

- Ross, J. R.: 1966, 'A Proposed Rule of Tree-Pruning', *Mathematical Linguistics and Automatic Translation*, Report No. NSF-17, Harvard University Computation Laboratory, Cambridge, Mass.
- Ross, J. R.: 1967a, 'Gapping and the Order of Constituents', Mimeographed. (To appear in the *Proceedings of the Tenth International Congress of Linguistics*.)
- Ross, J. R.: 1967b, *Constraints on Variables in Syntax*. Ph.D. dissertation, MIT. (Mimeographed. Indiana University Linguistics Club, 1968.)
- Ross, J. R.: 1969, 'On the Cyclic Nature of English Pronominalization', in D. A. Reibel and S. A. Schane (eds.), *Modern Studies in English*, Prentice-Hall, Englewood Cliffs, N.J. pp. 187-200.
- Sanders, G.: 1969, 'Invariant Ordering', mimeographed preliminary version.
- Sanders, G.: 1970, 'Constraints on Constituent Ordering', *Papers in Linguistics* 2, 3. (To appear.)
- Sanders, G. and Tai, J.: 1969, 'Immediate Dominance and Identity Deletion in Mandarin Chinese', LSA 1969 winter meeting.
- Schane, S. A.: 1966, 'A Schema for Sentence Coordination', *Information System Language Studies* No. 10, Mitre Corp., Bedford, Mass.
- Tai, J.: 1969, *Coordination Reduction*, Ph.D. dissertation, Indiana University.

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## ON THE ROLE OF DEEP STRUCTURE IN SEMANTIC INTERPRETATION

A relation was first suggested between sentences like 1a and 1b in Hall (1965):

1. a. John smeared paint on the wall  
b. John smeared the wall with paint.

Hall suggested that in these cases, and many others like them, one form should be taken as basic for both, and the other derived by a transformational operation. For various reasons, Hall proposed that 1a be taken as the basic form, and 1b be derived from it by displacing the original deep structural object, attaching *with* to it, and removing the preposition from the original adverbial adjunct.

Such a derivation was questioned by Fraser (1969), who noted that there are cases where one of the forms in 1 is semantically anomalous and the other is not:

2. a. John jammed a pencil into the jar.  
b. John jammed the jar with a pencil.  
c. John jammed the jar with pencils.

While 2a is non-anomalous, 2b is strange; it seems to imply that a single pencil filled the entire jar. The non-anomaly of 2c shows that the verb *jam* is not exceptional with respect to the (putative) transformation; Fraser's conclusion from this was that 2b somehow violated a selectional restriction that was not applicable to 2a, and hence that 2a and 2b should be regarded as distinct underlying structures, rather than being transformationally related. This paper will attempt to suggest a systematic basis for the difference between 2a and 2b, and to examine the implication of this difference for syntactic theory.

An observation related to Fraser's was made by Chomsky (1970) in a recent discussion of work by Fillmore (1968). Chomsky observed that sentences 3a and 3b differ slightly in meaning:

3. a. Bees are swarming in the garden.  
b. The garden is swarming with bees.

Fillmore had claimed that 3a and 3b show the same set of 'case relationships' (in his sense) between the NP's *garden* and *bees* and the VP *be swarming*; hence, he would represent them as having the same marker at the case-

As noted above, grammatical relations play a role in assigning holistic interpretation. The generalization to be made about the sentences in 3 is that holistic readings can be assigned to the constituent which is *subject* at some level at which 3a and 3b differ in this respect; thus, in Fillmore's framework, the level in question is *after* the case representation has been converted into a phrase marker. As noted, this level must also be before any of the transformations used in the formation of 4 and 5 have applied, since they have the effect of moving the former subject into various other positions in the derived structure of the sentence. In sentence 1, however, and others like it, the generalization to be made is that holistic readings are assigned to the constituent which is *direct object* at some level of structure. Sentences similar to those of 4 and 5 show that here too the structural level in question must precede the application of more or less well-known transformations:

8.
  - a. A pencil would be easy for John to jam into the jar.
  - b. A pencil is certain to be jammed into the jar by John.
  - c. It's a pencil that John is certain to jam into the jar.
  - d. It's into the jar that John is certain to jam a pencil.
9.
  - a. The jar would be easy for John to jam with pencils.
  - b. The jar is certain to be jammed with pencils by John.
  - c. It's the jar that John is certain to jam with pencils.
  - d. It's pencils that John is certain to jam the jar with.

