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INSTRUMENTAL ADVERBS AND THE CONCEPT
OF DEEP STRUCTURE

0. INTRODUCTION

The definition of deep structure that emerges from Katz and Postal's *An Integrated Theory of Linguistic Descriptions* and Chomsky's *Aspects of the Theory of Syntax* is that it is that level of linguistic analysis defined by the following conditions:

(i) Basic grammatical relations (e.g., subject-of, object-of) are represented at this level in terms of fundamental grammatical categories (e.g., S, NP, VP, N, V).

It is assumed that these relations are defined in terms of phrase-structure rules involving the categories. Since one of these categories is S(entence), this view of deep structure implicitly defines a notion akin to what traditional grammarians called a simple sentence and equivalent to Chomsky's earlier notion of a 'kernel sentence', i.e., a S(entence) that does not have any other S(entence) embedded in it.

(ii) The correct generalizations about selectional restrictions and co-occurrence can be stated at this level.

The assumption here is that once the correct basic grammatical relations in a sentence are known, then the correct generalizations about selectional restrictions and other co-occurrence relations among the elements of the sentence can be stated naturally.

(iii) Lexical items are assigned to their appropriate categories at this level.

This accords with the assertion that the semantic representation of a sentence is determined by the level of deep structure. Semantic interpretation rules are defined in terms of lexical semantic content (iii) and grammatical relations (i). Since selectional restrictions involve lexical items, (ii) and (iii) are interdependent.

There is also a fourth defining characteristic of deep structure, namely,

(iv) The structures defined at this level are the input to the transformational rules.

However, most transformational rules are motivated by arguments concerning (i), (ii), and (iii). The reasons usually given for postulating a transformational rule are that the rule allows one to state apparently correct generalizations about deep structure. Either (1) it permits one to simplify the basic grammatical relations and to eliminate certain categories; or (2) it

permits one to state generalizations about co-occurrence of items in deep structure; or (3) it permits one to simplify the representations of classes of lexical items. Very often, all three are involved. For these cases, (iv) would be redundant in a characterization of what is meant by deep structure. But there are cases where this is not true and where (iv) is not redundant. We will discuss one of them below, in Section 13.

It ought to be borne in mind that it is an empirical assumption that there is a single level of linguistic analysis defined by (i) – (iv). It is an extremely strong assumption and one which might well be eventually falsified by empirical evidence. For example, it may be the case that the level defining the input to transformational rules may not be the same level as that on which the correct generalizations about selectional restrictions can be stated. However, in the sections to follow, we will be making the empirical assumption that lies behind current work in transformational grammar, that there is a single level of syntactic analysis defined by (i)–(iv) – a level which is called ‘deep structure’.

This paper deals with the relationship between conditions (i) and (ii). In particular, it deals with the role that correct generalizations about selectional restrictions and co-occurrence play in determining what are the fundamental grammatical categories and the basic grammatical relations. The empirical questions raised here concern adverbs. So far as I know, it has been maintained throughout traditional grammar that simple sentences may contain not only subjects, predicates, and objects, but also a full range of adverbials modifying the predicate. To date, this position has been carried over into transformational grammar. It has been assumed that kernel sentences (and their equivalents in a theory containing deep structures) may contain categories such as *Manner Adverb* and *Instrumental Adverb*. In my dissertation (Lakoff, 1965), I argued that many adverbs were transformationally derived from other, more basic structures. In the case of manner adverbs, I argued that a number of generalizations about selectional restrictions would be missed if the category *Manner Adverb* were assumed to exist in deep structure. In the present paper, I will consider arguments of this sort against including the category *Instrumental Adverb* in deep structure. If these arguments and arguments like them concerning other types of adverbs prove to be valid, then

(a) There would be many fewer grammatical categories and relations in deep structure than had previously been believed,

(b) The deep structures for sentences containing such adverbs would be much more abstract (i.e., further removed from surface structure) than had previously been thought.

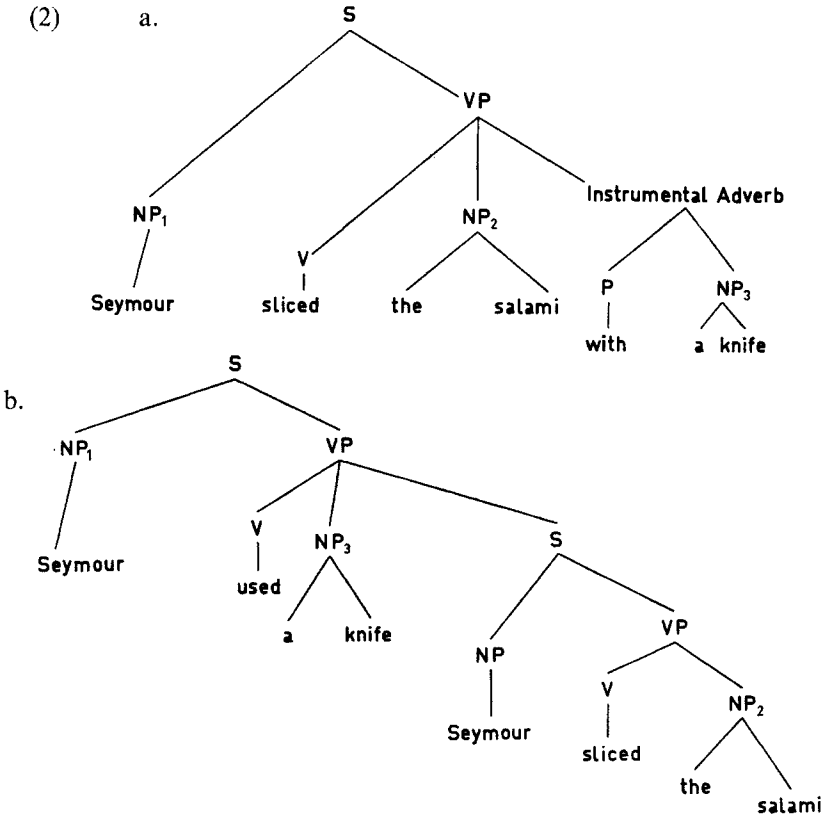
Questions concerning the validity of these arguments and all arguments of this kind will be considered in Section 14, below.

