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A DECOMPOSITIONAL APPROACH TO PREDICATES DENOTING EVENTS

City University of New York

Ph.D. 1987

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A DECOMPOSITIONAL APPROACH TO
PREDICATES DENOTING EVENTS

by

Yael Ravin

A dissertation submitted to the Graduate Faculty in
Linguistics in partial fulfillment of the requirements
for the degree of Doctor of Philosophy, The City
University of New York

1987

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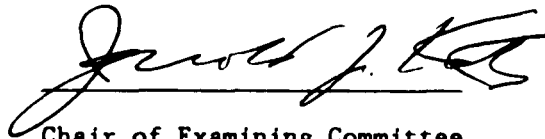
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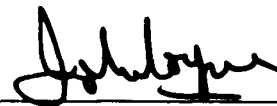
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Abstract

A DECOMPOSITIONAL APPROACH TO PREDICATES DENOTING EVENTS

by

Yael Ravin

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The semantic representation of predicates has received renewed attention in recent linguistic research, following the 1981 publication of Chomsky's Lectures on Government and Binding. One of the major features of Chomsky's new theory is the reinstitution of thematic roles, such as Agent and Patient, to express semantic relations between predicates and their arguments. These roles are posited as primitives and play a prominent part in the derivation of syntactic structures. The first part of this dissertation argues against theories such as Chomsky's, which rely on thematic roles. It is shown that their underlying Restrictive approach prevents them from accounting for the syntax and semantics of propositions denoting events. The second part of the dissertation argues in favor of a Nonrestrictive, non-thematic approach to semantics. J. Katz's Decompositional Theory is the Nonrestrictive model adopted here. The meaning of several predicates and propositions denoting events is analyzed and represented in terms of Katz's Theory. The Decompositional analysis is contrasted with the different thematic analyses to reveal a formal system for semantic representation which is complete and consistent and a set of principles which determine semantic properties and relations.

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INTRODUCTION:

A RESTRICTIVE VERSUS A NONRESTRICTIVE APPROACH TO SEMANTIC REPRESENTATION

This dissertation discusses some theories concerning the semantic principles involved in the construction and representation of propositions denoting events. First, principles stipulated by four thematic theories are reviewed: Fillmore's Case Theory, Chomsky's Government and Binding Theory, Levin's Lexical Theory and Jackendoff's Thematic Theory. The theories differ in their underlying approach to semantic phenomena. Fillmore, Chomsky and Levin hold what will be referred to as the Restrictive view of semantics. Under this view, thematic relations are the only part of semantics which should be accounted for by a linguistic theory. In reviewing the Restrictive theories, it will be claimed that problems arise for them in their syntactic and semantic treatment of sentences denoting events, which cannot be solved within their underlying Restrictive approach. The Restrictive approach imposes excessively severe theoretical constraints, and any theory that adopts it must fail in either its syntactic or semantic explication of linguistic phenomena. Jackendoff's view differs. It can be referred to as the Nonrestrictive view. Under this view, all the semantic concepts found in the meaning of linguistic expressions are to be accounted for. In reviewing Jackendoff's theory, it will be shown that his Nonrestrictive view is free of the syntactic problems encountered by the Restrictive theories, but since his

semantic system is based on a thematic motional model, it provides inadequate semantic representations. The second part of the dissertation presents alternative Nonrestrictive, non-thematic, principles for the construction of sentences denoting events. These principles can be viewed as part of Katz's Theory of Semantic Decomposition. It will be argued that since the theory is based on a Nonrestrictive approach, and since, unlike Jackendoff's theory, it employs decompositional tree structures and does not adopt a motional model, it provides better means for the representation and explanation of the meaning of propositions denoting events.¹

Let us now consider some differences between the Restrictive and the Nonrestrictive approaches. Under the Restrictive approach, only syntactically-relevant semantic concepts are considered linguistic and are therefore represented by the theory. Concepts lacking syntactic relevance are considered non-linguistic and are consequently not captured. A concept found in the meaning of a lexical item is said to be syntactically relevant if it corresponds to some specific syntactic behavior on the part of that item; that is, if it corresponds to syntactic relations the lexical item holds with other constituents in complex constructions in which it occurs.

The principle of syntactic relevance is assumed by the proponents of the Restrictive theories as a criterion for the representation of semantic concepts: The meaning of two lexical items is differentiated only if the difference corresponds to a difference in their syntactic behavior. One

can question the plausibility of such a criterion for determining what constitutes a linguistic concept by attempting to apply a parallel principle to phonological phenomena: Suppose that a principle of syntactic relevance were posited for distinguishing between linguistic phonological phenomena that correspond to certain syntactic patterns and non-linguistic phonological phenomena that do not correspond to such patterns. The principle would determine that the theory should differentiate between the phonological structures of lexical items only if they occur in different syntactic structures. Thus, the difference between the sound patterns of keep and postpone, which does not correspond to a difference in their syntactic structures, would be considered non-linguistic and would not be represented, while the difference between the sound patterns of keep and kept, which does correspond to a syntactic difference, would be considered linguistic and would be represented. But no linguistic theory embodies such a criterion for determining the range of phonological phenomena that are to be accounted for. If such theory existed, the adequacy of its system of phonological representation would be called into question.

The rationale given by the proponents of the Restrictive approach for adopting the principle of syntactic relevance is that this relevance offers explicit criteria for determining whether a certain semantic concept is present in the meaning of a lexical item or not. Without this principle, it is claimed, semantic representations would have to depend on intuitive semantic judgements, which are said to be vague and unreliable. But this rationale seems strange in view of the criteria by which

phonological and syntactic representations are judged in these theories. The sound pattern of a certain lexical term is determined on the basis of the phonological intuitions of native speakers about the sounds inherent in it. Similarly, the syntactic subcategorization features of lexical items are determined on the basis of intuitions about grammaticality. It is therefore not clear why, according to the Restrictive approach, the semantic concepts inherent in linguistic expressions cannot be determined on the basis of semantic intuitions about their meanings. Instead of discarding semantic intuitions as vague, the task of a linguistic theory is to translate them into explicit and precise formal representations.

According to the Restrictive principle of syntactic relevance, the semantic concepts to be represented are those that express meaning relations, referred to as thematic relations, between the lexical item including them and other constituents in complex constructions. In sentences denoting events, the syntactically-relevant relations are captured by a set of thematic roles (such as Agent and Patient) associated with the main verb, which the verb assigns to its complements. These roles are said to correlate with some constant syntactic relations, holding between the verb and its complements, so that it is possible to predict these syntactic relations on the basis of the verb's thematic roles. For example, the meaning of the verb kill includes the thematic roles of Agent and Patient. Therefore, the verb occurs in sentences consisting of a deep-structure subject, which is assigned the role of Agent, and a deep-structure object, which is assigned the role of Patient. The

meaning of the verb die, by contrast, includes the thematic role of Patient only. Therefore, it occurs in sentences consisting of a deep-structure object only, which is assigned the role of Patient, with no deep-structure subject.

Since the Restrictive theories consider thematic relations syntactically relevant and since they utilize them to generate syntactic constructions, they integrate thematic structure into syntactic structure. In the lexicon, entries associate thematic roles with verbs. These roles determine the number and type of complements that a verb takes in syntactic constructions it occurs in. According to the principle of syntactic relevance, the syntactic categories of the complements selected by a verb need not be specified, since they are predictable on the basis of the type of thematic roles assigned to them. Thus, Agent and Patient, for example, are realized as noun-phrases; Instrument as a prepositional phrase headed by with, etc.² The thematic structure lexically specified for a verb becomes part of the deep structure of syntactic constructions headed by the verb. In Fillmore's system, thematic labels appear explicitly as nodes dominating the representations of the complements. In Chomsky's system, they do not appear explicitly but, like grammatical functions, are associated with structural positions in the syntactic representation. The deep-structure thematic relations are unchanged by the derivation of surface structures, and in both theories, they determine such derivations. Fillmore's theory relies more heavily on thematic information, since thematic relations are solely responsible for the syntactic well-formedness of surface structures; Chomsky's theory depends on thematic

relations to a lesser extent since they are only one among several conditions constraining the derivation of surface structures. In fact, as argued in Chapter 2, thematic roles are introduced into Chomsky's Government and Binding Theory only because other syntactic conditions fail to block all the ill-formed structures generated by the grammar.

The principle of syntactic relevance, underlying the Restrictive approach, states that the thematic structure specified by the meaning of a lexical item determines the particular syntactic configuration in which the lexical item occurs. However, such regular correspondences between meaning and syntactic configurations simply do not occur in language. On one hand, a thematic role can be present in the meaning of a particular verb without giving rise to the syntactic pattern supposedly associated with it; this is, for example, the case in "John committed suicide", where the thematic roles of Agent and Patient exist in the meaning of commit suicide, if they are said to exist in the meaning of kill, but in which the syntactic subject and object do not correspond to these roles as they do in "John killed himself". On the other hand, a thematic role may be absent from the meaning of a certain verb and the syntactic structure of the sentence may not reflect it. This is the case in "He suffered a fatal injury", where only Patient is present, but the sentence contains both a subject and an object. If syntactic structures are derived on the basis of the thematic structure of their heads, these and many other similar constructions fail to be adequately captured. As will become evident in the discussion of the Restrictive theories, the more heavily the theory relies on thematic structure to generate well-formed syntactic struc-

tures, the more problems it encounters in attempting to represent derived structures.

An interesting question arises in connection with the empirical lack of correspondence between semantic concepts and syntactic structures, namely, whether this lack is an accidental property of language or whether it has some principled explanation. There seems to be a functional explanation for the absence of thematic-syntactic correspondences³ Without the constraint of a thematic-syntactic correspondence, language offers a range of syntactic structures with which the same meaning can be expressed. This richness of means increases the adequacy of language as a means of communication. In not expressing the arguments of thematic relations by means of syntactic complements, speakers achieve economy: Instead of having to say "John divided the meat into slices, using an instrument with a sharp edge", one can simply use "John sliced the meat". All the information conveyed by the syntactic complements of the first structure is conveyed by a single syntactic head (sliced) in the second. This economical mode of expression is useful when the implicit arguments are not particularly important to the discourse context. Since they are not explicitly mentioned, they do not shift the listener's attention away from the topic of the discourse. By contrast, in expressing arguments by means of syntactic complements, speakers can convey more information about the particular nature of their referents: "John sliced the meat into uneven pieces, using his pocket knife" conveys more information than "John sliced the meat". Explicit mention brings arguments to the foreground and can thus serve to control the topic of discourse. By not im-

posing strong correspondences between concepts and their syntactic realizations, language allows speakers to strike an optimal balance between the amount of information conveyed, its importance to the discourse, and the complexity of the forms in which it is conveyed.

To maintain their thematic-syntactic generalizations in spite of the problematic evidence, proponents of the Restrictive theories are forced to successively redefine their thematic roles until they cease to correspond to any coherent semantic concept. They either broaden the semantic content initially described as the meaning of the thematic roles to the point of rendering them meaningless, or if they keep the thematic roles rather restricted semantically, they are forced to predict thematic ambiguity in cases where there is no real semantic ambiguity. As shown in the discussion of Levin's Lexical Theory, she opts to broaden the meaning of thematic roles. To maintain, for example, the generalization that Agents are realized as deep-structure subjects, she allows Agent to refer to noncausative entities performing action (as in "He read the book") as well as to causative entities performing no action (as in "The hammer broke the window"). Since there is no common semantic denominator for these two types of predicate-argument relation, it becomes impossible to determine whether a particular predicate not specifically discussed by Levin, such as find, assigns the role of Agent or not. Thus, generalizations about the correspondences between thematic relations and syntactic structures are attained at the expense of generalizations about the correspondences between thematic roles and semantic concepts. In the extreme case, thematic roles become simply another type of syntactic re-

lation holding between syntactic constituents, corresponding to no semantic relations at all. This is true of Chomsky's theta-roles, as shown in Chapter 2. As a new type of syntactic relation, theta-roles might play a part in the derivation of syntactic structures, but they cannot be said to represent any semantic relations.

Fillmore opts to restrict the meaning of his thematic roles. He restricts Agent to refer only to animate entities instigating action. Thus, for him, find does not assign Agent to its subject. But by thus restricting the semantic content of Agent, verbs like break become thematically ambiguous, between an interpretation on which the causative entity is animate and acting ("John broke the window") and a second interpretation on which the causative entity is inanimate and does not act ("The hammer broke the window"). Semantically, however, the predicate is not ambiguous. The ability or inability to act is solely dependent on the nature of the causative entity involved, and the meaning of the verb itself does not specify whether action is performed or not, even when the entity is capable of such action. Thus, as argued in Chapter 1, Fillmore's Cases misrepresent the semantic properties of propositions.

The lack of correspondence between thematic relations and semantic concepts exhibited by the Restrictive theories is not always apparent to their proponents since their approach prevents them from relying on independent criteria for establishing what constitutes a genuine semantic concept. Thus they cannot determine whether the thematic relations they posit truly correspond to the relations arguments bear to predicates.

In the absence of a semantic component, there is no formal level at which semantic concepts can be analyzed, and no recourse to criteria like ambiguity or synonymy to establish them. The Restrictive theories take thematic relations as primitives, and provide only intuitive and often vague descriptions of the semantic content of these relations. But even in the absence of a formal way of representing and analyzing meaning, one would expect the proponents of these theories to consult their intuitive judgements about the meaning of lexical items and the semantic properties and relations they exhibit. However, in order to determine whether a certain thematic candidate postulated corresponds to a genuine semantic concept, they turn to syntactic criteria. They thus determine whether a certain candidate concept is really a semantic concept on the basis of whether it corresponds to some identifiable syntactic behavior. By doing so, the theories run the danger of circularity: Syntactic phenomena are to be explicated by semantic concepts, but what semantic concepts there are is determined by the very syntactic phenomena they are meant to explicate. Thus, when the Restrictive theories capture correspondences between thematic relations and syntactic phenomena, they lack the basis on which to claim that these are correspondences between semantic concepts and syntactic phenomena.

The implications of the Restrictive approach and its underlying principle of syntactic relevance leads to the conclusion that such an approach is untenable. Factual evidence makes it clear that there is no general correspondence between semantic structure and syntactic structure. An attempt to derive the latter from the former results in the generation

of syntactically ill-formed structures. To avoid misgeneration, the semantic content of thematic roles has to be severely modified, to a point where the correspondence between thematic relations and semantic concepts no longer holds. But in the absence of a formal and explicit level of semantic representation, the lack of thematic-semantic correspondence is not immediately apparent in the Restrictive theories.

Jackendoff's theory does not derive syntactic structures from thematic structures and is therefore free of the syntactic problems encountered by the Restrictive theories. His underlying approach is Nonrestrictive: Unlike the proponents of the Restrictive approach, he does not believe in the principle of syntactic relevance. He intends his theory to represent all semantic concepts inherent in the meaning of linguistic expressions, whether expressing relations to other syntactic constituents or not. But despite his Nonrestrictive view, Jackendoff originally modelled his theory on those of the Restrictive approach, by constructing his representations on the basis of thematic roles. In particular, he took the thematic structure of motion verbs as prototypical and adapted it to represent the thematic structure of all other verbs of events or states. In Chapter 4 it will be shown that as Jackendoff's theory has developed, it has moved further and further away from the thematic model, to the point where its most recent representations do not include thematic roles at all.

The discussion quarrels with several aspects of Jackendoff's theory, objecting primarily to the view, which Jackendoff still holds, that motion

verbs are prototypical. Such an idea limits the range of predicates the theory can represent. Moreover, his notation is too restrictive and his semantic representations not fully specified. But in spite of these objections, Jackendoff's theory is still closer to Katz's theory than the other thematic theories, since it shares its underlying Nonrestrictive approach.

By not limiting semantic representations to syntactically relevant concepts, the Nonrestrictive theories can provide full representations of all the concepts inherent in the meaning of lexical items. They are thus able to account for all semantic properties and relations exhibited by linguistic expressions, and are not limited, as are the Restrictive theories, to representing these only to the extent that they reflect syntactic configurations. By fully representing the meaning of kill, for example, as including not only two participants, but also the particular change in the condition of one participant, who is alive at the beginning of the event and dead at the end of it, they can capture the difference in meaning between kill and all other event predicates that include two participants. Under the Restrictive approach, by contrast, the semantic representation of kill is identical to that of eat or read. Moreover, the Nonrestrictive representation of kill captures the relation of sense inclusion that holds between kill and a predicate such as die, for example: Die is represented as including a participant undergoing the exact same change specified in kill. Its representation is therefore completely included in the representation of kill. (The converse, of course, does not hold, since kill includes one more participant that is not included

in the meaning of die.) The Restrictive theories also differentiate between these two predicates, since the number of complements the two verbs can take differs. But because they do not represent the nature of the change involved, they cannot capture the similarity in their meanings. The semantic prediction that results under the Restrictive analysis is very counter-intuitive: such theories predict that kill and eat are closer in meaning than kill and die.

Furthermore, by not differentiating thematic concepts and other semantic concepts, the Nonrestrictive theories can determine semantic properties and relations of linguistic constructions regardless of whether they are expressed by means of the verb and a complement or only by means of the verb. For example, they can represent the synonymy of "John sliced the meat" and "John cut the meat into slices", although the concept of division into parts is conveyed by means of one lexical item in the first sentence and by means of a verb-complement phrase in the second. The Restrictive theories, by contrast, represent such division only if it is conveyed by a syntactic complement external to the predicate. Their semantic account thus fails in generality. Whether a certain concept is represented or not depends not on the meaning of the expression conveying it but on its syntactic form.

To provide fully explicit semantic representations and capture all semantic properties and relations by means of formal rules, the Nonrestrictive approach posits two independent levels of representation, both in the lexicon and in the representation of complex constructions. The

lexical entry for a verb specifies information on two levels: syntactically, its subcategorization features specify which syntactic constructions it can head; that is, what syntactic complements it can select. Semantically, it specifies the verb as a predicate, by determining which semantic concepts are inherent in each of its senses, thus also specifying what arguments form part of its meaning. The semantic entry also includes mapping frames which associate the semantic representations of particular syntactic complements with arguments in the semantic representation of the predicate, if such associations are possible. The subcategorization features of kill, for example, specify that the verb can be transitive; its semantic representation specifies an event which includes a causative entity and another entity that becomes dead; the mapping frames associate the causative argument with the semantic representation of the subject and the change argument with the semantic representation of the object. The subcategorization features of die specify that the verb is intransitive; the semantic representation specifies that it is a predicate expressing a noncausative change identical to the one expressed by kill; its mapping frames associate the change argument with the semantic representation of the subject.

As for the representation of complex structures - at the syntactic level, a simple sentence contains a main verb and its complements, specified by the subcategorization features of the verb in the lexicon. At the semantic level, the same construction is represented as a simple proposition, consisting of a predicate and its arguments, as specified by the sense-representation of the predicate. The link between the two

representations is captured by the mapping frames in the lexical entry of the predicate, which determine where to attach the semantic representation of the syntactic complements, in the semantic representation of the predicate.

By having two independent levels of representation, the Nonrestrictive theories can capture semantic properties and relations of linguistic constructions despite differences in the idiosyncratic mapping of the syntactic complements of their predicates. Thus "kill oneself intentionally" and "commit suicide" are represented as synonymous, by having identical representations at the semantic level. They differ only in the ways the semantic representations of the complements of kill and commit attach to the representations of the verbs.

The Nonrestrictive approach provides a systematic methodology for determining whether a certain concept is a genuine semantic concept or not. By examining intuitions about the properties and relations that senses exhibit, one can gain insight into the semantic concepts that are inherent in them. By contrasting the meaning of kill and die, for example, one concludes that causation is a semantic concept, since it is what distinguishes the otherwise identical senses of these two predicates. Similarly, by contrasting kill oneself with commit suicide, one concludes that intentionality is a semantic concept since its absence from the meaning of the former and its presence in the meaning of the latter is the only factor that distinguishes these otherwise identical senses. When intention is combined with the meaning of kill oneself ("kill oneself

intentionally"), the two expressions become synonymous. Thus, under the Nonrestrictive approach, semantic structure is determined independently of syntactic criteria, without circularity.

To conclude, by avoiding the principle of syntactic relevance, by representing all the concepts inherent in the meaning of lexical items, and by maintaining two independent levels of syntactic and semantic representations, the Nonrestrictive theories are able to represent and explain all the semantic phenomena exhibited by linguistic expressions. The Restrictive theories, by contrast, encounter problems of syntactic representation when they rely on thematic relations to predict syntactic configurations. Semantically, since they rely on syntactic criteria, they make arbitrary distinctions between instances of semantic concepts that they represent and those that they do not recognize. As a consequence, contrary to their claims, the thematic structures that they represent do not correlate with semantic structures. The theories thus fail to derive syntactic structures on the basis of the meaning of lexical items.

The first three chapters of this dissertation discuss the syntactic and semantic limitations of the Restrictive theories. In Chapter 1, Fillmore Cases are shown to be syntactically inadequate - they license ungrammatical constructions and fail to generate grammatical ones. Cases are also shown to be semantically inadequate in providing identical representations for verbs that differ in meaning, and in failing to capture similarities between verbs that have related meanings. In Chapter 2,

Chomsky's theta-roles are shown to be completely non-semantic in nature. They function in his theory as abstract syntactic relations holding between complements and heads. In Chapter 3, Levin's attempt to endow Chomsky's theta-roles with semantic content is discussed. The generalizations that she claims to hold among the decompositional meaning of verbs, their thematic structures and their syntactic behavior are shown to be invalid. Chapter 4 discusses Jackendoff's motional approach. Since his theory is Nonrestrictive, thematic roles are shown to play a marginal role in it, serving merely as labels. But his motional model and his functional notation are shown to be too limited to provide full semantic representations of non-motional events.

The second part of the dissertation present a Nonrestrictive, non-thematic and non-motional approach to meaning. In Chapter 5, Katz's theory is applied to the analysis of the various senses of break. The decompositional treatment illustrates the principles by which the number of distinct senses is determined. It also captures the phenomenon of indeterminacy, which cannot be represented by the thematic theories. Chapter 6 discusses the semantic criteria for determining the number and nature of semantic arguments and reveals the lack of correspondence between semantic arguments and syntactic complements. The last three chapters compare the semantic content said to be captured by thematic roles with the semantic concepts posited by the decompositional approach. In Chapter 7, the thematic role of Agent is compared with the decompositional concepts of autonomy, causation and action. It is found semantically inferior to

the decompositional representations, since it forces a dependency among these three concepts that are in fact independent. Chapter 8 deals with instrumentality. The thematic role of Instrument fails to capture the intricate relations that hold among the concepts of instrumentality, causation and action, as revealed in their decompositional treatment. Finally, in Chapter 9, the role of Theme is compared with the decompositional concepts of change and experience. It is shown that when Theme corresponds to the semantic concept of change, it is too narrow and fails to provide representations for verbs that do not express change. When Theme is taken to correspond to a variety of semantic concepts, it provides the necessary representations, but becomes semantically meaningless. The conclusion that emerges from the comparison is that in order to represent the full meaning of verbs, their semantic properties and the semantic relations that hold among propositions which include them, a semantic theory must be Nonrestrictive, non-motional and decompositional.

FOOTNOTES

1. Other Nonrestrictive, non-thematic theories do, of course, exist. Theories that use meaning postulates, for example, are not Restrictive and do not employ thematic roles. However, a comparison of the different non-thematic theories is not undertaken in this dissertation. For a full criticism of Carnapian logic-based theories, see Katz (1986).

2. Chomsky's derivation of syntactic subcategorization features and syntactic configurations on the basis of thematic roles is particularly surprising, since this incorporation of semantic information into the syntactic component constitutes a sharp departure from his Standard principle of syntactic autonomy. In Syntactic Structures, for example, Chomsky argues that "such sentences as 'John received a letter' or 'the fighting stopped' show clearly the untenability of the assertion ... that the grammatical relation subject-verb has the 'structural meaning' actor-action, if meaning is taken seriously as a concept independent of grammar. Similarly, the assignment ... of any such structural meaning as action-goal to the verb-object relation as such is precluded by such sentences as 'I will disregard his incompetence' or 'I missed the train'" (Chomsky 1957:100). In Lectures on Government and Binding, however, Chomsky holds an almost opposite view.

3. This functional explanation was suggested to me by J. Katz.

CHAPTER 1 - FILLMORE'S CASE THEORY

Case Theory is proposed by Fillmore as a theory to account for "certain types of judgements human beings are capable of making about the events that are going on around them, judgements about such matters as who did it, who it happened to, and what got changed" (Fillmore 1968:24). According to Fillmore, such judgements are made on the basis of semantic relations that hold between predicates and their arguments. His theory is intended to represent these relations, since, as he observes, neither grammatical functions nor surface case markers can adequately represent them. The grammatical subject of a sentence, for example, can relate to the predicate in a variety of semantic ways: It is the personal agent in "He hit the ball"; the patient in "He received a blow"; and a beneficiary in "He received a gift" (Fillmore 1968:6). The genitive case marker can also relate to its head in a variety of ways: as has been traditionally noted by grammarians, statua Myronis can mean the statue possessed by Myro; the statue sculptured by Myro; and the statue depicting Myro (Fillmore 1968:7).

These observations lead Fillmore to adopt a Restrictive approach, according to which semantic relations between predicates and arguments are represented at the syntactic level, with no recourse to an independent level of semantic representation. To capture predicate-argument re-

lations, Fillmore posits Cases¹ - a set of linguistic primitives, such as Agentive, Instrumental and Objective - which represent "semantically relevant syntactic relationships involving nouns and the structures that contain them" (Fillmore 1968:5). For each predicate, the lexicon specifies which obligatory and optional Cases it assigns to the noun-phrases it selects as complements. Break, for example, assigns an obligatory O (Objective) and optional A and I (Agentive and Instrumental) Cases to its complements. Cases generate deep structures, by determining the kind and number of NP complements the verb combines with to form complex syntactic structures. Cases also figure in the syntactic representation of deep structures, as labelling nodes associated with the syntactic representation of the complements. In "John broke the window with a rock", the representation of John is labelled A; that of window, O; and that of rock, I. A principle of Case hierarchy is incorporated into the subject selection and the object selection rules, which derive surface structures from deep structures. In the unmarked derivation, the hierarchy is respected. Thus, in "John broke the window with a rock", A is chosen as surface subject; O as surface object; and I as surface object of the prepositional phrase headed by with. The subject selection and object selection rules also specify alternative surface structures, where the hierarchy is violated, and the verb is marked to signal this choice. "The window was broken by John" is such an alternative, where O is chosen as the surface subject. Consequently, the verb is marked by passive morphology.

Fillmore rightly observes that the semantic intuitions of speakers must be captured by a linguistic theory, but this observation is inconsistent with his Restrictive approach. Fillmore's conception of semantic judgements that should be accounted for is not well-defined, since without an independent semantic component, he cannot determine what judgements form part of speakers' semantic knowledge as opposed to judgements that are non-semantic. He resorts to syntactic criteria for choosing what semantic concepts to account for. His system of Cases is consequently semantically deficient. Section I of this chapter discusses the semantic nature of Cases: because Cases are based on syntactic criteria, they represent only an arbitrarily selected subset of the semantic properties and relations that are exhibited by the meaning of lexical items. Cases are not only arbitrarily limited but also semantically inadequate for the subset of semantics they are intended to represent. As will be shown, they yield inconsistent semantic analyses. Section II deals with the representation of Cases in the lexicon: Contrary to Fillmore's claims, his lexical entries are not superior to the lexical entries needed for a theory that does not employ Cases. Section III discusses the inadequate syntactic representations that result under the Restrictive approach, according to which syntactic structures are derived from Case structures: Well-formed structures cannot be derived, and ill-formed ones cannot be ruled out.

In the course of the discussion, the limited linguistic coverage that Case Theory provides, both syntactically and semantically, is noted, but only in passing. Fillmore himself admits that Case Theory as it was

presented in "The Case for Case" should not be taken as complete: "My proposals did not cohere into a model of grammar. Instead, they were suggestions about a level of organization of a clause that was relevant to both its meaning and its grammatical structure; that provided a way of describing certain aspects of lexical structure;... my writings somehow gave the impression that case grammar so-called was being presented as a general model of linguistic structure. Nowadays I try to be more careful about the phrase 'case grammar'" (Fillmore 1977:62). The discussion therefore concentrates on the principled inadequacies that result from Fillmore's adherence to the Restrictive approach.