The sentences in 8 are synonymous with 2a in the relevant respect, while those of 9 are like 2c, where the holistic reading is assigned to *the jar*. Thus, the level at which it is possible to state the generalization that holistic readings in transitive sentences are assigned to the syntactic direct object must precede the rules used to form 8 and 9. Furthermore, since Fillmore would represent both these types in the same way on the level of case structure, the level of structure in question must again be *after* such a case structure is realized as a phrase marker.

That it is the syntactic relation of *direct object* which is relevant for the determination of holistic interpretation is supported by the fact that this provides a convenient way of accounting for certain other semantic distinctions between closely related structures. Many verbs of motion are usable either in an achievement sense (in which the action is assumed to have been successfully carried to completion) and a mere activity sense (in which the action is asserted to have gone on, but without presumption of successful completion). Consider the sentences in 10:

10.
  - a. John climbed the mountain.
  - b. John leapt the chasm.
  - c. A yellow roadster traveled this road last night.

Each of these sentences presumes a complete action: John got to the top of the mountain or the other side of the chasm, the yellow roadster went from one end of the road to the other, etc. Compare these with the sentences in 11:

11.
  - a. John climbed up the mountain (but halfway up he ran out of food and had to come down again).
  - b. John leapt over the chasm (but just as he did, he caught his foot on a branch and fell to his death).
  - c. A yellow roadster traveled on this road last night (but only as far as Centerville).

As the optional second clauses show, these sentences are perfectly consistent with incomplete or unsuccessful outcomes. The impossibility of adding similar clauses to the sentences in 10 is due to their 'achievement' sense. A similar example is discussed in Gruber (1965). He compares 12a and 12b:

12.
  - a. The pencil pierced through the cushion.
  - b. The pencil pierced the cushion through.

Gruber observes that while 12b implies that the pencil went all of the way through the cushion and came out on the other side, 12a is consistent with the pencil's only having gone part way into the cushion.

Many other verbs can appear in sentences differing with respect to the presumed completion of the activity referred to. Consider the pairs in 13:

13.
  - a.
    - i. John chewed his steak.
    - ii. John chewed on his steak.
  - b.
    - i. The student committee voted a strike.
    - ii. The student committee voted for a strike.
  - c.
    - i. The press secretary read his prepared speech.
    - ii. The press secretary read from his prepared speech.
  - d.
    - i. John painted Bill's portrait this morning.
    - ii. John painted on Bill's portrait this morning.
  - e.
    - i. John punched Bill.
    - ii. John punched at Bill.

The differences between the i and ii sentences here are rather parallel to those between 10 and 11 above: in 13a, i means that John chewed his whole steak, while ii only means that he tried; in 13b, i means that the strike motion was approved, while ii only means that the committee voted for it (though no one else may have, and it may thus have failed); in 13c, i means that the entire speech was read, while ii means only that at least some of the prepared remarks were delivered; 13d, i implies that the whole portrait was done this

structure level, the level which for Fillmore constitutes the input to the rules of semantic interpretation. Both Fillmore and Chomsky observe that 3a and 3b differ in that while 3b claims that the entire garden is full of bees, 3a asserts only that some part of the garden has bees in it. Fillmore wishes to attribute this to a 'focusing' difference – evidently a low level semantic/stylistic phenomenon, on a par with the topic/comment distinction, the notion of 'natural answer' to a question (as discussed in Chomsky, 1969), etc. Thus, he would seem to be assimilating this phenomenon to others which have been shown to be treated most adequately in terms of principles of interpretation of surface (or shallow) structure. It was observed by Chomsky, however, that regardless of how this difference is to be treated in the grammar, it cannot be in terms of surface structure, since the difference (which seems to reside in the choice of one term or another as subject) is no longer storable generally after certain transformations have applied:

4.
  - a. Bees are certain to be swarming in the garden.
  - b. Bees were believed to be swarming in the garden.
  - c. John believed bees to have been swarming in the garden.
  - d. It is in the garden that bees are swarming.
  - e. It is bees that are swarming in the garden.
  