1. THE PROBLEM

In traditional grammar as well as in recent transformational studies, the following sentences have been analyzed as being quite separate constructions, having little or nothing in common.

- (1) a. Seymour sliced the salami with a knife.
 b. Seymour used a knife to slice the salami.

(1a) has been considered a simple sentence, containing a subject, transitive verb, direct object, and an instrumental adverb in the form of a prepositional phrase. (1b) has, on the other hand, been considered a complex sentence, consisting of a subject, a transitive verb ('use') that does not appear in sentence (1a), a direct object ('knife') different from the direct object of (1a), and an infinitival phrase ('to slice the salami'), whose subject is understood as being the same as the subject of 'use'. According to recent practice in transformational grammar, the sentences of (1) would be represented as having the underlying structures of (2):



(2a) and (2b) are radically different, so different that there would be no reason whatever to believe *a priori* that such structures should have anything whatever in common. But, as we shall see, they have a great deal in common, far more than could be attributed to superficial grammatical facts about English.

Let me point out at the outset that (1a) and (1b) are synonymous. This means that if they have radically different underlying structures, then they will have to be assigned semantic readings by different rules of semantic interpretation. Yet, the readings assigned will have to be identical. If, however, the real underlying structures of (1a) and (1b) are virtually identical (as we will propose), then one set of rules for semantic interpretation could be disposed of. This would be a favorable consequence, but it does not constitute an argument that the underlying structures are indeed identical. Any such argument would have to rest upon empirical syntactic evidence. In what follows, I shall argue that the constructions involved in (1a) and (1b) are in a one-to-one correspondence with respect to a number of grammatical phenomena, and that for each such phenomenon, a significant generalization will be missed if (1a) and (1b) are assigned underlying structures like those of (2a) and (2b). On the other hand I will argue that in each case a grammatical generalization can be captured if (1a) and (1b) can be analyzed as having essentially the same underlying structure.

2. PRELIMINARIES

We will consider the relationship between grammatical constructions of the forms (3a) and (3b):

- (3) a. $NP_1 - V - NP_2 - \text{with} - NP_3$
 b. $NP_1 - \text{use} - NP_3 - \text{to} - V - NP_2$

2.1. I assume that the 'with' of (3a) is understood as the 'with' of the instrumental adverbial, not as any of the other occurrences of 'with'. For example, none of the occurrences of 'with' in the following sentences are the instrumental 'with'.

- (4) Seymour sliced the salami *with* Sheila.
 (5) Seymour sliced the salami *with* enthusiasm.
 (6) Seymour sliced the salami *with* no trouble.

There is a simple syntactic test to show whether or not a given 'with' is the one of the instrumental adverbial. If one can conjoin the object of the 'with' in question with the object of 'with' in (1a), then the instrumental 'with' is present. If not, it is some other occurrence of 'with'. Consider (7):

- (7) Seymour sliced the salami with a knife and a scalpel.

Since 'a scalpel' can conjoin with 'a knife', we know that (8) contains the instrumental 'with':

- (8) Seymour sliced the salami with a scalpel.

Note that (4), (5), and (6) fail this test.

- (9) *Seymour sliced the salami with a knife and Sheila.
 (10) *Seymour sliced the salami with a knife and enthusiasm.
 (11) *Seymour sliced the salami with a knife and no trouble.

There is another sense of 'with' that seems intuitively to be related to the instrumental 'with', but which functions quite differently. Consider (12):

- (12) a. I cut my finger with a knife.
 b. I broke the window with a bat.

Both sentences of (12) are ambiguous. They can be interpreted in the instrumental sense, which assumes a purposive action, as in 'I used a knife to cut my finger' and 'I used a bat to break the window'. Or they can be interpreted in the accidental sense, as in 'I cut my finger on a knife' or 'I broke the window while I was using a bat (in some other activity)'. I am interested in this paper only in the purposive instrumental sense, not in the accidental sense. It is therefore necessary that it be asked whether these two senses can be distinguished grammatically. That is, it must be determined whether there are two different deep structures involved, one associated with each sense, or whether there is a single deep structure for both senses (which would be open to either the accidental or purposive interpretation). If one assumes that deep structures are defined by conditions (i)–(iv), then one can invoke condition (ii) to see if there are any selectional restrictions or co-occurrence constraints in which the two senses differ. If there are grammatical contexts in which one sense but not the other can appear, then it must be assumed that two different deep structures are involved.

(I) The accidental sense cannot occur in the progressive:

- (13) a. I was cutting my finger with a knife.
 b. I was breaking the window with a bat.

Neither (13a) nor (13b) is open to the accidental interpretation.

(II) The accidental sense cannot occur with 'only' modifying the object of 'with':

- (14) a. I cut my finger with only a knife.
 b. I broke the window with only a bat.

The accidental sense is impossible here.

(III) The accidental sense cannot occur if 'without' is substituted for 'with':

- (15) a. I cut my finger without a knife.
- b. I broke the window without a bat.

(IV) The accidental sense cannot occur in the imperative:

- (16) a. Cut your finger with a knife.
- b. Break the window with a bat.

(V) The accidental sense cannot occur with the modal 'can':

- (17) a. I can cut my finger with a knife.
- b. I can break the window with a bat.

(VI) The accidental sense cannot occur with 'for'-phrases:

- (18) a. I cut my finger with a knife for a dime.
- b. I broke the window with a bat for a dollar.

(VII) The accidental sense cannot occur with such adverbs as 'carefully', 'easily' and 'successfully':

- (19) a. I carefully cut my finger with a knife.
- b. I successfully broke the window with a bat.
- c. I easily knocked the vase off the table with my elbow.

(VIII) The accidental sense cannot occur embedded as a complement of verbs like 'force', 'try', 'begin', and others like them:

- (20) a. Ethelbert forced me to cut my finger with a knife.
- b. Herbie tried to break the window with a bat.
- c. Max tried to knock the vase off the table with his elbow.
- d. Selma began to smear grease on her face with the rag she was using.

However, in the complements of verbs like 'except', 'believe', 'say', and 'hope' both the accidental and purposive sense may appear:

- (21) a. Ethelbert expected me to cut my finger with a knife.
- b. Herbie believed that I broke the window with a bat.
- c. Max said that he knocked the vase off the table with his elbow.
- d. I hoped that Selma would smear grease on her face with the rag she was using.