I. CASES AND SEMANTIC REPRESENTATION

The central concept of Case Theory is Case, which is defined as an underlying syntactic-semantic relationship holding between noun-phrases and predicates. The set of Cases is claimed to be finite in principle, although the list suggested in "The Case for Case" might not be exhaustive. The following Cases are defined (Fillmore 1968:24-25): Agentive - (A) - an animate perceived instigator of the action identified by the verb (Fillmore notes, though, that A applies to institutions and machines as well).

Instrumental - (I) - an inanimate force or object causally involved in the action or state identified by the verb.

Dative - (D) - an animate being affected by the state or action identified by the verb.

Factitive - (F) - an object or being resulting from the action or state identified by the verb or understood as a part of the meaning of the verb.

Locative - (L) - the location or spatial orientation of the state or action identified by the verb.

Objective - (O) - "the semantically most neutral case ... whose role is identified by the semantic interpretation of the verb itself; conceivably the concept should be limited to things which are affected by the action or state identified by the verb".

A general principle states that in a simple sentence, a Case can be realized only once: every NP is assigned a unique Case, except for conjoined NP's, which are assigned the same Case. No conjunction of two distinct Cases is possible. Thus,

(1) *John broke the window by Mary
is ungrammatical, as it contains two A's; but

(2) John and Mary broke the window
is fine, because the two NP's are conjoined. Similarly,

(3) The car broke the window with a fender
is ungrammatical, as it contains two I's. To allow for

(4) The car broke the window with its fender
the grammar has a rule that I can be split into the possessor in subject position and the remainder in the with-phrase, together with an obligatory possessive adjective.

Under the Restrictive approach, Fillmore holds a rather limited view of semantics. He does not intend to capture all the semantic concepts that are expressed in the meaning of predicates but only those that have syntactic implications. In talking about the difference between

(5) John ruined the table
and

(6) John built the table

Fillmore says: "Having depended so far on only introspective evidence, we might be inclined to say that the distinction is purely a semantic one, one which the grammar of English does not force us to deal with. Our ability to give distinct interpretations to the verb-object relation in these sentences has no connection, we might feel, with a correct description of the specifically syntactical skills of a speaker of English"(Fillmore 1968:4). But, Fillmore goes on to say that "the distinction does have syntactic relevance" and therefore proceeds to capture it in his Case grammar. Thus, Cases are not intended to represent full decompositional concept-structures of predicate meanings.

The implicit assumption of proponents of the Restrictive approach is that if only syntactically-relevant semantic distinctions are to be represented, a relatively small set of primitives is sufficient to capture those. But the set of Cases proposed by Fillmore proves immediately insufficient even for this restricted aim. Consider

(7) The wind broke the window with a loud noise.

The wind is I; but as there is no possessive adjective in the PP, noise should be assigned an independent Case. The only Case that seems to apply to it is O, but this is already assigned to window. A possible move would be to add another Case to the set, such as Manner (M). Consider next

(8) The storm filled the room with rain.

The storm is I; what Case is assigned to rain? Clearly, neither I nor M will do. Should another case, such as Substance, be added? Consider a slightly different structure

(9) The directions come with a map of the area.

Directions is O; what Case could be assigned to map? Should the concept of Substance be stretched to cover discrete objects such as maps? Even if it were made to do so, an important distinction between come and fill would be missed, namely, the grammaticality of

(9a) The directions came without a map
versus the ill-formedness of

(8a) *The storm filled the room without rain.

Another Case may be stipulated - that of Accompaniment. Actually, Fillmore mentions similar examples later in the paper and seems willing to add a Comitative Case (C) to cover sentences such as

(10) He came with his wife

or

(11) He discussed it with John.

But as these sentences can be paraphrased with a conjunction

(10a) He and his wife came

and

(11a) He and John discussed it

it follows, according to Fillmore's principle, that the conjoined NP's in both these sentences have the same Case, namely A, and there is no C after all. This conflict can be resolved if C is restricted only to arguments that convey the sense of accompaniment but cannot be paraphrased as part of a conjunction, as in

(12) John came with a book

but not

(12a) *John and the book came.²

In sentences like (10) and (11) that can be paraphrased with a conjunction A will be assigned to both arguments. However, note that the meaning of come differs from that of discuss, as becomes apparent when together is added to these sentences:

(10) He came with his wife

(10b) He came together with his wife

(11) He discussed it with John

(11b) He discussed it together with John

(10) is unambiguous and constitutes an exact paraphrase of (10a). (11), by contrast, is ambiguous. On one reading, it is a paraphrase of (11b) and means that both he and John explained their position to some third party. On another reading, it is not a paraphrase of (11b) and means quite the opposite, namely, that he explained his position to John. This second reading is more evident with a verb like argue:

(13) He argued with John

is ambiguous. On one reading it means that he and John defended their position together, disagreeing with a third party. This sense can be paraphrased with together:

(13a) He argued (the case) together with John.

On a second reading, (13) means that he and John disagreed. Such a reading is not possible for (10). Come and discuss also differ in that (10) is true even if the wife took no action, as in

(10c) He came with his wife unconscious
whereas (11) requires action on the part of John

(11c) *He discussed it with John unconscious.
Yet another new Case is therefore needed to be assigned to he and his wife in (10), which must differ from A assigned to he and John in (11), in order to capture the differences between these verbs.

The abundance of examples which do not fit into the set of Cases provided by Fillmore suggests that the range of semantic concepts captured by the six Cases is too limited. Obviously, the set should be larger. How much larger, though, is not clear. Fillmore acknowledges this difficulty in "The Case for Case Reopened": "I will discuss some of the most important challenges to the theory, including the serious one of how one can know what the cases are and how many of them there are; and I will fail to offer a satisfying solution to this problem" (Fillmore 1977:59). The problem is a direct consequence of adopting the Restrictive approach, under which semantic concepts are not differentiated unless they reflect distinct syntactic behavior. But since, empirically, semantic concepts and syntactic structures do not exhibit one-to-one correspondences, employing syntactic criteria for the definition of semantic concepts prevents an independent treatment of semantic concepts which is needed for a systematic determination of what semantic concepts there are.

The syntactic criteria for determining Cases classify semantic concepts rather arbitrarily, by neglecting some differences between semantic concepts and by overemphasizing the importance of minor ones. Consider

the distinction between Agentives and Instrumentals, which separates animate beings on one hand, from natural forces and inanimate objects on the other. It is not clear what semantic concept is represented by the category Instrumental that is common to both natural forces and objects but that does not apply to animate beings. In fact, natural forces are quite different from inanimate objects, as far as instrumentality is involved: Natural forces are not usually used as instruments, since in order to be so used, they must lend themselves to external control, but natural forces are mostly not amenable to such control. Hence the oddity of

(14) John opened the door with the wind.

And inanimate objects are usually incapable of self-instigated motion, which is a rather common characteristic of natural forces. Grouping natural forces together with inanimate objects under the same Case implies that these entities are semantically similar. However, such a grouping fails Fillmore's own test of possible conjunction under sameness of Case, as can be seen in

(15) A chisel and the wind opened the door

cited by Dougherty (Dougherty 1970:509). The sentence is semantically deviant in spite of the fact that the conjoined NP's share the same Case.

Another semantic distinction made by Fillmore, which yields a counter-intuitive semantic classification of concepts, is the one drawn between the Dative and the Objective. Both apply to entities that are affected by the action denoted by the verb. They differ only in that

Dative applies to animate beings, while Objective applies to inanimate objects. On this analysis, the following is the case:

- (16) "John watched Paul" - Agentive and Dative
- (17) "John watched the book" - Agentive and Objective
- (18) "John broke the window" - Agentive and Objective

Fillmore's Case grammar thus stipulates that (17) and (18) are more similar in their predicate-argument relations than (16) and (17) are. This counter-intuitive stipulation is the result of Fillmore's poorly defined notion of semantic concepts. On one hand, he chooses not to represent semantic concepts that are shared by (16) and (17), inherent in the nature of the action of watching, such as the sensing of visual stimulus and the attention directed towards it by the viewer. Consequently, he cannot represent the similarity between watch Paul and watch the book. On the other, he chooses to represent animacy and inanimacy and to use them to capture differences between predicate phrases. Note, though, that the difference between watch Paul and watch the book is not a difference in the relations of the predicate watch to its respective arguments but rather a difference in the nature of the referents of these arguments. The predicate holds the same relation to both, in spite of their difference in animacy.

A similar counter-intuitive result of the Dative/Objective distinction is found in examples like

- (19) John has two arms

where arms is O (and John is D); versus

- (20) The car has two doors

where car is 0 (and it is not clear what Case is assigned to doors). But the relation of the predicate to the two subject-arguments and the two object-arguments in these two sentences is the same, namely that of possession of parts by the whole. Fillmore's intention is to capture similarities in the semantic relationships that arguments bear to predicates by means of Case representations, but his Objective/Dative distinction achieves the opposite effect: It distinguishes between sentences that exhibit identical predicate-argument relations. In "The Case for Case Reopened", Fillmore acknowledges that animacy cannot form part of the definition of Cases. He writes: "In "The Case for Case", I described the agent and the dative cases as necessarily animate. This, by a curious kind of bad logic, led some people, for example me, to assume that obligatory animacy in a verbal complement implied that the associated nominal had to be on one of these two cases... I am now more careful about keeping relational notions and categorial notions distinct"(Fillmore 1977:65).

Animacy is not the only semantic concept that creates arbitrary semantic distinctions between predicate-argument relations. Consider the semantic consequences of distinguishing between Agentive and Dative:

- (18) "John broke the window" - Agentive and Objective
- (21) "John watched the window" - Agentive and Objective
- (22) "John saw the window" - Dative and Objective

Under this analysis, (18) and (21) are said to express the same semantic relation between the argument John and the predicates break and watch, whereas no semantic resemblance is captured for (21) and (22). But, ob-

viously, the events of watching and seeing share a lot in common that the events of watching and breaking do not.

Another consequence of the absence of independent (i.e. non-syntactic) criteria for establishing Cases is the vagueness found in the descriptions of some Cases. Consider the description of the Objective Case as "semantically neutral". In a system that is intended to represent semantic relations, a semantically neutral relation is inadmissible. It is all the more so when Fillmore criticizes similar vagueness in other case theories: "The difficulties in discovering a unified meaning for each of the cases in a case system has led to the alternative view that all but one of the cases can be given more or less specific meanings, the meaning of the residual case being left open. This residual case can either have whatever relation to the rest of the sentence is required by the meanings of the neighboring words, or it can serve any purely caselike function not preempted by the other cases" (Fillmore 1968:10). Fillmore attributes this problem of vagueness to an attempt to handle case directly on surface structure. But his Case grammar, which assigns Cases at deep structure, exhibits just the same vagueness.

To conclude, Fillmore's Cases are inadequate to represent the semantic relations that hold between predicates and their arguments. First, Cases do not represent many semantic concepts shared by the meanings of predicates, thus failing to capture similarities in the relations that these predicates hold with their arguments. The fact that in both "John saw the book" and "John watched the book" John has a visual experience of the book

is not captured. Second, the same Case is assigned to different types of entities whose relations to their respective predicates have little in common. Thus, both the wind in "The wind broke the window" and the rock in "John broke the window with a rock" are Instrumental, failing to capture the fact that the wind is not used as an instrument by an actor, whereas the rock is. Third, Cases distinguish between arguments that bear very similar relations to their predicates. Thus, "John has two arms" is Dative, while "The car has two doors" is Objective, although both express the relationship of containing parts. Finally, the vagueness found in the description of some of the Cases (the Objective and the Factitive) classifies many completely different predicate-argument relations as similar. Thus, John in both "John saw the book" and "John has a book" is Dative, although it is not clear what is common to the event of seeing something and the state of possessing something.

The semantic inadequacies exhibited by Fillmore's Case grammar are the inevitable consequences of an attempt to represent semantic relations without recourse to strict semantic criteria. The need for semantic criteria is apparent in Fillmore's description of the kind of judgements he intends his theory to represent: "certain types of judgements human beings are capable of making about the events that are going on around them, judgements about such matters as who did it, who it happened to, and what got changed" (Fillmore 1968:24). Human beings are capable of making a variety of judgements concerning events that happen around them, but only a subset of these are linguistic. Linguistic judgements are those that are made on the basis of the meaning of the words found in statements

describing events. To differentiate them from non-linguistic ones, a linguistic theory must have defined criteria to determine what is expressed by the meaning of linguistic expressions versus what forms part of human beings' knowledge of the world or of the social conventions that hold in their world.

Consider the event represented by (18), repeated here,

(18) John broke the window.

One possible judgement that can be made is that John is responsible for the consequences of the event and therefore should compensate the owner of the window for the damage created. This, however, is clearly not a linguistic judgement. One can imagine a society in which causing damage does not legally imply being held responsible for it. In such a society, the meaning of (18) would remain the same, and the statement would still hold true for the same set of states of affairs, in spite of the difference in its legal implications. Thus judgements of this kind should not be represented by the theory. Fillmore's notion of judgements about events, though, does not exclude such extra-linguistic judgements, and there is no principled reason for not positing something like a Compensator Case for these judgements.

By contrast, the judgement that John caused a change in the window is linguistic, since if John did not cause such change, the statement "John broke the window" would be false. Since a linguistic theory has to specify the conditions under which statements are true, it should repre-

sent any concept that has bearing on the truth conditions of statements. Presumably, Fillmore's Agentive represents causation. But note that

(21) John watched the window
does not give rise to a judgement that John caused a change in the window. The theory should represent this fact, too. Fillmore's Cases, however, do not distinguish between John's causative participation in the breaking and his noncausative participation in the watching. Both are represented by means of Agentive. Thus, without recourse to the truth conditions of statements and to the semantic concepts that they embody, Fillmore cannot bar extra-linguistic judgements on one hand, and cannot account for all proper linguistic ones on the other.

Fillmore gives an example for the kind of distinction his Case grammar should make. He contrasts (5) and (6):

(5) John ruined the table
where table is assigned O,

(6) John built the table
where table is assigned F, and says: "Note that in one case the object is understood as existing antecedently to John's activities, while in the other its existence resulted from John's activities" (Fillmore 1968:4). He makes the point that this distinction is not purely semantic, because it has syntactic relevance. He cites two syntactic phenomena in which the distinction plays a role: "What did John do to the table?" applies only to (5), not to (6); and only (5) can be paraphrased as

(5a) What John did to the table was ruin it.
According to Fillmore,

(6a) What John did to the table was build it
is syntactically ill-formed.

Fillmore is right in observing that the meaning of ruin includes the prior existence of the object ruined, while the meaning of build includes the prior nonexistence of the object built. But this distinction is not syntactic. (6a) is not ungrammatical but contradictory, since to do something to X involves the prior existence of X, while to build X involves the prior nonexistence of X. This confusion between the semantic properties of propositions and the syntactic properties of sentences is at the heart of the Restrictive approach. Since Fillmore's theory does not have an independent level of semantic representation, there is no place in the theory in which valid inferences from propositions can be stated independently of well-formed syntactic transformations of sentences. As a result, the distinction between inferences and truth values on one hand, and transformations and grammaticality on the other is not made, and semantic facts are treated as syntactic phenomena.

To conclude, due to the absence of an independent level of semantic representation, Fillmore's Case grammar is inadequate in its representation of the semantic relations that hold between predicates and arguments. The theory lacks well-defined criteria for what judgements count as semantic judgements; syntactic phenomena are not clearly differentiated from semantic phenomena; and the Cases posited to capture semantic relations represent only an arbitrary set of semantic concepts, which they classify into arbitrary categories. Consequently, predicates that are

very close in meaning are represented as completely different, while others that are quite dissimilar receive identical representations.

II. CASES AND LEXICAL REPRESENTATION

The notion of Case determines the structure of the lexicon in Case Theory. Noun entries specify semantic features needed for proper Case assignment. The entry for man, for example, contains [+animate] to allow it to be assigned A or D. The entry for idea contains [-locative], to bar it from being assigned L. Predicate entries contain features determining which Case frames the predicate can occur with. The entry for run reads:

(23) [____A].

It specifies that run assigns A. The entry for open reads:

(24) +[____O (I) (A)]

specifying several Case frames: Open must assign O and may also assign A, I or both.

Fillmore claims that Case grammar allows a much more concise lexical representation than does a theory under the Nonrestrictive approach, which posits separate syntactic and semantic features. According to him, his lexicon achieves a reduction in the number of entries both for the same lexical item, if it occurs in different syntactic structures, and for different lexical items, if they are synonymous. But Fillmore's economy is only apparent. It is mainly due to his use of a shorthand notation, which allows him to combine several distinct entries in one representation. When the combined representation is unfolded, Fillmore's lexicon contains, in fact, more entries than a theory of the Nonrestrictive

tive approach does. Another reason for Fillmore's fewer entries is that he does not represent many semantic concepts that differentiate senses from one another, which a Nonrestrictive theory does represent. For him, these senses are synonymous and he assigns them the same representation.

Let us first consider the reduction proposed in the number of entries for a single lexical item. Fillmore's entry for open, (24), uses parentheses to represent the optionality of I and A. But parentheses are only a shorthand notation for combining the following possible Case frames:

(24a) [___ 0]

(24b) [___ 0 + I]

(24c) [___ 0 + A]

(24d) [___ 0 + I + A]

The use of the term "optional" is misleading here. It suggests that perhaps there is only one basic Case frame (24a), to which optional Cases may be added. But, in fact, (24a) to (24d) represent three distinct, mutually exclusive, Case frames, with which open may occur, and only (24d) is a genuine optional variation of (24c). (24a) to (24c) are distinct Case frames since each allows the generation of a different deep structure and a corresponding set of surface structures, that cannot be generated from the other two frames. (24a) yields

(25) The door opened;

(24b) yields

(26) The key opened the door

and

(27) The door was opened by the key;

(24c) and (24d) yield

(28) John opened the door (with a key)

and

(29) The door was opened (with a key) by John ³.

Thus Fillmore has, in fact, three separate entries for open, whereas a Nonrestrictive theory has only two. Syntactically, these will be:

(30a) NP_____

and

(30b) NP_____NP

corresponding to the intransitive and the transitive forms of the verb. Note that the shorthand notation used by Fillmore is just as possible here:

(30) NP_____ (NP)

Each of the syntactic entries for open corresponds to a distinct sense and therefore has a distinct semantic representation ⁴. The intransitive open expresses a change occurring to a part of the enclosing surface of some bounded space, which moves to allow free passage into or out of that space, as in

(25) The door opened.

The transitive open expresses the same change but explicitly specifies that the change is caused by some other entity, as in (26) or (28).

Let us compare Fillmore's lexical treatment of open to the above analysis of the meaning of the verb. First, Fillmore posits three entries for the predicate, while the analysis calls for only two. There are only

two entries since there is no need to distinguish between two different senses of open in (26) versus (28). Both John and the key are causes in the event of opening, and both can function as instruments manipulated by another entity. The fact that the key must be manipulated and cannot open the door on its own is a consequence of the fact that keys are inanimate objects incapable of autonomous action and are therefore used by other, autonomous entities. Second, there is a need to distinguish between the intransitive noncausative sense of open and its transitive causative sense. When Fillmore claims that "certain related transitive and intransitive verbs need not be given separate semantic descriptions" (Fillmore 1968:29). he implies that the noncausative sense The noncausative sense must be differentiated from the causative sense need not be distinguished from the causative one. But such distinction is needed to capture the fact that

(31) The door was opened but without anyone or anything doing it
is contradictory, whereas

(32) The door opened without anyone or anything doing it
is perfectly acceptable (Katz 1972:359). Fillmore avoids the need to distinguish the causative from the noncausative meaning simply because his lexicon is selective in the semantic concepts that it represents. Case grammar does not include the concept of causation and therefore equates the two senses of open. But without representing causation, it cannot differentiate between the contribution of John in (28), where John is the cause in the event, and his contribution in

(33) John watched the girl

where he is not. Evidently, if certain semantic concepts are not accounted for in Case grammar, it is only natural that its lexicon will contain fewer entries than the lexicon of a theory which gives more detailed semantic representations for the meaning of lexical items. To call such sparsity more economical, however, is misleading.

Fillmore claims that Case grammar also allows him to combine different lexical items in one representations, thus making it "possible to reduce the number of semantic entry types ... [where] ... some syntactically different words are in fact semantically identical (with respect to that aspect of their meaning which is independent of the contribution of the associated Cases)" (Fillmore 1968:30). To illustrate this, Fillmore discusses the representations of see and show : "The verb show... might well have the same representation as see, differing from it only in that the frame feature for show contains an A where that for see does not" (Fillmore 1968:30). Fillmore's representations are:

(34) see [___O + D]

(35) show [___O + D + A]

But if (35) contains a Case that (34) does not, in what way can these two be combined? Fillmore does not even show how this combination is to be achieved. Thus, the claim that there is reduction here is simply false.

Fillmore goes on to say that see and show constitute an "instance of synonymy where there are frame feature differences depending on whether a particular case category [is] present or absent" (Fillmore 1968:30). But, clearly, as far as these two verbs are concerned, their meanings

differ in more ways than the mere absence or presence of an agent, as can be seen in the lack of contradiction in

(36) I showed John the pictures, but he didn't see them
which indicates that the event of seeing is not included in the meaning of show. Fillmore could have chosen a better example to make his case, such as watch, whose meaning does contain the concept of seeing, as is evident in the contradiction found in

(37) John watched the slides but didn't see them.
But Fillmore's use of the term "synonymy" would be inappropriate in any case. Synonymy occurs only when the two senses are identical, not when one sense is simply included in the other, as is the case with see and watch.

This erroneous use of "synonymy" instead of "sense inclusion" is merely a confusion of terms. What is more objectionable in Fillmore's discussion of these verbs is his claim that Case grammar allows him to represent sense inclusion, when it is obvious that Case grammar is what prevents him from doing so. Since Fillmore does not represent the full meaning of lexical items, he cannot represent in what way the meaning of see is closer to the meaning of watch than the meaning of find is, since both find and see have (34) as their representation. Case grammar makes it impossible to determine what predicates are closer in meaning than others, since it does not represent concepts such as visual experience, which are necessary in order to indicate the similarity between see and watch.

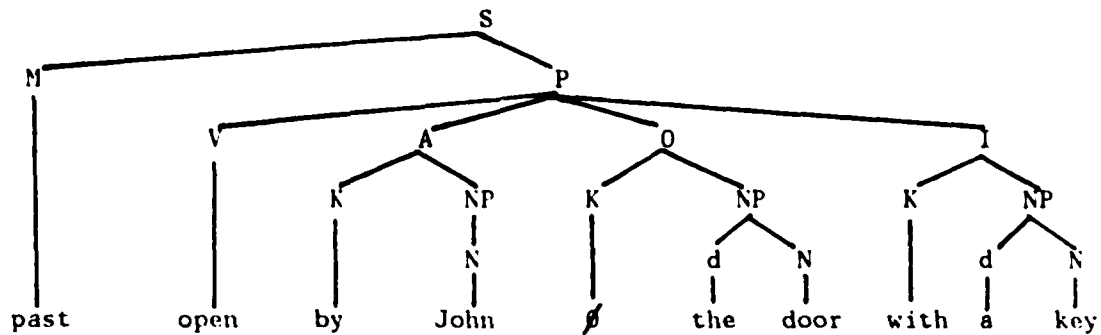
To conclude, contrary to Fillmore's claims, his lexicon is not more economical than the lexicon of the Nonrestrictive approach. More importantly, his lexicon does not contain many semantic concepts inherent in the meaning of predicates, without which it is impossible to represent relations of synonymy and sense inclusion that hold among various predicates in the language. Thus the Restrictive approach does not improve lexical representation but rather hinders it.

III. CASES AND SYNTACTIC REPRESENTATION

In his treatment of syntax, Fillmore does not address traditional syntactical problems, such as wh-extraction, preposition stranding, word order, and many others. The two areas which he does discuss are passive transformations and preposition selection. His Restrictive approach, which embodies the principle of syntactic relevance, creates unsolvable problems both for passive generation and for prepositional selection.

Deep structures in Case Theory are "array[s] consisting of a V plus a number of NP's holding special labeled relations (cases) to the sentence" (Fillmore 1968:32). The deep structure corresponding to "John opened the door with a key" is the following:

(38)

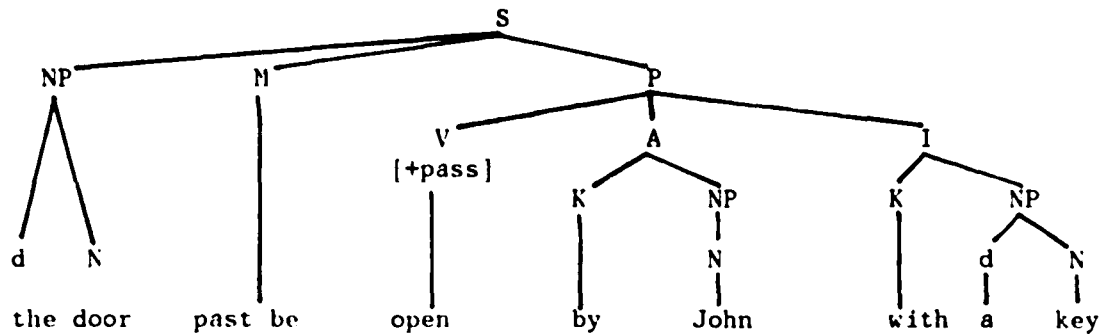


where M is the modality component, containing negation, tense or modals; C stands for a Case category; and K stands for a Case marker, such as a preposition or an affix. The Subject Selection and Object Selection rules generate surface structures from deep structures. The Subject Selection rule selects one of the C's as a surface subject, according to a general rule: if A is present, it is selected as subject; if no A is present, I is selected as subject; if no A or I is present, O is selected as subject. If a non-normal selection is made, that is, if the hierarchy of this general rule is violated, this fact is registered in the verb, in the form of passive morphology. Thus Fillmore explains the surface structure of

(39) The door was opened with a key by John

as a derivation from (38), with passive morphology to mark the non-normal selection of O as subject in the presence of both A and I. The intermediate representation of (39) is the following:

(40)



Although Fillmore's surface-structure rules explain the derivations of some well-formed surface structures, such as (39), they fail in many other instances. On one hand, they do not account for the existence of other grammatical surface structures, and on the other, they predict the existence of ungrammatical ones. Consider

(41) The door opened with a key
mentioned by Dougherty in "Recent Studies of Language Universals" (Dougherty 1970:519). The sentence is an instance of O chosen as subject although I exists in the deep structure. According to Fillmore, since the normal choice of subject is violated, the verb should be registered as passive. But the verb is clearly active. Next, consider

(42) *The key was opened the door by John.
According to Fillmore's subject selection rule, such a structure can be derived from the deep structure represented in (38), if a non-normal selection of I is made for the surface subject and marked, accordingly, with the passive. But such a selection is clearly ungrammatical. In order to block it, Fillmore could stipulate that I cannot be chosen as a non-normal

surface subject if A is present at deep structure. But then, sentences like

(43) Paint was smeared on the wall by John
would not be derivable, since paint, being I according to Fillmore's analysis (Fillmore 1968:48), would not be able to function as a surface subject in the presence of A (John in this case). The stipulation could be further modified to state that I cannot be chosen as a surface subject only in the presence of both A and O. This would exclude (42) and allow (43) since the latter does not contain O (Wall is L, according to Fillmore's analysis). But then other ill-formed surface structures would be derived. Consider

(44) *The cane was walked by John
where cane is I, John is A, and there is no O. These examples indicate quite clearly that there is no possible way in which Fillmore's rule for surface-subject selection can be modified to yield only and all well-formed passive structures. In other words, Cases cannot capture the fact that only direct and indirect deep-structure objects but not any other complements can figure as surface subjects in passive constructions.

These problems point to the need for generating syntactic structures independently of semantic structures, to allow for sentences that are well-formed syntactically and meaningful; for others that are syntactically well-formed but semantically deviant; and for those that are both ill-formed and semantically deviant. Under a Nonrestrictive approach, syntactic generation is independent, and the sentences discussed above receive appropriate categorizations: (41) is both syntactically well-

formed and meaningful. Syntactically, it satisfies the subcategorization features of open, which specify that the verb may occur intransitively, selecting a subject NP only. It also satisfies some general rule for adjuncts, whose exact nature need not concern us here, which states that in general, any VP can take a with prepositional phrase as an adjunct. Semantically, door respects the selection restrictions on the subject argument, which specify that it must refer to a movable part of the enclosing surface of some bounded space⁵. (42) is ruled out by the syntactic subcategorization features on open, which mark it as a transitive verb, taking only a subject and a direct object, with no indirect object possible. These subcategorization features allow

(45) The key was opened by John

as syntactically well-formed. The semantic selection restrictions, however, are violated in this case, since the key does not refer to a part of the surface enclosing some space, and the sentence, although syntactically well-formed, is semantically deviant.

