i) and (79), but different in (77ii). Furthermore, (77ii) has no passive paraphrase. What is suggested by (77)-(79), then, is that the order of quantifier and negation in the surface structure determines the meaning. Consequently, if the surface subject has a quantifier, then sentence negation (such as (77i)) will be different in meaning from verb phrase negation (such as (77ii)); but if the quantifier is part of a noun phrase that follows the verb, then the order of negation and quantifier is identical in sentence negation and verb phrase negation, and the meanings will be the same.

This principle is supported by (80), (81). The subject contains a quantifier, and correspondingly the case (80) of sentence negation differs in meaning from the case (81) of verb phrase negation, since the order of quantifier and negation is different. This principle is further supported by examples (82)-(85). Sentences (82) and (83) are obviously different in meaning, though (84) and (85) are the same in meaning³¹ as are (82) and (85). In (82), (84), (85) the order of negation and quantifier is the same; in (83), the order differs. This is as required by the principle just stated.

According to this principle, sentence negation will differ in meaning from verb phrase negation in case the surface subject contains a quantifier, that is, in case the order of negation and quantifier differs in the two cases. Since it is the notion "surface subject" that is involved in determining sameness or difference of meaning, the principle is inconsistent with the standard theory. Furthermore, the principle of interpretation of surface structures seems clear, and, in addition, the transformations that form passives can be left in a simple form (though they will drastically

³¹ Assuming, that is, that (84) is well-formed. The question is actually irrelevant, having to do with the transformational source of (85) rather than the principle in question. It is sufficient to point out that (82) (under the most natural interpretation) is a paraphrase of (85). Under a less natural, but perhaps possible interpretation, it might be taken as *there are many arrows that John didn't buy*, a possibility that is irrelevant here because it remains consistent with the assumption that surface structure determines scope of negation, though it does not provide evidence for this assumption as do the other examples discussed.

change meaning, if they change the order of quantifier and negation). These facts, then, provide strong support for the hypothesis that surface structure determines (in part, at least) the scope of logical elements, and serve as strong counter-evidence to the standard theory in its most general form. Conceivably, one might modify the standard theory to accommodate these facts, but this modification would be justified (assuming it possible) just in case it achieved the naturalness and explanatory force of Jackendoff's proposal that negation and quantifiers are associated with phrases of the surface structure, and their interpretation is determined by the phrases in which they appear and their relative order. Jackendoff shows that a number of other cases can be explained in the same way.

Jackendoff's arguments, like those involving focus and presupposition, leave unaffected the hypothesis that the grammatical relations defined in the deep structure are those that determine semantic interpretation. If we modify the standard theory, restricting in this way the contribution of the base to semantic interpretation, we can take account of the fact that many aspects of surface structure appear to play a role in determining semantic interpretation; correspondingly, insofar as some development in syntactic theory is motivated by the demand that these aspects of semantic interpretation be expressed in deep structure, it will have lost its justification. To mention one example, consider the sentences (86):

- (86) (i) the sonata is easy to play on this violin
(ii) this violin is easy to play the sonata on

These sentences share a single system of grammatical relations and, in some reasonable sense of paraphrase, may be regarded as paraphrases; they have the same truth conditions, for example. However, they seem different in meaning in that one makes an assertion about the sonata, and the other about the violin. Before this difference is used to motivate a difference in deep structure, however, it must be shown that this aspect of meaning is one

expressed in deep rather than surface structure. In the present instance, this conclusion seems at best dubious.³²

Certain properties of modal auxiliaries also suggest a role for surface structure semantic interpretive rules. Thus J. Emonds has pointed out that *shall* is interpreted differently in question and corresponding declarative.

- (87) (i) I shall go downtown
(ii) shall I go downtown
(iii) I $\left\{ \begin{array}{l} \text{asked} \\ \text{wonder} \end{array} \right\}$ whether I shall go downtown

In (87i) and (87iii), the modal is essentially a tense marker. In (87ii), however, it has a very different meaning, namely, the meaning of *should*. In general, interrogative expressions such as (87ii) have the same meaning as the corresponding embedded expression in sentences of the form (87iii), and, in fact, this observation, appropriately extended, has been used to support the syntactic derivation of interrogatives from embedded interrogative clauses (see, e.g., Katz and Postal, 1964). However, in the case of (87), this expectation is not verified. If we assume that the sentences of (87) are related as are those derived by replacing *shall* by *will*, or by perfect aspect, etc., then the standard theory in its strongest form is refuted. If, furthermore, we wish to maintain the weaker hypothesis that the semantically functioning grammatical relations are those represented in deep structure, then we must conclude that the relation of *I* to *shall* in (87) is not a grammatical relation in this sense — it is not, for example, the subject-predicate relation. This seems a natural enough conclusion.

