features is the worst possible solution, in that it represents an arbitrary bifurcation of the lexicon, and so every marked feature represents independent information. Interpreted another way, the use of exception features makes the claim that each exceptional lexical item must be learned individually. On the other hand, if the difference in grammatical behavior has something to do with the meaning of the items in question, then that is the best possible case, since the rule has only to refer to the properties already present—if the meaning of the item is learned, its behavior is known automatically.

Unfortunately, this latter case is also the least formalizable, since we often do not have a principled way of expressing the meaning. For the sake of stating a rule, however, it seems to me perfectly adequate to provisionally adopt an arbitrary feature, if we have clear intuitions about when this feature is present, and if it is fully understood that it has no life independent of the complete reading in which it is embedded.

Our investigation will be organized as follows: Chapter 2 introduces a formalism for expressing functional structure and defends it with respect to other current proposals. Chapter 3 is a detailed investigation of adverbs and adverbial phrases, a demonstration of the efficacy of a theory employing projection rules and syntactic distinctive features to capture generalizations. Chapters 4 and 5 are concerned with coreference. The former develops an interpretive theory of pronouns and reflexives; the latter extends this analysis to the deleted complement subject and explores its extensive consequences on the complement system as a whole. Chapter 6 discusses focus and presupposition, with a systematic semantic analysis of some intonation contours. Chapter 7 introduces the modal structure as a representation of specificity and extends it to several other phenomena. Chapter 8 is a detailed study of negation and its interaction with modal structure and focus and presupposition. Chapters 9 and 10 present conclusions and consequences of the proposed semantic theory for the transformational component.

CHAPTER TWO

Grammatical Relations and Functional Structure

2.1 The Semantic Insufficiency of Grammatical Relations

Chapter 1 claimed that one aspect of semantic representation, the functional structure, is determined on the basis of underlying phrase-markers, and that other aspects of readings are determined at other levels. In this chapter we will briefly sketch an approach to functional structure that will be of use in succeeding chapters.

The feature of underlying syntactic structure that presumably relates to functional structure is the system of ***grammatical relations,*** that is, the structural relations obtaining between verbs and the noun phrases, adjective phrases, prepositional phrases, and sentence complements that they strictly subcategorize. Much of the justification of transformations involves arguments about understood grammatical relations and their representation in deep structure. Yet the "natural" grammatical relations such as subject and object do not correspond in any simple fashion to the understood semantic relations. Consider these well-known examples:

(2.1) The door opened.
(2.2) Charlie opened the door.

(2.3) Fred bought some hashish from Reuben.
(2.4) Reuben sold some hashish to Fred.

In the traditional sense of grammatical relations, (2.1)–(2.4) have their underlying grammatical relations expressed in the surface as well; the sentences have undergone no movement transformations that would alter the underlying positions. But the grammatical relations do not express certain obvious semantic facts. *The* ***door*** has the same semantic function in (2.1) and (2.2), although it is the subject in one and the object in the other. In both (2.3) and (2.4) the relation between ***Fred*** and ***Reuben*** is *recipient-donor.* Yet in (2.3) Fred is subject and ***Reuben*** is in a prepositional phrase; and the reverse holds in (2.4).

The existence of numerous examples like (2.1)–(2.4) has led many grammarians to feel that something is seriously wrong with the traditional

notion of grammatical relations. Their feeling is substantiated in a theory of grammar which includes the strong form of the Katz-Postal Hypothesis. For if all semantic information is contained in deep structure, the "natural" deep structures of (2.1)–(2.4) cannot be the "real" deep structures. In the "real" deep structures, ***the door*** would occupy the same position in (2.1) and (2.2), and Fredand ***Reuben*** would occupy the same respective positions in (2.3) and (2.4).

If we assume the strong Katz-Postal Hypothesis, then, we are forced to give up the "natural" deep structures of (2.1)–(2.4) in favor of some more "abstract" representation. The original notion of deep structure as a representation of syntactic distributional patterns must thus be rejected in favor of a more semantically based conception.

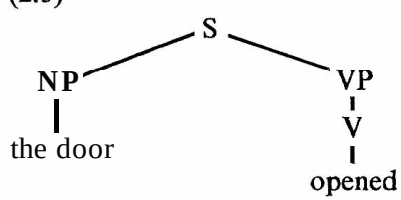
Alternatively, one could retain a notion of deep structure in the spirit of ***Syntactic Structures,*** adopting the "natural" deep structures for (2.1)–(2.4), and give up the strong Katz-Postal Hypothesis. Thus deep structures and semantic representations will not be isomorphic; we will have to find a mapping relating them. The problem, then, is to decide which of these alternatives to choose in order to arrive at an adequate description of (2.1)–(2.4).

There have been two rather different lines of approach within the constraints of the strong Katz-Postal Hypothesis. One approach, proposed in Lakoff (1971) and taken up and developed by the generative semanticists, is to break off parts of the semantic reading and express them as higher pro-verbs that must eventually be deleted. For example, the similarity of (2.1) and (2.2) would be represented by the deep structures (2.5) and (2.6).

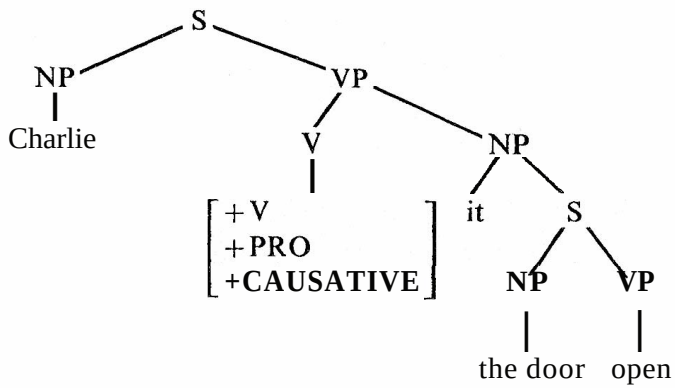
In (2.6), a transformation raises ***open*** into the position of the causative pro-verb, leaving no trace of the pro-verb; then various nodes are deleted, leaving the "natural" surface structure for (2.2). The presence of the clause ***the door open*** in (2.5) and (2.6) explains the semantic relation between (2.1) and (2.2).