As for preposition selection, the ad hoc nature of the conditions which have to be stipulated for the correct choice of the surface realization of prepositions are discussed in Dougherty (1970). But Dougherty's criticism makes Fillmore's theory look much more ad hoc than it actually is. This is due to Dougherty's failure to perceive the correct underlying Case structures of the sentences he uses as examples. He challenges Fillmore's rule which states that "the I preposition is by if there is no A; otherwise it is with" (Fillmore 1968:32). Dougherty cites two well-formed sentences:

(46) John was killed by the poison

(47) John was killed with the poison

He then claims that with can occur (as in (47)) even if A is not present, contrary to Fillmore's rule (Dougherty 1970:520) However, Dougherty's counter-example is not genuine, since (47) is better described as a surface variation of (48),

(48) John was killed with the poison by A
generated from the Case frame (49),

(49) { ___ 0 + 1 + A }

with A deleted on surface structure. The occurrence of with with 1 in (47) thus follows from the underlying presence of A in the deep structure. (46), by contrast, has a different underlying structure, based on the Case frame (50),

(50) { ___ 0 + 1 }

and thus, a surface occurrence of by with 1. This confusion arises because of Fillmore's failure to indicate that the presence of A that counts for the preposition rule is a deep-structure presence. If the rule is made clearer to read: The 1 preposition is by if there is no A at deep structure, otherwise it is with - it will hold for both (46) and (47).

Similar confusion arises with the change of the D preposition from to to by in the absence of a deep structure A, as is exemplified in:

(51) The book was seen by John

(52) The book was given to John (Dougherty 1970:522)

(51) does not have A in its deep structure, whereas (52) does. The same holds true again for the change of the O preposition from zero to by in the absence of a deep-structure A, as is exemplified in:

(53) John was pleased by the book

(54) John was given the book.

Dougherty is led to believe that in all three preposition changes a peculiar condition must hold for the change to take place, namely, that a corresponding active sentence must be well-formed: With changes to by in the surface realization of I only if the sentence

(55) (_s NP_I V [-pass] NP_{C_x})

is well-formed. (48) undergoes a preposition change because

(56) The poison killed him

is well-formed. For the Dative, to changes to by in the surface realization of D only if the sentence

(57) (_s NP_D V [-pass] NP_{C_x})

is well-formed. (51) undergoes a preposition change because

(58) John saw the book

is well-formed, but (52) does not undergo it because

(59) John gave the book

is ill-formed with John as D. A similar condition is specified by Dougherty for the Objective preposition change as well. Dougherty goes on to say that the condition on the rules for preposition changes is very peculiar. It "is unlike any condition required in an Aspects type grammar. stat[ing] that a phrase marker, PM_x, can undergo a transformational change to form another phrase marker, PM_y, if there exists a well-formed sentence with the phrase marker, PM_z. This is an extremely powerful descriptive

mechanism and alters the concept of derivation. Such a powerful descriptive mechanism is not allowed by the Aspects formulation" (Dougherty 1970:524).

Dougherty is mistaken in believing that Fillmore makes use of such an extraordinary device for predicting the surface realization of prepositions, but he is right in observing that Fillmore fails to capture the facts in a general enough way. To explain the occurrence of by in passive sentences, Fillmore needs to formulate three distinct rules:

- (60) with --> by for I in the absence of A at deep structure
- (61) to --> by for D in the absence of A at deep structure
- (62) zero --> by for O in the absence of A at deep structure.

As Dougherty points out, Fillmore misses a significant generalization that can be captured by a single rule (namely, passive transformation) in a system which does not employ Cases and makes use of syntactic deep structures instead. The rule reads:

- (63) DS [NP₁ V NP₂] --> SS [NP₂ be V_[+pass] by NP₁]

for any sentence that meets its structural description.⁶ Fillmore admits in "The Case for Case Reopened" that "at the end, such provisions [to account for the assignment of by] did not look any better than an account according to which the preposition by gets introduced by means of a Passive Transformation" (Fillmore 1977:65). Actually, the discussion here shows it to be worse than the purely syntactic alternative.

To conclude, Fillmore fails to derive surface structures from deep structures that include Cases. His rule for surface subject selection

cannot generate all well-formed passive constructions without allowing the derivation of some ill-formed ones as well. His rules for preposition selection do describe the facts correctly (for those sentences that his grammar can generate), but the presence of three separate rules to account for the occurrence of the preposition by in passive constructions fails to capture the generality of this occurrence. By contrast, a theory which includes a separate syntactic component would be able to generate all and only well-formed passive constructions, by using the notion of deep-structure object and will account for the by preposition phrase by using the notion of deep-structure subject.

IV. CONCLUSION

Fillmore's claim that a linguistic theory should account for judgments that speakers make about events and the entities that participate in them is certainly valid. So is his observation that neither syntax nor surface-structure case forms can account for these judgements. However, as has been shown, Cases do not fare much better. Syntactically, Cases cannot generate all well-formed surface structures and cannot rule out ill-formed ones. Those syntactic phenomena that are accounted for by the theory are described but fail to generalize. Indeed, in "The Case for Case Reopened" Fillmore admits that he "must concede that a level of representation including the grammatical relations subject and object...is probably necessary for grammatical theory. This does not mean, however, that a level of representation which recognizes case functions is spurious. We still have, after all, the problem of determining from an understanding of what is being said, which of the arguments

of a multiplace predicate are to appear as its subject, and which if any, as its object" (Fillmore 1977:70). Thus, Fillmore retracts from the Restrictive Approach and acknowledges the need for independent syntactic and semantic levels of representations.

But Fillmore's new conception of Cases and what they represent has little to do with semantics. In "The Case for Case Reopened", Cases no longer represent the relationships between arguments and predicates as they are conveyed by the meaning of verbs, but rather the interactions of participants in the event, as seen from the particular perspective chosen by the speaker to represent the event. Thus, "a complete description of [a] commercial event would identify the buyer, the seller, the money and the goods... In the usage that I suggest, any verb identifying any particular aspect of the commercial event will constrain it to bring one or more of the entities in the event into perspective... For example, if I wish to take the perspective of the seller and the goods, I will use the verb sell. Should I wish to take the perspective of the buyer and the money, I will use the verb spend. If I wish to bring into perspective either the buyer and the money or the buyer and the seller, I will use the verb pay. Should I wish to take the perspective of the goods and the money, I will use the verb cost." (Fillmore 1977:72-73).

The choice of a perspective by a speaker is a stylistic or pragmatic issue which should not be represented by a linguistic theory whose goal is to describe and explain linguistic entities and the principles by which

they operate, regardless of speakers' use. Consider two syntactic options available to a speaker wishing to describe an event of selling: He can use the active form ("I bought a book") or its corresponding passive form ("The book was bought by me"). But the stylistic rules and norms of conversation which dictate his choice do not form part of a syntactic theory. The theory explains only the structure of such sentences and what rules account for their generation but does not indicate the conversational situations for which they are appropriate. The same holds for speakers' choice of semantic options. A semantic theory would only expose the similarity in the meanings of sell and buy, but would not determine the conversational context in which they should be used. Confusing stylistic choices with semantic meaning leads Fillmore to hold semantically inadequate views. He argues, for example, that what differentiates sell from pay or cost is the choice of a perspective. But this is clearly not the case. No matter what perspective is chosen, "He paid the hospital for the operation" and "The operation cost ten thousand dollars" are well-formed, whereas "He bought an operation" is not. This shows that the meanings of these verbs differ. Similarly, the lack of contradiction in: "I paid a hundred dollars for the car but did not buy it after all" and "The book did not cost much but nobody bought it", also indicates that the verbs differ in meaning. If the verbs were mere choices for describing the same meaning, contradictions would arise when the meaning were both asserted and negated. A semantic theory should therefore specify the differences that exist among them. Since there is contradiction in "He sold me his car but I did not buy it", the two verbs have the same meaning. A semantic theory should therefore capture this synonymy in its repre-

sentation. But Fillmore's new conception of Cases as speakers' choice of perspective, is even less adequate as a theory for the representation of relations between predicates and arguments than the old Case Theory was, and thus, even if separated from the level of syntactic representation, Cases will still not do as semantic primitives.

FOOTNOTES

1. Following Chomsky, I adopt the convention of referring to Case in its technical sense with an initial capital letter, to differentiate it from the nontechnical use of the word 'case'.

2. Note, however, that it is not clear how Fillmore's system can predict which arguments can be conjoined and which cannot. Obviously, this does not depend on the verb, since come occurs both with a conjunction and without it. It depends on the degree of similarity shared by the two entities referred to by the arguments. Fairly similar entities, such as a map and directions (both inanimate objects) or he and his wife (both animate beings), can be conjoined. Fairly dissimilar entities (John and a book) cannot.

3. The generation of deep structures and the derivation of surface structures is discussed in Section III.

4. Note that a one-to-one correspondence between syntactic frames and semantic senses, like the one exhibited by open, is not always the case. Read, for example, is also NP___(NP), but has only one sense corresponding to the two syntactic frames. The lack of general correspondence between the syntactic and semantic structures of predicates is discussed in length in Chapter 5.

5. In fact, the selection restrictions for the subject argument of open are more complicated, since they have to allow for "The box opened with a key" as well.

6. This Standard passive-transformation rule is somewhat simplistically formulated. It would have to contain a "passivizable" feature on the verb, since not all active verbs can be passivized. Note also, that such transformational rule no longer exists in the recent version of Chomsky's Government and Binding Theory: "It would be a mistake to suppose that in such agentless passives as

(i) John is believed to be a liar

there is a suppressed phrase by-PRO or something of the sort (perhaps a deleted by-phrase, as in the earliest versions of transformation grammar" (Chomsky 1981:100). Chomsky is aware of the need to account for the possible addition of a by-adjunct, but does not suggest how this should be done: "Note that a generalization of theta-theory beyond the framework assumed here is necessary to accommodate the role of the optional adverbial in (i)" (Chomsky 1981:147, fn 100).

CHAPTER 2 - CHOMSKY'S THEORY OF GOVERNMENT AND BINDING

Thematic roles occupy a central position in Chomsky's current syntactic theory of principles and parameters, as it is stated in Lectures on Government and Binding (LGB). This centrality is a recent development in the theory: Standard Theory did not refer to thematic roles at all (the term is not even mentioned in Aspects) and the Extended Standard Theory referred to them only marginally as a means to preserve deep-structure grammatical relations which are obscured on surface structures as result of substitution. In the current version of the theory, as in Fillmore's Case Theory, thematic roles, referred to as theta-roles, are the only components of lexical representations; they serve as a basis for generating base structures; and they constrain the derivation of certain surface structures.

The introduction of theta-roles into the theory constitutes a marked departure from Chomsky's earlier view. The underlying approach of Standard Theory was Nonrestrictive. Syntactic generation was conceived of as completely independent of semantic structure. The approach underlying Government and Binding is Restrictive: theta-roles, which express semantic relations between predicates and arguments, are posited as syntactic primitives. Obviously, such a drastic change must be strongly motivated. But the justification for adopting a Restrictive approach is inherently

problematic within the Government and Binding context. Recall that Fillmore justified Cases by appealing to certain semantic judgements formed on the basis of propositions denoting events. He found Cases necessary to account for these judgements, since syntactic relations could not do so. Chomsky also claims that theta-roles are needed to represent relations holding between predicates and arguments at the level of LF, which is his level of semantic interpretation. But, unlike Fillmore, Chomsky cannot make such claims about what is to be represented at the level of semantic representation, because of his understanding of the nature of LF: the semantic coverage of LF is not specified a priori but determined empirically. A semantic phenomenon is found to be linguistic, and therefore represented at LF, only if it can be captured by mechanisms already independently stipulated for syntactic representation. Thus, the justification for introducing theta-roles into the system must be syntactic. Only if they are independently needed to explain syntactic phenomena, can they serve to explain semantic phenomena at LF.

In fact, there is a syntactic need for theta-roles under Chomsky's current view. Government and Binding is conceived of as a theory that explains language learnability. To account for the fact that children learn language rather fast and well despite impoverished stimuli, the theory severely restricts the number of possible grammars the learner has to choose from. Only one base rule and one transformational rule are stipulated, and they are optional and applicable in any syntactic context. Free to operate with no constraints, these rules overgenerate. To block ill-formed structures that result from this overgeneration, the grammar

includes several global conditions on derivation. But these conditions do not suffice to block all ill-formed structures. For the remaining ones, a new condition - theta-theory - is introduced, which operates on the basis of theta-roles. The motivation for introducing theta-roles into the theory is thus purely syntactic. Their function is to mark certain structural positions as argument positions. But in order to do so, theta-roles need not have any semantic content at all. Thus, Chomsky could have included theta-roles in his new syntactic theory without endowing them with semantic content; that is, without committing himself to a Restrictive view, under which semantic concepts determine syntactic structure.

The adoption of a Restrictive view, however, is an attempt to better justify the need for theta-roles. Theta-roles block undesirable derivations, but they do so at the expense of increasing the complexity of the system. Increased complexity poses a major problem for a theory like Government and Binding, which has to explicate learnability: the more complex the grammar is, the less plausible it becomes as a learnable model. This is why Chomsky is anxious to find other independent reasons for the existence of theta-roles, and does so by equating them with thematic relations, which then can have a function at the level of LF. Thus, Chomsky's Restrictive approach is only an attempt to justify the introduction of complexity into his syntactic theory. In fact, however, theta-roles have little to do with semantics.

Section I of this chapter discusses Chomsky's failed attempts to justify his Restrictive approach on semantic grounds. Section II presents the syntactic grounds that require the positing of theta-roles. Section III discusses Chomsky's Restrictive approach as it is manifested in the attempt to derive subcategorization features on the basis of theta-roles. This attempt to derive syntactic features from thematic features in the lexicon is similar to Fillmore's attempt to derive syntactic structure from Case structure in derivations. The problems encountered by Chomsky's lexical entries are therefore similar to the ones noted in connection with Fillmore's theory.

1. THETA-ROLES AND SEMANTIC REPRESENTATION

Since Government and Binding (henceforth GB) is a theory that is highly motivated by considerations of language acquisition, any addition of new concepts (i.e., thematic roles) and any increase in language specific information (i.e., theta-roles specifically associated with each lexical entry) are highly problematic. It is therefore crucial for the theory to justify the existence of theta-roles independently of the newly-created syntactic need for them. Meta-theoretic justification for the existence of theta-roles is found in the notion of their "epistemological priority": "The primitive base must meet a condition of epistemological priority... We want the primitives to be concepts that can plausibly be assumed to provide a preliminary, prelinguistic analysis of a reasonable selection of presented data... It would, for example, be reasonable to suppose that such concepts as 'precedes', or 'is voiced' enter into the primitive basis, and perhaps such notions as 'agent-of-action' if one believes, say,

that the human conceptual system permits analysis of events in these terms independently of acquired language. But it would be unreasonable to incorporate, for example, such notions as 'subject of a sentence' or other grammatical relations within the class of primitive notions, since it is unreasonable to suppose that these notions can be directly applied to linguistically unanalyzed data. Rather, we would expect that such notions would be defined in UG in terms of a primitive basis that meets the condition of epistemological priority" (Chomsky 1981:9).

These remarks about the epistemological priority of theta-roles can be interpreted in two ways: a strong interpretation would require that the theory provide a linguistic argument, or at least some justification, for the priority of theta-roles. But such strong interpretation seems inappropriate: first, the priority claim is couched in tentative terms. Second, since it links linguistic notions to more general cognitive notions and to prelinguistic conceptual processes, it is by nature a meta-theoretic claim, which cannot be justified internal to the theory. A weaker interpretation would simply adopt the priority claim as an underlying assumption of the theory and would show how the non-primitive concepts are derived from those taken as primitive. One would therefore expect the theory to posit theta-roles and define the non-primitive notion of grammatical functions such as subject and object on their basis. However, the discussion in LGB points to the contrary: "We are now assuming, following standard practice, that two factors enter into the determination of theta-roles: intrinsic properties of lexical items which are heads of phrase categories (as the verb is the head of VP), and GF's,

grammatical functions such as subject, object, clausal complement, head, etc" (Chomsky 1981:42). Grammatical functions are necessary in order to link a particular theta-role stored in the lexical entry of the head with its proper argument. Thus, not only do theta-roles fail to serve as primitives for the definition of other grammatical notions, but they themselves depend on these notions in order to function.

If theta-roles are not primitives, there should be another theoretical motivation for their existence, in view of the lexical complexity they introduce to the system. This is why they are claimed to be necessary at the level of LF: "It has traditionally been assumed that such notions as 'agent-of-action', 'goal-of-action', etc, play an important role in semantic description, and there has been important recent work elaborating these ideas. These notions in fact enter into many different theories of semantic description. They are the semantic relations of Jerrold Katz, the thematic relations of Jeffrey Gruber and Ray Jackendoff, the case relations of Charles Fillmore, and the primitive notions of event logics such as that of Donald Davidson... Let us assume that LF must be so designed that such expressions as the man, John, he, are assigned theta-roles, that is, assigned the status of terms in a thematic relation. Let us call such expression 'arguments', as distinct from idiom chunks, ...non-argument it, or existential there, terms which assume no theta-role. Thus, we understand NP arguments to be NP's with some sort of 'referential function', including names, variables, anaphors, pronouns... Let us refer to a position in LF to which a theta-role is assigned as a 'theta-position'" (Chomsky 1981:35).

The assumption that LF must represent thematic relations is, however, completely unmotivated. The inclusion of thematic roles at LF cannot draw support from other semantic theories, because the rationale behind LF is different from that of other theories. Theories such as Fillmore's or Davidson's start with a priori assumptions about the linguistic phenomena they are to explicate: They are intended to account for semantic judgments, truth conditions, or inferences. The choice of their primitive bases can thus be evaluated against their factual success in accounting for the semantic phenomena they claim to be able to account for. LF does not have similar a priori goals. On the contrary, the linguistic phenomena it is to account for are determined empirically; whatever can be explicated by the syntax of LF is to be regarded as part of the theory of linguistics. The rest forms part of either pragmatics or a non-linguistic system of knowledge and beliefs. Rather than being delimited by a priori goals, LF is constrained by the lexical information and syntactic apparatus made available for it by the other components of the theory. Quantifier scope, for example, is said to be part of LF and consequently part of semantics because it is assumed to be able to be representable by means of Move- α operating on S-structures. "If some attribute of a sentence that enters into logical inferences turns out not to be provided by the best theory of grammar that we can devise, we will conclude that this is not an element of the representations of meaning provided by grammatical competence. Proceeding in this way, we will try to identify just what it is that we have loosely been calling 'representations of meaning'... The fact that the conclusion may not conform to some a priori scheme or satisfy some specific need such as codifying in-

ference is plainly irrelevant to this empirical inquiry". (Chomsky 1980:65). Thus, the need to represent thematic relations at the level of LF cannot justify the inclusion of theta-roles in GB. Rather, it is only if theta-roles are otherwise justified that LF can make use of them. Notably, the claim that theta-roles form part of LF is a recent addition to the theory. In Rules and Representations, they were considered to possibly lie outside of the realm of linguistics: "The system of conceptual structures that involves object-reference with all of its subtleties and complexities, thematic structures, aitiational factors, and the like, might be distinct from the language faculty, though related to it" (Chomsky 1980:58).

To conclude, the attempt to justify the new Restrictive approach by recourse to epistemological priority fails since theta-roles are not more primitive as linguistic concepts than are grammatical functions. On the contrary, theta-roles depend on grammatical functions for their correct assignment. Justification of the Restrictive approach on the basis of LF requirements fails since, by definition, there could be no a priori LF requirements. If theta-roles are not conceptual primitives and if, furthermore, there is no ground for holding them essential at LF, the only reason for incorporating them into GB is the existence of the theta-criterion, a syntactic principle which requires thematic information for its operation.

II. THETA-ROLES AND SYNTACTIC REPRESENTATION

The newly-created syntactic need for the theta-criterion is a consequence of Chomsky's new conception of syntactic theory, as a system of principles and parameters. Its discussion therefore requires a more general discussion of the nature of the new theory.

II.1. THE SYSTEM OF PRINCIPLES AND PARAMETERS

In very broad terms, the basic goals of the theory have remained unchanged: descriptively, the grammar put forth by the theory is to generate all and only well-formed surface structures¹. The lexicon provides the set of terminal symbols that occur in these strings together with structural descriptions of the environments in which they can occur; a base component generates structures into which the terminal symbols are inserted; a transformational component derives various surface-structure strings from the deep structures generated by the base by means of constituent movement; an interpretive semantic component relates predicates to arguments, variables to their operators and bound expressions to their antecedents. From the explanatory point of view, the goal of the theory is still to represent linguistic phenomena as a product of the application of universal principles, in order to account for the linguistic competence exhibited by native speakers in the face of impoverished linguistic evidence.

The major revision that has motivated the present framework of principles and parameters is the introduction of universal processes and universal conditions (referred to as principles) in place of the various language-specific and context-sensitive rules of the earlier versions of

the theory. To account for differences among languages, the principles include language specific parameters ("on/off" switches) whose values have to be fixed by the learner on the basis of experience. In LGB, the base rules that form the possible D-structures of a particular language are greatly reduced. In their place, a projection principle is introduced to link lexical entries to base structure configurations. It states that "representations at each syntactic level (i.e. LF-, and D- and S-structure) are projected from the lexicon, in that they observe the sub-categorization properties of lexical items" (Chomsky 1981:29). That is, the presence of constituents at D-structure is determined by the number and nature of complements specified in the lexical entry of the lexical head. If the lexical entry for persuade, for example, contains both an NP-object and a clausal complement, an appropriate D-structure for persuade will be a projection of the lexical information and will contain both. X-bar theory determines the hierarchical structure of the projection in universal terms. It represents all different constituent structures as realizations of the same expansion process: all major categories of the base (N, V, A and P) are defined by means of the same two binary features (N and V). Each category serves as the head of a higher level category of the same type, called a maximal projection, which dominates the head as well as its specifiers and complements.²

$X' \rightarrow \dots X \dots (X=[+N, \pm V] \text{ or } [+V, \pm N])$ (Chomsky 1981:48)

Each maximal projection contains as many complements as are specified in the lexical entry for the head. The X-bar formulation is said to reduce the load of learnability, since the child does not have to learn any base rules in addition to learning the lexicon. There are, though, at least

two language-specific parameters in the base: one defines word order - whether the language is configurational or not, and if it is, whether the head precedes or follows its complements; the second determines whether the language is pro-drop or not - that is, whether it allows subjectless clauses or requires that each clause contain a surface subject.

In place of a variety of transformational rules, which in the earlier version of the theory produced surface structures from deep structures, there is now only one transformational schematic rule - Move- α - which can apply to any phrase marker and which is always optional. Thus it is claimed that "the notions of 'passive', 'relativization', etc, can be reconstructed as processes of a more general nature, with a functional role in the grammar, but they are not 'rules of grammar'" (Chomsky 1981:7). Move- α differs from the earlier transformations: it is restricted to movement only and does not perform deletion³ or substitution. Moreover, in place of the specific constraints associated with each transformation, Move- α is subject to global constraints, formulated as general principles to block all movement under certain general structural conditions. Move- α overgenerates: since it is optional, it produces more surface structures than did the Standard transformations, many of which were obligatory. The general principles therefore also have to rule out many ill-formed surface structures that result from the non-application of Move- α in what were considered obligatory movement contexts for transformations. Move- α and the principles are said to reduce the load of learnability since the child does not have to learn specific movement rules and does not have to determine if they are optional or obligatory.⁴

Move- α is constrained in two distinct ways: by the projection principle, formulated as a global principle which defines the nature of the rule's operation, and by a set of other principles, referred to as sub-systems, such as Case-, bounding- and binding theory, which either block or force its application in certain configurations.⁵

The projection principle implies that Move- α can result in neither deletion nor insertion. Since subcategorization features must remain transparent on all levels, deletion of a category is not allowed. Such deletion would result in the irrecoverability of a complement which would obscure subcategorization. Thus every moved lexical item must leave a trace behind it, under its category node. Similarly, insertion of a category is not allowed. Such insertion would result in the "addition" of a complement. Thus, a lexical item can only move to an empty position, that is, an empty node of the same category. In order for empty nodes to be available, D-structures must be generated with empty positions. This means that lexical insertion into D-structures is also optional, another change brought about by the current revisions.

Case-, bounding- and binding theories constrain the possible applications of Move- α : Case theory is a principle which "deals with assignment of abstract Case and its morphological realization" (Chomsky 1981:6). It includes the Case-filter condition which states that NP's must have Case (assigned by a governing category):

* NP if NP has phonetic content and has no Case (Chomsky 1981:49)

Thus, Case theory "forces" movement by ruling out certain S-structures in which movement does not occur. Since movement is optional, the D-structure (1) can yield two different S-structures - (1a), where movement applies and (1b) where it does not:

(1) e is certain [John to like ice-cream]

(1a) It is certain [John to like ice-cream]⁶

(1b) John is certain [t to like ice-cream]

Case is assigned to the subject of a clause by a tensed INFL. The subject of an infinitive clause, which is tenseless, is not assigned Case. (1a) is therefore blocked, since John has phonetic content and no Case. (1b) is well-formed since John moved to a position in which it is assigned Case by the tensed INFL of the matrix verb. This also explains the well-formedness of (1c), where John is assigned Case in the embedded clause since it is governed by an INFL node which is tensed:

(1c) It is certain [that John likes ice-cream].

Bounding is a principle which "poses locality conditions on certain processes and related items" (Chomsky 1981:5). It regulates movement, since it embodies the subjacency condition, stating that a constituent X cannot move to a position Y if, in order to do so, it must cross more than one bounding node:

* Y ... [... [... X ...] ...] ...


This condition blocks the following derivation:

(2) e seems [that e is certain [John to like ice cream]]

(2a) John seems [that it is certain [t to like ice cream]]

since in order to move, John crosses two s nodes, which are bounding nodes in English. If, by contrast, only one node is crossed, movement is allowed, as in (2b):

(2b) It seems [that John is certain [t to like ice cream]]

(Chomsky 1981:58)

Binding is a principle which "is concerned with the relations of anaphors, pronouns, names and variables to possible antecedents" (Chomsky 1981:6). It defines the structural conditions which must exist for an antecedent to govern its trace. Binding, like Case and bounding, is also evoked to bar ill-formed S-structures, such as (3a), derived from (3):

(3) e is known [_s, how [_s Bill to solve this problem]]

(3a) Bill is known [_s, how [_s t to solve this problem]]

(Chomsky 1981:58)

Here, (3a) is ill-formed since the trace is not governed by its antecedent (Bill), due to the presence of two nodes (s' and s) which separate them and block government. Binding explains why (3b), where only one node separates the antecedent from its trace, is grammatical:

(3b) Bill is known [t to have solved this problem].

11.11 THETA-THEORY

The three principles just discussed account for a fairly wide range of ill-formed derivations; however, they fail to account for the ungrammaticality of (4a), cited in Freidin (forthcoming):

(4) It is odd [e to like John]

(4a) It is odd [John to like t]

John is assigned Case by the verb like, which governs it; its movement is local, and its trace is governed. Therefore, none of the three principles is violated. Another principle is therefore needed to account for the ill-formedness of examples like (4a). Theta-theory, which "is concerned with the assignment of thematic roles such as agent-of-action, etc" (Chomsky 1981:5) is invoked for this purpose. Theta-theory includes the theta-criterion, which states that "each argument bears one and only one theta-role and each theta-role is assigned to one and only one argument" (Chomsky 1981:36).⁷ The criterion blocks movement from one argument position (i.e., a position which is occupied by an argument) to another, since such movement would yield two theta-roles for the moved NP: In (4), both e and John are arguments and are each assigned a role. If John moves to occupy the position of e, it will have two roles - the one assigned to it in its original position and the one it will acquire in its new position. This will violate the theta-criterion. Consequently, only movement from an argument position to a non-argument position is allowed, as is the case in (3b): the subject position of passive verbs is a non-argument position and can either be filled by an argument which moves into it (e.g., Bill) or by a pleonastic element, as in (3c):

(3c) It is known [that Bill solved the problem].