Other examples involving modals immediately come to mind. Thus it has frequently been noted that (88i) and (88iii) merely

³² What is involved, apparently, is a relation of topic-comment which must be distinguished from that of subject-predicate. See Chomsky (1965), for some brief discussion within the framework of the standard theory of a question with a long history. Other arguments for distinguishing (86i) and (86ii) at the deep structure level have been proposed in recent work (e.g., Perlmutter, 1968), but they seem to me unpersuasive, though the interesting phenomena noted by Perlmutter must certainly be accounted for.

predict, whereas (88ii) is ambiguous, in that it may also mean that John refuses to go downtown:

- (88) (i) John will go downtown
 (ii) John won't go downtown
 (iii) it is not the case that John will go downtown

Again, the interplay of negation and modal seems a natural candidate for a principle of surface structure interpretation.³³ Or consider such sentences as (89) (also pointed out by Emonds):

- (89) John can't seem to get his homework done on time

There is no corresponding form without *not*. Furthermore, the modal is interpreted as associated with an underlying embedded proposition *John gets his homework done on time*. Hence if *can* appears in deep structure in association with *seem*, as it appears in association with *work* in *John can't work*, then a rule of surface structure interpretation is needed to account for its semantic relation to the embedded verbal phrase *get* Suppose, on the other hand, that *can* appears at the deep structure level in association with the embedded sentence *John gets his homework done on time*.³⁴ Then a rule is necessary that extracts *can* from the embedded sentence and assigns it to the matrix sentence — in fact, to exactly the position it occupies in simple sentences. However, note that this extraction is possible only when *can* is interpreted as indicating ability, not possibility. Thus (89) has approximately the sense of (90), but the sentence (91), if grammatical at all, surely does not have the sense of (92):

³³ Examples such as (88ii) have been used to justify the argument that there are two sources for *will* (and other modals as well). The arguments in general seem to me unconvincing, since an alternative formulation involving rules of interpretation is immediately available. Furthermore, it seems that the phenomena observed are of some generality. Thus the difference in meaning between (88ii) and (88i,iii) is characteristic of the future "tense" in many languages, and thus has nothing to do, apparently, with the volitional force of the element *will*.

³⁴ A conclusion which appears implausible in that in general *to*-VP constructions, as in (89), exclude modals.

- (90) it seems { that John can't get his homework done on time
 that John is unable to get his homework done on time
 (91) the war can't seem to be ended by these means
 (92) it seems { that the war can't be ended by these means
 that it is impossible for the war to be ended by these means

Hence either the extraction operation will have to be sensitive to the difference in sense of two cases of *can* — an otherwise unmotivated complication — or else the interpretation will have to be "delayed" until after extraction has taken place. The latter choice requires a rule of interpretation that does not apply to deep structure.

Notice that in general rules of semantic interpretation have a "filtering function" analogous to that of rules of transformation in the standard theory. This is true no matter at what level they apply. Thus a rule of interpretation applying at the deep structure level may assign an anomalous interpretation to an otherwise well-formed sentence. A rule of interpretation that applies to other structures of the class K of syntactic structures, say to surface structures, may have the same effect, in principle. Thus a decision that *can* in (89) appears at the deep structure level in association with *seem* would not be refuted by the observation that (91) is deviant; rather, the deviance, in this view, would be attributed to the filtering function of a principle of semantic interpretation applying at the surface structure level.

Anaphoric processes constitute another domain where it is reasonable to inquire into the possibility that rules of semantic interpretation operate at the level of surface structure. It has been noted by Akmajian and Jackendoff (1968) that stress plays a role in determining how the reference of pronouns is to be interpreted. For example, in the sentence (93), *him* refers to Bill if it is unstressed, but it may refer either to John or to someone other than John or Bill if it is stressed:

- (93) John hit Bill and then George hit him

Similarly, in (94), where *else* is stressed, *someone else* refers to someone other than John, whereas when *afraid* is stressed, it refers to John himself:

- (94) John washed the car; I was afraid someone else would do it

The same phenomenon can be observed within sentence boundaries. The explanation hinges on the analysis of placement of primary stress, but it is reasonable to suppose, as Akmajian and Jackendoff suggest, that a principle of surface structure interpretation is involved, given what is known about the relation of intonation to surface structure. See also Jackendoff (1967).