I could go on to mention more grammatical contexts in which the purposive, but not the accidental sense appears; but eight should be enough to

show that if condition (ii) is one of the defining conditions of deep structure, then these two senses of (3a) must have different deep structures. One might raise the objection that the semantic readings associated with these grammatical contexts make the accidental sense impossible and that facts (I) through (VIII) are semantic and not grammatical facts. There is no question that the accidental sense is semantically impossible in (I)–(VIII). The question is whether it is also excluded for grammatical reasons. What is at issue is partly the definition of ‘grammar’. At present, deep structure is partially defined by condition (ii). This means that facts like (I)–(VIII), which involve selectional restrictions and co-occurrence are deep-structure facts, and hence ‘grammatical’ facts. But there is more at stake here than mere terminology. Deep structure is defined not only by condition (ii), but also by conditions (i), (iii), and (iv). It is a central empirical assumption of transformational grammar that these conditions define the *same* level of linguistic analysis. This is the strongest assertion that one could make about the relationship among these conditions; a weaker one would be to say that they each define different levels. The reason for making the strongest assertion in cases like this is that it is the most easily falsifiable assertion. We have made this rather strong assertion and we intend to see where it leads us. So far, it has led us to the conclusion that there are different deep structures underlying the accidental and purposive senses of construction (3a). In this paper, we will be concerned only with the purposive sense.

2.2. Just as there are different senses of ‘with’ in (3a), so there are different senses of ‘use’ in (3b), and these senses have different grammatical properties. By a ‘sense’ of ‘use’ we mean either:

(i) There is a single lexical item ‘use’ which can occur in a number of different deep-structure configurations which give rise to different meanings, each corresponding to a surface-structure sequence like that in (3b); or

(ii) There are distinct homonymous lexical items ‘use’ which occur in different deep-structure configurations, the difference in meaning being due to both lexical and deep-structure differences; these too correspond to surface-structure sequences like that in (3b).

It is irrelevant for this discussion which of these is true. I want only to distinguish among the various senses of ‘use’, since I am interested only in the instrumental sense here. Consider (22):

- (22)
- a. Hilbert’s proof uses the Bolzano-Weierstrass Theorem.
 - b. Skates use ball-bearings to cut down on friction.
 - c. The Volkswagen uses disk brakes to provide adequate stopping power.
 - d. That recipe uses a wire whisk to thicken the sauce.

In all of these the subject of 'use' is non-animate. In each case, 'use' has a generic interpretation and can never indicate a specific action. Thus, time adverbials which indicate specific actions are excluded:

- (23)
- a. *Every other Thursday Hilbert's proof uses the Bolzano-Weierstrass Theorem.
 - b. *At 4 o'clock skates used ball-bearings to cut down on friction.
 - c. *Three times this morning the Volkswagen used disk brakes to provide adequate stopping power.
 - d. *When I arrived this morning, that recipe was using a wire whisk to thicken the sauce.

Such time adverbials can occur with the instrumental 'use' which always takes animate subjects:

- (24)
- a. Every other Thursday I use a typewriter.
 - b. At 4 o'clock I used a ball-bearing to break a window.
 - c. Three times this morning John used that knife to slice the salami.
 - d. When I arrived this morning, Max was using a wire whisk to thicken the sauce.

Also note that sentences with the generic and instrumental occurrences of 'use' cannot conjoin:

- (25) *Max and that recipe used a wire whisk to thicken the sauce.

Now let us consider another sense of 'use' – this one meaning 'use up':

- (26)
- a. Angela used a can of clam sauce to make the lasagna.
 - b. The contractor used 1000 tons of concrete to build the library.

Compare these with (27):

- (27)
- a. Angela used an oven to make the lasagna.
 - b. The contractor used a crane to build the library.

In (26), 'use' cannot take duration adverbials, while the 'use' in (27) can:

- (28)
- a. *Angela used a pint of clam sauce for two hours to make the lasagna.
 - b. *The contractor used 1000 tons of concrete for six months to build the library.
- (29)
- a. Angela used an oven for two hours to make the lasagna.
 - b. The contractor used a crane for six months to build the library.

And we get corresponding 'use up' sentences in the case of (26), but not (27):

- (30) a. Angela used up a can of clam sauce in making the lasagna.
 b. The contractor used up 1000 tons of concrete in building the library.
- (31) a. *Angela used up an oven in making the lasagna.
 b. *The contractor used up a crane in building the library.

Moreover, the corresponding sentences in (26) and (27), which contain different senses of 'use', cannot be compared:

- (32) a. Angela used $\left\{ \begin{array}{l} \text{*a pint of clam sauce} \\ \text{her new pot} \end{array} \right\}$ more than the oven to make the lasagna.
 b. The contractor used $\left\{ \begin{array}{l} \text{*1000 tons of concrete} \\ \text{the bulldozer} \end{array} \right\}$ more than the crane to build the library.

Since the instrumental sense of 'use' has different selectional restrictions than the generic and 'use up' senses, it follows from (ii) that different deep structures must be involved. We will be concerned only with the deep structure associated with the instrumental sense of 'use'.

2.3. The infinitival phrase in (3b) (to - V - NP) ought not to be confused with the reduced form of an 'in order to' phrase. They are quite distinct:

- (33) The marquis used the knife to please his mother.
 (34) The marquis used the knife in order to please his mother.
 (35) The marquis used the knife in pleasing his mother.

(33) is ambiguous. It can be synonymous with either (34) or (35). In the sense of (33) which is synonymous to (35), the knife is being used in the activity portrayed in the infinitival phrase. In the sense of (33) which is synonymous to (34), the knife is being used in some activity which is not specified for the purpose given in the infinitival phrase.

In (34), it is not entailed that the marquis succeeded in pleasing his mother. In (35), on the other hand, it is entailed that the marquis succeeded in pleasing his mother. Thus, we can get (36), but not (37):

- (36) The marquis used the knife in order to please his mother, but he nevertheless failed to please her.
 (37) *The marquis used the knife in pleasing his mother, but he nevertheless failed to please her.