5.
  - a. The garden is certain to be swarming with bees.
  - b. The garden was believed to be swarming with bees.
  - c. John believed the garden to be swarming with bees.
  - d. It is bees that the garden is swarming with.
  - e. It is the garden that is swarming with bees.

The sentences in 4, which are synonymous (in the relevant respect) with 3a, and those of 5, which are synonymous with 3b, have the subjects of 3a and 3b, respectively, in a wide variety of surface structure positions. Hence, it does not appear to be a matter of surface structure grammatical relations that is at issue here.

The so-called 'standard theory' (approximately that of Chomsky, 1965; Katz and Postal, 1964, and other works) requires that all of the information necessary to provide an adequate semantic interpretation of a sentence be present in deep (syntactic) structure; work of Katz (especially Katz, 1970) has attempted to refine the notion of what aspects of semantic representation the semantic theory in question should be held accountable for. A Katzian (i.e., standard) semantic component should provide information about those aspects of a sentence's meaning that are necessary to derive its logical properties, such as synonymy, antonymy, analyticity, contradiction, valid inferences, semantic anomaly and ambiguity, etc. Whatever the difference in

question between 3a and 3b (and also between 1a and 1b), it is clearly a matter for such a semantic theory, since this distinction can be responsible for the difference between contradictory and non-contradictory sentences:

6.
  - a. Bees are swarming in the garden, but most of the garden has no bees in it.
  - b.  $\nexists$  The garden is swarming with bees, but most of the garden has no bees in it.
  
7.
  - a. John smeared paint on the wall, but most of the wall didn't get any paint on it.
  - b.  $\nexists$  John smeared the wall with paint, but most of the wall didn't get any paint on it.

(where  $\nexists$  denotes a contradictory sentence)

Thus, according to the standard theory, this difference must be determinable from deep structure (which serves as input to the rules of semantic interpretation). The so-called 'revised standard theory' does in fact permit certain aspects of semantic interpretation to be determined on the basis of interpretive principles applying to derived structure (as suggested in Jackendoff, 1969, and other works); but any semantic property must be predictable from deep structure when the determination of this property involves grammatical relations. Only properties of a different sort – such as scope of logical and adverbial operators, co-reference relations, etc. – are exempted from this requirement. The evidence we have so far considered seems to indicate that grammatical relations do indeed play a role in determining the difference between, say, 3a and 3b. Since these are semantically distinct in a way essential to their logical structure, they must also be distinct in deep structure, according to the standard theory. Accordingly, if Fillmore's case representations, which are the same for 3a and 3b, are taken as the 'deep structure', this condition will not be met.

Since the property with which we are dealing seems to be a matter of whether the whole of something is affected by the action described by the sentence, or just a part of it is affected, let us coin the terms *holistic* interpretation and *partitive* interpretation to denote the difference. Thus, we say that the direct objects of 1b, 2b and 2c, and the subjects of 3b and sentences related to it in 5 receive a holistic interpretation. Evidently, holistic vs. partitive interpretation interacts in various ways with definiteness, genericness, plurality, etc. We are not interested in giving a precise account of the semantic structure of holistic interpretation; accordingly, we will allow these further issues to be swept under the rug for the time being. The distinction seems to be clear in definite NP's, and the examples to follow will make use of these.

morning, while 13d, ii may mean that some painting was done on a work in progress; and in 13e, i implies that John hit Bill, while ii may only mean that he took a wild swing.