A number of objections can be made to this approach, mostly concerned with the nature of the proposed pro-verbs. First, it should be noticed that it is a substantial increase of power in the syntax to allow lexical items which never appear in the surface, and which always must be deleted by a particular transformation (which in turn is used only to delete pro-verbs). Lakoff presents other, more precedented, cases of lexical items which must undergo particular transformations, then proposes a formalism to handle them called a ***positive absolute exception.*** But in each of these other cases,

(2.5)



(2.6)



two other conditions hold: the lexical items do not delete, and the transformations they must undergo also apply to other lexical items, optionally. Hence these cases differ significantly from the hypothetical pro-verbs. In applying the notion of positive absolute exception to hypothetical pro-verbs, Lakoff shows that he has chosen a device far more powerful than is necessary to handle his original data. (For discussion of Lakoff's other examples of positive absolute exceptions, see section 5.9.) This is the kind of power the Extended Lexical Hypothesis seeks to exclude.

One might attempt to meet this objection in part by claiming that the main verb in (2.6) is not a hypothetical pro-verb, but the real verb ***cause*** (or ***bring about).*** It would thus be claimed that ***Charlie opened the door*** and ***Charlie caused the door to open*** have the same deep structure, that is, are synonymous. But this cannot in general be the case. (This point is due to Katz, among others.) In (2.7) and (2.8), ***drop*** has a paradigm similar to ***open***:

(2.7) The glass dropped to the floor.
(2.8) Floyd dropped the glass to the floor.

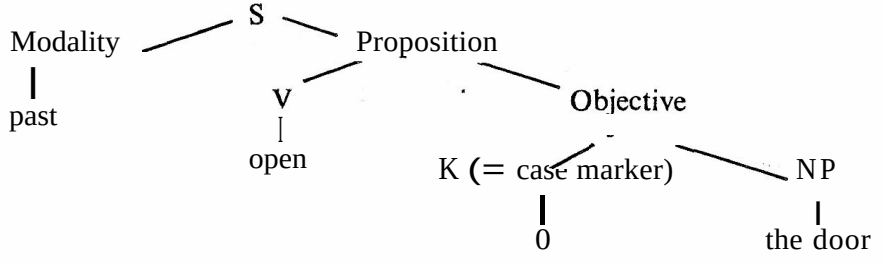
Thus we would incorrectly predict that (2.9) and (2.10) are synonymous:

(2.9) Floyd caused the glass to drop to the floor by tickling Sally, who was holding it.
(2.10) "Floyd dropped the glass to the floor by tickling Sally, who was holding it.

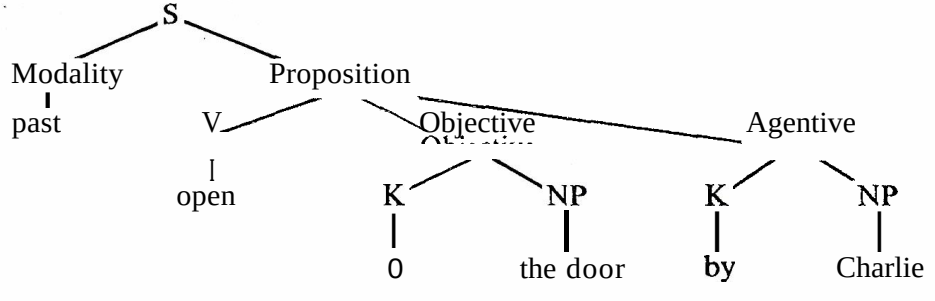
The causation implied in (2.2) and (2.8) is of a more direct nature than seems to be expressible by any verb in English. Therefore it cannot be due to the deletion of any real item; the verb must be the hypothetical form that Lakoff posits, and the original objection stands (see Jerry Fodor 1970 for' other relevant points).

Another way of expressing the semantic relations of (2.1)–(2.4) in deep structure has been discussed by Fillmore (1968); a somewhat different version of the same theory is given in Matthews (1968). Instead of expanding deep structures of sentences into additional clauses, Fillmore puts more deep structure information into the clause itself, in the form of a system of case relations. The deep structures of (2.1) and (2.2) are (2.11) and (2.12), respectively.

(2.11)



(2.12)



The surface forms are created by transformations which move exactly one NP into subject position and delete its case marker. The semantic similarity of (2.1) and (2.2) is expressed in the case relations; the surface disparity is explained by the application of the transformations that create subjects. As in Lakoff's approach, the traditional notion of underlying grammatical relations is of no importance.

Fillmore's approach makes the interesting claim that there is a relatively small class of case relations, and that they are universal. One extremely interesting question that it poses, then, is what the right case relations are for expressing the observed semantic and syntactic generalizations.

I will propose here a third way of accounting for (2.1)–(2.4). It is based on a system of semantic relations developed by Jeffrey S. Gruber in his dissertation and other work (Gruber 1965, 1967a). This system of semantic relations looks superficially like a possible realization of Fillmore's case system. However, section 2.3 will demonstrate that they differ in an important way, and that Gruber's system is preferable. In section 2.4 we will relate this system to deep structure by developing a general framework for the lexical entries of verbs and for deep structure projection rules. Section 2.5 will show that this system enables us to make some interesting predictions about the applicability of the passive transformation.

2.2 Thematic Relations

The fundamental semantic notion in Gruber's analysis is the ***Theme*** of a sentence. The centrality of the Theme accounts for the term ***thematic relations*** with which I will refer to the entire system. (The term is due to Richard Stanley.) In every sentence there is a noun phrase functioning as Theme. Gruber does not give totally explicit criteria for determining in every sentence which NP is the Theme, but some overall considerations emerge from his work.

With verbs of motion the Theme is defined as the NP understood as undergoing the motion.