The same facts hold true about the corresponding senses of (33). In (38), (33) is disambiguated and only the sense synonymous to (34) appears:

- (38) The marquis used the knife to please his mother, but he nevertheless failed to please her.

Also note that the infinitival phrase can be preposed only if it specifies purpose, as in (34):

(39) To please his mother, the marquis used the knife.

(39) is unambiguous and synonymous to (34).

(40), (41), and (42) show that both infinitival phrases can be used in the same sentence:

(40) To please his mother, the marquis used the knife to butter the brioche.

(41) The marquis used the knife to butter the brioche in order to please his mother.

(42) The marquis used the knife to butter the brioche to please his mother.

(42) entails that the marquis succeeded in buttering the brioche, though it does not entail that he succeeded in pleasing his mother. Thus we can get (43) but not (44):

(43) The marquis used the knife to butter the brioche to please his mother, but he nevertheless failed to please her.

(44) *The marquis used the knife to butter the brioche to please his mother, but he nevertheless failed to butter it.

In the sections that follow, I will assume that the infinitival phrase of (3b) is not a reduced form of the 'in order to' phrase, but rather portrays the action in which an instrument is being used, as in (35).

Having clarified what I mean by 'with', 'use', and 'to' in (3), I can now proceed to show certain deep syntactic similarities between the constructions of (3a) and (3b).

3. V MUST BE +ACTIVITY

(3a) and (3b) share the property that V must be +ACTIVITY.

(45) a. Albert *computed* the answer with a sliderule.
b. Albert used a sliderule to *compute* the answer.

(46) a. *Albert *knew* the answer with a sliderule.
b. *Albert used a sliderule to *know* the answer.

This is a fact about selectional restrictions in deep structure. If (45a) has a deep structure like that of (2a), then the non-occurrence of sentences like (46a) must be ruled out by a selectional restriction between the verb and the instrumental adverbial. Such a restriction is not needed elsewhere in the

grammar of English. It would be a new type of deep-structure constraint. If (45b) has a deep structure like that of (2b), then the non-occurrence of (46b) could be ruled out by a constraint between the verb 'use' and the next lowest verb in its complement sentence. This is a constraint needed elsewhere in English grammar. For example, the verbs *force*, *remember*, *try*, etc., require an activity verb in their complements:

- (47) a. I forced John to *compute* the answer.
 b. *I forced John to *know* the answer.
- (48) a. I remembered to *compute* the answer.
 b. *I remembered to *know* the answer.
- (49) a. I tried to *compute* the answer.
 b. *I tried to *know* the answer.

If something like (2b) is the correct deep structure for both (1a) and (2a), then no new type of deep-structure constraint will have to be added to the theory of grammar to account for the lack of (46a).

But the real problem here is not just whether a new type of constraint will have to be added to the theory of grammar to handle (46a). The real difficulty is that if (45a) and (45b) have essentially different deep structures, then the constraints prohibiting (46a) and (46b) will have to be entirely different constraints. In one case we would have a constraint between a verb and a type of adverbial. In the other case, we would have a constraint between two verbs. Any grammar which excluded (46a) and (46b) by such different means would be making the implicit claim that the non-occurrence of sentences like (46a) is completely unrelated to the non-occurrence of sentences like (46b), that one fact has nothing to do with the other fact. This seems to me to be a false claim. The fact that (46a) is ungrammatical seems to be *the same fact* as the fact that (46b) is ungrammatical. If this is so, then (46a) and (46b) should be excluded by the same deep-structure constraint. This would be impossible if they had radically different deep structures – like those of (2a) and (2b).

4. NP₁ MUST BE ANIMATE

(3a) and (3b) share the property that NP₁ must be animate. For example,

- (50) a. *John* killed Harry with dynamite.
 b. *John* used dynamite to kill Harry.
- (51) a. **The explosion* killed Harry with dynamite.
 b. **The explosion* used dynamite to kill Harry.

If the deep structures of (2) are correct, then the deep-structure constraints necessary to rule out (51a) and (51b) must be rather different. To exclude (51a) we would need a selectional restriction between instrumental adverbs and subjects. This would be a new type of deep structure selectional restriction, not needed elsewhere. It would state that instrumental adverbs require animate subjects. (51b), on the other hand, would be excluded on entirely different grounds – namely, that ‘use’ in this sense requires an animate subject. Subject-verb constraints of this sort are independently motivated and required in the syntax of all languages.

Thus, to claim that the deep structures of (50a) and (50b) are like those of (2a) and (2b) would be to claim:

(i) We need a new type of deep-structure constraint between subjects and instrumental adverbs, and

(ii) The fact that instrumental adverbs require animate subjects is completely unrelated to the fact that ‘use’ requires animate subjects.

It seems to me that (ii) is incorrect. So far as I can see, the fact that ‘use’ requires animate subjects and that instrumental adverbs require animate subjects are *the same fact*. Any grammar of English that sets up essentially different deep structures for (50a) and (50b) cannot state these as the same fact.

5. $NP_2 \neq NP_3$

In both constructions in (3), NP_2 cannot be identical to NP_3 :

- (52) a. I scratched *the wire* with a *knife*.
 b. I used *a knife* to scratch *the wire*.
- (53) a. *I scratched *the wire* with $\left\{ \begin{array}{l} \textit{it} \\ \textit{itself} \end{array} \right\}$.
 b. *I used *the wire* to scratch $\left\{ \begin{array}{l} \textit{itself} \\ \textit{it} \end{array} \right\}$.

If (52a) and (52b) have deep structures like those of (2a) and (2b), then (53a) and (53b) would have to be excluded by constraints like (i) and (ii).

(i) The object of the preposition in an instrumental phrase cannot be identical to the direct object of the main verb, and

(ii) The object of ‘use’ cannot be identical to the object of the verb in the complement sentence following ‘use’.

Neither of these constraints occurs elsewhere in English grammar, to my knowledge. Both are exceedingly strange. The fact that they correspond in these constructions would be even stranger if their deep structures were essentially different. Why, after all, should a strange constraint like (i) have any

relation at all to an equally strange, but entirely different, constraint like (ii)? Again, it seems to me, a generalization is being missed. In a correct grammatical analysis, (i) and (ii) should be expressed as the same constraint.