We can observe that all of the above pairs differ in syntactic structure in the following way: while the range of the action appears as the syntactic direct object of the verb in the 'achievement' sentences, it appears obliquely as the object of a preposition in the 'activity' sentences. We could then relate this to the difference between 1a and 1b: when the verb allows a holistic interpretation, this is imposed on a range which appears as direct object, while a range appearing in some other relation to the verb is unspecified (and potentially partitive). We can then relate the difference between the achievement and activity senses of many verbs to the notion of holistic versus partitive senses of their associated ranges, a property assigned by general rules of interpretation. Naturally enough, the non-synonymy of 13a-e(i) with 13a-e(ii) argues against their derivation from the same underlying structure, at least at the level which is relevant for semantic interpretation, in case anyone was tempted to try.

What are some other properties of the level of representation on which the appropriate notion of direct object is defined? In the sentences above, we have shown that it precedes the application of transformations such as passive, subject-raising, object raising (or 'tough movement'), cleft sentence formation, etc. On the other hand, if there is a transformation relating 1a and 1b, it must follow this, since it is only after this has applied that we can assign holistic interpretation to *the wall* in 1b.

Let us consider another rule relating direct objects and prepositional phrases: the rule of indirect object movement. This rule is discussed in Fillmore (1965) and other places: it relates pairs of sentences like 14 and 15:

14. a. John gave a corsage to his girlfriend.  
b. John gave his girlfriend a corsage.
15. a. John carved a tombstone for his father.  
b. John carved his father a tombstone.

We ignore here the distinction between the operations relating 14 and 15 (i.e., the distinction between *to*-datives and *for*-datives). Transformational grammarians have generally assumed that either the *a* or the *b* forms are derived from the other, though it is not so easy to find arguments for which one is basic. The most telling one seems to be the fact that in derived nominals (which, as has recently been shown by Chomsky (1968) do not generally undergo transformational processes applying to sentences), only the form with *to* or *for* is possible:

16. a. John's gift of a corsage to his girlfriend (raised eyebrows all around).  
b. \*John's gift (of) his girlfriend (of) a corsage. . .  
c. John's purchase of a home for the orphans (was widely regarded as a tax dodge).  
d. \*John's purchase (of) the orphans (of) a home. . .

This fact would be accounted for simply by saying the expanded form (i.e., 14-15a) is basic to both sentence and NP structure, and that the dative movement rules do not apply to NP's.

Assuming, then, that the expanded forms (i.e., the *a* forms in 14 and 15) of sentences with datives serve as input to the rule(s) of dative movement, let us consider the relation of this rule to the problem of holistic interpretation. Consider 17 and 18:

17. a. I've just sent my money to my creditors.  
b. I've just sent my creditors my money.
18. a. I'm saving the cake for the orphans.  
b. I'm saving the orphans the cake.

These pairs seem synonymous with respect to the holistic/partitive distinction; that is, both sentences in 17 mean that all my money has been sent out, but are consistent with some of my creditors' not having gotten any; while both sentences in 18 mean that the whole cake is being saved, but are consistent with the outcome that some of the orphans don't get any. If we interpret the structures which are input to the dative rule for holistic/partitive, this will be exactly what we expect: the direct object is the same for each member of both pairs at this point. If we wait until after dative has applied, however, we predict a semantic difference between the members of the pairs 17 and 18 which does not in fact exist. Thus, the level of structure at which the holistic/partitive reading must be assigned is seen to precede dative movement.

What else can we say about the structures of sentences containing verbs subject to holistic object interpretation? Consider the sentences in 19-22:

19. a. John spread jelly on the sandwich.  
b. John spread the sandwich with jelly.
20. a. \*John covered jelly on the slice of bread.  
b. John covered the slice of bread with jelly.
21. a. John sprayed paint on the canvas.  
b. John sprayed the canvas with paint.

22. a. John threw paint on the canvas.  
b. \*John threw the canvas with paint.

We see that the verbs in 19 and 21, like those in 1 and 2, appear relatively freely in sentences where either of their two related NP's appears as direct object and the other as a prepositional phrase. If a transformation relates these two forms, as suggested by Hall, this would be expressed by saying they freely undergo the rule. If they are related to a common case structure, as Fillmore proposes, by the choice of one of two optional realization rules, they could be described as allowing either realization rule to apply. The sentences in 20 and 22, however, show that for some verbs only one form is possible: in the transformational solution, one would have to say that verbs like *cover* obligatorily undergo the rule, while verbs like *throw* obligatorily fail to undergo it. Similarly, in Fillmore's framework, each of these verbs is subject to only one of the two realization rules that can apply with verbs like *spread*, *spray*, *load*, *smear*, etc. In either case, this must be indicated as an idiosyncratic syntactic property of these verbs, unrelated (apparently) to anything else.