(2.13) The rock moved away.
(2.14) John rolled the rock from the dump to the house.
(2.15) Bill forced the rock into the hole.
(2.16) Harry gave the book away.
(2.17) Will inherited a million dollars.
(2.18) Charlie bought the lamp from Max.
(2.19) Dave explained the;roof to his students.

In the first three examples, involving physical motion, the rock is obviously the Theme. Note that depending on the main verb and the presence of other NPs, the Theme can be either subject or direct object. The other four examples illustrate nonconcrete types of motion, to which the definition of Theme is extended by analogy. The book, a million dollars, and the *lamp* are Themes undergoing change in possession rather than physical position. *The proof*, or rather information about it, is undergoing change in some sort of abstract position. This last kind of motion is the least conceptually transparent, but it is important because it will be of great interest in subsequent discussion here (see sections 2.5 and 4.11).

With verbs of location, the Theme is defined as the NP whose location is being asserted:

(2.20) The rock stood in the corner.
(2.21) John clung to the window sill.
(2.22) Herman kept the book on the shelf.
(2.23) Herman kept the book.
(2.24) The book belongs to Herman.
(2.25) Max owns the book.
(2.26) Max knows the answer.

In (2.20)–(2.22), we are dealing with physical location, and the rock, John and the book are Theme. (2.23)–(2.25) involve possessional location, and the book is Theme in each case.[1] (2.26) is an abstract analogue of possession, so the answer is Theme.

An important principle for the extension of the notion Theme to abstract verbs is that when a verb can be used to express motion or location in different domains, the Theme occupies the same syntactic position. For example, kept in (2.22) expresses physical location, and in (2.23) possessional location, but the book is Theme in both cases. This principle follows from the belief that a verb is fundamentally the same in its different uses. A large number of such correspondences are discussed in Gruber's thesis.

A further principle that emerges from Gruber's work is that the Themes of morphologically related words are in semantically parallel positions. For example, consider the following two sentences:

[1] **There is not time in the present discussion to motivate the analogy of possessional to physical location in these examples. Gruber goes through a lengthy discussion (1965, Chapter 4) to establish such an analysis, based on correspondences in prepositional patterns.**

(2.27) The circle contains the dot.
(2.28) The dot is contained in the circle.

In (2.27) it is not clear which NP is the Theme and which is the Location. But (2.28) has the preposition in, an unmistakable mark of a Location phrase, so the dot must be Theme. Therefore we conclude that the dot is the Theme in (2.27). Arguments similar to this are used throughout Gruber's work.

Besides the Theme, Gruber works with several other thematic relations. I will discuss only four more here. The first three of these are the expressions of Location, Source, and Goal. Location is defined as the thematic relation associated with the NP expressing the location, in a sentence with a verb of location. It is often, but not always in a PP: (2.20), (2.21), (2.22), and (2.24) have a preposition, and (2.23) (Herman), (2.25), and (2.26) (Max) have none. Adjectives can function as abstract locations, as if they meant "in the abstract domain (of 'quality space') containing those things which are Adj." For example, stay can express either a physical or an abstract location:

(2.29) John stayed in the room.
(2.30) John stayed angry.

Corresponding to Location with verbs of location, we have the thematic relations Source and Goal with verbs of motion. Like Location, these are often expressed with a PP, but not always. Consider again (2.13)–(2.19). The dump in (2.14) and Max in (2.18) are clearly expressions of Source. The house in (2.14), the hole in (2.15), and his students in (2.19) are expressions of Goal marked by a PP. Away in (2.13) and (2.16) is analyzed by Gruber (section 5.3) to mean something like "to another place," so that it is also an expression of Goal. Will in (2.17) and Charlie in (2.18) are expressions of Goal in subject position. As with abstract Location, abstract Source and Goal may also be filled by an adjective: compare the following examples:

(2.31) George got to Philadelphia.
(2.32) George got angry.
(2.33) Harry went from Bloomington to Boston.
(2.34) Harry went from elated to depressed.

The last thematic relation I will discuss is Agent. The Agent NP is identified by a semantic reading which attributes to the NP will or volition toward the action expressed by the sentence. Hence only animate NPs can function as Agents (or perhaps the other way around, i.e. the semantic relation "potential agent" is a defining criterion for the feature *+animate).* The Agent is generally in the subject, but the subject can simultaneously bear other thematic relations. For example, in *(2.13)* there is no Agent, but if we change *the rock* to *John,* there is a reading in which John deliberately moved away, so *John* is functioning both as Agent and Theme. In (2.14), *John* is only the Agent, and in (2.15), *Bill,* since in both cases it is *the rock* that moves, that is, is Theme. In *(2.16)* and possibly *(2.19)* the subject is functioning as both Source and Agent, whereas in *(2.18)* the subject is Goal and Agent. In *(2.17)* however, there is no Agent: an act of volition is not being attributed to Will since one cannot say, for example, *Will inherited the money intentionally.* Gruber notes, by the way, that "causative" sentences are sentences like (2.14), where the subject is only Agent.

The presence of an Agentive subject correlates in part with the possibility of using purposive constructions like *in order to* and *so that* and purposive adverbials like *intentionally, accidentally,* or *on purpose.*

(2.35) "The rock deliberately rolled down the hill.
(2.36) John deliberately rolled down the hill.

(2.37) *John received the book from Bill in order to read it.
(2.38) John took the book from Bill in order to read it.

(2.39) ?John lost the money so that he could get sympathy.
(2.40) John gave the money away so that he could win his friends' admiration.

(2.41) ?John intentionally struck Bill as funny.
(2.42) John intentionally made Bill think of him as funny.

The first two of these examples show the difference between an inanimate object acting as Theme only and an animate subject functioning both as Theme and Agent. *(2.37)* is an example of an animate subject which is not an Agent. Contrast this with (2.38), which expresses the same semantic content but with the added proviso that the subject is Agent, permitting the *in order to* phrase. *(2.39)* and *(2.40)* form a similar pair. Finally, *(2.41)* is a type of example we will return to in sections *2.5* and *4.11* ; the inappropriateness of the adverb indicates that the subject is not an Agent. In (2.42),

however, the volition on John's part is expressed explicitly, and so the adverb is permissible.