6. $NP_1 \neq NP_3$

In the constructions of (3), NP_1 must not be identical to NP_3 :

- (54) a. *James Bond* broke the window with *the Russian spy*.
 b. *James Bond* used *the Russian spy* to break the window.
- (55) a. **James Bond* broke the window with *himself*.
 b. **James Bond* used *himself* to break the window.

Although we do find NP_1 as a modifier of NP_3 , as in (56),

- (56) a. *James Bond* broke the window with *his own* body.
 b. *James Bond* used *his own* body to break the window,

we do not find NP_1 identical to NP_3 in the constructions of (3).

If the deep structures of (2) are correct, then these facts would have to be stated by two rather different deep structure constraints:

(i) The object of the preposition in an instrumental adverbial phrase cannot be identical to the subject of the main verb that the phrase modifies, and

(ii) The subject of 'use' cannot be identical to the object of 'use'.

Constraint (i) occurs nowhere else in English grammar. Constraints like (ii) do occur in certain verbs (e.g., 'kidnap', 'murder', 'assassinate').

Again, (i) and (ii), as stated, have nothing to do with one another; yet these superficially different constraints seem to be saying the same thing.

(i) and (ii), as they now stand, miss a generalization.

7. 'AS'-PHRASES

If the constructions of (3) are modified by *as*-phrases, NP_1 can be identical to NP_3 in both cases (I am indebted to Paul Schachter for this observation):

- (57) a. Paul analyzed the English passive construction with *himself* as an informant.
 b. Paul used *himself* as an informant to analyze the English passive construction.

These sentences would be ungrammatical without the phrase 'as an informant':

- (57) c. **Paul* analyzed the English passive construction with *himself*.
 d. **Paul* used *himself* to analyze the English passive construction.

I have no idea why these constructions behave differently with the addition of an *as*-phrase. This is certainly a strange fact. Note, however, that the addition of the *as*-phrase changes both constructions *in the same way*. If these were different and unrelated constructions, then their changes in behavior with the addition of an *as*-phrase would be different and unrelated facts. But it seems that the same process is at work in both cases.

8. QUESTIONS

The questions corresponding to the constructions of (3) are understood in the same way:

- (58) a. Did Seymour slice the salami with a knife?
 b. Did Seymour use a knife to slice the salami?

(The sentences of (58) are both ambiguous. In one sense, they are questions of the 'Is it so . . .?' variety. In this case, nothing at all is presupposed and a denial of the following kind would be in place: 'No. The salami was eaten up before Seymour even got home.' This sense of the questions will not concern us here; we are interested only in the sense discussed below.)

What is being asked in both cases is not whether the slicing took place – it is assumed that it did. What is being asked is whether the instrument used was a knife.

This interpretation is to be expected in the case of (58b). But if one assumes that the deep structure of (58a) is that of (2a) plus whatever indicates a question, then it is not at all clear why (58a) should be synonymous to (58b). Compare (58a) with (59):

- (59) Did Seymour slice the salami?

If the deep structure of (2a) is correct, then the only difference between the deep structures of (58a) and (59) is that (58a) contains an instrumental adverb where (59) lacks one. But (59) does not assume that the slicing did take place; it asks whether it took place. This is rather unlike (58a), where the action is assumed and the instrument is questioned. It might be proposed that the rule of semantic interpretation for questions containing instrumental adverbs always indicates that the adverb is being questioned and that the rest of the verb phrase is being assumed. This is possible; but if it is true, then it must be considered a kind of coincidence that, when the constructions of (3a) and (3b) are questioned, the same thing is being questioned. Since the deep structures of (2a) and (2b) are radically different, there would be no reason to believe that their questions should be interpreted in the same way, and the fact that they are would have to be considered fortuitous. Again, it

seems to me that this is not the case and that a generalization is being missed.

9. NEGATIVES

The negatives of the constructions in (3) are also understood in the same way:

- (60) a. Seymour didn't slice the salami with a knife.
- b. Seymour didn't use a knife to slice the salami.

(The sentences of (60) are both ambiguous, just as in the case of (58). In one sense, they could be denials of the 'It is false that . . .' type where nothing is presupposed. In reply to the question 'Is it true that Seymour sliced the salami with a knife?', one might use (60a) or (60b) as a reply with the qualification 'Seymour didn't even get out of bed that day'. This sense of (60) will not concern us here; only the other sense is considered below.)

What is being denied here is not that the slicing took place; it is assumed that it did occur, just was the case in questions. What is being denied is that a knife was the instrument involved.

As in questions, one would expect this interpretation for (60b), where the verb phrase 'use a knife' is overtly negated. But assuming that (2a) plus a negative element is the deep structure for (60a), then a special rule of semantic interpretation would be needed to account for the meaning of (60a). The normal rule simply negates the verb phrase. Consider (61):

- (61) Seymour didn't slice the salami.

(61) asserts that the slicing did not take place. (60a), on the other hand, assumes that it did.

If the only difference in their deep structures is that (60a) has an instrumental adverbial where (61) lacks one, then a special rule of semantic interpretation would be needed to account for the meaning of (60a). As in the case of questions, this is possible. But again, such a solution would amount to a claim that the facts that (60a) and (60b) both assert that the slicing took place and both deny that the instrument used was a knife are unrelated facts, since they arise through the interpretation of unrelated structures by unrelated rules of semantic interpretation.

10. NO EMBEDDED NEGATIVES

The verb phrase in the complement of 'use' cannot be negated:

- (61) *I used the knife not to slice the salami.
- (62) *I used the knife to not slice the salami.

From sentences like (60a) it appears that the verb phrase in the *with*-construction can be negated. But, as we saw in the previous section, the negative in (60a) has the semantic function of negating the instrumental phrase, not the remainder of the verb phrase. It turns out that the remainder of the verb phrase cannot be negated at all. We can see this from sentences like (63). When the instrumental phrase is topicalized by being preposed, negation of the verb phrase is impossible.

(63) *With this knife, I didn't slice the salami.

Correspondingly, we do not get the cleft sentence, (64),

(64) *It was with a knife that I didn't slice the salami,

just as we would not get the cleft sentence corresponding to (62):

(65) *It was a knife that I used to not slice the salami.