As it stands, the theta-criterion fails to work. It requires that each theta-role be assigned to an argument. This requirement is too strong since it cannot accommodate complements which are only optionally realized as syntactic arguments. Consider the lexical entry for eat, for example: if eat is listed as assigning no role, it will head constructions

that have no theta-positions. "John ate a sandwich" will then be ill-formed since a sandwich, which is an argument, occupies a non-theta position. If, on the other hand, eat is listed as assigning a role, "John ate" will become ill-formed since it will contain an empty theta-position at D-structure. This problem is not addressed in LGB, but without a plausible solution to it, the theta-criterion cannot be incorporated into the theory. A possible solution would be to have two separate lexical entries for eat (and by analogy, for all optionally transitive verbs): one entry assigning a role; the other not assigning one. Such added complexity is undesirable but seems necessary in order to maintain the theta-criterion.

The second requirement of the criterion states that an argument receives no more than one theta-role. This, too, is too strong.⁸ Consider the following:

(5) I consider the man intelligent

Intuitively, it would seem that man receives two theta-roles - one from consider and the other from intelligent. That intelligent serves as the head of the construction the man intelligent, rather than as a modifier of the man, is made clear by the contrast in meaning between (5) and (5a) on one hand, and (5b) on the other:

(5a) I consider the man to be intelligent

(5b) I consider the intelligent man

where intelligent is a modifier which does not assign a role to man. But since a double-role assignment would violate the theta-criterion, the GB analysis of (5) is the following:

(5c) I [_{VP}consider [_{AP}the man intelligent]]

(Chomsky 1981:169)

where the man is assigned a role by intelligent and the whole AP is assigned a role by the matrix verb consider, by virtue of being its argument.⁹ However, there are problems with treating the AP as one constituent, as noted by Chomsky: on one hand, the AP is like an S-complement on the level of LF, where it is interpreted as a proposition; on the other, unlike a regular S-complement, it cannot be a maximal projection since the matrix verb can assign Case to the subject of the complement, as in "I consider him intelligent", and can also subcategorize for the embedded predicate. Thus, "They consider [John the best candidate]" is grammatical, while *"They prefer [John the best candidate]" is not (Chomsky 1981:111). These problems are dismissed by assuming that the AP behaves like a clausal complement without being a maximal projection itself. However, even if it is assumed not to be a maximal projection, the man intelligent does not behave as one syntactic unit, as can be seen by the behavior of the clitic in the equivalent sentence in Italian:

(6) Considero l'uomo intelligente

It is possible to substitute a clitic for l'uomo:

(6a) Lo considero intelligente

But it is ungrammatical to substitute a clitic for the whole AP:

(6b) * lo considero (where lo stands for the whole AP)

This fact suggests that l'uomo and intelligente do not form a single syntactic constituent and that the analysis provided for it in LGB is not correct.

To conclude, theta-theory is introduced into GB as an additional condition on syntactic derivation, whose function is to block ill-formed surface structure. Theta-theory includes the theta-criterion, which requires that every role associated with a predicate be assigned to an overt argument and that every argument be assigned only one role. In its present formulation, the criterion is too strong. Whether it can be modified to circumvent the problems raised here remains an open question.¹⁰ But even if these syntactic problems are solved, the inherent problem caused by the introduction of theta-roles into the system remains: theta-roles greatly increase the complexity of the theory and the amount of information stored in the lexicon. The introduction of such complexity into a system that is to serve as a model of learnability must be carefully justified. The only justification for it seems to be the inability of the current grammar to account for well-formed surface structures without it.

III. THETA-ROLES AND LEXICAL REPRESENTATION

Theta-theory resembles the other theories in its syntactic function but differs from them in its nature. Case, bounding and Binding are purely structural principles, defined in terms of government, that is, in terms of the number and type of nodes in configurations to which they apply. (Case theory involves the added notion of abstract Case, but it, too, is structural, since the type of Case assigned is completely determined by the category type of the Case assigner - only major categories and INFL assign Case - and by the category type of the Case receiver - only NP's receive Case). These three principles operate on structural positions and they refer to lexical items only as terminal symbols which

occupy the structural positions on which they operate. Theta-theory, by contrast, is only partially definable in structural terms: a lexical head assigns a thematic role to a theta-position which is a "position satisfying the subcategorization features of the lexical head of a construction... in the terminology of X-bar theory, each complement position is a theta-position" (Chomsky 1981:35). Furthermore, the subject of NP or S may also be assigned a theta-role. Unlike the other principles, theta-theory also relies on lexical information in order to determine the nature of roles assigned by the head. Thematic information is associated with each lexical entry. Thus persuade, for example, assigns the roles of "target of the action (let us say, with the general semantic role of goal)" (Chomsky 1986:86) and that of proposition to its complements, while expect assigns the role of proposition only. This information is idiosyncratic and must be specified for each lexical item.

The introduction of theta-theory as a principle of GB results in a considerable increase in the complexity and size of the lexicon. To justify this complexity Chomsky adopts a Restrictive approach which subsumes the principle of syntactic relevance. Under this approach, thematic structure is said to predict syntactic structure. In the lexicon, theta-roles are said to predict subcategorization features. If subcategorization features are predictable, they can be removed from lexical entries. Their elimination thus compensates for the complexity introduced by theta-roles. If the lexicon is just as simple with or without theta-roles, their presence in the theory becomes less controversial.

The elimination of subcategorization features is motivated by the similarities noted between theta-theory and the projection principle. The projection principle creates a link between the lexicon and the base component by providing an initial base structure for a lexical head and by requiring that this structure be preserved through movement. Very much like the projection principle, theta-theory provides a thematic configuration for a lexical head on the basis of lexical information. Thus, for each entry that is a major category, the lexicon contains two sets of features: subcategorization and thematic roles. Each complement of each entry is mentioned twice - as a subcategorized complement and as a theta-role. The complement of kill, for example, is an NP object; it is also patient. The projection principle requires that all complements of a head be syntactically realized so that D-structures reflect the subcategorization features. The theta-criterion requires that all thematic roles be assigned to arguments, so that LF reflect the thematic grid (or frame) in the lexicon. The theta-criterion therefore fulfills practically the same role as the projection principle, guaranteeing that thematic assignments are preserved through movement. The two principles overlap, but only partially. Theta-marking does not completely entail subcategorization since the subject position in NP's and S's may be theta-marked but is never subcategorized for. Subcategorization, too, does not completely entail theta-marking in the case of idioms: components of idiomatic expressions are subcategorized for but are not assigned theta-roles. To solve the idiom problem, Chomsky suggests "inventing a new theta-role, call it #, for non-arguments that are subcategorized by heads, e.g. advantage in 'take advantage of'. Then even in idioms, each sub-

categorized position is a theta-position. We may now regard e.g. advantage as a kind of argument, call it a quasi-argument" (Chomsky 1981:37). Firmer grounding of theta-theory within the system is achieved but at the cost of further complexity in the lexicon, produced by the addition of a new type of theta-role.

The merging of the two principles (i.e. the projection principle and theta-theory) is an attempt to solve the problem of lexical complexity. If the two principles become one, then there is no need for duplicating lexical information: "This requirement that subcategorization entail theta-marking... restricts the variety of lexical entries. It is minimally necessary that the lexicon provide for each lexical head information about theta-marking for this element. We are now assuming that it is also maximally necessary; that is, there is no independent subcategorization information, except, possibly, in the case of idioms, or with regard to the linking of theta-roles and category (e.g. is an infinitival complement an NP or only an S'?). Even the latter may well be eliminable either on general grounds or, at worst, in terms of redundancy rules for the lexicon of a particular language" (Chomsky 1981:38). Thus, if the Restrictive approach can be maintained, that is, if the reduction of subcategorization features to thematic roles can be achieved, the addition of thematic information to the lexicon in place of subcategorization features would not increase its complexity. The system of principles and parameters would then constitute an improvement over the older system of rules and transformations, since it would capture more universal generalizations by means of fewer global principles.

That such a reduction is seriously proposed is puzzling, since the problems encountered in deriving syntactic structures from thematic structures have been generally acknowledged in the literature, especially since the publication of "The Case for Case". But these problems are not discussed in LGB. It is implicitly assumed that the canonical realization of the roles of agent and patient (the only roles mentioned and only by way of example) is NP. Thus "the verb break assigns the theta-role patient to window in 'John broke the window' and to the trace t in 'the window was broken t by John', thus derivatively to its antecedent window" (Chomsky 1981:105).

But the reduction fails as soon as one considers a sentence like "John sent Mary the book". Since such sentences are not discussed in LGB, there is no way of telling which theta-role is assigned to Mary. But whichever it is (let us assume, following Jackendoff, that it is goal), it is realized canonically as an NP. However, in "John sent the book to Mary", it is realized as a PP. Therefore, it is not possible to reduce the role of goal to one syntactic form. That is, it is not possible to derive the subcategorization features of send from its thematic features, unless it is posited that goal is reduced to either NP or to-PP. But then, how would *"He explained Mary the problem" be excluded? It seems that at least some idiosyncratic subcategorization features, such as those of explain, would have to be included in the lexicon. The problem is more general: goals of certain types, such as geographical locations, cannot be realized as NP's; hence, *"John sent the city the book". Should the number of roles increase to include two types of goals, those that are realized as to-PP's

only and those that are realized as either NP's or PP's? If so, there would be two separate entries for send: one with a goal that can be realized as either NP or to-PP; the other with a goal that can be realized only as a to-PP. This constitutes a complication of the lexicon as it existed in the old transformational framework. There, only one entry for send was required, specifying that the verb is ditransitive (that is, that it takes two NP-complements). A transformational rule would then turn $\langle \text{send-NP}_1\text{-to-NP}_2 \rangle$ into $\langle \text{send-NP}_2\text{-NP}_1 \rangle$ in the appropriate contexts.

Actually, theta-role assignment in GB is more complicated than what was assumed above, since GB, unlike other thematic theories, allows prepositions, as well as verbs, to assign roles, as in the case of "the window was broken by John", where the role of agent is said to be assigned to John by the preposition by and not by the verb. By analogy, the role of goal in "John sent the book to Mary" would be assigned to Mary by to. But the same role of goal would be assigned to Mary by sent in "John sent Mary the book", where there is no preposition. According to this analysis, send would be stored in the lexicon with two thematic grids: one assigning the roles of agent and patient only; the other assigning the roles of agent, patient and goal. But this analysis does not show how to determine whether a to-PP can occur with the verb or not. Consider, for example, would also have an agent-patient grid, to allow for "he considered the issue". However, unlike send, it cannot occur with a to-PP: *"He considered the issue to Mary". In the absence of subcategorization features, these simple facts cannot be accounted for.

A host of other problems are left perplexingly unexplained: Consider "It is known to everybody that John is a liar". What role does to assign to everybody? That of a goal, as in "send a book to Mary", or that of an agent, as in "It is believed by everybody that John is a liar"? And in sentences such as "A is preceded by B", does by assign an agent role to B? Such questions remain unfortunately open, since there is no clue in LGB as to how they should be handled.

Evident problems with the reduction claim also rise in connection with clausal complements: The theta-role assigned to clauses cannot be reduced to one syntactic form. An example of such an assignment is given for seem: "seem takes a clausal argument and thus must have the lexical entry: -S... Thus in 'John seems [t to have hit Bill]', seems must assign to the embedded infinitival clause the same theta-role that it assigns to the embedded clause in 'it seems [that John hit Bill]'" (Chomsky 1981:106). Based on this example, the reduction of the theta-role for clausal complement is either an infinitival complement or a tensed clause. How would this reduction account for verbs like conclude, which take a tensed clause but not an infinitival complement (*"He concluded to go"), or for minimal pairs such as likely and probable, where one lexical form takes an infinitival complement but the other does not ("He is likely to go" but *"He is probable to go")?

Problems exist not only in connection with the elimination of subcategorization features, but also in connection with the assignment of theta-roles to clear instances of NP-arguments. Consider the assignment

of role to the subject: "It is natural to regard the subject as 'subject-of-VP' or 'subject-of-S' rather than 'subject of verb', though it should be stressed that this whole question is more peripheral than many others that we have been considering, If so, then we may assume that the theta-role of the subject (where it exists) is determined compositionally by the VP in general" (Chomsky 1981:104). Although this is not considered a major problem, it is quite unclear how a theta-role is to be assigned compositionally and the examples given in this context do not illustrate how this is to be achieved: "John is understood to be the agent of the action in (i)'John broke the window', though there is another interpretation in which he is taken to be instrument as in the hammer broke the window, where we think of the hammer (or John) as being wielded by someone who is the agent; (ii)'John broke his arm' has these two interpretations, but its more normal interpretation takes John to be patient, so that (ii) but not (i) might be a response to What happened to John?" (Chomsky 1981:104). What seems to be implied by these examples is that the VP in (ii) assigns an additional role to the subject that the VP in (i) does not. But how is this assignment achieved? Clearly, no thematic information of this kind can be stored in the lexicon: The entry for arm cannot specify that if it is an inalienable possession of the subject of the verb break, then it may compositionally assign the role of patient to the subject. Nor can the entry for break specify such information. If GB is to represent thematic information of this kind, it can do so only with an intricate system of semantic rules that extends much beyond mere thematic grids in the lexicon.

Another problem avoided in LGB is the range and type of thematic roles posited. Here, as in every other theory that posits roles, a crucial problem is the adequacy of a criterion that will determine how many different types of roles exist. Fillmore attempted to determine this question with the principle of syntactic relevance: Cases were posited to account for differences in syntactic behavior. But, as discussed in Chapter 1, such a criterion proves inadequate. Ultimately, Fillmore himself admits that the question of the number of distinct Cases that need to be posited remains open. Chomsky attempts to give a semantic criterion: Roles are said to be assigned to arguments which are in some way "referential", but this criterion fails to account for the theta-roles assigned to clauses and idiom chunks. Clauses denote events and states, and therefore refer to states of affairs rather than to entities. Idiom chunks do not refer at all, since they do not bear independent meaning. Therefore, it is not clear in what sense arguments are considered referential. Moreover, theta-roles are assigned to structural positions, and only derivatively to arguments which occupy them. It is even less clear in what sense positions can be said to be referential.¹¹

To conclude, theta-roles give rise to syntactic problems that are similar to the problems raised by Cases. This similarity is a consequence of the underlying Restrictive approach shared by the two thematic theories. The approach, which implies that syntactic structures are derived from thematic structures, proves untenable in its Case formulation, where deep Case structures fail to generate well-formed surface structures; it proves untenable in its GB formulation as well, where thematic features

fail to generate correct subcategorization features. Just as Case theory could not dispense with syntactic rules for the derivation of well-formed syntactic structures, so is GB unable to dispense with subcategorization features for the successful operation of the projection rule.

IV. CONCLUSION

The discussion of Cases in Chapter 1 revealed not only syntactic problems resulting in an attempt to derive structure on the basis of thematic information, but also semantic inconsistency inherent in Case representations. The semantic nature of theta-role representations is less clear. This is because the semantic content of theta-roles is never discussed in LGB. There is no mention of how many theta-roles need to be posited or of what semantic concepts they should represent. The omission seems less surprising if one realizes that the real function of roles in the GB system is purely syntactic and has very little to do with semantics. What theta-roles represent in GB is not a semantic relation between predicates and their arguments but rather a new type of grammatical relation between heads and the positions of their subjects and complements: a head either assigns a role to a position and then theta-marks this position or it does not. Theta-relations are not only different from semantic relations but are also distinct from more conventional grammatical functions. This can be seen in sentences like "It seems that John is sick", where it is the subject of seems but is not theta-marked by it. Since theta-relations cannot be identified with conventional grammatical functions, the attempt in LGB is to identify them with semantic relations, familiar from other semantic theories, in order to make the distinction

between theta- and non-theta position seem more intuitive. But in fact theta-positions in GB are a completely structural notion. They are positions which must be occupied by arguments at D-structures. Arguments are similarly defined in purely syntactic terms: they are overt anaphors, such as "each other"; pronominals, which include pronouns and PRO (the subject of infinitive clauses); R-expressions which "include noun-phrases with heads that are in some intuitive sense 'potentially referential'... and variables"; and, finally, clauses. Non-theta positions are those positions which are generated empty at D-structure and which are occupied at S-structure either by moved arguments or by non-arguments (non-NP categories, "it" and "there"). Thus, theta-theory would not change much if instead of a range of roles, only one abstract theta-marker were posited, simply to indicate which subject or complement position must be theta-marked. What is needed for the theta-criterion to operate is only this distinction between theta- and non-theta positions. Whether the distinction is made by means of a variety of theta-roles or not is currently inconsequential.

Viewed in this light, the Restrictive approach currently assumed in GB is not an essential part of the theory. It is assumed in order to provide justification for the existence of theta-marking, but since theta-marking is an abstract type of grammatical marking bearing no semantic import, it cannot be grounded in semantics. Theta-theory is very costly to the system, associating particular theta-marking with each lexical head in the lexicon. Thematic information must be added to the already existing subcategorization information, for the claim that the

latter can be reduced to the former is highly disputable. As argued by Chomsky, "Shifting the variety of devices from one to another component of grammar is no contribution to explanatory adequacy. It is only when a reduction in one component is not matched or exceeded elsewhere that we have reason to believe that a better approximation to the actual structure of mentally-represented grammar is achieved" (Chomsky 1981:13). This is clearly not the contribution of theta-theory.

FOOTNOTES

1. There is a change in perspective in Chomsky's current view of the structures that the grammar has to account for. These constitute only the well-formed structures of I-languages, that is, languages that are the product of a certain biological makeup and of some experience. The exact nature of these languages, though, need not concern us here.
2. The status of the category S is less clear - it is viewed by some as a maximal projection of VP, by others as the maximal projection of INFL, a category that is non-lexical.
3. It is not clear, however, how phenomena that were previously explained by deletion, such as gapping, for example, are accounted for now, by movement only.
4. Whether Move- α can indeed function as "a single rule ... that constitutes the transformational component" (Chomsky 1981:18) is not clear. Even if misapplication and overgeneration are handled correctly, it is not evident how phenomena of feature changing or restructuring can be handled by this general rule.
5. In Knowledge of Language, two more global principles are added: the principle of Full Interpretation and the principle of licensing.
6. The insertion of it is required by a parameter setting of English, which states that all clauses have subjects.
7. The theta-criterion is based on the principles of functional relatedness and functional uniqueness, first formulated by Freidin. See Freidin (1978).
8. Indeed, in Knowledge of Language, (p. 97), the theta-criterion is somewhat modified, to allow for multiple-role assignments in constructions such as
 - (i) John left the room angrywhere both left and angry assign roles to John. A new condition of "uniformity" is then introduced, to insure that multiple-role assignments occur only in constructions similar to (i), and not in ones similar to (ii):
 - (ii) *John seems [that it is raining] angry.
9. Theoretical arguments for treating [the man intelligent] as a clause-like constituent are presented in Stowell (1985).
10. Problems also arise in connection with the stipulation that theta-positions are never occupied by pleonastic elements, a stipulation which is a direct consequence of the theta-criterion. A detailed discussion of the untenability of this position is found in Postal and Pullum (forthcoming).

11. Recognizing the failure of a semantic criterion to determine theta-roles, Roeper claims that a syntactic criterion could be developed: "The thematic grid is a formal object in government-binding theory. Its existence depends upon there being a distinction between the "meaning" of a word and its formal accountments." But he is cautious to add: "What is the extent of the thematic grid? Which elements can be implied? It is difficult to delineate where the thematic grid stops and the "meaning" of a word begins. In Finer and Roeper (1983) we argue that cognitive relations are represented on the thematic grid when they occur as PP's, or objects of the verb. This criterion offers a clear diagnostic for an acquisition device but it seems, conceptually, somewhat weak. ...This issue, which exists for government-binding theory as a whole, cannot be resolved within the scope of this essay" (Roeper 1984:37-38).

CHAPTER 3 - LEVIN'S LEXICAL SEMANTICS

The omission of any semantic discussion concerning the nature of thematic roles in LGB has not gone unnoticed within the GB framework. In particular, it has led to the formation of the Lexical Project Group at MIT, who held a seminar devoted to the issue of lexical semantics in 1983-1984. This group published a collection of reviews of a range of thematic and semantic theories, with an introduction written by Beth Levin, which states the group's approach to the issue of thematic roles¹.

The aim of the Lexical Project is to provide Chomsky's GB theory with a more developed notion of thematic roles: "The reliance on a predicate-argument representation in the GB framework makes it imperative that those other components of theta-theory [the set of possible theta-roles and their assigners] be developed. This will require looking beyond the process of theta-role assignment to the nature of the roles themselves. It is necessary to arrive at the inventory of theta-roles and associate theta-role assigners as well as criteria for determining the argument structures of verbs" (Levin 1985:4).

Levin does not present a full-fledged theory but rather some general principles illustrated with detailed discussion of specific examples. Following Chomsky, she holds a Restrictive view: thematic information

provided for verbs in the lexicon explains the syntactic configurations in which these verbs occur. General rules specify the syntactic forms of their complements, according to the roles assigned to these complements. Like Fillmore and Chomsky, Levin maintains that subcategorization frames can be dispensed with, once thematic frames are introduced into the lexicon. Levin's version of syntactic predictability differs, however, from those of Fillmore and Chomsky, in that she tries to derive the thematic structures of particular verbs from the semantic classes the verbs belong to. Thus, departing from Chomsky's treatment of roles in LGB, where "predicates at d-structure are treated as unanalyzable wholes" (Ibid.), Levin requires "reference to decomposition of predicates or to other than the abstract properties of theta-roles assignment" (Ibid.). These lie outside of syntax. Thus, her theory calls for a distinct level of lexical representation at which generalizations can be stated.

The main claim is that the thematic structure of a particular verb is not idiosyncratic but follows from the semantic class to which the verb belongs; that is, verbs can be classified into coherent semantic classes, which determine the number of arguments these verbs take and the roles they assign to their arguments. Since thematic structure determines syntactic configuration, it follows that semantic classes also determine the syntactic realizations of the arguments. Thus, Levin's theory is an attempt to find regularities on two levels: lexically, the semantic class a verb belongs to determines its thematic structure; syntactically, the thematic structure of a verb determines all the syntactic constructions

it can head. By implication, semantic classes determine syntactic configurations.

Since Levin attempts to derive syntactic structure from thematic structure, her generalizations suffer from the same inadequacies noted in connection with the other Restrictive theories. Since she also attempts to derive syntactic structures from semantic classes, her theory reveals a more severe problem: generalizations concerning the semantics of verbs and their syntactic realizations are circular. Semantic classes are defined according to the same syntactic phenomena that they are supposed to predict. The generalizations stipulated by Levin are presented in Section I. In Section II, they are examined one by one and shown to be both inadequate and circular.

I. THEMATIC ROLES, SEMANTIC CLASSES AND SYNTACTIC REPRESENTATION

Levin's lexical entries for verbs are further simplified than those of either Fillmore or Chomsky. The lexicon needs only specify which semantic class a verb belongs to. All thematic and syntactic information is then derivable on that basis by general rules. The entry for slide, for example, specifies that the verb is a causative verb of change of position. General rules determine that the verb takes Agent and Theme, realized as subject and object respectively; that by virtue of taking an Agent it can take manner and instrument adjuncts; that it can be extended to mean a transfer of possession as well; and finally, that it can undergo the Anti-causative alternation and appear with a Theme argument only, in surface subject position. Thus, according to Levin, there is no need

to specify the number of arguments a predicate can take or the roles it assigns to them. Nor is there a need to specify subcategorization features or optional adjuncts. All these are predictable on the basis of general semantic regularities.

Levin lists five types of regularities:

(1) "All arguments bearing a particular semantic relation are systematically expressed in certain ways". For example, Agents are generally expressed as subjects, Themes (the entities in motion) or Patients (entities affected in some direct physical way) are generally expressed as (underlying) objects. This regularity expresses the main Restrictive premise, held by Fillmore and Chomsky as well, that the thematic roles lexically associated with a lexical item determine the syntactic configurations it can head.

(2) "Predicates fall into classes according to the arguments they select and the syntactic expression of these arguments". For example, predicates such as bring, carry and put, that select both Agent and Theme, constitute one such class. Semantically, they all express some change in the position of the Theme caused by the Agent. Syntactically, they are all transitive, with the Agent in subject position and the Theme in object position. Verbs such as come, go and arrive select Theme only. Semantically, they constitute a class of verbs expressing a non-causative change in the position of the Theme. Syntactically, they are intransitive, generated at D-structure with the Theme in underlying object position. At S-structure, the Theme is moved to subject position. This regularity expresses Levin's particular Restrictive view: the se-

semantic class a verb belongs to determines the thematic roles it assigns, and, hence, the syntactic configurations it can head.

(3) "Adjuncts are systematically expressed in the same way(s) and their distribution often seems to be limited to semantically coherent classes of predicates". Benefactive phrases are expressed as prepositional phrases headed by for; instrumental and manner phrases, as prepositional phrases headed by with. The occurrence of these three types of adjuncts is limited to verbs that take Agent. There are two regularities noted here: first, the semantic class an adjunct belongs to determines its syntactic form; second, the semantic class a verb belongs to determines which adjuncts it can occur with.

(4) "There are regular extended uses of predicates that are correlated with semantic classes". For example, many verbs of change of position may be used to express change of possession. When they are so used, they exhibit the syntactic properties of verbs of change of possession. This regularity is really a semantic claim: the semantic class a verb belongs to determines what other semantic classes it can belong to. Because of Levin's Restrictive view, this semantic claim has syntactic implications: verbs head all the syntactic configurations predicted for all the semantic classes they belong to.

(5) "Predicates belonging to certain semantic classes display regular alternations in the expression of their arguments". One example provided by Levin is the Dative Alternation, where verbs that belong to the class of transfer of possession may have their Source/Goal argument expressed either as a prepositional phrase or as an object (as in "Debbie gave a present to Susan" and "Debbie gave Susan a present"). Another example

is the Anti-causative alternation, where causative verbs that belong to the Agent/Patient type may become non-causative verbs that do not express their Agent argument and express their Theme argument as surface subject (as in "He moved the chair" and "The chair moved"). This regularity states that semantic classes determine alternative syntactic configurations. Like Fillmore, Levin attempts to account for different syntactic realizations of the same thematic structures; but whereas Fillmore posited one underlying Case structure and a subject- and object-selection rules for its different surface realizations, Levin accounts for the different realizations in the lexicon, thus allowing them to be generated as distinct deep structures.

II. REGULARITIES

This section discusses particular applications of each of the regularities proposed by Levin and illustrates how they fail to account for the linguistic behavior of verbs and their syntactic complements. In Section II.I, the correspondence between Agent/Patient verbs and transitivity is shown to hold only at the cost of stripping Agent and Patient of any semantic content. In Section II.II, the correspondence between verbs of intentional action and the distribution of adjuncts of instrumentality and manner is shown to hold, but only if the parallel correspondence between Agent and these adjuncts is abandoned. In Section II.III, the lexical extension of motion verbs to express transfer of possession is shown to be too idiosyncratic to give rise to a generalization. Finally, in Section II.IV, the correspondence between verbs

of transfer of possession and participation in the Dative alternation is shown to be invalid.

II.1. AGENTS AS SUBJECTS

The first regularity, (1), states that a particular role is systematically expressed in a certain syntactic way. Agents, for example, are realized as subjects of transitive verbs. This means that there can be no Agents in other than subject positions. If Agents are found in other positions, they are either not truly Agents, or else the product of some alternation that can be explained by means of a regularity of type (5). The status of the converse of (1) is less clear. There are two logical alternatives: either all subjects are Agents, or else some subjects bear other roles that are also allowed to be expressed as subjects. Both alternatives are problematic: If all subjects are Agents, the semantic content of Agent becomes so general that it ceases to correspond to any meaningful semantic concept. If subjects are assigned other roles, there is the danger noted in the discussion of Fillmore's Cases, of multiplying the number of roles, with no clear criterion for deciding how many should be stipulated. Levin is rather vague about which of these two alternatives holds: "The transitive pattern may be extended to verbs that less clearly describe an action which has an effect. For instance, in a number of languages including English and Walpiri, verbs of perception and cognition are among the transitive verbs. The person who mentally apprehends is expressed in the same way as the agent of an agent-patient verb" (Levin 1985:11). It is not clear whether the subject of such verbs should be considered Agent or not². Levin probably opts for the first alternative, namely, for treating all transitive subjects as Agents. This is probably

the case since, first, she does not explicitly commit herself to positing other roles in subject position, and since, second, she objects to Fillmore's commitment to both subject Instruments and subject Agents: "The question is whether this evidence is adequate to allow the proliferation of semantic roles. It is not clear that the semantic distinction between agents, instruments and natural force ... should be represented as differences in assignment of semantic roles" (Levin 1985:44).