Likewise, imperatives are permissible only for Agent subjects:

(2.43) *Receive the book from Bill.
?Lose the money.
?Strike Bill as funny.

This follows naturally from the fact that the possibility of successfully carrying out an order depends on the order requiring volition (i.e. agenthood) on the part of the hearer.

The *lack* of an Agent subject in a sentence generally correlates with the possibility of embedding it as a gerund under such verbs as *resent* and *accept*:

(2.44) John resented { inheriting the money. / *hitting Bill. / having to hit Bill. }

Obviously, I am only giving a skeleton of Gruber's lengthy analysis.

One might well ask in what sense this system of thematic relations is more than a way of describing certain facts about semantic interpretations and the distribution of prepositions. From what has been said so far, there is little evidence that some other set of relations cannot do just as well. There are two reasons, however, why I think this system is of more than usual theoretical interest. First, it provides a way of unifying various uses of the same morphological verb. One does not, for example, have to say that the *keep* in *Herman kept the book on the shelf* and *Herman kept the book* are different verbs; rather one can say that *keep* is a single verb, indifferent with respect to positional and possessional location. Thus Gruber's system is capable of expressing not only the semantic data, but some important generalizations in the lexicon.

A second reason to prefer Gruber's system of thematic relations to other possible systems will become apparent in section *2.5* and in Chapters *4* and *5.* It turns out that some very crucial generalizations about the distribution of reflexives, the possibility of performing the passive, and the position of antecedents for deleted complement subjects can be stated quite naturally in terms of thematic relations. These generalizations have no a priori connection with thematic relations, and in fact radically different solutions,

such as Postal's Crossover Condition and Rosenbaum's Distance Principle, have been proposed in the literature. It will be shown, however, that a solution involving thematic relations is more satisfactory. The fact that they are of crucial use in describing independent aspects of the language is strong indication of their validity.

2.3 Thematic Relations vs. Case Grammar

Can thematic relations be thought of as simply one possible set of cases for a case grammar of Fillmore's type? It seems to me that there is one crucial difference between the two that makes this impossible; this difference argues that case grammar cannot be altogether correct.

In proposals on case grammar with which I am familiar, the deep structures differ from surface structures in word order and in the addition of case nodes and case markers. However, the number of noun phrases in the deep and surface structures is the same: each surface structure noun phrase is assumed to have exactly one deep structure case. On the other hand, in Gruber's system of thematic relations, noun phrases can function in more than one thematic role within the same sentence. For example, in (2.45), the rock is Theme; the semantic similarity of Max's action in (2.46) shows that Max is also Theme.

(2.45) The rock rolled down the hill.
(2.46) Max rolled down the hill.

However, (2.46) is ambiguous. On one reading Max may be asleep and not even be aware of his motion. On the other reading he is rolling under his own volition; for this reading he must be an Agent. However, to say simply that the ambiguity of (2.46) is between the two functions Theme and Agent misses the fact that on the Agent reading, Max still undergoes the motion implied by the Theme reading. Therefore the similarity between the two readings can be captured only if we allow Max to be both Theme and Agent on the second reading. The only way to express this in a case grammar would be to introduce Max in two different places in deep structure, once under each case, then add a transformation to delete one of them—obviously an undesirable complication of the grammar.

Or consider the pair of verbs buy and sell.

(2.3) Fred bought some hashish from Reuben.
(2.4) Reuben sold some hashish to Fred.

On one hand, there is a similarity in the action in these two sentences: the hashish is passing from Reuben's possession to Fred's. This can be expressed by saying that some hashish is Theme, Reuben is Source, and Fred is Goal in both sentences. On the other hand, the sentences differ with respect to who is designated as taking initiative — Fredin (2.3) and Reuben in (2.4). To see this, append onpurpose to both sentences. Note especially that if Fredis moved into surface subject position by the passive applying to (2.4), onpurpose still applies to Reuben, if the sentence is acceptable at all.

(2.47) Fred was sold some hashish by Reuben on purpose.

These facts can be captured by specifying that with both buy and sell, the subject is Agent, but with buy it is also Goal and with sell it is also Source. There is no convenient way in a case grammar to simultaneously express the reciprocity of the Source-Goal patterns and the Agent status of the subject.

To show that Agent is not the only relation which can combine with others, we turn to a more complicated example, which involves some semantic relations not discussed by Gruber. Consider the verb trade, which takes a direct object, an optional phrase with to, and an obligatory phrase withfor.

(2.48) Esau traded his birthright (to Jacob) for a mess of pottage.

This sentence describes two related actions. The first is the change of hands of the birthright from Esau to Jacob. The direct object is Theme, the subject is Source, and the to-object is Goal. Also there is what I will call the secondary action, the changing of hands of the mess of pottage in the other direction. In this action, thefor-phrase is Secondary Theme, the subject is Secondary Goal, and the to-phrase is Secondary Source.

Thefor-phrase indicating Secondary Theme is not restricted to the verb trade. It appears as an optional element in the complements of, for example, *buy*, sell, and pay.

(2.49) Harriet bought a pig from Zelda for $5.98.
(2.50) Zelda sold a pig to Harriet for $5.98.
(2.51) Harriet paid $5.98 to Zelda for a pig.

All of these sentences describe the same transaction. They differ in which of the transfers is primary and which is secondary, as well as in the identity of

the Agent, which we have already discussed. With buy and sell the transfer of the pig is primary; with pay the transfer of money. There does not seem to be a verb in English expressing a transaction in which the transfer of money is primary and the person receiving the money is Agent. Collect might be close.

(2.52) The agency collected $79.50 from Max for back taxes.

Rent is interesting in that the transfer of the thing being rented is primary and the transfer of money is secondary, but the direction of the transfer is left open. The direction of the secondary action is, as usual, opposite to the primary action.[2]

(2.53) Max rented an apartment to Harry for $1.97 a month.
(2.54) Harry rented an apartment from Max for $197 a month.