Recent observations by Ray Dougherty (1968a, b) lend some support to this proposal. He argues that the interpretive rules of reference must apply after the application of various transformations, making use of information that is not present at the deep structure level. Thus consider the sentences (95):

- (95) (i) each of the men hates his brothers
(ii) the men each hate his brothers

Dougherty gives considerable evidence to support the view that (95ii) is derived from a structure such as (95i), by a rule that moves *each* to one of several possible positions in a sentence. But clearly (i) and (ii) differ in the range of possible interpretations for the reference of the pronoun *he*. Thus in (ii), but not (i), it is necessary to interpret *he* as referring to someone other than the men in question. The deviance of (96ii), then, might be attributed to the filtering effect of rules of surface structure interpretation:

- (96) (i) each of the men hates his own brothers
(ii) the men each hate his own brothers

Or, consider the sentences (97):

- (97) (i) each of Mary's sons hates his brothers
(ii) his brothers are hated by each of Mary's sons
(iii) his brothers hate each of Mary's sons
(iv) each of Mary's sons is hated by his brothers

The simplest formulation of the passive transformation would derive (ii) from a structure like (i), and (iv) from a structure like (iii). But in (ii) and (iii), *he* cannot be interpreted as referring to any of Mary's sons, though in (i) and (iv) it can be so interpreted. As Dougherty points out in detail, there are many similar phenomena. The matter is not restricted to pronominalization; thus consider the effect of replacing *his* by *the other* in (97). There appears to be, in such cases, a relatively simple rule of interpretation which makes use of surface structure information, and which, with its filtering effect, rules that certain otherwise well-formed sentences are deviant. Such observations as these, then, also lend support to a revision of the standard theory that incorporates such rules.

Turning to still more obscure cases in which semantic interpretation may involve surface properties, consider the curious behavior of perfect aspect in English with respect to the presuppositions it expresses. Quite generally, a sentence such as (98) is taken as presupposing that John is alive:

- (98) John has lived in Princeton.

Thus knowing that (99) is true, one would not say *Einstein has lived in Princeton*; rather *Einstein lived in Princeton*:

- (99) Einstein has died³⁵

But now consider the following sentences:

- (100) Einstein has visited Princeton
(101) Princeton has been visited by Einstein

³⁵ As can be seen from (99), it is not invariably true that use of the present perfect aspect as the full auxiliary presupposes that the subject is alive, although (99) would nevertheless only be appropriate under rather special circumstances, e.g., if Einstein's death had just occurred. Where a verb can be used in the historical present, use of the present perfect does not seem to carry the presupposition that the subject is alive. Thus I could not say *Aristotle has visited Crete* or *Aristotle visits Crete* (in historical present), but there is no presupposition that Aristotle is alive in *Aristotle has claimed, investigated, demonstrated,...* (or in *Aristotle demonstrates in the Posterior Analytics that...*, etc.).

The example (98) is discussed in Chomsky (1970), p. 50, but with no reference to the full range of complexities involved.

- (102) Einstein (among others) has told me that ...
- (103) I have been told by Einstein (among others) that ...
- (104) Einstein has taught me physics
- (105) I have been taught physics by Einstein

It seems to me that (100), (102), (104) presuppose the denial of (99), but that (101), (103), and (105) do not. If this is correct, then the semantic interpretation of perfect aspect would appear to depend on certain properties of surface structure.³⁶

The problem is still more complex when we consider coordinate and other constructions. Thus consider the following cases:

- (106) Hilary has climbed Everest
- (107) Marco Polo has climbed Everest
- (108) Marco Polo and Hilary have climbed Everest
- (109) Marco Polo and many others have climbed Everest
- (110) Everest has been climbed by Marco Polo (among others)
- (111) many people have climbed Everest

Sentences (106) and (107) express the presupposition that Hilary and Marco Polo, respectively, are alive.³⁷ On the other hand, sentences (108)-(110) do not express the presupposition that Marco Polo is

³⁶ Unless it is maintained that the surface subject of the passive is also the deep subject. Although arguments for this view can be advanced (see, e.g., Hasegawa, 1968), it seems to me incorrect, a strong counter-argument being provided by idioms that undergo passivization, moving to the surface subject position noun phrases which cannot otherwise appear as subject — e.g., *advantage was taken of Bill*, *offense was taken at that remark*, *a great deal of headway was made*, etc.