Agent, according to Levin, is the role assigned to the argument "that denotes the person who brings about the action" (Levin 1985:6). It is not clear whether "brings about" is to be taken to mean causally involved or whether it is a somewhat weaker notion of involvement in the action. Be this as it may, there immediately arises the problem noted by Fillmore in connection with sentences such as

(6) The rock broke the window.

Levin claims that the distinction between animate and inanimate subjects of transitive verbs is not sufficient to justify the positing of an Instrument role. "After all, animate and inanimate transitive subjects share an important semantic property: the argument bearing the subject relation to the verb is involved in bringing about the action. Any differences in interpretation have an independent explanation. In particular, they could follow from knowledge of the world and intrinsic properties of the noun-phrases and would not be explicit at the same level of representation as the other regularities" (Levin 1985:44). Thus, if the rock in (6) is Agent for Levin, the description of what Agent is must

be modified. It is not necessarily a person but any entity which brings about the action.

Other transitive subjects raise similar questions: In

(7) Paul found Mary.

Paul does not seem to have brought about the finding. Rather, it is something that happened to him. Is he still an agent? If he is, then the meaning of Agent becomes even more general - it simply refers to an entity that is involved in the action expressed by the predicate. Worse still, since no action is expressed by find, Agent seems to apply simply to entities that are involved in the event expressed by the verb. But if so, why is the window in

(8) The window broke

not an Agent too? According to Levin, window in (8) is Theme rather than Agent because it is generated in deep object position. Thus, what ultimately determines the thematic role assigned to an argument is not the semantic relation it bears to the predicate (both Paul in (7) and window in (8) refer to non-causative entities participating in the event), but rather its syntactic position. The regularity is therefore circular: thematic roles determine syntactic realizations because syntactic realizations determine thematic roles.³

To prevent this consequence, Levin could opt for the second alternative and hold that Paul in (7) is not Agent but has another role. But her own argument against Fillmore's Instrument role works against this alternative: She objects to Fillmore's distinction between subject Agents and

subject Instruments since it "depends heavily on [intuitive assessments of semantic similarity] as the primary means of identifying semantic roles" (Levin 1985:45). If the distinction between Agents and Instruments is not a valid thematic distinction, why is the one between Agents and non-causative participants more valid? According to Levin, only semantic differences that result in different syntactic realizations should be represented, but since Paul in (7) is the transitive subject of found, just as rock, in (6) is the transitive subject of broke, the semantic difference between the two sentences is not mirrored in the syntax and should not result in positing an extra thematic role.

Unlike Chomsky, Levin attempts to derive thematic roles from semantic concepts inherent in the meaning of verbs. Thus she maintains a double correlation between the thematic role of Agent and the semantic components of causation and action on one hand, and between the role of Agent and its syntactic realization as subject on the other. When these clash, i.e. when subjects are found which do not correspond to the semantic classification of causal participants in the action, Levin abandons the semantic criterion as being an "intuitive assessment". Thus, semantically her notion of Agent is vacuous, and in order to determine whether a certain noun-phrase is Agent, she looks to see whether it is in subject position or not. Thus, a strict correlation is found between Agents and subjects, but the criterion is rendered circular.

II.II. AGENTIVE VERBS AND ADJUNCTS

(3) states that certain regularities hold between the thematic structure of verbs and the kinds of adjuncts they can take: "Some adjuncts

are found only with verbs that take a participant bearing the agent role. Such verbs denote an action that is controllable and able to be performed intentionally. This constraint holds of benefactive, instrumental and manner phrases" (Levin 1985:39). This regularity predicts the well-formedness of

(9) John broke the window with a rock

and the ill-formedness of

(10) *The window broke with a rock

since only the causative break can take an Agent. However, it does not predict the ill-formedness of

(11) *The wind broke the window with a rock

since wind is considered an Agent. Levin is aware of this outcome, but she maintains that such ill-formedness depends on the meaning of the nouns used and on knowledge of the world, and should not be accounted for by the theory. Appeals to knowledge of the world are always hard to refute, since the use of natural language is obviously tied to knowledge of the world. One can just as well claim that the causative component in the meaning of the transitive break is part of one's knowledge of the world. To argue against such appeal to world knowledge, one can only point to the fact that (11) is judged ill-formed not on the basis of knowledge gained from observing the wind break windows but on the basis of the meaning of the sentence, since even knowing that the wind can break a window by blowing heavy objects against it, one still judges *"The wind broke the window with a board" to be ill-formed. Therefore, the judgement is based on knowledge of a rule that permits instrument adjuncts to be used only with causative participants who exercise some control over the

action. As for the claim that it is the meaning of the noun-phrases that is involved in such judgements, while the claim is true, it is not clear why a theory of lexical competence should be limited to account only for regularities that involve the meaning of verbs and prepositions but not account for similar regularities that involves the meaning of nouns.

Levin's account is thus arbitrarily restricted. The ill-formedness of (10) is deemed linguistic and is given a thematic explanation, while the ill-formedness of (11) is deemed non-linguistic and is given a pragmatic explanation. But both (10) and (11) are instances of the same linguistic phenomenon, namely, that only autonomous beings, capable of causative action are referred to as users of instruments. The arbitrary distinction between the explanation given for non-causative entities and the one given for causative natural forces stems from Levin's attempt to equate thematic structure with semantic meaning. But, contrary to her claims, the class of verbs which "denote action that is controllable and able to be performed intentionally" and which take instrument adjuncts does not converge with the class of verbs which, according to Levin, "take a participant bearing the agent role".

That these two classes differ is further illustrated by other verbs: On one hand, there are verbs that, according to Levin, do not take Agent (they take only Theme) but that can take instrumental or manner phrases: "walk with a cane", "dance with grace" or "leave with haste". On the other hand, other intransitive verbs that, according to Levin, take Agent do not take instrumental or manner phrases: *"sleep with care" or *"cry

with haste". Levin distinguishes two classes of intransitive verbs - Unergatives, that take only an Agent, generated in deep subject position, and Unaccusative, that take only a Theme, generated in deep object position and then moved to surface subject position. The distinction is not apparent in English, but it is posited for independent syntactic reasons in other languages. It is apparent in Italian, for example, where it serves to account for the distribution of the partitive ne. Levin claims that the distinction correlates with the distribution of Agent and Patient arguments. She acknowledges that "questions have emerged concerning the feasibility of providing the unaccusative and unergative classes of verbs with homogeneous semantic characterizations" but that "a close examination of the exceptions reveals that they are not arbitrary" (Levin 1985:17)⁴. Finally, verbs like find and see, which probably take Agent according to Levin (see the discussion of (7) above), do not take instrumental phrases either.

These counter examples show that the distribution of adjuncts does not correlate with the syntax-based distribution of Agents and Themes, but does correlate very well with verbs that "denote an action that is controllable and able to be performed intentionally". Walk and dance describe actions that are normally done with control and intention, and can therefore take a manner or instrument adjunct. The distinction between semantic competence and knowledge of the world becomes clear here - "He dance with a fork" has an instrumental reading (in addition to the more obvious accompaniment reading) by virtue of the fact that the sentence denotes the action of an autonomous being exercising some control. But

this instrumental reading is puzzling, since one's knowledge of the world does not include experiences of dancing with utensils. One's reaction, upon hearing such a sentence, is not to judge it ill-formed, but rather to wonder how such an action can be performed. Verbs like sleep, find, see and cry, on the other hand, do not denote actions performed with control. Sleeping, finding and seeing are not actions; crying is an action usually done without control. In the infrequent cases where the action of crying is controllable, it is possible to use such adjuncts: "The actor cried with care".

Here too Levin maintains a double correlation - between the distribution of adjuncts and a semantic criterion of controllable action on one hand, and between the distribution of adjuncts and the syntactically-based thematic Agent on the other. Here, too, the correlation fails. While the distribution of adjuncts correlates with the semantic criterion, it fails to correlate with the thematic criterion. Levin's attempt to find regularities in the occurrence of adjuncts points again to the basic lack of correlation between semantic concepts and syntactically-based thematic roles.

II.III. EXTENDED MOTION AND THE DATIVE ALTERNATION

(4) states a semantic regularity: verbs of a semantic class A can be used to express meanings of semantic class B; correspondingly, they exhibit the syntactic properties of B-verbs⁵. As an example, Levin cites the verb slide, a causative verb of change of location, which can also be used as a verb of transfer of possession. According to Levin, "Jill

slid the money to the door" is a change of location, whereas "Jill slid the money to Susan", is a transfer of possession: "the money was given by using a physical transfer characterized by sliding" (Levin 1985:34). On pure semantic grounds, this observation is questionable: one might say that at the beginning of the action, Jill is in possession of the money by virtue of holding it. But it is not clear that at the end of the action Susan is similarly in possession of it. The fact that the money is in close physical proximity to Susan does not in itself mean that she is in possession of it. Moreover, it is not even clear whether the money reached Susan, since the sentence only means that Jill slid it in Susan's direction, but does not specify if it reached her. In this aspect, slide differs from other verbs of transfer of possession.

But since Levin bases her semantic observations on syntactic evidence, and since in her system, membership in semantic classes is reflected in syntactic realizations, she uses syntactic tests for determining membership rather than purely semantic considerations. As evidence for the use of slide as a verb of transfer of possession, Levin points to its behavior with regard to the Dative alternation: according to her, only verbs of transfer of possession undergo this alternation; causative verbs of motion do not. Thus there exists "Jill gave Susan the money" but not *"Jill moved Susan the money". Since there is also "Jill slid Susan the money", slide expresses a transfer of possession; when it expresses change of location, the alternation is ungrammatical: *"Jill slid the door the money".

The reliance on the syntactic test of the Dative alternation is very weak, as will become evident in the discussion of alternations in Section II.IV; but even if the test were accurate, Levin's position cannot be maintained. The process of lexical extension, which turns verbs of change of location into verbs of transfer of possession is claimed to be a predictable regularity: "It is hardly likely that this property is idiosyncratic to slide. Rather, it should derive from slide's membership in a particular class. This ability seems to be open to at least causative change of location verbs" (Levin 1985:36).

A strong interpretation of (4) would mean that all verbs belonging to a semantic class A can be extended to belong to a semantic class B. In the case at hand, all verbs of causative change of location would be used to express transfer of possession, and, consequently, they would all be able to undergo the Dative alternation. But consider move, fly, rotate, kick, etc., all causative verbs of change of location, which cannot undergo the Dative alternation: *"Jill moved/flew/rotated/kicked Susan the money". The number of causative motion verbs that do not participate in the alternation is too large for them to be considered exceptions to the rule.

A weaker interpretation of (4) would mean that only some verbs belonging to the class of causative motion can be extended to express transfer of possession. The question then is how to determine which verbs of causative motion are extended and which are not. Semantic considerations cannot provide much help, since motion verbs are similar in some

respects of their meanings and different in others. Is bring, for example, closer in meaning to slide than kick is? In both "Jill brought the money to Susan" and "Jill kicked the money to Susan", Jill can be said to be initially in possession of the money by virtue of holding or touching it, exactly as with slide. Unlike slide, bring implies that during the action the money is still in Jill's possession. At the end of the action, although the money is in close proximity to Susan, it is not clear whether Jill is still holding it or not, and thus not clear whether Susan can be said to be in possession of it or not. Kick, by contrast, resembles slide in that during the action, the money is not in Jill's possession. This semantic comparison would suggest that kick is closer in meaning to slide and is therefore more likely to have its meaning extended to express transfer of possession than bring. However, kick does not participate in the Dative alternation (*"Jill kicked Susan the money") whereas bring does ("Jill brought Susan the money"). Thus, to determine whether a causative verb of motion is extended to mean transfer of possession, Levin must rely on the Dative alternation. But this makes regularities of type (4) circular: The extended use of a motion verb determines its participation in the Dative alternation, but the Dative alternation is the test for determining whether its meaning is extended or not.

Moreover, verbs of transfer of possession that undergo the Dative alternation also allow the passivization of such an alternate construction, as in "Susan was given the money" or "Susan was sold a book". This, however, is not possible for slide - *"Susan was slid the money". This inability of slide to pattern like the other verbs of transfer of possession

should exclude it from belonging to this class, according to Levin's own argument. The existence of alternations that do not conform to the extension regularity thus strongly undermines it.

To conclude, even if lexical extension is a productive semantic phenomenon, and even if there are somewhat predictable tendencies for verbs of a certain semantic class to acquire additional meanings of another semantic class, these tendencies are not general enough to be expressed as regularities. Within one semantic class, some verbs exhibit lexical extension while others do not. The semantic concepts inherent in their meaning cannot determine which verbs are extended. Extension must, therefore, be determined on the basis of the syntactic behavior of the verbs. Thus motion verbs are claimed to also mean transfer of possession if they participate in the Dative alternation. But the reliance on the syntactic behavior of verbs renders the extension claim circular. Moreover, even within this circularity, the syntactic behavior of verbs that are claimed to be extended does not always match the syntactic behavior of the verbs they are extended to. Motion verbs extended to mean possession transfer do not passivize like other possession-transfer verbs.

II. IV' TRANSFER OF POSSESSION AND THE DATIVE ALTERNATION

(5) states that there exists a correlation between membership in a certain semantic class and the ability to participate in specific alternations. Levin's prototypical example is the class of verbs of transfer of possession that undergo the Dative alternation. This seems to hold for a variety of verbs: give, mail, sell, send etc. However, it is well known that many verbs of similar meaning do not undergo the alternation: "He

donated/contributed/transferred/delegated/returned the money to Susan" but not *"He donated/contributed/etc Susan the money". There seems to be no semantic criterion that can explain the difference between the two types of verbs. Moreover, many verbs of other semantic classes also participate in this alternation, such as feed, tell, write, show and sing. Levin could claim that these verbs express a more abstract transfer of possession, although it is obscure, at best, how by singing a song or showing a picture to someone, a transfer of possession occurs. Moreover, there are other verbs with similar meanings which do not undergo the alternation: *"He recited/expained/revealed/dedicated Susan the poem"; again, indicating that the difference is not semantic. Finally, some of these non-transfer verbs allow passivization ("The dog was fed the meat"), as do verbs of transfer, while others do not (*"John was sung a song").

This lack of semantic and syntactic correspondence has led linguists to believe that the Dative alternation depends on a phonological, rather than a semantic, criterion. In "Remarks on Dative Verbs and Universal Grammar", Jane Grimshaw discusses the alternation from a phonological point of view and suggests that it depends on the number of prosodic feet the verb contains. Her explanation fares well with another very similar alternation, occurring with the preposition for, as in "John bought/built a car for Susan" and "John bought/built Susan a car", as opposed to *"John purchased/constructed Susan a car". Levin's semantic criterion cannot generalize over the two alternations since her treatment of nouns headed by to differs from her treatment of nouns headed by for: The former are considered Goal arguments of a specific class of transfer verbs; the

latter are considered Benefactive adjuncts, able to be attached to a variety of verbs from different classes which take Agents. Thus, the phonological explanation may succeed in explaining these two related syntactic phenomena, whereas the semantic explanation fails to explain either.

Since the Dative alternation is exceptionally productive, it might be regarded as somehow special. Indeed, Levin says that "most alternations, with the exception of the dative alternation, are limited to relatively small classes of verbs. No matter what their size is, these classes exhibit semantic coherence" (Levin 1985:31). In order to determine whether this is so, let us consider verbs that participate in what I will call the with-alternation: These verbs, such as discuss, meet, trade, share, co-operate, combine and compete, take either a plural subject: "John and Mary discussed the issue" ; or a singular subject and a with preposition: "John discussed the issue with Mary".⁶ According to Levin, all these verbs should belong to the same semantic class. Instead, they seem to fall into three classes: there are verbs denoting some exchange, such as discuss, correspond, meet, exchange and trade; there are others denoting some opposition, such as fight, argue, disagree, compete and race; finally, there are verbs denoting some type of combination, such as combine, share, co-operate and agree. Some verbs seem to belong to two classes: fight and argue are verbs of both exchange and opposition. These semantic classes seem fairly well defined on the basis of pure semantic considerations. However, since they do not differ in their syntactic alternations, it is not clear that Levin's system can allow such classification. On the con-

trary, Levin would have to posit another classification, based on the syntactically-based thematic differences that exist among these verbs: First, there are the intransitive race and combine ("John raced with Mary" and "Water combined with salt"), which, according to Levin, have Theme as their only argument, since they are the non-causative realizations of their causative transitive counterparts ("The coach raced John and Mary"; "The man combined water and salt"). Thus the intransitive race and combine cannot belong to the same class as the other verbs participating in the alternation, which all have Agents. Is their participation in this alternation an exception, in spite of their semantic closeness to compete and share, or do they form a class of their own? The Agentive verbs themselves further divide into transitives, which according to Levin, have both Agent and Patient arguments (discuss, exchange and share) and intransitives, which have only Agent (correspond, converse and co-operate).

To conclude, the claim that verbs belonging to certain semantic classes exhibit regularities in the alternations they participate in is problematic. The Dative alternation does not exemplify such regularity. Other alternations seem to correlate much better with semantic classes, but the size of these classes is very small. The question at this point is pragmatic: What mode of representation would be more economical? Levin would have to state a series of alternation rules (e.g., verbs of exchange participate in the with-alternation; verbs of opposition do so too); she would have to specify the semantic class each verb belongs to (e.g., converse is a verb of exchange) and would have to list the exceptions to

the rule (e.g., dispute is a verb of opposition which does not participate in this alternation). In addition, she would have to list all the verbs which participate in the Dative alternation (and there might be other alternations like it), since it does not correlate with meaning. A more traditional representation mode would simply list subcategorization features for each lexical item. In either case, it is clear that a correlation with thematic roles is not only irrelevant but also renders the correlations even less general. If thematic structures are also correlated with syntactic alternations, the semantic classes markedly decrease in size since the thematic division runs across the semantic one and results in tripling the number of classes stipulated: instead of one class of exchange verbs, for example, there will be Agent/Patient exchange verbs, Agent exchange verbs, and Theme exchange verbs. The same will apply to the opposition verbs and to the combination verbs. Very little economy would be achieved with such a lexicon.

II. CONCLUSION

Levin tries to demonstrate the existence of correlations among the semantic, syntactic and thematic patterns exhibited by predicates. Her conclusion is that such correlations are highly predictable, to the point where given the semantic class a predicate belongs to, the syntactic realization of its arguments and the thematic roles assigned to them can be inferred on the basis of general rules that apply to its semantic class. However, there is an inherent problem of circularity with the way Levin establishes the correlations. In order to determine whether three independent phenomena correlate with any regularity, one needs independ-

ent criteria for determining when these phenomena occur. In other words, one needs independent semantic criteria for determining what semantic classes exist and what verbs belong to them; independent thematic criteria for determining what roles exist and when a particular noun-phrase is assigned a role; and independent syntactic criteria for determining what syntactic configurations predicates can occur in. Of the three, Levin has only the latter. To determine, for example, whether a verb participates in a certain syntactic alternation, she relies on judgements of grammaticality. Thus, regardless of the verb's thematic and semantic properties, she can determine that "Jill slid Susan the money" is grammatical, whereas "Jill moved Susan the money" is not. Her criteria for determining semantic classes are more mixed: At times, she relies on independent semantic judgements formed on the basis of the semantic decomposition of predicates, as, for example, when she classifies move and slide as causative verbs of change of location. At other times, though, her semantic classification is totally dependent on syntactic evidence. This is the case when she classifies slide as a verb of transfer of possession, on the grounds that it participates in the Dative alternation. This confusion between semantic and syntactic criteria is a natural consequence of the Restrictive approach. Since Levin's theory is Restrictive, it does not contain semantic representations. In the absence of a semantic component, all references to the meaning of lexical items must be captured at the level of syntactic representation, since a semantic level is not available.

The criteria for thematic roles are never independent. Sometimes they are based on semantic judgements: the transitive break, for example, assigns the role of Agent to its subject by virtue of being a causative verb of action, and the role of Patient to its object by virtue of expressing a physical change occurring in its referent. At other times, the criteria are purely syntactic. Know, for example, also assigns the roles of Agent and Patient, although it cannot be said to express a direct physical change caused to the object. The motivation for classifying it as an Agent/Patient verb is the fact that it is transitive.

Levin's regularities are therefore a mixed bag: Some of the correlations between semantic and syntactic phenomena are properly established. Such is the case with the distribution of adjuncts. On one hand, an independent semantic criterion picks out all verbs that express an action able to be controlled and performed intentionally. On the other, an independent syntactic criterion of well-formedness licenses the attachment of with-PP to sentences containing these verbs. Other correlations between semantic and syntactic phenomena are circular: verbs of change of location can express transfer of possession, not because of their meaning, but because they exhibit the same syntactic properties as verbs of transfer. The correlations with thematic roles are the most problematic. Since there are no independent criteria for establishing them, they correlate by definition with either semantic classes or syntactic realizations. Thus, to give some meaning to the notion of Agent, it is claimed that Agent is a causative participant in an action. But when no causation or action is expressed by the verb, the criterion for de-

termining when Agent is assigned, is the syntactic position of subject of a transitive verb.

Levin's goal is to replace the abstract theta-marking of GB with a more developed thematic component and with better criteria for determining thematic roles. She therefore attempts to link the notion of thematic roles to that of meaning, by examining the semantic concepts inherent in the meaning of verbs and by grouping verbs into semantic classes. The claim is that semantic classes correlate with, and therefore determine, both the thematic structures and the syntactic configurations of their members. But, as was discussed in connection with each of the five types of regularities posited, such correlations simply do not exist.⁷ If semantic classes are posited on the basis of independent semantic criteria, they fail to generate uniform thematic structures, and they incorporate verbs with similar meaning but different syntactic behavior. In an attempt to force the regularities to hold, circularity is introduced. Semantic classes and thematic roles are determined on the basis of syntactic criteria, which are then claimed to be derived from meaning. Ultimately, thematic roles, such as Agent and Patient, become indistinguishable from mere grammatical relations, such as subject and object. Thus, the Restrictive view that syntactic configurations are based on thematic structures is maintained, but at the cost of rendering thematic roles semantically vacuous.

FOOTNOTES

1. For convenience, I will refer to this approach as Levin's, although her introduction is only a summary of the discussions that took place during the seminar.

2. Similarly, it is not clear how regularity (2) applies to these verbs; that is, whether verbs that "less clearly describe an action" belong to the same semantic class as verbs that clearly describe action or not.

3. Levin's attempt to predict syntactic transitivity on the basis of agentive meaning proves unsuccessful, yet it stems from a solid statistical observation, namely, that most causative verbs are syntactically transitive. Therefore, it should be shown that her failure to predict transitivity on the basis of agency is perfectly compatible with this statistical correlation of causation and transitivity.

An explanation for the frequent (but not predictable) co-occurrence of causation and syntactic transitivity is provided in Hopper and Thompson (1980). The authors describe transitivity as "a matter of carrying-over or transferring an action from one participant to another". They suggest that transitivity is a notion comprised of several parameters of semantics, syntax, morphology and discourse. The parameters represent the different facets of transitivity, and "taken together, they allow clauses to be characterized as MORE or LESS Transitive: the more features a clause has in the 'high' column [see below], the more Transitive it is - the closer it is to CARDINAL Transitivity" (Hopper and Thompson 1980:253).

	HIGH	LOW
PARTICIPANTS	2 or more	1
ASPECT	telic	atelic
PUNCTUALITY	punctual	non-punctual
VOLITIONALITY	volitional	non-volitional
AFFIRMATION	affirmative	negative
MODE	realis	irrealis
AGENCY OF Agent	high in potency	low in potency
AFFECTEDNESS OF Object	totally affected	not affected
INDIVIDUATION OF Object	highly individuated	not individuated

This relative notion of Transitivity explains why, on one hand, causation often co-occurs with syntactic transitivity and with the semantic concepts of volition and affect; while, on the other hand, it does not suffice to insure syntactic transitivity.

4. The difference in the distribution of the particle in Italian can be seen in the following examples, provided by Patrizia Violi, personal communication:

Quando parte il prossimo treno?
(When does the next train leave?)

NE partono in continuazione.
(They leave frequently.)

as opposed to:

Quanti impiegati lavorano in questo ufficio?
(How many employees work in this office?)
* (Qui) NE lavorano dieci.
(Ten of them work here.)

And also in:

Di treni, ne partono in continuazione.
(The trains leave frequently.)

as opposed to:

* Di impiegati, qui ne lavorano dieci.
(Ten employees work here.)

This difference would group go, come, walk and swim as Unaccusatives, patterning after leave. According to Levin, these verbs take Theme only. Sleep, cry, dine and work, are Unergatives, and according to Levin, take Agent only.

5. The principle of lexical extension is based on Gruber's and Jackendoff's observation that certain verbs of motion can also be used to describe other changes. This principle is discussed in detail in Chapter 4.

6. If these verbs occur in other syntactic structures, they express a different meaning: "He discussed his ideas" means that he presented them rather than exchanged opinions about them; "He met Mary" means that he encountered her rather than conversed with her. I will ignore these different meanings in the following discussion.

7. Lack of correspondence between subcategorization features and semantic complementation is supposedly demonstrated also in Grimshaw (1979). It is observed that wh-complements fall into two distinct semantic classes: exclamatives (as in "It's amazing how (very) tall John is") and interrogatives (as in "Fred will ask how tall John is"); and that predicates differ in their semantic selection of these complements: amazing, for example, takes exclamatives only; ask takes interrogatives only; and know takes both. Syntactically, however, these types of exclamatives and interrogatives are said to be indistinguishable. The conclusion drawn by Grimshaw is that "the combinatorial properties of predicates and their complements can be explained only in terms of two independent sets of cooccurrence restrictions. Subcategorization expresses restrictions between predicates and the syntactic category of their complements. Semantic selection expresses restrictions between predicates and the semantic type of their complements" (Grimshaw 1979:279).

Although the facts observed by Grimshaw are correct, the conclusion drawn from them seems too strong and does not apply to the Restrictive theories analyzed here. Grimshaw shows that semantic selection cannot be inferred from the syntactic structure of certain well-formed expressions. Thus, the structure of "It's amazing how tall John is" does not indicate whether the complement is exclamative or interrogative. Levin, however, does not attempt to derive semantics from syntax. On the contrary, she attempts to derive syntactic structure from semantic selection. Thus, if amazing is stored in the lexicon as assigning an Exclamative role, the wh feature of its complement can be predicted by Levin.

CHAPTER 4 - JACKENDOFF'S THEMATIC THEORY

Jackendoff's Thematic Theory is Nonrestrictive: It does not derive syntactic structures from thematic representations but contains, instead, two independent levels of syntactic and semantic representations. These are linked by means of mapping rules, which associate the syntactic complements of verbs with their corresponding semantic arguments. Since there is no reliance on thematic roles for syntactic derivations, the theory is free of the syntactic problems encountered by Fillmore's and Chomsky's theories.¹

Semantically, however, Jackendoff's theory is based on two conflicting principles: it is Nonrestrictive, but at the same time, modelled after the thematic structure of motion verbs. The Nonrestrictive approach commits the theory to a full representation of all the semantic concepts inherent in the meaning of lexical items, regardless of their syntactic realization. It also calls for representations which can capture semantic properties, such as ambiguity and redundancy, and semantic relations, such as synonymy and sense-inclusion. The thematic model, on the other hand, forces a distinction between two kinds of semantic concepts: those which express thematic relations and those which do not. The former are represented as arguments of semantic functions, such as GO and CAUSE; the

latter are represented as modifiers on these functions. The adherence to a motional model, as opposed to a more general thematic model of the kind chosen by Fillmore and Levin, imposes severe constraints on Jackendoff's semantic representations. It forces them not only to capture meaning in terms of thematic roles, which, as seen in the discussion of Fillmore's Cases and Levin's thematic roles, are semantically inadequate; but to do so in terms of motion only. Thus, Jackendoff's representations reveal arbitrary semantic distinctions of the kind exhibited by the other thematic theories. But, more severely, they completely fail to represent a large range of non-motional predicates.