Now observe that the verbs we have been considering appear not only in the above structures with two NP adjuncts, but also in structures with only one:

23. a. John loaded the wagon (with hay).  
b. John loaded the hay (on the wagon).  
24. a. John littered the landscape (with gum wrappers).  
b. \*John littered the gum wrappers (on the landscape).  
25. a. \*John pitched the corner (with his books).  
b. John pitched his books (into the corner).

It will be seen that the question of *which* of the two possible NP adjuncts is optional for a particular verb is directly correlated with its behavior with respect to the (putative) transformation relating 1a and 1b. That is, verbs which appear in both types of structures can omit either type of adjunct, while those that appear only in one structure can also omit only one adjunct. Furthermore, the adjunct which is omitted has to be the one that would *not* wind up in direct object position after the transformation has applied (or failed to apply). Thus, in verbs which obligatorily undergo the rule, like *litter* in 24, the NP which would be transformed into a *with*-phrase can be present or not, but the one which would appear as direct object must appear; while in verbs like *pitch* in 25, the NP which appears in the directional expression is optional, but the NP which appears in direct object position is obligatory. Thus, the occurrence of one or the other of the possible adjuncts

of the verb without the other is directly correlated with its (possible) exceptional behavior with respect to the rule relating 1a and 1b.

In this connection, consider verbs taking indirect objects, like those in 14, 15, 17, and 18. In all of these cases, the indirect object phrase is optional, while the direct object phrase is obligatory. There are not, however, any verbs in English which *require* the presence of an indirect object, but for which the direct object (in underlying structure terms) is optional. This fact, together with all of the idiosyncracies of particular verbs with respect to the rule relating 1a to 1b noted above, can be expressed in a single unified statement made at a level of structure *after* 1a and 1b have been differentiated but before the dative movement rules have applied: all of these verbs appear freely in the frame [\_\_\_\_NP (PP)]. If semantic interpretation also takes place at this level, it is possible to state the idiosyncratic properties of verbs in a unified way: verbs like *load*, *smear*, *spray* have two possible interpretations of the following PP (one of which is consistent with the reading of a *with*-phrase, and the other of which is consistent with the reading of a pseudo-directional like *on the wall*), while those like *litter*, *cover* on the one hand, and *throw*, *pitch* on the other have only one possible interpretation of the PP which differs from one class to the other. The suggestion that verbs like *load*, etc. be treated as having two readings is of course further supported by the clear difference in sense between sentences like 2a and those like 2b and 2c, quite independent of the issue of holistic versus partitive readings.

Since the above analysis of subcategorization and selection restrictions of verbs taking two adjuncts shows that if they are stated at this level, it is unnecessary to make use of any transformational exception features to explain their behavior, it appears that the transformation relating 1a and 1b (or, in Fillmore's terms, the option of one or the other of two syntactic realization processes) can be dispensed with altogether. This is the only rule, apparently, which might plausibly be argued to apply *before* the level at which subcategorization and selection restrictions are stated; accordingly, it is only if this rule exists that it could be argued that the level of statement of these restrictions was not the appropriate input to the rules of the transformational component. We have thus demonstrated the coincidence of these two properties in a single level of representation: appropriateness as input to the transformational component, and appropriateness for the statement of subcategorization and selectional restrictions. In the standard theory, these properties define the syntactic level of deep structure.