Any adequate semantic representation must express secondary actions, since they are indeed part of the meaning, and important semantic differences between verbs hinge on them. But when there is a secondary action, the primary Source is also the Secondary Goal, and the primary Goal is the Secondary Source. A theory of case grammar in which each noun phrase has exactly one semantic function in deep structure therefore cannot provide deep structures which satisfy the strong Katz-Postal Hypothesis, that is, which provide all semantic information about the sentence. Since the motive for adopting case grammar as a theory of deep structure is to enable deep structures to satisfy the strong Katz-Postal Hypothesis, its plausibility is weakened by these examples.

2.4 Correlating Thematic Relations with Deep Structure

Section 2.3 showed that the strong Katz-Postal Hypothesis cannot be implemented without considerably increasing the power of transformations

[2]One might speculate on another possible use of thefor-phrase of Secondary Theme. A well-known problem has been to characterize the difference between ask a question and ask for a book. If we recognize thisfor-phrase as a Secondary Theme, we see that the primary action expressed by ask is always verbal, just as with say and *tell*. But unlike say and tell, a secondary action can be implied, an action in which something returns to the speaker. What is peculiar about ask, in comparison with the other verbs with secondary actions we have discussed, is that it can express overtly only one of the Themes at a time.

and at the same time losing generalizations about syntactic distribution. Therefore there is little reason for trying to implement thematic relations in deep structure by some enlargement of the theory of case grammar, unless there is considerable syntactic evidence that such a step is necessary. Much of the purely syntactic evidence for case grammar comes from the analysis of surface case inflections. Surely it would be an important generalization if the surface cases in some way mirrored the deep cases. Since I am not making any proposals at all on how to handle inflectional morphology in the theory proposed here, this particular advantage of case grammar must stand unchallenged.

On the other hand, the deep structures used in case grammar are sufficiently different from surface structures to require careful consideration. The particular point open to question is the claim that surface subjects always must arise through the application of transformations. For English there would be a number of different transformations that move NPs into subject position from case positions in the Proposition constituent. Thus grammars incorporating case grammar-type deep structures violate Emonds's structure-preserving constraint (see section 1.4). The movement of NPs into subject position cannot take place unless an NP node in subject position can occur in deep structure, which is exactly what case grammar denies. If something like Emonds's constraint proves useful in otherwise constraining transformations in the correct way, we should be suspicious of case-grammar deep structures.

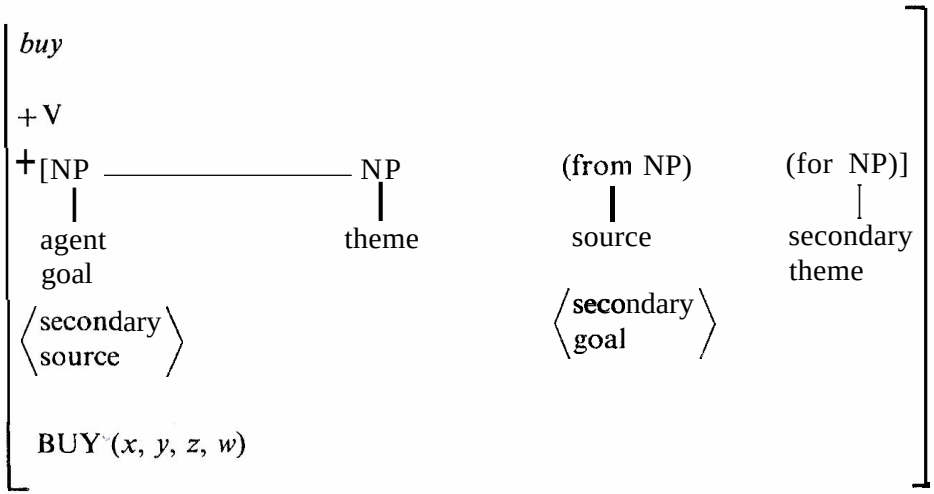
Since we are not adopting the strong Katz-Postal Hypothesis here, semantic considerations do not force us into adopting a case grammar formulation of deep structure. Instead we will choose a more traditional deep structure, in an effort to constrain the transformational component as much as possible. The base rules are then to be conceived of, in the spirit of Syntactic Structures, as describing "basic" sentence forms in the language, while the transformations describe the distortions applicable to these forms.

It will be left to the semantic component to derive the thematic relations of a sentence from the deep structure. Clearly the verb of the sentence is what determines the relationship: the lexical entry of a verb must correlate grammatical and thematic relations. For a first approximation, the strict subcategorization features of the verb can effect this correlation. For example, given the representation (2.55) for the general form of lexical items,

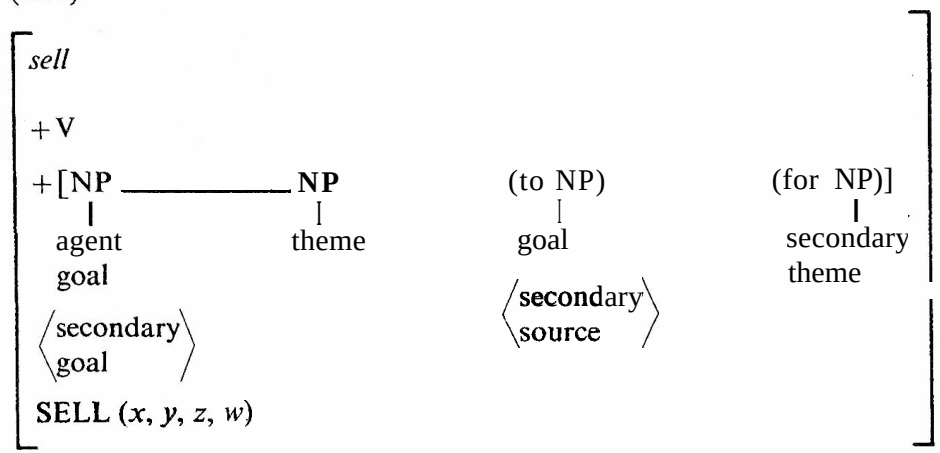
(2.55) [*phonological properties*
syntactic properties
SEMANTIC PROPERTIES]

(2.56) and (2.57) could be the entries for ***buy*** and *sell*.[3]

(2.56)



(2.57)



[3]The angled brackets ⟨ ⟩ in *(2.56)–(2.57)* denote co-occurring portions of the semantic interpretation: in *(2.56)* for example, the subject NP is Secondary Source and the from-phrase is Secondary Goal in case the for-phrase is present.