Notice, incidentally, that assumptions about whether the entity referred to by a noun phrase is alive can be related in rather complex ways to the structure of an utterance and the lexical items it contains. Thus if I say that John is a friend of mine or that I get along with John, the presupposition is that he is alive; but if I say that John is a hero of mine or that I admire him, this is no longer presupposed; as of course, it is not presupposed, in any of these cases, if present tense is replaced by past tense.

³⁷ It is even clearer, perhaps, in *Marco Polo has succeeded in climbing Everest*. However, for some obscure reason, it seems to me that if Hilary had just announced that he had succeeded in climbing Everest, it would have been appropriate, without the presupposition that Marco Polo is alive, to have said: *But Marco Polo has done it too*.

alive; and (111) expresses no such presupposition with regard to the various climbers of Everest. Intuitions about this matter do not appear too firm, but if the judgments just expressed are accurate, then it seems that surface structure must play a role in determining the presupposition of the utterance in a rather complex manner.

Significant differences in interpretation of sentences as the auxiliary is changed are very easy to demonstrate. Thus sentence (112) presupposes that John is a Watusi, but if we replace *is* by *would be*, the presupposition is that he is not:

- (112) John is tall for a Watusi

Furthermore, (112) presupposes that the Watusi are generally not tall, but if *even* is inserted after *tall*, the presupposition is that the Watusi are tall, and it is asserted that John, who is a Watusi, is even taller than expected. If *even* precedes *John* in (112), the assertion is that John, who is a Watusi, is short, as are the Watusi in general. Thus the change in position of *even* changes the content with regard to the height of John and the standard height of the Watusi.

This by no means exhausts the class of cases where it appears reasonable to postulate rules of interpretation that make use of information not represented in deep structure. These cases suggest that the standard theory is incorrect, and that it should be modified to permit these rules. These considerations may not affect the weaker hypothesis that the grammatical relations represented in deep structure are those that determine semantic interpretation. However, it seems that such matters as focus and presupposition, topic and comment, reference, scope of logical elements, and perhaps other phenomena, are determined in part at least by properties of structures of K other than deep structures, in particular, by properties of surface structure. In short, these phenomena suggest that the theory of grammar should be reconstructed along the lines intuitively indicated in (113), using the notation of the earlier discussion:

- (113) base: (P₁, ..., P_i) (P₁ the K-initial, P_i the post-lexical (deep) structure of the syntactic structure which is a member of K)

transformations: (P_i, \dots, P_n) (P_n the surface structure;
 $(P_1, \dots, P_n) \in K$)
 phonology: $P_n \rightarrow$ phonetic representation
 semantics: $(P_i, P_n) \rightarrow$ semantic representation (the grammatical relations involved being those of P_i , that is, those represented in P_1).

Notice, incidentally, that it is, strictly speaking, not P_n that is subject to semantic interpretation but rather the structure determined by phonological interpretation of P_n , with intonation center assigned. We have already noted, in discussing the matter of "opaque" contexts, that it is impossible to construct a "semantically-based" syntax along the lines that have been proposed in recent discussion. See pp. 85-88. The phenomena that we have now been considering lend further support to this conclusion (unnecessary support, in that the earlier observations suffice to establish the conclusion). It must be borne in mind, however, that the proposed revision of the standard theory does not imply that grammar is "syntactically-based" in the sense that in generating a sentence one must "first" form P_1 by the categorial component, "then" forming P_i by lexical insertion, "then" forming the remainder of the syntactic structure $\Sigma \in K$ by transformation, "then" interpreting Σ by semantic and phonological rules. In fact, this description, whatever its intuitive suggestiveness, has no strict meaning, since the revised theory assigns no "order" to operations, just as the standard theory assigns no order of application, as already noted. In fact, there is nothing to prevent one from describing the standard theory or the proposed revision as characterizing grammars that map phonetic representation onto triples (deep structure, surface structure, semantic representation), or as mapping pairs (phonetic representation, deep structure) onto pairs (surface structure, semantic representation), etc. In fact, the revision, like the standard theory, characterizes grammars that define a certain relation among these concepts, where the relation has properties determined by the precise nature of base rules, transformations, rules of phonological interpretation, and rules of semantic interpretation.