Jackendoff tries to unify his Nonrestrictive approach to semantics with his thematic motional model. In "Multiple Subcategorization and the Theta-Criterion" he says: "It should be noticed that in the Conceptual Semantics treatment, lexical entries need contain no level of 'argument structure' distinct from the level of semantic structure. That is, unlike Bresnan's theory, there is no representation of the form RUN(i,j) or ENTER(i,j) in which run and enter are not decomposed semantically. Nor are the arguments explicitly marked as Theme, Goal, etc., as generally assumed by Government-Binding theorists. Rather, just as the grammatical functions Subject and Object are derivatively defined in terms of NP positions in syntactic structure (in ST, EST, and GB though not LFG), so thematic functions are defined in Conceptual Semantics in terms of argument positions in semantic structure." (Jackendoff 1985:274) In spite of this attempt, the incompatibility of Jackendoff's Nonrestrictive approach and his motional model remains. In the concluding paragraph of this 1985

paper, Jackendoff says on one hand that "this study has also provided evidence confirming Grimshaw's (1979) conclusion that syntactic and semantic conditions on lexical insertion are autonomous"; on the other hand, "Theta-structure and argument structure are better thought of as each constraining potential projections of the other." (Jackendoff 1985:294) This incompatibility can be seen as the source of the revisions incorporated into the theory over the past ten years. As is shown in Section I, the revisions constitute a gradual abandonment of the thematic model in favor of increased adequacy in semantic representations: the recent formulations of Jackendoff's semantic functions do not correspond to thematic structures as strictly as his original functions did. Their arguments no longer represent thematic roles, and they are augmented with labels and indices that cannot be translated into thematic terms. However, the theory is still handicapped by its adherence to the motional model, which restricts its semantic coverage. The limitations of the motional model are discussed in Section II. Finally, Jackendoff's formalism itself, of functions consisting of a fixed number of arguments, imposes constraints on their ability to represent certain aspects of meaning. The limitations imposed by the functional system of representation are discussed in Section III.

I. THEMATIC ROLES AND SEMANTIC FUNCTIONS

Jackendoff's semantic functions are based on the set of thematic relations posited by Gruber. Following Gruber, Jackendoff analyzes the meaning of verbs as assigning the roles of Theme, Source, Goal, Agent and Location to their arguments. These roles form the thematic structure of

motion verbs, and, by extension, the thematic structure of all other verbs.

1.1. GRUBER'S THEMATIC ROLES

Gruber defines Theme as "the entity which is conceived as moving or undergoing transition" (Gruber 1976:38). Source is the place from which the Theme moves; Goal is the place to which it moves. Agent is defined as "a noun-phrase that has the identity [of the intender of the action]" (Gruber 1976:157). Location is slightly different in that it occurs with verbs expressing states rather than events. These concepts are then used by Gruber to explain the semantic relations between motion verbs. For example, "send and receive form a pair such that we have nearly equivalent meanings expressed by both of these when their subjects and complements are interchanged" (Gruber 1976:39). The near equivalence is said to be captured by the representation of both verbs as verbs of motion, specifically of a change in location, assigning similar roles. In both (1) and (2),

(1) John sent a book to Mary

(2) Mary received a book from John

the book is Theme, John is Source and Mary is Goal. But Gruber observes that (1) and (2) are not completely synonymous: "The significant distinction that does not enable us to say that these sentences are complete paraphrases with completely identical prelexical structures is the presence, absence or identity of the underlying NP structurally determined as Agent and lexicalized as the surface subject of the sentence." (Gruber 1976:40). The difference is captured in the assignment of Agent by send,

but not by receive. Thus, John in (1) is both Source and Agent, but only Source in (2).

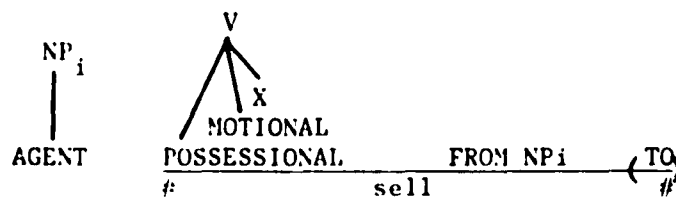
This analysis has the undesirable consequence of treating differences between (1) and (2) as similarities and of marking their similarities as differences. That the sentences are not nearly equivalent in meaning can be clearly seen from the plausibility of "John sent a book to Mary but she didn't receive it", which contains no contradiction. Thus, the term Goal, used to refer to Mary in both (1) and (2) obscures the fact that in (1) Mary is only an intended destination since the sentence does not imply that the book has indeed reached her. (2), by contrast, implies that Mary is in possession of the book. In other words, send does not imply receive. Nor does receive imply send, since clearly Mary could have gotten the book from John in any number of ways: John could have brought it, he could have given it to her directly, etc. This is similar to the problem encountered with the thematic roles of Case Theory. Again, careful analysis of the meaning of the verbs indicates that more thematic roles should be added to account for differences in meaning between verbs. In this instance, an Intended Goal should be differentiated from a Goal reached.

As for the difference in Agency between send and receive - although Gruber is right in observing that John in (1) refers to the cause of the action of sending, whereas Mary in (2) does not (Gruber's test for Agency is the well formedness of "John intentionally sent the book" versus the ill-formedness of *"Mary intentionally received the book"), the differ-

ence explains only part of the facts.² It accounts for the syntactic realization of the semantic arguments of the two verbs: the subject of send stands for the actor, whereas the subject of receive does not. But the analysis obscures the fact that despite their different syntactic mappings, both verbs denote causative events. Without some action on the part of John in (2), such as sending the book or giving it, Mary could not have received the book. Receive inherently specifies action on the part of the entity causing the transfer. But Gruber's thematic analysis cannot capture this fact. If the object of from in receive-sentences is allowed to be an optional actor, it will account for the action of John in (2), but will also misrepresent action in (3),

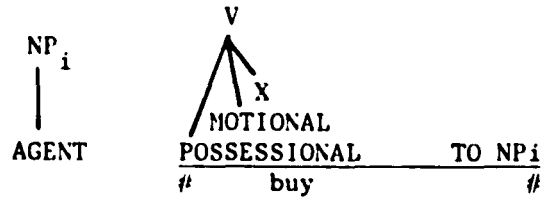
(3) Mary received the book from New York³
 on the part of New York. Thus, Gruber's thematic roles fail to represent causation and action in the meaning of receive: Source is too general since it can also refer to a location, which cannot function as a cause; Agent is too restrictive, since it implies that the actor is always expressed as the object of the preposition from. By relying on thematic concepts, Gruber's representations give rise to the same arbitrary semantic distinctions found in Fillmore's and Levin's representations. When causation or action is obligatorily expressed by a particular syntactic complement, as it is in the case of the subject of send, it is captured. When the same semantic concept is inherent in the meaning of the verb but not necessarily expressed by a complement, as in (3), it is not represented.

Another instance of lack of uniformity in semantic representation resulting from a thematic analysis is exemplified in Gruber's treatment of buy and sell: Gruber's entry for sell (Gruber 1976:44) reads as follows:



The underlined components are those incorporated in the meaning of sell, namely, that it is an event of transfer of possession from a Source (NP_i) to a Goal. Incorporated components are not realized syntactically, but are already conveyed in the phonological realization of the lexical item itself. The preposition to is accompanied by parentheses to indicate that although incorporated, it can optionally be realized syntactically, as in "John sold the book (to Mary)". The NP to the left of the verb is a component which is never incorporated but is always obligatory in the environment of the verb and syntactically realized. The indexing marks the identity of Agent and Source.

Since Gruber is mainly interested in showing similarity among verbs with identical prepositional patterns, he ignores the semantic components that differentiate sell from other possessional verbs. The X under V "represents the idiosyncratic categorial structure distinguishing sell from other transitions of possession" (Ibid.). The converse relationship that holds between sell and buy is then explained as a difference in the configuration of their complements. The entry for buy is the following:



Sell and buy share the X properties but differ in the syntactic realization of their complements - in sell, the Source is realized as subject; in buy, the Goal is. Gruber claims that the verbs also differ semantically, with respect to their Agents. In sell, the Agent is the seller; in buy, the Agent is the buyer: "The difference in meaning between such pairs as:

(4) John sold flowers to Bill

(5) Bill bought flowers from John

is that in the first of these John wills the action and intentionally effects it whereas Bill is relatively passive. On the other hand, in the buy sentence the active Agent is Bill, while John is relatively passive." (Gruber 1976:157) But clearly, the sentences do not convey such difference in the relative Agency of the participants. First, a sale can only be achieved with the willful and intended participation of both the seller and the buyer. This is why both participants must be sentient beings (*"John sold the flowers to the dog"). Second, the degree of passivity is not specified by either sentence, as can be seen in the following: "John reluctantly sold the flowers to Bill", "John sold the flowers to Bill only because Bill kept on insisting", "John ended up selling the flowers to Bill", etc. In all of these perfectly acceptable sentences, Bill emerges as much more active and willful than John.

It is not clear why Gruber makes this semantic distinction between (4) and (5), which are so clearly synonymous. Jackendoff, who accepts this distinction, turns it into a generalization. He uses it as an example of a "rule describing generalities among the lexical correlations of thematic and grammatical relations... Agents are invariably found in subject position" (Jackendoff 1972:42). As this is the only example given for such a general correlation between thematic structure and grammatical relations, and since it is based on a questionable analysis of the meaning of the verbs chosen as paradigmatic, the generality of the correlation is doubtful. This generalization about the syntactic realization of Agent illustrates Jackendoff's unsystematic approach to semantic representation. On one hand, his Nonrestrictive approach should permit him to represent both seller and buyer as Agents, since their syntactic realizations do not depend on their semantic content. On the other hand, Gruber's thematic model leads him to adopt a Restrictive view. Thus, he unnecessarily claims that Agents are always realized as subjects. But an abandonment of such a claim to generality could be easily incorporated into Jackendoff's Nonrestrictive system since it simply amounts to admitting that the syntactic realization of Agent is just as idiosyncratic as those of Source and Goal and has to be specified explicitly for each verb in the lexicon.

1.11. JACKENDOFF'S SEMANTIC FUNCTIONS

Unlike Gruber, Jackendoff analyzes the idiosyncratic properties that distinguish buy and sell from other verbs of transfer of possession. First, he notes that a secondary transfer of money takes place simul-

taneously with the transfer of possession, which differentiates sell from give. Second, he remarks that the event is one of change, where ownership of both the object sold and the money is caused to change by the participants, although he agrees with Gruber that selling is caused solely by the seller and buying solely by the buyer.

The concepts of causation and change are expressed in Jackendoff's theory as semantic functions: "CAUSE will be a semantic function that takes two arguments, an individual and an event; its meaning 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. [It is] quite possibly a semantic primitive. CHANGE takes three arguments, an individual, an initial state and a final state; presumably it will also be semantically primitive." (Jackendoff 1972:39). In order to capture all differences in meaning among verbs, semantic functions are supplemented by modifiers, expressing further semantic information. Thus, CHANGE in sell or buy is modified as a CHANGE of possession. Finally, selection restrictions are needed to limit the range of permissible values for the function's arguments. Thus "money" indicates that the secondary transfer in sell is restricted to money, to differentiate it from trade or exchange. Jackendoff's representation of sell reads as follows:

sell

+ V

+ [NP₁ _____ NP₂ (to NP₃) (for NP₄)]

CAUSE(NP₁, [CHANGE_{Possession}(NP₂, NP₁, NP₃)
Y [accompanied by
CHANGE([NP₄], NP₃, NP₁)
money]])

(Y represents "any semantic residue that has not yet been expressed").

Note that with the introduction of semantic functions, thematic roles do not figure as part of the representation of lexical items. One may well ask what place they occupy in Jackendoff's theory.

In the Restrictive theories, thematic roles occur as primitives in lexical representations. In Fillmore's theory, they become nodes in deep-structure representations of sentences. In Chomsky's theory, they become a type of grammatical relation defined between the head and its complements. In Gruber's theory, their status is not clear, since different thematic roles exhibit different properties: Theme never occurs in lexical representations since by definition it is present in every sentence and is assumed to be in subject position in the unmarked case. Thus, the entry for enter, for example, reads:

V
/ \
/ MOTIONAL
/ POSITIONAL
_____ enter (INTO (NP) #)

with no argument place provided for Theme, since it is assigned to the subject of the sentence. Source and Goal differ from Theme in that they do not occur as such in representations but are defined as the objects

of the primitive prepositions TO and FROM. They are understood to refer to the NP's which occur with these prepositions (or other prepositions which are analyzed in their terms). The NP in the representation of enter, for example, is a Goal, since it is the object of INTO (which is analyzed in terms of TO). Agent is different again: it always occurs explicitly in lexical representations, as was indicated in the entries for buy and sell. Theme and Agent seem to be primitive terms in the theory, but Source and Goal seem definable in terms of the primitive prepositions that must dominate them. This is a puzzling asymmetry for concepts that are conceived of as equally basic.

Jackendoff's representations do not exhibit such asymmetry: with the introduction of semantic functions, all thematic roles are removed from lexical representations. In fact, they are not longer primitives in the theory but rather defined in terms of the semantic functions, which are taken as semantically primitive: "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)" (Jackendoff 1972:39). Clearly, thematic roles are no more than convenient labels for the arguments of semantic functions. But even as labels, they are superfluous: the arguments are already referred to by other terms, such as individuals, states and events; moreover, not all arguments bear thematic labels - the second argument of CAUSE, for example, lacks it

without creating any problem. Indeed, in later papers, Jackendoff describes thematic roles as more and more marginal: "For convenience, we will call the phrase describing the moving object the Theme of the sentence... We will call the phrase describing the Theme's initial position the Source... The phrase describing the Theme's final position we will call the Goal" (Jackendoff 1976:93).

There could hardly be any objection to the use of thematic roles as mere labels for argument places, as long as such use implies no a priori restrictions on the nature of the arguments. This is not, however, the case in "Towards an Explanatory Semantic Representation", where the reference of the first argument of CAUSE is, by virtue of being labeled Agent, restricted to sentient beings with intention. This restriction forces Jackendoff into an awkward position: "For those verbs such as open that permit an Instrument in the subject... the strict subcategorization feature must be set up to substitute the interpretation of the subject for either the Agent or the Instrument, either by setting up separate but related lexical entries or by generalizations within a single lexical entry." (Jackendoff 1976:106) The entry suggested by Jackendoff for open reads:⁴

$$\begin{array}{l} /open/ \\ + V \\ + \left[\begin{array}{c} \{NP_1\} \\ NP_2 \end{array} \right] \text{---} NP_3 \\ \left[\begin{array}{l} CAUSE (NP_1, GO_{posit}(NP_3, y, OPEN)) \\ Inst: NP_2 \end{array} \right] \end{array}$$

A few problems are exhibited by this representation: The subcategorization frame provides two alternative NP's for subject position, although clearly, no syntactic feature differentiates NP's which refer to instruments from others which refer to beings capable of intention. Furthermore, no subcategorization feature is provided for a with-phrase, the most prevalent realization of an instrument phrase. If the implication of this omission is that an instrumental with-phrase can be optionally added, there will be no way to block sentences like *"The screwdriver opened the door with a knife". Finally, the representation implies that there is always an understood instrument in the semantic representation of the verb, but this is clearly not the case, as "John opened the window with no instrument" expresses no contradiction.

These problems are the result of holding a concept of Agent. In Semantics and Cognition, Jackendoff's concept of Agent is radically modified: "Notice that the agent is not necessarily acting willfully; for example, "the wind" is agent in ["The wind pushed Sim into the room"]. The possibility of willfulness arises from the fact that an event of causation can be reanalyzed as an actor performing an action... Willfulness or intentionality is an optional property of an actor, and need not be represented in addition as part of the function CAUSE." (Jackendoff 1983:176). Thus the first argument of CAUSE is modified so that it does not carry any thematic notions usually associated with the role of Agent. This is perhaps why Jackendoff replaces it with a somewhat more neutral term - Actor.

A gradual reduction in the importance granted to thematic roles is observed in comparing Fillmore's, Gruber's and Jackendoff's earlier and later semantic theories. It is interesting to realize that the marginality of thematic roles correlates directly with the amount of semantic information accounted for by the theories. The more semantic information there is in the semantic representation of verbs, the less need there is for introducing thematic roles into the representation. When semantic concepts such as causation and change are accounted for, when they are supplemented with modification which further describes their nature and with selection restrictions which operate on their argument places, argument places themselves can be referred to as simple NP's. The conclusion that seems to emerge is that the need for thematic roles arises only in Restrictive theories, which are not sufficiently developed to account for the meaning of lexical items.

Gruber's thematic model, inherited by Jackendoff, suffers from problems similar to the ones encountered by the Restrictive theories. Since thematic structure is posited so that it corresponds to syntactic structure, arbitrary semantic distinctions result: concepts such as causation and action are represented only when they are obligatorily expressed by a syntactic complement of the verb. Thus they are represented for send, but not for receive. Agency (or action) is assigned to syntactic subjects but not to other syntactic complements, contrary to the meaning expressed by the verbs analyzed. Thus, sell and buy receive distinct representations. But since Jackendoff's system is Nonrestrictive, its semantic representations should not be constrained by the principle of syntactic

relevance. In fact, they do not even include thematic roles. Thus, the Restrictive vestiges found in Jackendoff's theory are difficult to justify. They yield undesirable semantic representations without serving any theoretical purpose.

II. EXTENSIONS OF THE MOTIONAL MODEL

Although thematic roles are not essential to Jackendoff's approach, their recurrent mention reflects the theory's underlying motional model. All event sentences are viewed as including Theme, Source and Goal, and all predicates are analyzed by means of the semantic functions based on motion verbs. Jackendoff refers to this view, which he attributes to Gruber, as the Thematic Relations Hypothesis: "In any semantic field of [EVENTS] and [STATES] the principal event-, state-, path-, and place-functions are a subset of those used for the analysis of spatial location and motion. Fields differ in only three possible ways:

- a. What sorts of entities may appear as theme;
- b. What sorts of entities may appear as reference objects
- c. What kind of relation assumes the role played by location in the field of spatial expressions" (Jackendoff 1983:188).

Gruber extends the notions of Source, Goal and Theme to apply to other verbs which convey motion in more abstract terms, such as transfer of possession, where the Theme "moves" from being in the possession of the Source to being in the possession of the Goal (as in give or sell); and change of identity, where the Theme "moves" from one state perceived as the Source to another state perceived as the Goal (as in turn or

become). The rationale for the extension is the similarity these verbs exhibit in their subcategorization for to-from prepositional phrases and the fact that many lexical items are commonly used for either physical motion or more abstract kinds of motion. The verb go, for example, expresses physical motion in "The book went from Paris to London" and possessional motion in "The house went from George to his brother". Due to this extension of the motional roles, send and sell have, according to Gruber, parallel structures except that the former is Positional while the latter is Possessional.

Jackendoff also extends his analysis of motion functions to other semantic fields. Change, for example, is present in motion - "He ran from the house to the beach" involves a change in location; it is present in identity transformations (Jackendoff's "identificational" field) - "He changed from a coach to a pumpkin" involves a change of category, and "The pages yellowed" involves a change of property; it is present in possession transfers - "He sold the book to John" involves a change of possession. This observation (aided by the similarity in prepositional-phrase subcategorization) leads Jackendoff to posit a GO function to capture these changes. But parallel to this move, one might posit an INTENTION function, since like GO, INTENTION is also present in motion, identity transformations and possession transfers, as can be seen from the ill-formedness of the following: "He accidentally chased John", "He accidentally converted to Christianity" and "He accidentally sold the book".⁵ In Jackendoff's theory, Intention is a modifier of CAUSE and not an independent function. The difference between GO and Intention seems to stem

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from the assumption that change is inherent in all predicates of motion, whereas intention is in most cases optional. But that change of location, like intention, is not always inherent is made clear by examples such as "He pulled the chair, but it wouldn't budge" and "He pushed Mary, but she didn't move", which contain no contradiction. To accommodate these sentences within Jackendoff's theory, one would have to claim that they are ambiguous between a sense which involves a GO function and a sense which does not.

Jackendoff supports the use of the same function across different fields with further evidence: "Recall that we claimed that morphologically related forms have related semantic interpretations, and observe parallels such as these:

- (6)(a) The coach turned into the driveway (Positional)
- (b) The coach turned into a pumpkin (Identification)

- (7)(a) The train went to Texas (Positional)
- (b) The inheritance went to Philip (Possessional)"

(Jackendoff 1976:103)

GO enables Jackendoff to relate the two senses of turn and go, but at the cost of distinguishing two senses of push and pull, which the theory cannot relate. A non-motional analysis, by contrast, would include GO (or an equivalent marker) as part of the representation of verbs which inherently denote change of location, such as motional go or turn. But it would exclude it from the representation of predicates whose meanings do not specify such change. Thus the representation of pull would not contain GO, to reflect the fact that "He pulled" does not specify whether any distance was covered by the object pulled.

Jackendoff cannot make this adjustment to his functions, since when GO is inapplicable, the consequences for his theory are fatal: There is no function in the theory which can serve for the representation of verbs which do not express change. Thus, there is no function available for push or pull when the object is not moved, as well as for other countless verbs which do not involve the notion of change - read, laugh, hit, watch, and consider are but a few examples. Obviously, it is always possible to augment the theory with more functions to increase its coverage, but which functions to posit is far from evident, since no further analogies to motion functions can be made for these verbs.

Gruber and Jackendoff further claim that the representation of stative verbs of location is similar to that of motion verbs, except that since they represent states and not events, stative verbs involve Location in place of Source and Goal. As Gruber notices, "if the verb is not a verb of motion, there is more difficulty in deciding which noun the Theme is, the subject or the object of the transitive verb. It is not possible to say that the theme in these circumstances is the entity in motion" (Gruber 1976:45). The example provided by Gruber is:

- (8) The circle contains the dot
- (9) The circle is surrounding the dot

He admits that "logically, these two sentences are alike, expressing the same positional relationship between the circle and the dot". The claim is that in (8) the Theme is the dot, since its position is conditioned by the position of the circle; and in (9), the Theme is the circle, since its position is conditioned by that of the dot. As evidence for this claim, Gruber appeals to the phenomenon of natural answer. According to

Gruber, wh-question concerning location refers to the Theme and is naturally answered only by a sentence preserving the same Theme, regardless of grammatical relations. Thus, for (8):

(8a) Where is the dot? The circle contains it
is acceptable, since the dot is Theme in both question and answer. The answer is natural in spite of the fact that grammatical relations are not preserved (dot is subject of the question and object of the answer).

(8b) Where is the circle? It contains the dot
is unacceptable since circle is Theme in the question but Location in the answer. The answer is unnatural in spite of the fact that grammatical relations are preserved (circle is subject in both question and answer).
For (9), the reverse holds:

(9a) Where is the circle? It is surrounding the dot
is acceptable since thematic relations are preserved;

(9b) Where is the dot? It is surrounded by the circle
is unacceptable since thematic relations are not preserved.

That judgements concerning natural answers constitute very weak evidence for semantic claims is immediately perceived in Gruber's examples. (9b) is just as acceptable as (9a). It is even more acceptable in other situations, such as: "Where is John? He is surrounded by these journalists", or "Where is the house? It is surrounded by tall buildings". Furthermore, notice that

(9a') Where is the circle? The dot is surrounded by it
is totally unacceptable, although it should not be so according to Gruber. If Gruber's example is slightly modified, the results are even worse:

- (10) A circle contains the dot
- (11) The circle is surrounding a dot

should yield the following as acceptable:

- (10a) Where is the dot? A circle contains it.
- (11a) Where is the circle? It is surrounding a dot

But (10a) and (11a) conform to Gruber's description of unnatural answers:

"There is a feeling that the answer is indirect, a hint from which we can figure out the answer; but the answer itself is not told us" (Gruber 1976:48). Jackendoff tries to improve Gruber's tests by suggesting that "question-answer pairs preferably have parallel semantic structures as well as parallel grammatical structures" (Jackendoff 1976:98). But this still does not explain why (11a) is unacceptable, as it preserves both types of relations.

Examples (9) to (11) indicate that the natural-answer test fails as a criterion for determining the presence of Theme in propositions denoting states. This consequence is not surprising, since Theme, defined as a motion concept, is ill-suited for the representation of states. This is made clearer in Jackendoff's treatment of stative verbs. Jackendoff accepts Gruber's analysis of stative verbs and posits a BE function: "BE(x,y), where x is the Theme and y is the Location" (Jackendoff 1976:96). The function is used to represent sentences such as the following:

- (12) The dog is on the left of the cat
- (13) The cat is on the right of the dog

as:

- (12a) BE(THE DOG, LEFT OF(THE CAT))
- (13a) BE(THE CAT, RIGHT OF(THE DOG))

These representations parallel the representations for:

- (14) The dog moved to the left of the cat
- (15) The cat moved to the right of the dog

which read:

- (14a) GO(THE DOG, y, LEFT OF(THE CAT))
- (15a) GO(THE CAT, y, RIGHT OF(THE DOG))

The extension of motion-verb representations to non-motional verbs results in a misrepresentation of the semantic facts. Here too, a similarity (between motion and non-motion) is claimed to be captured, but only at the expense of creating a dissimilarity (between two synonymous non-motional representations). The gain is highly questionable. Jackendoff's acceptance of this consequence is puzzling: "The mutual entailment of [10a] and [11a] is a consequence not of equivalent semantic representations, but of the pragmatic fact that they describe a particular spatial configuration as two different but equivalent states of affairs, one locating A in terms of object B, the other locating B in terms of A". (Jackendoff 1976:96) This claim is inconsistent with other claims of the theory: Equivalence in Source/Goal sentences, as between "John accepted the book from Bill" and "Bill relinquished the book to John", is considered a semantic fact, linguistically represented; but equivalence in Location sentences is considered non-semantic and is not accounted for. This lack of uniformity in the treatment of equivalences is the result of extending the notion of Theme, posited for motion verbs, to the representation of non-motional location sentences.

To conclude, the motional model and the extension hypothesis adopted by Jackendoff fail to provide semantic representations for predicates

that do not express change. By representing state verbs as assigning Theme, the semantic equivalence of sentences denoting states cannot be captured. The equivalence is thus said to be pragmatic rather than semantic. This is inconsistent with the treatment of semantic equivalence in sentences denoting events of change, where the equivalence is captured. More severely, the meaning of a wide range of event verbs that do not express change, such as pull, read, laugh and others, cannot be represented at all. Such omission in a semantic theory that is intended to provide full representation of meaning is inadmissible.

III. FUNCTIONS AND SEMANTIC REPRESENTATION

As revealed in the previous sections, Jackendoff's semantic representations are severely constrained by the thematic model on the basis of which they are conceived, and, in particular, by the motional model. But the representations are also constrained by the very nature of the functional formalism in which they are expressed. In this section, the limitations of the functional formalism are discussed.

Consider the sentence

(16) He broke the door

whose representation is:

(16a) CAUSE(HE, GO(DOOR, y, BROKEN))

According to Jackendoff, the function CAUSE takes two arguments: an individual and an event. Thus, the change component in the causative event of breaking is represented as an independent event. This representation is counter-intuitive, since it implies the occurrence of two events: a

causation and a resulting change, whereas (16) really expresses only one event, with two participants. The consequence of this representation is that the semantic distinction between (16) and (17),

(17) He caused the door to break

which truly consists of two events, cannot be captured. Since the lexical item cause is also represented by means of CAUSE, taking an individual and an event, the representation of (17) will be identical to that of (16). But the meanings of (16) and (17) differ.⁶ In (16), causation is internal to the event of breaking; in (17), it is external. This explains the ill-formedness of *"He broke the door by itself", as opposed to the well-formedness of "He caused the door to break by itself". To differentiate cause from break, Jackendoff would have to posit two parallel CAUSE functions, each with a different categorization of its arguments: CAUSE_{ext} would have event as its second argument, for the representation of external causation, as in verbs like cause; CAUSE_{int} would have a mere change as its second argument, for the representation of internal causation, as in verbs like break.

Although functions categorize their arguments as individuals or events, they themselves are not categorized. Thus, breaking as a whole is never labeled as an event. This implies that breaking is viewed as an instance of causation which includes an event. This is puzzling since intuitively, causation does not correspond to any independent ontological category as do events and states of affairs. It is rather a relationship between causes and results. Therefore, one would want to characterize break itself as expressing an event which consists of causation and

change. In Semantics and Cognition, Jackendoff modifies his semantic functions to incorporate labels. Accordingly, the representation of break will read:

[_{Event} CAUSE (HE, [_{Event} GO (DOOR, y, BROKEN)])]

But this use of labels does not solve the problem raised in connection with cause to break. If GO is now always labeled Event, it cannot serve as a second non-event argument of CAUSE_{int}, to represent break. Another non-event GO function is needed to represent the change component of a single event like breaking. Thus, GO_{event} will represent events, as in "The door broke" or "He caused the door to break"; and GO_{nonevent} will represent mere changes, as in "He broke the door".