This first approximation gives us the thematic relations from the deep structure position, but nothing else. It does not show that the thematic relations play an integral part in the semantic relationship between ***buy*** and ***sell.***

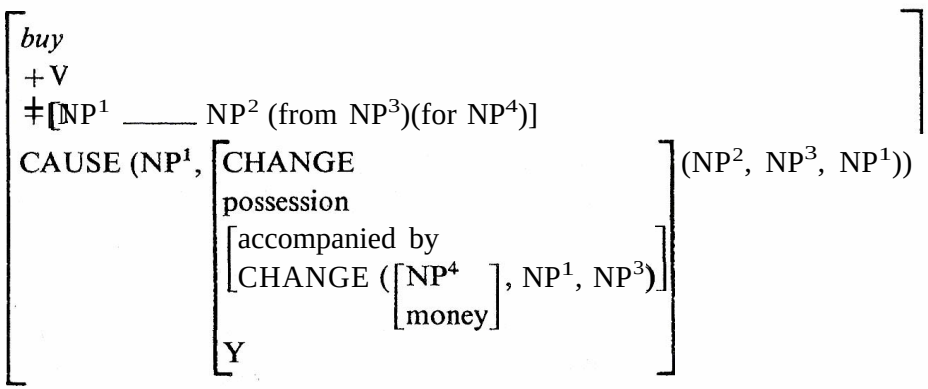
The two semantic functions that are relevant for the present discussion can be referred to as CAUSE and CHANGE. CAUSE will be a semantic function that takes two arguments, an individual and an event; its meanir will be that the individual causes the event, in the special direct sense of "cause" which is not accurately conveyed by the lexical item ***cause.*** We may be able to regard CAUSE as a universal possible constituent of semantic readings, and quite possibly as a semantic primitive. CHANGE takes three arguments, an individual, an initial state, and a final state; presumably it will also be semantically primitiye. By expressing these concepts as purely semantic functions, we can avoid any commitment as to whether there should be a lexical item carrying their particular meanings.

The thematic relations can now be defined in terms of these semantic subfunctions. Agent is the argument of CAUSE that is an individual; Theme is the argument of CHANGE that is an individual; Source and Goal are the initial and final state arguments of CHANGE. Location will be defined in terms of a further semantic function BE that takes an individual (the Theme) and a state (the Location).

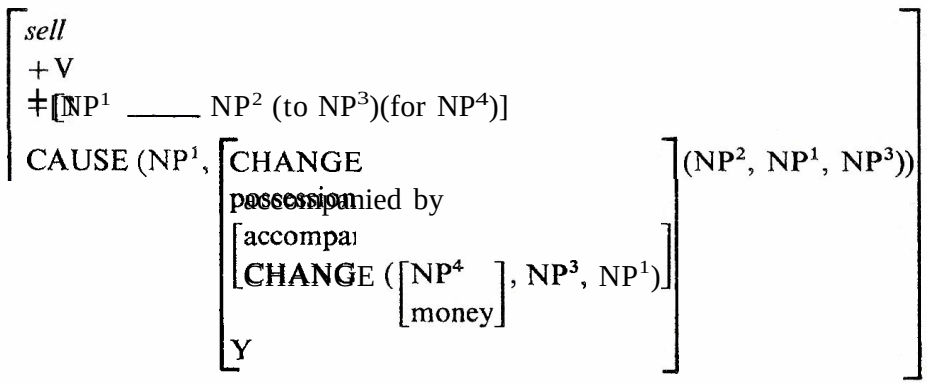
Of course, these three semantic functions alone are insufficient to characterize the semantic readings of verbs. For example, CHANGE can have other semantic information added on to restrict the nature of the change to locational, possessional, or abstract. More precise information as to manner, for instance the difference between ***break*** and ***smash,*** can also be specified in terms of additional semantic specification on the subfunctions Presumably, the projection rules incorporate the readings of constituents like manner adverbs into the readings of sentences by attaching them as additional specifications of some semantic function, without disturbing th embeddings of functions and arguments. This would explain the semantic similarity of, for example, ***smash*** and ***break violently*** (see section 3.7). Perhaps instrumental phrases are incorporated as modifications of CAUSE; this would account for their relationship to Agent phrases (cf. Chapter 8 of Gruber 1965 for extensive documentation of this relationshi

Given this conception of a lexical item's semantic reading, the similarity of ***buy*** and ***sell*** might be expressed more accurately with these approximations to their lexical structure:

(2.58)



(2.59)



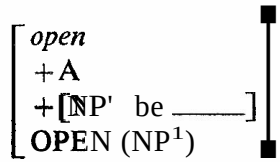
The superscripts in the strict subcategorization feature correlate with those in the semantic representation so that semantic functions can be properly derived from grammatical relations. The fact that a grammatical argument can appear more than once as a semantic argument accounts for the possible multiplicity of thematic relations associated with a particular syntactic position. If an optional syntactic position is not filled, the projection rules will fill its semantic position automatically with an indefinite reference. If an obligatory syntactic position is not filled, a well-formed reading cannot be generated.

I have somewhat arbitrarily chosen to represent the secondary action as a condition modifying CHANGE of the primary action. The selectional restriction on NP4 is represented, again arbitrarily, by the expression "money" beneath NP4; it is to be regarded as a presupposition about NP4

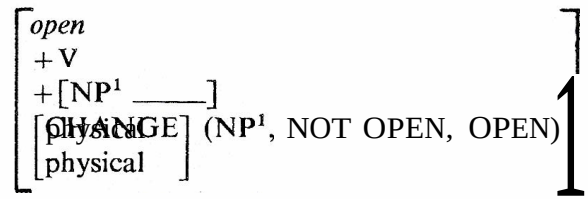
placed on it by the verbs buy and *sell*, which *trade* (for example) does not put on its secondary theme. Y represents simply any semantic residue that has not yet been expressed; presumably it will be more or less the same for buy and *sell*.