The topicalization is irrelevant here. (65) is impossible for the same reason that (62) is impossible; namely, because of the constraint:

(A) One cannot use an instrument in an action that does not occur.

Clearly, (64) is impossible for the same reason.

As stated, (A) is an informally represented semantic constraint. If its grammatical analog is represented syntactically as a deep-structure constraint, then that constraint should account for the ungrammaticality of all the sentences of (61) through (65). This means that it must be a single constraint: to have more than one would be to miss the generalization stated in (A).

Let us suppose that the deep structures of (2) are correct. Consider how such a constraint might be stated in terms of them. In the case of (2b), one would have to say that the complement of 'use' could not be negated. This would not be a new sort of constraint. There are other verbs and adjectives whose complements cannot be negated, e.g., 'careful in', 'finish', and 'fail at':

- (66) a. *Max is always careful in not slicing the pastromi.
 b. *Sheila has finished not slicing the corned beef.
 c. *Nathan failed at not slicing the brisket.

To adopt this constraint for 'use' would not only be possible, but would involve using a type of constraint that is needed on other grounds.

The situation is rather different in the case of (2a). The same constraint cannot be used, since neither the verb 'use' nor any complement construction appears in (2a). But the situation is even worse. It is impossible to state the necessary constraint at all. In order to prohibit (63) and (64), one would have to indicate that the verb phrase 'slice the salami' could not be negated. But in (2a), 'slice the salami' is not a verb phrase – it is not even a constituent.

fact, a VP constituent if our proposed analysis is correct) and that instrumental adverbs are not part of the VP they modify.

12. NO INSTRUMENTALS OF INSTRUMENTALS

Suppose you want to break a rather thick window with a chisel. However, you find that you are not strong enough to manage it just by slamming it against the pane. So you get a hammer, hold the chisel to the window's surface, and hit the chisel with the hammer until the window breaks. What you have done *cannot* be described in the following way:

- (71) a. *Melvin broke the window with a chisel with a hammer.
 b. *Melvin used a hammer to use a chisel to break the window.

Although there is nothing incongruous or inconceivable about your action, it is impossible to describe it with one instrumental construction modifying another. However this constraint is to be described, it appears that the same constraint is at work in both (71a) and (71b). Again, if the deep structures of (2) are correct, then (71a) and (71b) will have to be excluded by different deep structure constraints. Moreover, even mixed instrumental constructions cannot occur:

- (72) *Melvin used a hammer to break the window with a chisel.
 (73) *With a hammer, Melvin used a chisel to break the window.

If the deep structures of (2) are correct, then (72) and (73) would have to be excluded by two still different constraints. (72) would have to be excluded by a constraint that says that the complement of 'use' may not contain an instrumental adverb. (73) would have to be excluded by a constraint stating that an instrumental adverbial cannot modify a verb phrase whose main verb is 'use'. Thus, with the deep structures of (2) we would need four different constraints where there should be one.

13. PARALLEL STRUCTURE

There are certain constructions that require parallel adverbials if the transformation introducing the Pro-VP's 'do so' and 'do it' applies, but not otherwise:

- (74) a. I slice salami in the living room more often than Sally slices salami on the front porch.
 b. I slice salami in the living room more often than Sally does so on the front porch.

- (75) a. I slice salami on the front porch more often than Sally slices salami with a knife.
 b. *I slice salami on the front porch more often than Sally does so with a knife.

(74b) is permissible since 'in the living room' and 'on the front porch' are adverbials of the same type. (75b) is ungrammatical since 'with a knife' is a different type of adverb than 'on the front porch'. Facts like this might at first seem like evidence for deep structures like (2a), which contain categories like Instrumental Adverb. That is, the transformation responsible for the appearance of 'do so' might be constrained to apply only if the same category (e.g., Locative Adverb, Instrumental Adverb, etc.) were present on both the left and right sides of the sentence. If there are no such categories (which is what we are claiming in the case of instrumentals), then such a constraint could not be placed on the rule.

However, there is further evidence that indicates that a constraint like that would be inadequate and that provides further evidence that there is no such category as Instrumental Adverb. It turns out that the rule that introduces 'do so' operates not only when there are two equivalent adverbs present, but also when the construction of (3a) is present on one side and that of (3b) is present on the other. That is, with respect to this rule, these constructions are equivalent.

- (76) a. John uses a knife to slice salami more often than I slice salami with a cleaver.
 b. John uses a knife to slice salami more often than I do so with a cleaver.
- (77) a. John slices salami with a knife more often than I use a cleaver to slice salami.
 b. John slices salami with a knife more often than I use a cleaver to do so.

Note that this rule will not operate in case of verbs other than 'use'?

- (78) a. John has *forced* Sam to slice the salami more often than Marvin has sliced the salami with a cleaver.
 b. *John has *forced* Sam to slice the salami more often than Marvin has done so with a cleaver.
- (79) a. Seymour has *mentioned* the fact that Selma slices salami more often than Marvin has ever sliced salami with an electric knife.
 b. *Seymour has *mentioned* the fact that Selma slices salami more often than Marvin has ever done so with an electric knife.

Here we have evidence that there is a transformational rule that considers constructions like (3b) to be equivalent to those like (3a). This seems to indicate once more that these constructions are essentially the same at some level of analysis, presumably the level of deep structure.

We should mention that not all speakers agree with the data of (74) and (75). Some speakers find (75b) grammatical. In the dialects of these speakers, the rule which introduces 'do so' provides no evidence whatever for our case.

14. CONCLUSIONS

In Sections 3–13, I presented evidence that the constructions of (3a) and (3b) have the same deep structure. I assumed that deep structure is defined by conditions (i)–(iv). In Sections 3–7, 10, and 12, I used condition (ii) in arguing that there were generalizations about selectional restrictions and co-occurrences that could not be stated unless the constructions had essentially the same deep structures. In Sections 8 and 9, I argued from condition (i), claiming that unless the same grammatical relations were present in the deep structures of these constructions, generalizations about semantic rules would be missed. In Section 13, I argued from condition (iv), asserting that in order for a deep transformational generalization to be stated, the constructions had to be the same at some level. By far, the main force of our argument is carried in the sections where we invoked condition (ii) and used arguments about co-occurrence. The arguments in Sections 8, 9, and 13 might be questioned on various grounds. However, I think that the arguments in sections 3–7, 10, and 12 are pretty much beyond question. There are clearly generalizations about co-occurrence and selectional restrictions to be stated here. My argument therefore hinges crucially on the employment of condition (ii). In view of this, I conclude:

(I) If there exists a level of linguistic analysis at which generalizations about selectional restrictions and co-occurrence are stated, then the constructions of (3) must have essentially the same representations at this level.