These problems in the representation of events, causation and change, arise as a consequence of the categorization of arguments of semantic functions. They can be avoided if no event categorization is imposed on the semantic components of verbs of events and processes.

Similar difficulties arise with the two arguments of GO, which are categorized as the initial and final states of the change. This categorization imposes too rigid a structure on the nature of the events represented. Consider the difference between events and processes as reflected in the nature of their change components: Events include changes for which only an initial and final state can be specified. The nature of intermediate states (if they exist) is not clear. The door cannot be said to become more and more broken as the event goes on. In processes, by contrast, the change includes a series of intermediate

states, which could all be uniformly characterized. Thus, while the door is being opened, it becomes more and more open (or less and less closed) at each stage along the way. Similarly, while a plant is being grown, it becomes taller (or thicker) at each successive state.

With Jackendoff's GO function, there is no way to capture this difference in changes of events and processes. Since GO allows for initial and final states only, it cannot accommodate a range of intermediate states. In Semantics and Cognition, Jackendoff corrects this oversight. He observes that motion changes are not always expressed by means of Source and Goal: "GO can occur not only with bounded paths (sources and goals) but also with directions and routes, where the end points are left inexplicit. This shows that the stipulation of beginning- and end- states is not essential to the use of a GO function. Rather, whatever the particulars of the path, GO expresses the traversal of every point of it" (Jackendoff 1983:174). The modified GO function reads:

[Event GO([Thing X], [Path Y])]

In its modified version, GO implies continuation (that is a series of intermediate states between the initial and final one) but is equally restrictive, since it now cannot express discontinuous changes, as in break. Jackendoff notices discontinuity in the field of possession transfers: "The pseudospace of all the possessive fields is discontinuous; there is no way to make sense of a continuous transition in possession from an individual to another. Thus [PATHS] degenerate essentially into their end points, and the function GO can be treated, in this special case, as a change-of-state function, if one desires"

(Jackendoff 1983:192). However, as was observed, this discontinuity is not particular to a specific field. Although neither break nor open are mentioned in Semantics and Cognition, it is reasonable to assume that they would belong to the same semantic field in a theory like Jackendoff's, which organizes predicates in broad semantic fields. But the theory cannot differentiate continuous from discontinuous changes in the same field. To solve the problem it would be necessary to posit two different GO functions - GO_{cont}, for continuous changes, and GO_{disc}, for discontinuous changes. Recall the problem observed earlier in connection with cause versus break. The solution to that required distinguishing between GO_{event} for events and GO_{nonevent} for change-components of events. The two distinctions cross. Thus, there is a need for four different GO functions: GO_{event/cont} - for sentences like "The fertilizer caused the tree to grow"; GO_{event/disc} - for sentences like "The earthquake caused the window to break"; GO_{nonevent/cont} - for sentences like "John grew the tree"; and GO_{nonevent/disc} - for sentences like "John broke the window".

Functions are descriptively restricted not only by the categorization imposed on the nature of their arguments, but also by the fact that they must have a fixed number of arguments. Thus GO allows two arguments only, a moving individual and a path. Since there is no argument available for representing the action of the individual, predicates involving action, such as swim, cannot be differentiated from predicates not involving it, such as float. Jackendoff recognizes the need for representing action as part of an event function. GO involving action is rewritten as:

$$[_{\text{Event}} [_{\text{Thing}} \text{ACTOR}]_i, [_{\text{Action}} \text{GO}(i, [_{\text{Path}} Y])]]$$

"In this expression, the first argument of [GO] is occupied by i , the index of the [ACTOR] constituent. Formally, one can think of this argument place as bound by the [ACTOR]; conceptually, this role is what the [ACTOR] does in performing the [ACTION]" (Jackendoff 1983:180). Jackendoff realizes that this formalism differs from the formalism used so far which included non-indexed functions only. The new formalism necessitates a reanalysis rule:

$$[Event\ F(X_i, Y_j, Z_k \dots)] \leftrightarrow [Event\ \overset{[ACTOR]}{X}_i, [Action\ F(i, Y_j, Z_k \dots)]]$$

which should be restricted to cases where an ACTOR can be said to exist.

This reanalysis exemplifies the difficulty inherent in positing functions with a fixed number of arguments. GO originally included only a moving individual and a path. To circumvent this restriction, formal mechanisms have to be supplied to allow GO to include the individual's action in addition to the path. But the rewriting of GO amounts to creating a new and different GO function: without action, GO takes an individual as its first argument. With action, it takes "what the actor does in performing the action" as its first argument. Again, the introduction of an additional semantic concept results in the introduction of a new semantic function to represent it.

Another difficulty raised by the fixed number of arguments can be observed in Jackendoff's representation of sell, repeated here for convenience:

sell

+ V

+ [NP₁ _____ NP₂ (to NP₃) (for NP₄)]

CAUSE(NP₁, [CHANGE Possession(NP₂, NP₁, NP₃)
 Y [accompanied by
 CHANGE([NP₄ money], NP₃, NP₁)]])

CAUSE takes only two arguments, which refer to the individual causing the event and the "event" (or change) caused. But sell contains two "events" - the transfer of the object sold and the transfer of money. To accommodate for the second transfer, Jackendoff is forced to represent it as a modifier of the object's transfer. This implies that the transfer of money is somehow subordinate to the object transfer, an implication not borne by the meaning of sell. With a verb like trade, the "subordinate" nature of the second transfer becomes even less defensible, especially in constructions like "They traded bicycles", where there are not even two separate syntactic components to be differentiated. Jackendoff is aware of this difficulty when he admits to "hav[ing] somewhat arbitrarily chosen to represent the secondary action as a condition modifying CHANGE of the primary action" (Jackendoff 1972:40). In Semantics and Cognition, the restriction imposed by the number of arguments is simply ignored. On one hand, event representations are still defined as containing one function:

EVENT --> [Event GO([Thing X], [Path Y])]

(Jackendoff 1983:174)

On the other, the revised representation of sell contains an event which includes two GO functions, existing side by side:⁷

$$[_{\text{Event}} \text{CAUSE}([X], \left[\begin{array}{l} \text{GOposs}([Y], \left[\begin{array}{l} \text{FROM...} \\ \text{TO...} \end{array} \right]) \\ \text{GOposs}([Z], \left[\begin{array}{l} \text{FROM...} \\ \text{TO...} \end{array} \right]) \end{array} \right])]]$$

(Jackendoff 1983:193)

This representation reflects another way of circumventing the restriction on the number of arguments - one Event argument contains several separate and independent components. By allowing the internal structure of arguments to be completely free, the theory overcomes the shortcoming of restricting their numbers. But if arguments cease to correspond to single semantic components, it is not clear what they do stand for.

IV. CONCLUSION

Jackendoff's Nonrestrictive semantic theory sets out to give an exhaustive account of the meaning of predicates, independently of the syntactic configurations in which they appear. In order to do so, it requires more powerful mechanisms than the set of thematic roles provided by Gruber. In addition to thematic roles, it contains semantic functions, modifiers on functions and selection restrictions. But the addition of more powerful mechanisms renders thematic roles dispensable. As the theory develops, they come to play an increasingly marginal part in it.

Thematic roles are not completely discarded, however, since they motivate the motional model and its underlying extension principle. Primacy is accorded to motion verbs, whose semantic functions are claimed to serve as the basis for the representation of predicates in other semantic fields. As has been shown, this extended analysis is inadequate: although

it succeeds in capturing some similarities across different fields, particularly in the areas of causation and change, it misrepresents the semantic facts expressed by non-motional spatial predicates. Synonymy and converse relations holding between spatial predicates such as "to the left of" and "to the right of" are explained away as pragmatic, thus making the theory non-uniform in the range of semantic phenomena it accounts for in different semantic fields. The extended analysis is particularly inappropriate to represent the meaning of predicates which do not involve change. Thus it offers an account of only a limited subset of natural-language predicates. This limitation is never acknowledged by Jackendoff.

The theory is also constrained by its formalism. First, functions impose certain categorizations on their arguments, which are not always present in the meaning of the predicates they represent. As a consequence, the theory fails to make crucial semantic distinctions, as between internal causation (as in break) and external causation (as in cause); or between continuous and discontinuous changes. Second, the functional formalism is too restrictive in that it fixes the number of arguments functions can take, thereby artificially limiting the number of semantic components predicates may exhibit. Thus, it fails to capture action in the presence of change or causation and fails to represent multiple changes, as in sell and trade. When an attempt is made to relax this rigidity in the formalism, the theory is compelled to either devise a complicated formal apparatus (e.g., indexation to handle action), or else to devoid arguments of any uniform internal structure (e.g., include several independent "events" in one Event argument, to capture the two

transfers in sell). These limitations suggest that semantic functions are not appropriate as a notation with which to formulate semantic representations.

FOOTNOTES

1. Actually, in Semantic Interpretation in Generative Grammar, Jackendoff does explicate some syntactic phenomena by means of thematic roles. He claims, for example, that cases of ungrammatical passivization, as in

(i) *"650 pounds was weighed by the piano" can be ruled out on the basis of a hierarchy of thematic roles. The hierarchy arranges thematic roles as follows:

Agent
Location, Goal, Source
Theme

Grammatical passive formation requires the NP of the by-phrase to be higher on the hierarchy than the surface-subject NP. Thus, (i) is claimed to be ill-formed because its by-NP, piano, is Theme, and therefore lower than the subject-NP, pounds, which is Location. Similar explanations are given for ill-formed reflexive constructions and for control phenomena. These claims are not discussed in this dissertation, since Jackendoff seems to have abandoned them in his later publications. Arguments and numerous counter-examples against these claims are provided in Freidin (1975), Hust and Brame (1976), and Gee (1974).

2. The sense of receive that Gruber refers to is probably the "passive" sense of coming into possession, not the "active" sense of welcoming or greeting, which, of course, can be done intentionally, as in "Mary intentionally received the guest in her kitchen".

3. In the sense discussed here, New York is a modifier of the verb, not of book.

4. GO is a more recent name for the CHANGE function.

5. Note that when these sentences are acceptable, intention is still present. An accidental selling of the book can only mean that some other book was intended to be sold, and a mistake in identity has occurred. The sentence cannot mean that a sale happened without the seller's intention to perform one.

6. The need to distinguish between the two has been argued for extensively. See Fodor (1970).

7. The representation is somewhat simplified in ways irrelevant to the present discussion.

CHAPTER 5 - A THEORY OF SEMANTIC DECOMPOSITION

The thematic theories reviewed in the preceding chapters are based on the assumption that thematic information is an integral part of the linguistic competence exhibited by native speakers. The Restrictive view motivates this assumption for the theories of Fillmore, Chomsky and Levin: thematic information is claimed to serve as the basis for syntactic derivation. Thematic roles are therefore included as theoretic primitives, under the assumption that their inclusion simplifies and reduces the syntactic apparatus needed to be posited by the theory. Fillmore's theory represents this view in its most extreme: Cases replace subcategorization features in the lexicon so that there is no need to specify how many complements a verb takes; the presence of specific prepositions heading complements is determined by the particular Cases assigned to the complements; there is only one general base rule, which generates all deep structures; and, finally, surface structures are determined by the choice of a particular Case as surface subject, in accordance with the Case Hierarchy. Chomsky's (and Levin's) theory is less extreme in the syntactic power it accords to theta-roles. Like Cases, theta-roles replace subcategorization features in the lexicon. But unlike Fillmore's general base rule, the theta-criterion, although unified with the projection principle to generate base structures, does not completely replace it. The theta-

criterion also serves to constrain surface structures, but only as one among several syntactic principles.

These reductions in the syntactic apparatus cannot constitute strong theoretical motivation for the introduction of thematic roles into the theory, because, as was discussed in Chapters 1 to 3, the reductions are very problematic. Fillmore's Case Hierarchy generates ill-formed surface structures (e.g., "The key was openend the door") and cannot generate other, well-formed ones (e.g., "The door opens with a key"). His thematic treatment of prepositions (such as by) lacks the generality that purely syntactic principles, such as passivization, can easily achieve. Chomsky's attempt to reduce subcategorization features to canonical realizations of theta-roles is similarly deficient. Theta-roles alone cannot determine whether verbs are transitive or ditransitive; nor can they specify what syntactic form clausal complements may take. The theta-criterion, as stated in LGB, cannot handle optional complements or adjuncts. Thus, thematic roles prove inadequate as syntactic entities. This inadequacy undermines the claim that they constitute part of linguistic competence.

From a semantic point of view, positing thematic roles as primitives is also problematic. The Restrictive theories do not offer semantic definitions of thematic roles but only descriptions of their nature in intuitive meta-theoretic terms. Thus, the Agentive Case for Fillmore is the noun-phrase describing "the perceived animate instigator of the action described by the verb". For Levin, Agent is the role assigned to

the "person who brings about the event". But it is crucial to note that although the Restrictive theories do not include a semantic component, they nevertheless appeal to semantic concepts to determine roles. Fillmore does not mention semantics explicitly, but his notion of judgements that Cases are supposed to represent is interpretable only with the help of semantic considerations. If judgements are not restricted by semantic criteria, they cover a lot of extra-linguistic knowledge (such as who is to be held legally responsible in a case of a broken window) on one hand, and, on the other, fail to cover genuine linguistic knowledge (such as the inherent difference between breaking and painting a window). Chomsky also tries to link theta-roles to some semantic notions of agency and affection, albeit without explaining the nature of this link. Levin is the most explicit in her reliance on semantic concepts: The distribution of thematic roles is predicted by semantic classes, and semantic classes are established on the basis of semantic components found in the decompositional meaning of verbs. Therefore it seems desirable, if not necessary, for the Restrictive theories to include a semantic component that would formally capture the semantic concepts alluded to.

The implicit reliance by the Restrictive theories on semantic concepts indicates that thematic roles are not genuine semantic primitives. Indeed, Nonrestrictive theories, which include an independent level of semantic representation, posit other semantic primitives instead. Thus, in Jackendoff's theory, thematic roles, as far as they are applicable, are defined on the basis of semantic functions. ACTOR, for Jackendoff, is an optional realization of the first argument of an Event function.

If roles are thus based on other semantic concepts, it is more plausible to claim that the native competence appealed to has to do with intuitions about the presence or absence of true primitive semantic concepts, rather than with intuitions about roles.

The syntactic problems exhibited by the Restrictive theories, their implicit reliance on semantic concepts, and the derivative and marginal part played by roles when an independent level of semantic representation exists, all indicate that thematic roles are, in fact, superfluous concepts. For a linguistic theory to properly generate well-formed syntactic structures, subcategorization features and purely syntactic rules have to be posited. For it to properly represent the inherent meaning of lexical items and complex configurations, an independent level of semantics is needed. Although these two components of the theory interact, neither can be reduced to the other. Thus, the lexicon contains both syntactic information and semantic information associated with each lexical entry. The syntactic information determines the item's syntactic category (N, V, etc) and its subcategorization features: the type of complements it takes and whether these are obligatory or optional. The semantic information determines the item's semantic representation: what concepts are inherent in its meaning and what arguments it is predicated of.

As for combining single lexical items into constituent structures, the syntactic component includes rules for forming deep structures, on the basis of which grammatical functions such as subject-of and object-of can be defined; and further rules and conditions for deriving surface struc-

tures from deep structures. The semantic component also includes rules for combining the lexical representations of constituents into a single semantic representation for the whole structure, in accordance with their syntactic configurations. Once full syntactic and semantic representations are available, however, the positing of thematic roles becomes not only superfluous but even interfering, since thematic roles cannot be clearly mapped onto semantic concepts that emerge from a decompositional analysis of the meaning of lexical items.

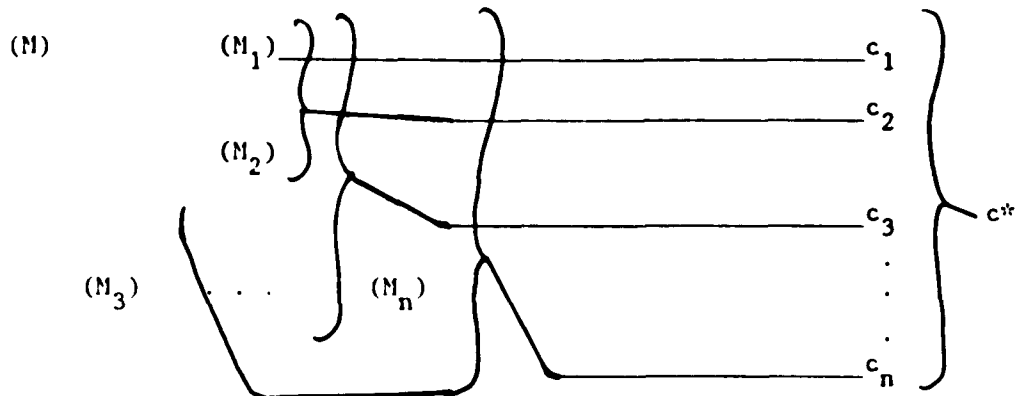
The discussion in the following chapters focuses on the semantic component of a Nonrestrictive, non-thematic theory and on the ways in which it interacts with the syntactic component. Since the focus is semantic, the nature of the syntactic component is not discussed. It is simply assumed that the syntax provides adequate subcategorization information, defines all grammatical functions and derives all well-formed surface structures.

I. KATZ'S THEORY OF SEMANTIC DECOMPOSITION

To analyze the meaning of predicates and the semantic relationships that hold between them and their arguments, I will use J. Katz's semantic theory. This theory is committed to a full representation of meaning: it is both decompositional, in that each lexical item is analyzed to reveal all the semantic concepts that are inherent in its meaning; and compositional, in that a semantic rule (the projection principle) is posited to account for the ways in which single lexical items in a complex syntactic structure combine to form more complex semantic structures. Thus, the

theory provides the means for building a lexicon that will contain representations for all senses of a given lexical item in a particular language, formed on the basis of a set of universal semantic concepts. These representations reveal the semantic properties of lexical items (an ambiguous term, for example, will have a different representation for each of its senses) and the semantic relations that hold among different lexical items (synonymous terms will have identical representations). The theory also provides the means for building semantic representations for complex syntactic structures, by projecting the representations of syntactic complements onto the representation of their heads. These compositional representations also reveal the semantic properties of the structures they represent (redundancy, for example, results if the representation of the complement is already fully contained in the representation of its head) and their semantic relations (entailment occurs when the representation of one sentence is contained within the representation of another).

Meanings (of either single items or syntactically complex structures) are represented by semantic markers, which are complex formal symbols. Like phrase markers, semantic markers also take the form of tree structures with labelled nodes, but the nodes represent semantic concepts rather than syntactic categories, and the branching structure represents relations of sense qualification that hold among these concepts rather than syntactic subcategorization.



The semantic marker of the form (M) represents a complex concept c^* , which is decomposed into component concepts $c_1, \dots, c_n$. The superordinate relations holding among the concepts $c_1, \dots, c_n$ are represented by the branching in (M): c_1 is superordinate to c_2 , c_2 is superordinate to $c_3, \dots, c_{n-1}$, and c_n but $c_3, \dots, c_{n-1}$ and c_n are not superordinate to one another.

The semantic concepts represented by the markers correspond to universal semantic notions that are independent of the vocabulary of any particular language. Some of them are primitives (such are the color concepts, for example) and are represented by semantic markers that occur as terminal nodes on the tree; others are complex semantic notions, completely determined by their component concepts, which are represented by subordinate markers on their trees. The presence or absence of semantic markers in a particular meaning representation is methodologically determined by inspecting the semantic intuitions of native speakers about the concepts found in the meaning of the structure in question; it is also systematically checked against the semantic concepts found in representations of other structures that bear semantic relations to the item analyzed to assure that the representations are consistent in reflecting such

relations. Thus, for example, the representation of "John broke the window with a hammer" must be identical to that of "John broke the window using a hammer" since the two sentences are synonymous. Consequently, all the markers posited to occur in the representation of the first structure must occur in the representation of the other as well.

Since the representation of complex syntactic constructions is done by projecting the representations of syntactic complements onto the representation of the head, the semantic representations of lexical items that can function as heads include place holders for the representations of their complements. These are categorized variables, written to the right and slightly below the semantic markers which are predicated of them.

$$(M') \quad ((M_i)(X), (Y), \dots (Z))$$

$$\quad \quad \quad < > \quad < > \quad \quad < >$$

$$X - [F_1] \quad (Y - [F_2]) \quad Z - [F_n]$$

In the application of the projection principle, these variables are replaced by the semantic representations of the appropriate complements. Syntactically, the replacing component should bear the grammatical function $[F_n]$ specified for it by the mapping frame provided in square brackets, at the bottom of the representation.¹ If the mapping frame is enclosed in parentheses (as shown for Y), it indicates that the syntactic realization of the argument is only optional. That is, the variable will be replaced by the appropriate complement if such a complement exists in the sentence; if a complement does not exist, the variable will be replaced vacuously, that is, simply removed from the final representation, without violating the projection principle that requires the replacement

of all variables. Semantically, the representation of the replacing component should meet the semantic criteria specified for it by the selection restrictions enclosed in angled brackets. The categorized variables can be seen as the argument places of the predicate that the semantic marker represents: the number of places is the number of distinct categorized variables occurring in the semantic marker.² The semantic representation replacing a variable is the term appearing in the argument place that the variable determines. Heavy parentheses enclosing a variable represent the fact that the place is referential.³

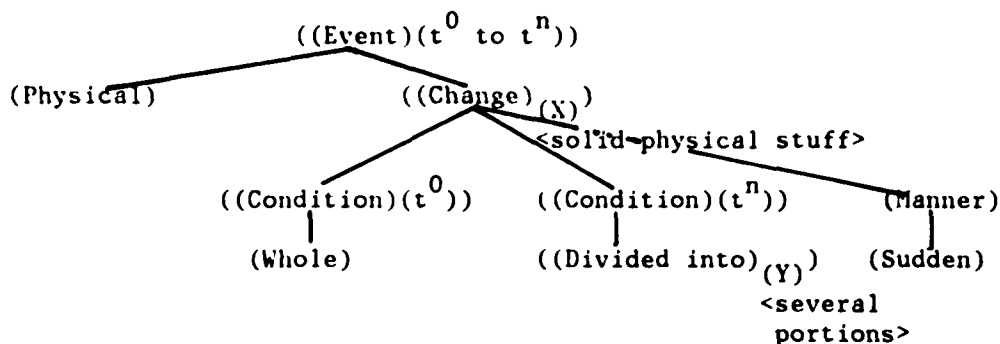
The projection principle determines the way in which the meanings of constituents of a syntactic configuration are combined to form a single complex semantic marker. There are three types of projection operations: Embedding of one semantic representation into another by substituting the first for an occurrence of a categorized variable in the second; this is the operation that projects the representations of arguments onto the representation of predicates. Conversion of a semantic representation into another semantic representation; this is the operation used for the representation of the interaction between a grammatical particle like negation, for example, and the sense of an expression in its scope.⁴ Attachment of one semantic representation to another. This is the operation that projects the representation of modifiers onto the representation of their heads. The projection operation starts with the composition of the most embedded syntactic component with the representation of its head and is repeated until all the syntactic components of the configuration are included within the representation of the main head. If no anomalous

representation results (as in the case of "He broke the dream"), the sentence acquires a well-formed semantic representation.⁵

II. A DECOMPOSITIONAL ANALYSIS OF BREAK

In this section, the meaning of the verb break will be analyzed in order to illustrate the workings of the theory in greater detail.⁶ As pointed out by Fillmore and Levin, break can occur either transitively or intransitively. The two syntactic forms involve a semantic distinction: the transitive use is causative, while the intransitive use is not. The semantic distinction implies that break has two senses, and therefore, two semantic representations:

(1) BREAK (noncausative):



X - [subject] (Y - [object of into/in/to-PP])

This representation captures the fact that breaking is an event beginning at time t^0 and ending at time t^n .⁷ It is a physical event (as opposed to dreaming, for example, which is mental), which includes a sudden change. All verbs of change specify different conditions the object is in during the event. Break specifies that in its initial condition, the object is whole; in its final condition, the object is separated into portions. The degree of separation is not determined: the object can be only lightly broken and contain cracks that separate the parts somewhat, although they

can still be characterized as mostly attached; or, in the most extreme case, the object is divided into several detached parts, to a degree where the object cannot be said to exist anymore. Note that this indeterminacy allows for a breaking event where the object initially contains cracks and then further changes by separating into pieces.

The variables, X and Y, represent the argument places of the predicate: X stands for the object broken and must be replaced by the noun-phrase functioning as the subject of the sentence. The selection restrictions on X specify that it must refer to a solid, physical entity, of the type "stuff", which is a term used to refer to class of entities whose members are either objects (such as windows) or substances (such as glass). The concepts of solid, physical and stuff form part of the meaning of the argument referred to by X. Formally, the nodes (Solid), (Physical), and (Stuff) figure in its representation. X occurs next to the (Change) node. This means that the concept of change as well as all its subordinate concepts (the initial and final conditions, the wholeness and the division) apply to the argument referred to by X.

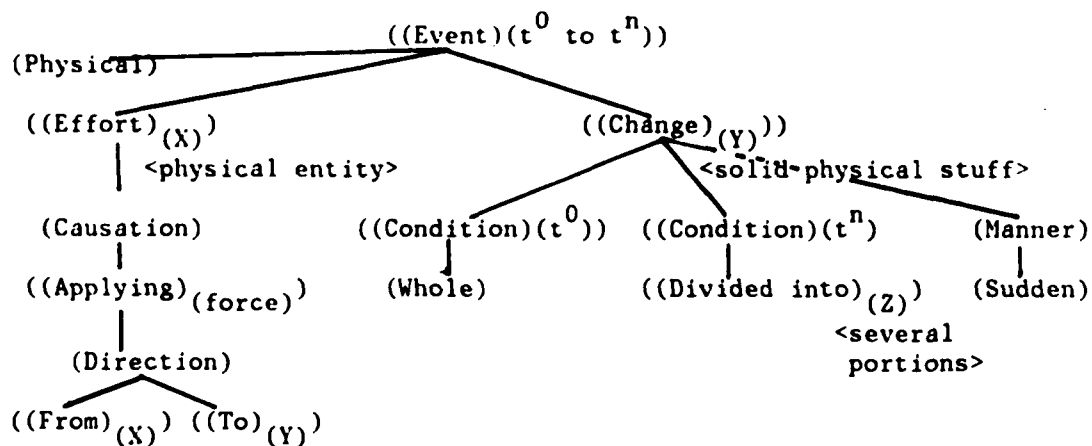
Y stands for the portions into which the object breaks. Y will be replaced by the noun-phrase functioning as the object of the prepositional phrase headed by in ("The window broke in two"), to ("The window broke to pieces"), or into ("The window broke into pieces"), if such a noun-phrase exists. If the appropriate complement does not exist, the semantic representation of the argument will be formed on the basis of the information specified by the selection restrictions on Y, and the variable will

be erased. This is discussed in detail in Section III. Note that the restriction on quantity (expressed by <several>) is necessary, to explain the ill-formedness of *"The window broke into a piece".

There are only two variables, but these can occur next to several nodes on the tree, if the concepts represented by these nodes apply to the arguments. For the sake of simplicity, I will note the selection restrictions only once, under the first occurrence of a variable; but they are to be understood as holding for the argument represented by the variable everywhere it occurs.

The causative representation of break is identical to the noncausative, except for the additional branch dominated by (Effort).

(2) BREAK (causative):



X - [subject] Y - [object] (Z - [object of into/in/to-PP])

The (Effort) branch specifies that the event includes an additional participant, in this case, an entity causing the change in the object broken.⁸ The selections restrictions on X specify that it is to be replaced by a physical entity, either an object, such as John or a rock; a

substance, such as water; or a force, such as the wind or sound waves. This physical entity applies some force onto the object broken. The verb does not determine whether the entity generates force or simply transmits it; nor does it determine whether any action is involved. Thus, "John broke the window" is true of a state of affairs in which John did some action, such as pushing or banging. But it is also true of a state of affairs in which John did not act but just fell or was simply leaning against the window. In the causative sense, there are three argument places - X, Y and Z, the grammatical subject, object and object of the prepositional phrase.