The lexical entries for open as an adjective, as an intransitive verb, and a a transitive verb can be represented as (2.60)–(2.62), respectively.

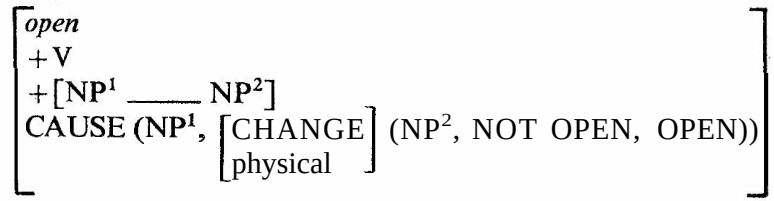
(2.60)



(2.61)



(2.62)



The semantic information represented here as OPEN will of course be more enlighteningly specified in a real lexical entry. Redundancy rules in the lexicon will make the amount of independent information in the lexico less than if (2.61) and (2.62) were entirely different from each other and from (2.60).

This approach to the structure of lexical entries is not particularly novel the actual semantic representations resemble Gruber's "pre-lexical" structure, the lexical entries of Katz (1966), and the deep structures of generative semantics. The projection rules for relating deep structure to func-

tional structure are not especially complex; since the lexical entries make all the important decisions, a simple algorithm referring to superscripts of arguments can construct a semantic representation from deep structure. For example, in Charlie opened a pistachio nut, Charlie is identified as NP^1 and a pistachio nut as NP^2 in the strict subcategorization feature of (2.62). The projection rule therefore substitutes the interpretations of Charlie and a pistachio nut for NP^1 and NP^2, respectively, in the semantic interpretation of (2.62) in order to form the functional structure (2.63) for the sentence.

(2.63) CAUSE (CHARLIE, $\begin{bmatrix}\text{CHANGE}\\ \text{physical state}\end{bmatrix}$ (A PISTACHIO NUT, NOT' OPEN, OPEN))

Such a simple process can hardly be cause for worry about excessively complicating the semantic component.

Likewise, the considerations that motivated the choice of the form of (2.58)–(2.62) for lexical entries are not new: the conclusion that syntactic and semantic generality cannot both be captured by a single level of deep structure has been the motivation for generative semantics and case grammar. Where we differ from these two schools of thought is in trying to preserve the traditional notion of deep structure for the sake of syntactic generality, and in trying to state the semantic generalizations directly at the semantic level, independent of deep structure considerations.

Of course, the material presented here should be considered as only a crude sketch of this section of the grammar. In addition to the need for more specific and highly structured semantic representations, there are at least two important mechanisms that must be built in. The first is a set of rules describing generalities among the lexical correlations of thematic and grammatical relations. For example, Agents are invariably found in subject position. The apparent solution in our framework would be to state a redundancy rule in the lexicon that would make lexical items contain less independent information if they conform to such generalizations. The redundancy could be expressed in terms of not needing to specify superscripts in the lexical entry. The other mechanism needed is a consistent way of handling prepositions in some way conceptually parallel to Gruber's (which we have not discussed here). More specifically, one would sometimes like to be able to avoid stating the permitted prepositions in the

subcategorization of the verb, allowing the meaning of the preposition itself to specify whether the phrase in question is a Source or a Goal or an Instrument. For example, the meaning of away should tell the grammar that it is a possible expression of Goal, without listing away as a possible complement of every verb taking a Goal. For another example, *put* subcategorizes a locative phrase, but many different prepositions are possible. The formalism I have given does not have a way to take into account the meaning of the preposition.

These shortcomings aside, this approach seems to me to be able to reflect the insights about functional structure discussed in the literature on case grammar and generative semantics without having to put deep structures in a form only remotely related to the surface. The more conservative deep structures permit us to state heavier restrictions on transformations, and the projection rules required are relatively trivial. Moreover, the internal structure of lexical entries does not seem any more complex than would be required in the other theories. Thus it appears that this approach may permit an overall reduction in the class of possible grammars, without any loss of generality.

2.5 The Thematic Hierarchy Condition

Set up the following hierarchy of thematic relations:

(2.64) (The Thematic Hierarchy)
1. Agent
2. Location, Source, Goal
3. Theme

The following condition seems to hold on the application of the passive transformation:

(2.65) (Thematic Hierarchy Condition)
The passive by-phrase must be higher on the Thematic Hierarchy than the derived subject.

Exactly how (2.65) is applied to a derivation will be discussed in a moment. Let us first verify its claim.

First, consider sentences with verbs that optionally mark the subject as Agent. Take, for example, touch or hit, which mark Theme in the subject

and Location or Goal in the object, but only optionally mark Agent in the subject.

(2.66) John was touching the bookcase.
(2.67) John hit the car with a crash.

(2.66) and (2.67) are ambiguous between an agentive and nonagentive reading of John. However, let us form the passives of (2.66)–(2.67).

(2.68) The bookcase was being touched by John.
(2.69) The car was hit by John (?with a crash).

Only the agentive readings are present in (2.68)–(2.69). The absence of the nonagentive reading is predicted by the Thematic Hierarchy Condition: if John were only Theme, it would be lower on the hierarchy than the derived subject, which is Location or Goal. However, if John is also Agent, it bears a thematic relation higher than that of the derived subject, so an acceptable passive can be produced.

Next consider verbs of measurement, whose inability to undergo the passive has been remarked upon many times.

(2.70) *Five dollars are cost by the book.
(2.71) *Two hundred pounds are weighed by Bill.

With these verbs, the measure phrase is an expression of Location on the scale of value being measured. The (deep) subject is Theme, and the sentence specifies its location on the scale denoted by the measure phrase. This analysis is confirmed by the use of the locational preposition at with measure phrases in expressions like (2.72)–(2.73).