But now notice that the level of deep structure we have arrived at (i.e., after 1a and 1b have been differentiated, but before indirect object sentences like 14 and 15 have been differentiated) is precisely the level we found we needed for the determination of the holistic/partitive interpretation of NP's,

an aspect of semantic interpretation which we argued earlier was determined by grammatical relations (in particular, by the relations of direct object, i.e. [NP, VP] in transitive sentences, and subject, i.e. [NP, S] in intransitive sentences). We have thereby shown that precisely the level of deep structure as defined in the standard theory is the appropriate level to serve as input to the rules of semantic interpretation in this case. If true, this is striking confirmation of the hypothesis about semantic interpretation made by the standard theory: the same level, a level appropriately defined by a context free phrase structure grammar, serves (a) as input to the transformational component; (b) for the statement of selectional and subcategorization restrictions; and (c) as input to the semantic component, at least insofar as that component makes reference to formally defined grammatical relations. The fairly subtle nature of the property in question makes this demonstration of particular interest.

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#### BIBLIOGRAPHY

- Chomsky, Noam: 1965, *Aspects of the Theory of Syntax*, MIT Press, Cambridge, Mass.  
 Chomsky, Noam: 1968, 'Remarks on Nominalizations', Unpublished Ms., MIT, Cambridge, Mass.  
 Chomsky, Noam: 1969, 'Deep Structure, Surface Structure, and Semantic Interpretation', Unpublished Ms., MIT, Cambridge, Mass.  
 Chomsky, Noam: 1970, 'Some Empirical Issues in the Theory of Transformational Grammar', Unpublished Ms., MIT, Cambridge, Mass.  
 Fillmore, Charles: 1965, *Indirect Object Constructions in English and the Ordering Transformations*, Mouton and Co., The Hague.  
 Fillmore, Charles: 1968, 'The Case for Case', in Bach and Harms (eds.), *Universals in Linguistic Theory*, Holt, Rinehart and Winston, New York.  
 Fraser, J. Bruce: 1969, 'A Note on the *Spray Paint Cases*', Unpublished Ms., Language Research Foundation.  
 Gruber, Jeffrey S.: 1965, *Studies in Lexical Relations*, Unpublished doctoral dissertation, MIT, Cambridge, Mass.  
 Hall, Barbara: 1965, *Subject and Object in Modern English*, Unpublished doctoral dissertation, MIT, Cambridge, Mass.  
 Katz, J. J.: 1970, *Semantic Theory*, Harper and Row, New York (forthcoming).  
 Katz, J. J. and Postal, Paul: 1964, *An Integrated Theory of Linguistic Descriptions*, MIT Press, Cambridge, Mass.

## A RECONSIDERATION OF DATIVE MOVEMENTS

Two well-known transformational relationships are the shifts of indirect objects with *to* and *for*.

- (1) Bill gave a book to Mary.
- (2) Bill gave Mary a book.
- (3) Bill bought a book for Mary.
- (4) Bill bought Mary a book.

To explain differences between the two processes, standard analyses of the dative, for example Fillmore (1965), generally postulate two similar dative movement rules, one of which applies to *to*-indirect objects, and the other which applies to *for*-indirect objects. In this paper we will show that this analysis can be improved somewhat within the framework of traditional transformational rules. However, not all difficulties can be eliminated in this way. In an effort to further improve the solution, we will show that, on independent grounds, constraints imposed by the hearer's perceptual strategy for interpreting sentences play a part in the unacceptability of certain constructions. These constraints will then be used to account for the remaining anomalies in the dative shift paradigms.

### 1. THE SYNTAX OF INDIRECT OBJECTS

Let us first try to arrive at the most general transformational solution for the indirect object shifts. For the purposes of exposition, we will assume that the underlying order of objects is *direct-indirect*, and that the dative movement rules permute the objects and delete the preposition of the indirect object. The alternative, that the opposite order holds in deep structure, and the preposition is inserted, or not deleted, just in case the permutation of objects takes place, is also essentially compatible with the arguments to be presented here. However, we will give some evidence that *to* and *for* are present in the deep structure and sometimes deleted (not inserted) by the dative movement transformations.

Given these assumptions, the customary statement of *to*-dative is (5).

- (5) X - V - NP - *to* - NP - Y  
     1  2  3   4   5   6  
     → 1 - 2 - 5 - 3 -  $\emptyset$  -  $\emptyset$  - 6