(II) If this level is that of deep structure (i.e., if it is defined by conditions (i)–(iv)), then the constructions of (3) must have essentially the same deep structures.

Note that if deep structure is defined in terms of (i)–(iv), then evidence about any one of the criteria for deep structure is evidence about deep structure. In the case of the constructions of (3), evidence that they shared a considerable number of co-occurrence constraints showed that they had to be close enough in structure for the generalizations involved to be stated correctly. The nature, number, and diversity of the constraints indicated that the structures had to be very close indeed, virtually identical.

Due to the nature of the definition of deep structure, one can provide arguments for *identity* of deep structures without proposing what those deep structures are and without proposing any transformational derivations. This type of argument differs considerably from the type of argument that has been used in transformational research so far. To date, research in transformational grammar has been oriented toward proposing rules. Arguments concerning generalizations of deep structure selectional restrictions and co-occurrences have been brought up only in support of some given set of rules. What we have done here is to show that arguments of this sort can be used by themselves without discussion of rules at all. In showing that (3a) and (3b) have the same deep structure we have shown that transformational rules relating those constructions must exist, though it is not known yet what they are. Similarly, we have shown that the common deep structure must exist, though we do not know what it is either. Note, however, that although we do not know exactly what that deep structure is, we do know a lot about it: that all the above co-occurrence constraints must hold for it. By looking closely at the co-occurrence constraints that hold between synonymous constructions, we have opened up a new area of research, and one which extends well beyond a single pair of constructions.

If (3a) and (3b) have the same deep structure, then there are some rather interesting consequences. (3b) contains two verbs and must contain at least two sentences (occurrences of *S*) in its deep structure. (3a) contains one verb in its surface structure, which corresponds to one of the verbs of (3b). This means that the other verb in the deep structure of (3b), 'use', must appear in the deep structure of (3a) and must subsequently be deleted, since it does not appear in the surface structure of (3a). Moreover, (3a) must have at least two occurrences of *S* in its deep structure, although it has only one in its surface structure. This means that verbs and *S*'s that appear in deep structure can be absent from surface structure. Deep structures therefore must be somewhat more abstract (further from surface structure) than previous research in transformational grammar has indicated. Furthermore, we know that the NP object of 'with' in (3a) is the direct object of the verb 'use' in (3b). That means that in the deep structure of (3a) it must also be the direct object of 'use'. But this means that it cannot be part of an Instrumental Adverb constituent, and this in turn, means that such constituents do not exist in deep structure. What we have proposed is to eliminate instrumental adverbs from deep structure in favor of some deep structure that we know we need independently (whatever deep structure underlies (3b) – although, of course, we do not know yet what that structure is like in detail). But why stop at instrumental adverbs? Similar evidence exists for other adverbs as well (see Lakoff, 1965). Given evidence of this sort, one can show using the same type of argument,

that a number of kinds of adverbs do not occur as such in deep structure. The results are that the traditional view that simple sentences contain a full range of adverbials modifying the predicate turns out on these grounds to be false; there are fewer grammatical categories and grammatical relations in deep structure than had previously been thought; and seemingly simple sentences are not simple in deep structure. These are rather startling results, and even more startling because they were arrived at without the statement of a single rule.

Such results are sufficiently surprising that the arguments used to arrive at them warrant very close scrutiny. The crucial part of the definition of deep structure that I have used is condition (ii). I have used condition (ii) to make substantive claims about what the grammatical categories and relations mentioned in condition (i) are. Thus far, I have made the empirical assumption that conditions (i)–(iv) define a single level of linguistic analysis, to which the name ‘deep structure’ has been given. So far as I can see, the only way one could argue against the above claims about the deep structure of instrumental adverbs would be to assert that the kinds of arguments I used – generalizations concerning selectional restrictions and co-occurrence – are irrelevant to the determination of what deep-structure categories and grammatical relations are. But to assert that would be to claim that there does not exist a single level of linguistic analysis defined by conditions (i)–(iv); that rather condition (ii) had to be thrown out. That is to say, generalizations about co-occurrence and selectional restrictions are to be determined at a different level of linguistic analysis than that at which basic grammatical categories and relations are defined. One might then maintain that conditions (i), (iii), and (iv) define some significant level of linguistic analysis. Whatever such a level might be like, it would certainly be rather different than deep structure as it has been previously conceived.

Let us look somewhat more closely at what would be involved in throwing out condition (ii). The selectional restrictions mentioned in (ii) are defined in terms of grammatical relations mentioned in condition (i); e.g., there are subject-verb restrictions, verb-object restrictions, and restrictions between a verb and the next lowest verb in its complement. Thus far, it has seemed that these are the appropriate terms in which to state generalizations about co-occurrence restrictions. If so, then it is hard to see how condition (ii) can be separated from condition (i). However, it may be that generalizations about co-occurrence will have to be stated in more abstract terms; at the very least, our assumption about the dependence of (ii) upon (i) should be questioned.

It should be noted, by the way, that one cannot get out of the consequences of our main argument by getting rid of just part of condition (ii). One cannot

claim that one can pick a few basic selectional restrictions to define deep structure and relegate the others (most of those used in the above argument) to some other level of analysis, presumably semantics. The reason is that the constraints that would have to be kept (subject-verb, verb-object, verb-verb) in any reasonable proposal of this sort are constraints that enter into the argument about 'with' and 'use'. In Sections 3, 10, and 12 verb-verb constraints are at issue. In Section 4, a subject-verb constraint is involved. One could not maintain this proposal, keeping the deep structures of (2), and still state the correct generalizations involving only these constraints.