(2.72) The champ weighed in at 654 pounds.
(2.73) I wouldn't buy oranges at 25 cents apiece.

Also note the use of the locational words high and *low* to refer to relative measures. Given this thematic analysis of verbs of measurement, observe that the (2.70)–(2.71) violate the Thematic Hierarchy Condition: the *by*-phrase, being Theme, is lower on the hierarchy than the derived subject, which is Location.

Finally consider so-called psychological predicates, such as impress, strike, and regard.

(2.74) Bill {strikes / impresses} Harry as pompous.
(2.75) Harry regards Bill as pompous.

The adjective, functioning as an abstract Location, is attributed to the subject in (2.74) and to the object in (2.75). This means that the subject is Theme with strike and impress, but the object is Theme with regard. Further, (2.74) has the alternative form (2.76):

(2.76) Harry is {striking / impressive} to Bill.

The presence of to here shows that the object of strike and impress is a Goal. From the semantic parallelism of (2.74) and (2.75), we can infer that the subject of *regard* is also a Goal.

Now notice what this thematic analysis predicts about the passives of these verbs. Regard should passivize, since the by-phrase will be Goal and the derived subject Theme, meeting the Thematic Hierarchy Condition. But strike and impress should not, since the by-phrase will be Theme and the derived subject Goal. And this prediction is borne out:

(2.77) "Harry is {struck / impressed} by Bill as pompous.
(2.78) Bill is regarded by Harry as pompous.

We see then that three apparently unrelated exceptions to the passive can be united under the generalization expressed by the Thematic Hierarchy Condition. There are three possible ways in which this condition could be applied within the grammar. The first incorporates the condition as part of the passive transformation, specifying the Thematic Hierarchy within the structural description that must be met before the rule can apply. The second uses the Thematic Hierarchy Condition as a redundancy rule in the lexicon, marking exceptions to the passive on the basis of thematic relations expressed in a verb's lexical entry. The third claims that the passive transformation has various effects on semantic interpretation, one of which

is the assertion that the Thematic Hierarchy Condition holds; if a passive sentence violates the THC, its interpretation will then make contrary claims about thematic relations and hence it will be ill-formed.

While the first of these solutions appears the least problematic, it is inconsistent with the theory of grammar we are pursuing here, in that it permits semantic factors to be mentioned in the structural description of a transformation. Were this permitted in general, grammatical theory would be far less constrained than it is in the theory that transformations can mention only syntactic conditions. The second solution is straightforward but ad hoc; we are trying to eliminate exception features from the lexicon whenever possible. Exceptions automatically specified by a redundancy rule are nevertheless exceptions and to be avoided.

There remains the third solution, which unfortunately is so vague at this point as to be virtually untestable. However, a certain amount of evidence for it will appear in later chapters. The strongest piece of evidence (section 4.10) is that another Thematic Hierarchy Condition governs the distribution of reflexive pronouns in a way that cannot be expressed as a condition on transformations or as lexical exceptions, but only as a well-formedness condition on interpretations. If the two Thematic Hierarchy Conditions are to be related, they must be expressed in the same part of the grammar. Only the third solution leaves this possibility open. Weaker evidence for the third solution arises in sections 3.10 and 8.8, where it is shown that certain exceptions to subject-aux inversion can be expressed only in terms of a solution similar to what we have proposed for the passive—a semantic effect that conflicts with a well-formedness condition on interpretations. The existence of such phenomena with a transformation other than the passive makes the solution less isolated in the theoretical framework; it argues at least for the plausibility of the solution, if not for its correctness.

However the Thematic Hierarchy Condition may be incorporated into the grammar, it provides strong evidence that thematic relations are a valid expression of functional structure; these relations enable us to formulate a significant generalization in an apparently unrelated part of the grammar. Thus thematic relations go beyond pure description and acquire explanatory power. [4]

[4] I have developed thematic relations further in "A Deep Structure Projection Rule," *Linguistic Znquiry* 5:4, and in "Toward an Explanatory Semantic Representation," *Linguistic Znquiry* 7:1.

CHAPTER THREE

Adverbs

3.1 The Approach

In the literature of generative grammar, perhaps the least studied and most maligned part of speech has been the adverb. This is to some extent understandable, considering the variety of semantic and syntactic roles adverbs play in English. The fact that the category "adverb" has traditionally been a catch-all term further confuses the issue.

But adverbs have been maltreated beyond the call of duty. Most studies in generative grammar do not even concede to them the right to be a part of speech. Before the introduction of the semantic component and the lexicon, this tendency could be justified. At that time it was thought necessary to state co-occurrence restrictions at the syntactic level. To make co-occurrence restrictions maximally general, it was important to reduce the number of deep grammatical relations in which a category took part, and to reduce cases of similar co-occurrence relations to identical grammatical relations. Adjectives submit fairly docilely to this reductionist treatment: since there is almost always a paraphrase for an *Adj-N* construetion with a relative clause N *which* is *Adj*, a rather simple set of transformations suffices. Adverbs are more unruly, since the constructions they occur in are less homogeneous, and since their paraphrase relations are much more widely varied. Hence they were neglected in favor of more tractable constructions.

The study of adverbs also suffers from a second assumption held over from early work. The lack of feature mechanisms forced early generative grammarians to subdivide major categories into a multitude of classes. For example, in Lees's *The Grammar of English Nominalizations* (1960), verbs are divided by phrase structure rules into predicative verbs, activity verbs, transitive verbs, intransitive verbs, and middle verbs; these classes are then further subdivided. In such a theory it is only natural to subdivide adverbs into manner adverbs, locatives, time adverbs, means adverbs, degree adverbs, and so forth. However, the treatment of adverbs has not kept up with the times. At least since *Aspects of the Theory of Syntax* (1965), the subdivision of verbs has been expressed in a set of syntactic and semantic lexical features, not by phrase structure rules. Yet the different adverb categories are still usually treated as entirely distinct in the phrase structure.