It may be useful, at this point, to recall the attempts of the past few years to study the relation of syntax and semantics within the framework of transformational-generative grammar. Within this framework, the first attempt to show how the syntactic structure of a sentence contributes to determining its meaning was that of Katz and Fodor (1963), an approach that was modified and extended in Katz and Postal (1964). The basic assumption was that meaning is determined by properties of phrase-markers and transformation-markers (P-markers and T-markers). In Katz and Fodor (1963), two types of rule of interpretation ("projection rule") were considered. Type 1 projection rules operate on configurations of P-markers; type 2 projection rules are associated with transformations and their configurations. In Katz and Postal (1964), it was argued that T-markers play no role in the determination of meaning. First, it was argued that obligatory transformations can in principle have no semantic effects, since "the output of sentences which result from such rules is fully determined by the input P-markers" (p. 31). Then, a variety of syntactic arguments were given to show that optional transformations also do not change meaning. It was further argued that only the configurations of underlying (base) P-markers are semantically relevant. We are left, then, with the conclusion that the only rules relevant to determination of meaning are the rules of the categorial component. This line of argument was accepted in most work done at about that time within the framework of transformational-generative grammar—including, in particular, Chomsky (1965).

Since surface structure is fully determined by base rules and transformational rules, it seems natural to suppose that properties of surface structure, not being a matter of "choice", could not contribute to semantic interpretation. Underlying this assumption one might perhaps discern the remnants of the "Saussurian" view that a sentence is constructed by a series of successive choices, and that each of these may be related to semantic considerations of some sort. Of course, such talk is only metaphorical when we are concerned with competence rather than performance. It may, however, have occasionally been misleading, suggesting, errone-

ously, that since surface structure is fully determined by other "choices", properties of surface structure cannot contribute to semantic interpretation. When we drop the loose and metaphoric use of such notions as "choice", we see that there is no reason at all why properties of surface structure should not play a role in determining semantic interpretation, and the considerations brought forward earlier suggest that in fact they do play such a role.

To conclude this discussion, I would like to take note of one additional line of investigation that appears to complement the study of semantic properties of surface structure. In outlining the standard theory (p. 65-68 above) I pointed out that it contained a well-formedness condition on surface structures, and thus implied that transformations have what has been called a "filtering function" (cf. Chomsky, 1965). In Ross (1967) there is further investigation of "output conditions" that serve as well-formedness conditions for surface structures. The conditions that Ross investigates are of a "graded" rather than an "all or none" character, recalling some interesting observations of Bolinger (1961). In Perlmutter (1968) it is demonstrated that there are also "output conditions" of a sort more typical of grammatical processes of the familiar kind, and it is shown that these conditions serve to enrich considerably the filtering effect of transformations. Joseph Emonds, in very interesting work now in progress, has amassed considerable evidence suggesting that the set of conditions on structures close to surface structure have properties expressible by a set of context-free phrase structure rules. Thus to mention just one typical example, he considers the observation in Chomsky (1970) that the passive transformation in English consists of two separate rules: a rule of subject-postposing that converts the structure underlying *John accept the proposal* into *accept the proposal by John*; and a subsequent rule of object-preposing that converts the latter into *the proposal accept by John*. Where the proposition in question is a nominal expression, subject-postposing may apply alone, giving ultimately *the acceptance of the proposal by John*; or both operations may apply, giving *the proposal's acceptance by John*. But where the proposition in question is a full sentence, it is necessary for both operations to apply, so

that we have the sentence *the proposal was accepted by John* but not *was accepted the proposal by John* or *accept the proposal by John*. He points out that this discrepancy can be accounted for by a condition which we can formulate (departing now from Emonds' interpretation) as requiring that the set of surface structures (or, to be more precise those structures that precede the application of "last-cycle rules" such as auxiliary inversion, etc.) satisfy the rules of a phrase structure grammar that permits noun phrases of the form N-PP-PP (e.g., *the offer of a book to John*) but no sentences of the form V-NP-PP (an obligatory rule of *of*-insertion applies in the context N—NP). Some of Perlmutter's data also seem susceptible to such an analysis. From many examples of this sort, it is reasonable to propose a further modification of the standard theory, perhaps along these lines: a set of context-free rules generates structures that become surface structures by application of last-cycle transformational rules, and a related set (perhaps a subset of these) serves as the categorial component of the base; transformations map base structures into well-formed structures close to surface structures meeting the requirements of a phrase structure grammar. Such an extension of the standard theory, if warranted, would be an interesting and suggestive supplement to the proposal that properties of surface structure play a distinctive role in semantic interpretation. It seems to me that these ideas suggest a line of investigation which, though still unclear in many respects, may prove quite promising.

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