I pointed out (Lakoff, 1965) that the syntactic features that enter into selectional restrictions are related one-to-one with semantic markers (animate, concrete, takes animate subjects, etc.) and that those that are not related to semantic markers (grammatical gender, conjugation class, declension) never enter into selectional restrictions. McCawley (1966) proposes that selectional restrictions are purely a semantic phenomenon. Since the violation of selectional restrictions always leads to semantic anomaly, and since semantic anomaly must be accounted for by semantic projection rules anyway, McCawley points out that violations of selectional restrictions can be defined by semantic projection rules and need not be defined in syntactic terms at all. Note that all of the violations of co-occurrence restrictions that are mentioned in Sections 3–13 involve semantically anomalous sentences – with the possible exception of the examples in Section 12. (The examples of Section 12 should be examined carefully with respect to this question.)

Suppose that McCawley is right (and I believe he is). Then would condition (ii) be relegated to semantics and taken out of the definition of deep structure? Would this be a way out of the claim that (3a) and (3b) have the same deep structure? Given the present conception of semantic anomaly defined in terms of Katz-Fodor projection rules, the answer would have to be 'no'. Projection rules are defined in terms of grammatical relations in deep structure. They apply to a deep-structure tree node-by-node from bottom to top. At each node a projection rule takes the semantic readings of the daughters of that node and forms a derived semantic reading. Semantic anomaly is also detected at the point at which the projection rule applies. For each configuration of mother and daughter nodes (i.e., for each deep structure grammatical relation) a different projection rule is needed (see Katz and Postal, 1964, 163). Thus, if we assume that the deep structures of (2) are correct, then rather different projection rules will apply in the two cases. Now consider the examples of Sections 3–7, 10, and 12. In each case, different projection rules will apply in the case of the 'with'-construction than in the case of the corresponding 'use'-construction. This means that in each example, the semantic anomaly in the 'with'-case cannot be ruled out by

the same projection rule that rules out the corresponding anomaly in the 'use'-case. In short, semantic projection rules defined on the structures of (2) could still not state the correct generalizations about selectional restrictions and co-occurrence. Since projection rules are defined on deep structure grammatical relations, the only way that projection rules could be made to state the correct generalizations about co-occurrence in these cases would be to assume that the same deep structure grammatical relations were present in both (3a) and (3b). This is equivalent to saying that they have the same deep structures.

Even if co-occurrence restrictions are to be stated in terms of semantic anomaly, the claim that semantic anomaly is defined in terms of projection rules leaves us just where we were before with condition (ii). Since we still have to state the correct generalizations about semantic anomaly, and since projection rules must take into account lexical semantic content and deep-structure grammatical relations, the proposal to use projection rules to state selectional restrictions still ties condition (ii) to conditions (i) and (iii) as defining a single level of linguistic analysis. However, this is due only to the fact that semantic anomaly is presently defined in terms of semantic projection rules. The only way that condition (ii) might be cut loose from conditions (i) and (iii) would be to define semantic anomaly not in terms of projection rules, but in terms of well-formedness conditions on semantic readings (i.e., on the output of the projection rules). For example, projection rules would be set up so that they defined semantic readings for 'I knew the answer with a sliderule' and 'I used a sliderule to know the answer'. The sentences would receive the same readings, and an appropriate well-formedness constraint would state that both were semantically ill-formed in the same way.

In this way, it might be possible to impose condition (ii) on the level of semantic representation rather than on the level defined by conditions (i), (iii), and (iv). So far as I can see, this is the only reasonable way that one could avoid the conclusion that (3a) and (3b) have the same deep structure. But to make such a move would be to throw out the baby with the bath water. The claim that condition (ii) together with conditions (i), (iii), and (iv) defines a single level of linguistic analysis is central to transformational grammar and to all work hitherto done in transformational analysis. The reason is that an enormous amount of the motivation for setting up transformational rules comes from condition (ii). A considerable part of the motivation for the existence of almost every transformational rule I can think of consists of an argument to the effect that if the rule exists, then it makes it possible to state certain generalizations about selectional restrictions and co-occurrence that would otherwise be unstateable. If condition (ii) were

removed from the level defined by (i), (ii), and (iii) and made instead to partially define the level of semantic representation, then all such arguments for the existence of transformations would no longer exist and the field of transformational grammar would change in a rather radical and as yet unpredictable way.

Our conclusion is this: Either

(I): Conditions (i)–(iv) define a single level of linguistic analysis called ‘deep structure’. As a consequence, the arguments of Sections 3–13 above prove that (3a) and (3b) have the same representations at the level of deep structure. Since similar arguments can be brought forth in the case of other adverbs, the view that a deep structure *S*(entence) contains a full range of adverbs modifying the predicate is false. Deep structure is considerably more abstract than it was previously thought to be.

or

(II): Condition (ii) is to be set up as a defining property of semantic representations, and not a property of the level defined by (i), (iii), and (iv). In this case, the arguments of Sections 3–7, 10, and 12 are irrelevant to determining how (3a) and (3b) are to be represented on the level defined by (i), (iii), and (iv). Similarly, all such arguments are invalidated. At the same time, all appeals to condition (ii) as a motivation for transformational rules are invalidated and the old definition of ‘deep structure’ is changed in an essential way.

Some of the above discussion may have given the reader the impression that the question of whether condition (ii) defines the same level of linguistic analysis as (i), (iii), and (iv) is a matter of definition and we can have it either way. If I have given that impression, I should like to correct it before concluding. It is an *empirical* assumption that (ii) defines the same level of analysis as (i), (iii), and (iv). The claim that (ii) defines the same level as (i), (iii), and (iv) is stronger than the claim that it defines a different level since it is a more easily falsifiable claim. As we saw in this paper, one can say a lot of things based on condition (ii) independently of (i), (iii), and (iv). If we assume that (i)–(iv) define the same level, then the probability increases that information about that level from condition (ii) will conflict with information about the level derived from other conditions. If such a conflict were to arise, then we would have empirical evidence that we were wrong in assuming that they defined the same level. So far, no such conflict has arisen. It still seems possible to maintain the strong claim that (i)–(iv) define the same level. And until *clear* empirical evidence is found to the contrary, there is still every reason to continue to maintain this claim. However, it is only through enter-

taining the possibility that this claim may be false that counter-examples may be recognized if they are encountered. It is for this reason that I have raised the issue.

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