III. SENSE DIFFERENTIATION

A major question that should be determined at this point is how many senses the verb break has. In Section II, two senses, (1) and (2), were described, corresponding to the transitive and intransitive forms. The reason for positing two separate senses is not syntactic but semantic: the presence or absence of a causative participant. In order to capture this difference, two distinct semantic representations are necessary. Note that in other cases, two different syntactic forms may have the same sense and receive the same representation, such as the intransitive wash and the transitive wash oneself, or the intransitive and transitive forms of eat. In other cases, one syntactic form may be semantically ambiguous and receive two different representations, as in "John broke his arm" discussed below.

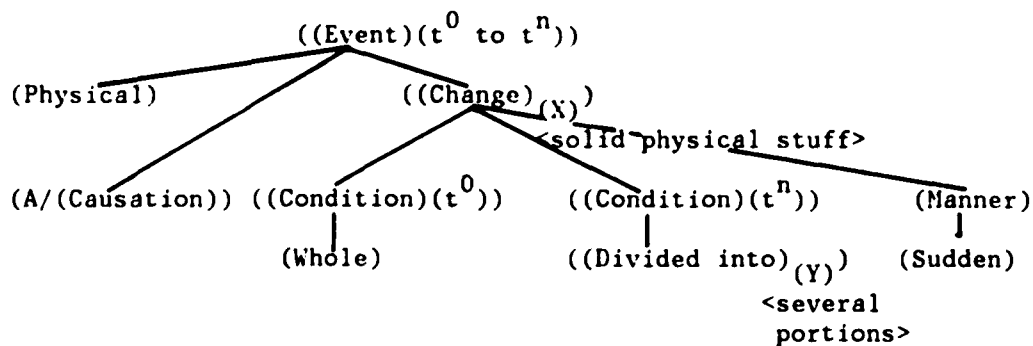
The exact semantic difference between (1) and (2) is somewhat more subtle than mere presence or absence of a causative participant: the causative sense inherently specifies the presence of such a participant, and therefore includes (Causation) in its representation, but the noncausative sense specifies neither its absence nor its presence and therefore does not have (Causation) as part of its representation. The participation of a cause in the noncausative sense is simply left indeterminate.

Thus, a single sense is allowed to include indeterminate information. Distinct senses are posited only if one contains explicit information that the other either does not contain at all or leaves indeterminate. Notice that there are other indeterminate elements in (1) and (2). The final condition of the broken object, for example, does not specify whether the division results in semi-separation or in complete separation into detachable portions. It might seem that I have chosen to collapse what are in fact different senses: One event resulting in the object containing dividing cracks; another in its being separated into pieces. However, if these are taken to be different senses, the verb will be have to be infinitely ambiguous, since, according to the same reasoning, there is a sense in which the object contains breaks (which are larger than cracks); a sense in which it is separated into parts and some of the parts contain cracks or breaks; a sense in which it is broken into two, a sense in which it is broken into fragments, etc. Therefore, the claim is that the verb is simply indeterminate with respect to the final condition and that in the absence of any further semantic information, it will hold true

In English, there are no syntactic means for expressing the (Causation) variable of an intransitive noncausative verb. Instead, to express causation, the causative transitive form is used. But some verbs do not have causative counterparts. To express causation in these cases, the verb make is used, as in "make him laugh", "make him sleep", etc.¹⁰ Make introduces an explicit (Causation) node. But when a lexicalized causative counterpart exists, it is preferred to the more cumbersome make construction, which becomes stylistically odd: "He made the window break"; "He made John die".¹¹

A prepositional phrase headed by by and coreferential with the subject is the modifier used to mark the explicit absence of causation, as in "The window broke by itself". Break by oneself is represented as follows:

(5) BREAK BY ONESELF (explicitly noncausative):



X - [subject] Y - [object of into/in/to-PP]

NULL - [object of by-PP, coreferential with subject]¹²

The semantic distinction between (1) and (5) must be represented in order to capture inference relations. Since (1) is included in (2), sentence (7) is a valid inference from (6):

(6) John broke the window

(7) The window broke.

Jackendoff distinguishes between the causative and the noncausative senses of break, and he, too, has two representations:¹³

- (10) BREAK (noncausative)

$$[_{\text{event}} \text{GO}([_{\text{thing}} x], \begin{bmatrix} \text{FROM } (y) \\ \text{TO } (\text{BROKEN}) \end{bmatrix})]$$

and

- (11) BREAK (causative)

$$[_{\text{event}} \text{CAUSE}([_{\text{thing}} x], [_{\text{event}} \text{GO}([_{\text{thing}} y], \begin{bmatrix} \text{FROM } (z) \\ \text{TO } (\text{BROKEN}) \end{bmatrix})])]$$

Jackendoff is able to turn the noncausative sense into a causative sense by enclosing its representation in a CAUSE function, but he will not be able to represent "The window broke by itself" in any different way than "The window broke". Both will have (10) as their representation, since Jackendoff has no mechanism to represent the difference between indeterminacy and the explicit absence of a semantic concept.

For the Restrictive theories, (5) poses a problem, since no role can be assigned to the noun-phrase headed by by. A by prepositional phrase, coreferential with the subject of a noncausative predicate of change, serves a special semantic purpose: it is a device to mark explicit absence of causation. Thus, its addition does not increase the number of argument places of the predicate; on the contrary, it indicates that the predicate remains a one-place predicate. Nor does its addition assign a second role to the subject argument. The nature of the participation of the subject referent in the event denoted in (5) is identical to its participation in the event denoted by (1).¹⁴ This type of syntactic complement that does not correspond to a semantic argument or a thematic role cannot be ex-

plained by the Restrictive approach. This lack of correspondence between syntactic structure and semantic structure is discussed in detail in Chapter 6.

The proponents of the Restrictive approach claim that a thematic representation of predicates like break achieves a certain lexical economy which is not possible with a non-thematic representation. This claim, however, confuses the notions of separate lexical entries and distinct senses. When entries are differentiated from senses, thematic representations prove to have at least the same number of distinct senses as posited by the decompositional approach.

Fillmore's representation of break will presumably be identical to his representation of open, discussed in Chapter 1:

(12) + [_____ O (I) (A)]

Fillmore stresses the advantage of his representation that encompasses both the transitive and intransitive forms in the same lexical entry. But, as indicated in Chapter 1, Fillmore's single entry is only a notational shorthand, achieved by the use of parentheses, to describe what are in fact four separate "senses" (if one can use the term to refer to Fillmore's thematic representations). Thus, there are two issues at hand: the number of distinct senses and the number of lexical entries. The number of lexical entries needed to accommodate (1) and (2) has not been discussed so far. In principle, (1) and (2) can also be combined into a single entry with a notational device similar to Fillmore's. If the combined result turns out to be more complex than Fillmore's collapsed entry,

it is only because (1) and (2) include not only the difference in the argument places that these two senses have but also the fact that causation and application of force are present in (2) but not in (1). Thus, the simplicity achieved in Fillmore's single entry is only a result of suppressing some semantic information found in the meaning of break. Whether one chooses to use a device to collapse fairly similar senses in one entry or not becomes a purely pragmatic decision: collapsing senses makes the lexicon more concise but renders each entry more complex.

As for the number of distinct senses, Fillmore posits in fact more than two senses for break, since he distinguishes between different causative "senses". For Fillmore, the predicates in

(13) He broke the window

and

(14) The wind broke the window

receive two different representations:

(15) + [____ 0 (A)]

and

(16) + [____ 0 (I)]

respectively. These, however, are not two genuinely different senses of the verb. The difference between (13) and (14) is solely due to the difference in the meaning of he and the wind. The verb itself does not specify the animacy of its causative participant.

Finally, consider the economy suggested by Levin. She claims that (1) does not have to be listed in the lexicon at all, since it is derivable

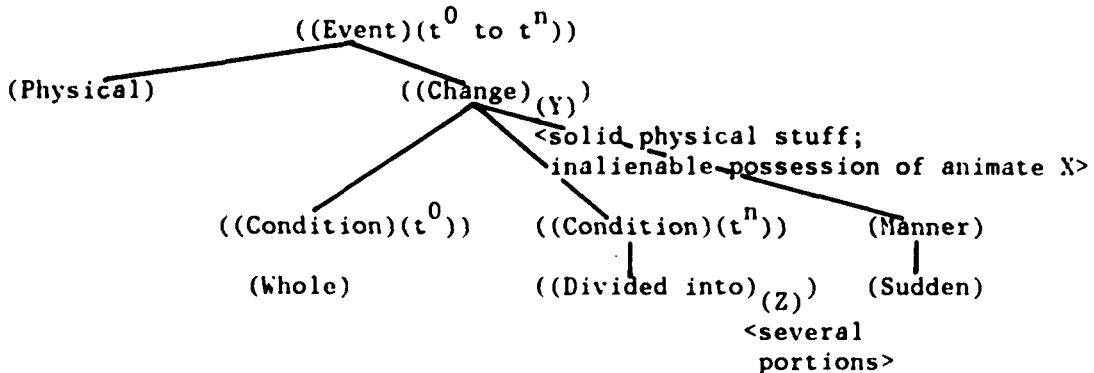
from (2). But this again is only a suggestion to use a "collapsing" device for a more concise lexicon. By convention, each entry for a verb of causative change is understood to include another noncausative sense, identical to the causative sense, except for the absence of a (Causation) node. For English, this device will significantly reduce the size of the dictionary. Only exceptions will have to be marked: forms that differ morphologically, such as raise and rise; kill and die; and verbs that do not have a corresponding noncausative meaning, such as cut (*"The bread cut"), or remove (*"The paper removed"). For other languages, morphological information relating the causative and noncausative forms will have to be included too. Such a convention will reduce the size of the lexicon but will not reduce the number of distinct senses.

Consider another use of break mentioned by Chomsky and found in sentences like

(17) John broke his arm.

There are two interpretations for this sentence: one corresponds to sense (2) of break, where John is the cause of the breaking. The second interpretation is one in which John does not cause the breaking but is simply understood to be the possessor of the broken limb. The second interpretation resembles sense (1) of break, in that it is indeterminate with respect to causation, but differs from it in that it only applies to an inalienable possession of a specified possessor. Since it thus involves explicit semantic information that is not found in (1), it is posited as a new sense of break, represented as follows:

(18) BREAK (possessive):



X - [subject]

Y - [object (NP modified by coreferential possessive adjective)]

(Z - [object of into/in/to-PP])

(18) is much more complex, both semantically and syntactically, than either (1) or (2). The semantic relationship of inalienable possession is not easily definable: Most probably it holds for body parts as well as for external objects closely associated with the functioning of the body or in close proximity to it. Thus, "John broke his glasses/his cane/his wheelchair" and "John broke his watch/tore his coat" also express a (18)-type sense, but "John broke his car" does not.¹⁵ Inalienable possession is expressed here as a selection restriction on Y, since it is a relationship that holds between the referents of X and Y, independently of the meaning of the verb, that is, independently of the event. John is not a direct participant in the event in (17); something happens to him only by virtue of his being the possessor of his arm.¹⁶ Syntactically, the subcategorization requirements for (18) specify more than mere grammatical relations. In English, Y is replaced by an NP modified by a coreferential possessive adjective. In other languages, such as French or Spanish, it is replaced by an NP preceded by a definite article (as in "Jean s'est cassé le bras").

It is not clear how any of the thematic theories can handle (18). Since their representations only capture relationships that hold between the predicate and its arguments, they have no mechanism to represent semantic relationships that hold among the arguments themselves. Proponents of these theories (especially those of the Restrictive approach that do not include a semantic component) might claim that their theories are not intended to represent all that is found in the meaning of linguistic expressions, but in this case, the relationship of inalienable possession is a necessary condition for the correct application of (18). Without it, there will be no way to determine that "John broke his arm" is ambiguous between the sense of simple causation represented by (1) and the possessive noncausative sense represented by (18), whereas "John broke my arm" is unambiguously simple causation.

Finally, consider another form of break, found in causative sentences such as

(19) John broke pieces from the bread

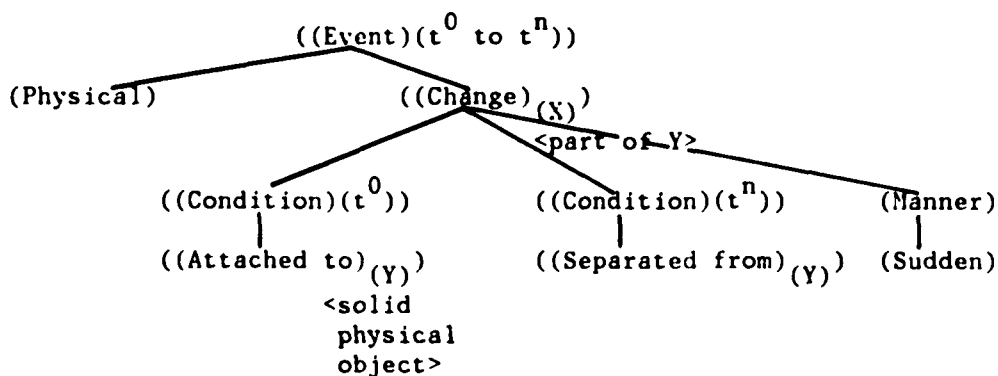
discussed by Levin, or in noncausative ones, such as

(20) A branch broke from the tree.

In order to determine whether this is a different sense of break or merely a syntactic variation expressing the same senses described above, let us inspect the concepts inherent in this use of break. Here, there are initially two entities, which are attached and bear the relation of part-whole. The whole object may contain other parts as well, which do not participate in the event. This is exemplified in "Branches broke from the tree", which is fine, as opposed to "The tree broke into branches".

which is odd, since a tree contains other parts (roots, a trunk, etc) besides branches as well. The breaking results in a complete separation of the two objects, each still maintaining its original identity. The notion of indeterminate degree of division, allowed by senses (1), (2) and (18) of break, is not allowed here. Consequently, the presence of the prepositional phrase is obligatory for this sense to apply, whereas the presence of an into prepositional phrase was optional for the previous senses. These semantic differences establish (21) as a new sense of break, represented as follows:

(21) BREAK (noncausative separation):



X - [subject] (Y - [object of from-PP])

Note that in this sense of the verb, unlike the previous senses, there are no selection restrictions on the quantity of the parts. This allows for both "A branch broke from the tree" and "Branches broke from the tree".

Consider the sentences

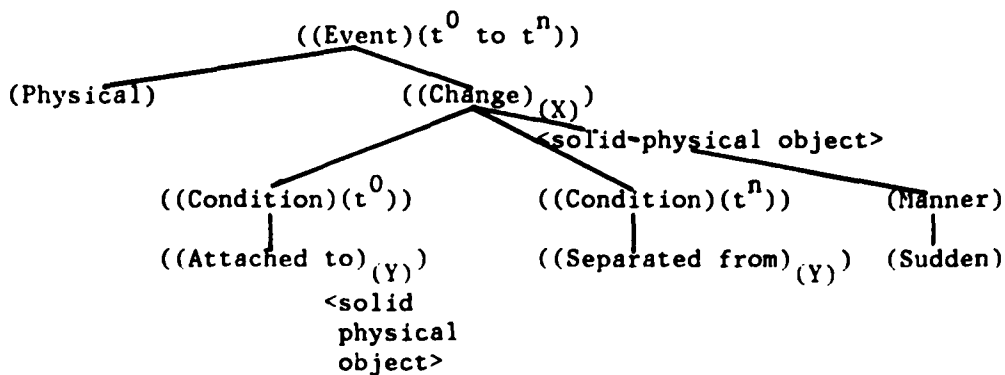
(22) The door broke from its hinges

and

(23) The boat broke from its moorings.

To determine whether they express a separate sense of break, one should inspect the concepts involved to see if they differ from the concepts found in (21). Break in (22) and (23) is similar to (21) except for the fact that the door/boat is not part of the hinges/moorings. This suggests that (21) is too determinate, in that it is unnecessarily limited to apply only to objects and their parts, rather than to any objects attached to each other. This overdeterminacy is like Fillmore's overdeterminacy in respect to the kinds of causes that can be involved in a causative breaking event. Fillmore distinguishes between an animate cause and a natural force. But such a difference is due to the meanings of the noun-phrases replacing the arguments and is not conveyed by the meaning of the verb, which is indifferent to the specific nature of the cause. Similarly, in (20), (22) and (23), the difference between the relations that the two objects bear to each other, namely, a relation of containment, or simply a relation of physical attachment, is not inherent in the meaning of the verb. The selection restrictions should therefore be relaxed, as follows:

(21) BREAK (noncausative separation):



X - [subject] (Y - [object of from-PP])

Thus, the representation of a branch as part of a tree is not required by the verb, but will be added to the representation of the whole sentence by the meaning of the noun-phrases.

Of course, corresponding to the noncausative (21), there exists a causative counterpart expressed in (19). Thus, this sense, too, participates in Levin's generalization.

IV. CONCLUSION

From the analysis of the meaning of break provided in this chapter, a few important conclusions emerge. A semantic concept can be part of the inherent meaning of a lexical predicate (or any other lexical item) in one of two ways: it is either explicitly conveyed by the meaning of the predicate, as is the concept of causation in sense (2) of break; or else left undetermined, as is causation in sense (1) of break. The number of distinct senses listed for a predicate in the lexicon is determined on the basis of the semantic concepts inherent in it and on whether these are explicit or undetermined. Thus, (18) constitutes an independent sense of break since it involves the concept of initial attachment of two objects, which differs from the initial condition specified by (1) and (2), involving the wholeness of a single entity. (The final condition conveyed by (18) is likewise different from the one conveyed by (1) and (2).) (2) constitutes an independent sense from (1), since it explicitly conveys causation, whereas (1) is undetermined with respect to causation.

As indicated in the discussion, none of the thematic theories represents indeterminacy, but indeterminacy is a crucial semantic feature of language. The meaning of lexical items represent abstractions over an infinite range of possible states of affairs, thus allowing these states of affairs to be reasoned about. By virtue of such abstractions, a specific sense of break can apply to a multitude of fairly similar events. Thus, (2), for example, applies to all events in which something (either an object or a substance) whole is separated into portions by the application of force onto it. If lexical items were to determine every aspect of the event to which they applied, there would be as many lexical items as there are possible events in the world, and language would be totally useless. A semantic theory must therefore represent the meaning of lexical items in their most general, undetermined application. Thus, if (1) by itself (in "X broke") does not determine whether something caused the breaking or not, neither causation nor its absence should be represented as part of it. (1) is then allowed to apply to both caused and uncaused breaking events. It is important to note also that (1) is not ambiguous between a causative and a noncausative sense. Similarly, (2) is indeterminate, not ambiguous, with respect to the nature of its causative entity. But Fillmore's Agentive and Instrumental Case assignments turn this indeterminacy into ambiguity. Consistent treatment of indeterminacy as ambiguity would render predicates infinitely ambiguous, with as many distinct senses as there are possible states of affairs. Thus, Fillmore's distinction should not be made.

Although the meaning of lexical items is indeterminate in many respects, language also provides means for reducing indeterminacy by combining lexical items in complex constructions. Thus when (1) is modified by a by coreferential phrase, the absence of causation is made explicit. A new meaning is created - a breaking event in which there is no causative participant. This meaning, however, is not a sense of the lexical item break by itself. As was indicated, the thematic theories cannot differentiate such explicit absence of causation from undetermined causation.

Often, the semantic differences that determine distinct senses correspond to syntactic differences. Thus, (18) obligatorily takes a from prepositional phrase, while (1) and (2) do not. They take optional into, to, or in phrases. Similarly, (1) and (2) differ syntactically, since (1) is intransitive, while (2) is transitive. But syntactic differences are not always present. (21), for example, constitutes an independent noncausative sense of break, but its syntactic features are identical to those of (2). Both are transitive, and both can take the same optional prepositional phrases. Thus, contrary to the Restrictive claim, the number of senses cannot be established on the basis of syntactic differences.

Finally, the number of distinct senses should be distinguished from the number of separate lexical entries by which the senses are represented. Shorthand conventions can be devised to create a more compact listing of senses, provided they do not alter the number of senses posited. The fact that thematic representations are simpler than decompositional ones, and therefore more readable in compact form, is only a

consequence of their partial representation of the meaning of lexical items. Their simplicity cannot be advocated as an advantage over decompositional representations.

FOOTNOTES

1. There is no need for the semantic representation to specify the syntactic category of the component replacing the variable, since such information will be stored in the syntactic subcategorization frame of the verb in the lexicon. This frame will specify, for example, that break takes only NP as object, while cause takes either NP or clause, and will account for the ill-formedness of *"He broke the boy to go" and the well-formedness of "He caused the boy to go". Thus, the semantic representation needs to refer only to grammatical functions.

2. A slight modification of this concept of argument places will be developed below. To anticipate, there are three types of arguments: (1) arguments that are always replaced by syntactic complements; these are represented by categorized variables and associated mapping frames; (2) arguments that are optionally replaced by syntactic complements; these are also represented by categorized variables but their associated mapping frames are enclosed in parentheses; and (3) arguments that are never replaced by syntactic complements; these are represented by phrase markers rather than variables, and are obviously not associated with mapping frames. Thus, a predicate may have more arguments than it has syntactic complements.

3. For simplification, I will ignore the difference between referential and non-referential argument places in this dissertation.

4. This projection operation will not be discussed in this dissertation.

5. For more detailed descriptions of the theory, see Katz (1972) and Katz, Leacock and Ravin (1985).

6. I will only discuss some of the literal senses of the verb and ignore metaphorical senses, as in "He broke her heart"; idiomatic expressions, such as "break the news" or "day break"; and the sense of malfunction or being out of order, as in "The machine is broken".

7. In all event-predicate representations, a top node of (Event) is assumed, although an appropriate tense is required for an event predicate to actually express an event: "The window broke" refers to an event, but "The window breaks (easily)" does not. The representation of tense will not be addressed in this dissertation.

8. (Effort) is a rather neutral term, chosen to represent a certain active involvement in the event. (Effort) can dominate a (Causation) node, in case the verb denotes causation; an (Action) node, in case the verb denotes action; both (Causation) and (Action) or neither. Different types of (Effort) are discussed in Chapter 7.

9. The symbol 'A/...' is an antonymy operator, which converts a semantic marker (indicated by the dots) into its logical complement. The logical complement of causation is, of course, absence of causation.

10. Whether a noncausative verb has a lexicalized causative counterpart is language specific and a matter of historical accident. In Hebrew, for example, there exist both a causative laugh and a causative sleep.

11. Obviously, make is also used in another causative sense of forcing, which is not the sense meant here. The sense of forcing can apply to verbs that do not express change, as in "make her sing" or "make the child eat". Moreover, in the sense of forcing, it can be used with verbs that have causative counterparts, such as eat, whose causative counterpart is feed, as well as with verbs such as sing, which lack them.

12. The use of NULL in the mapping frame is discussed in Chapter 6.

13. Jackendoff has somewhat modified his notation for verbs of motion in Cognition and Semantics, but he does not discuss how this modification would apply to his former representation of verbs like break. My interpretation of the new notation may, therefore, be slightly different from what Jackendoff would propose, but I do not think that the differences can be meaningful to the points discussed here.

14. Note the difference between "The window broke by itself", which expresses the fact that the window underwent a change, and "The window broke itself", which expresses the fact that the window both underwent a change and caused it.

15. A transitive noncausative sense is not limited to inalienable possession only. Other verbs have this sense with different arguments, as in "He developed a disease", suggested to me by T. Langendoen.

16. The verb's function with respect to this relationship of inalienable possession is very restricted: it simply permits the sense of noncausative breaking if this relationship is present. In this respect, open, for example, differs from break: "John opened his eyes" does not have a sense parallel to (18). This explains why the relationship of inalienable possession must occur in the representation of (18), to differentiate break in this sense from other similar verbs that do not have such a sense.

CHAPTER 6 - SEMANTIC ARGUMENTS AND SYNTACTIC COMPLEMENTS

The implicit assumption underlying the Restrictive theories is the existence of correspondences between the semantics of predicates and the syntactic structures they head. The placedness of predicates and the type of roles they assign to their arguments are said to correspond to the number and types of syntactic complements predicates take.¹ This assumption is the motivation for the Restrictive attempt to derive the number and types of syntactic complements from the number and types of thematic roles associated with predicates. But, as pointed out in the discussion of Levin's generalizations in Chapter 3, there is a danger of circularity in the establishment of such correspondences, if the same syntactic criteria are used to determine both syntactic complements and semantic arguments. To avoid circularity, semantic arguments must be determined independently of syntax. Thus, in determining how many arguments a predicate can (or must) take, it will not do to look at the number of noun-phrases and/or prepositional phrases it can take.

The placedness of a predicate is specified by its meaning. Meaning embodies truth conditions: a set of relations among arguments that must be satisfied in order for the predicate to hold true. The arguments are place holders for entities. Thus, if all the entities in a certain state

of affairs exhibit the relations specified for them by the truth conditions, the predicate holds true of that state of affairs. For example, buy is a predicate that expresses four relations among four arguments, grossly, of the following form:

Possession(seller,merchandise) at t^0

Possession(buyer,sum of money) at t^0

Possession(seller,sum of money) at t^n

Possession(buyer,merchandise) at t^n

Whenever these relations hold among four entities of the types specified (the seller and the buyer, for example, must be sentient beings), the truth conditions for buy are satisfied. If some entity fails to satisfy the relations, as when, for example, there is no sum of money involved, the truth conditions fail, and the event is not one of buying, but of exchanging, giving, etc. Thus to determine the placedness of a predicate, one should examine how many entities are referred to in the relations specified by its meaning. To determine the nature of the arguments, one should examine the selection restrictions on the entities specified.

The number or type of syntactic complements is irrelevant, as far as the truth conditions of a predicate are concerned. Syntactic realization is important only to determined grammaticality, but not meaningfulness. When syntax and semantics are separated, propositions can be meaningful but ungrammatical, or, conversely, grammatical but meaningless. "Bought a book", for example, is meaningful but ungrammatical as a sentence, since the subject must be syntactically realized. "John bought the book for no money", by contrast, is grammatical, since the subject and the direct

object, both syntactically obligatory, are realized; but it is semantically contradictory, since "no money" implies that there is no referent for the money argument, while the meaning of buy requires such a referent for the satisfaction of its truth conditions.

The claim presented in this chapter is that when the presence and nature of semantic arguments is determined on the basis of the inherent meaning of predicates, there exists no strong correspondence between arguments and complements. Thus, a linguistic theory must have two completely independent levels of representation (semantic and syntactic) and, rather than having rules for deriving complements from arguments, allowing only for a mapping between the two. Section I discusses different kinds of mapping of arguments onto complements. Section II discusses the thematic attempts to account for optional complements, which prove particularly problematic under the Restrictive approach.

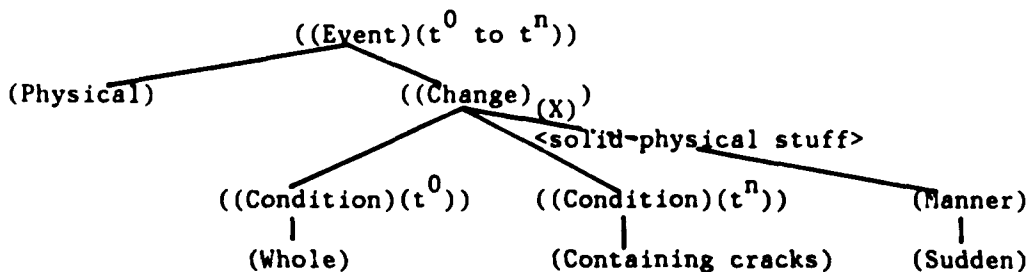
I. THE MAPPING OF ARGUMENTS ONTO COMPLEMENTS

Since predicates have as many arguments as there are entities represented in their meaning, whether these are syntactically realized or not, there are four types of relations logically possible for arguments and complements. Section I.I discusses arguments that do not correspond to complements and are never syntactically realized; Section I.II discusses arguments that are obligatorily realized; Section I.III - arguments that are optionally realized; and Section I.IV - syntactic complements that do not correspond to semantic arguments.

1.1. ARGUMENTS WITH NO CORRESPONDING COMPLEMENTS

An argument that is never syntactically realized is found in the meaning of the verb crack, whose noncausative sense is represented as follows:

(1) CRACK (noncausative):

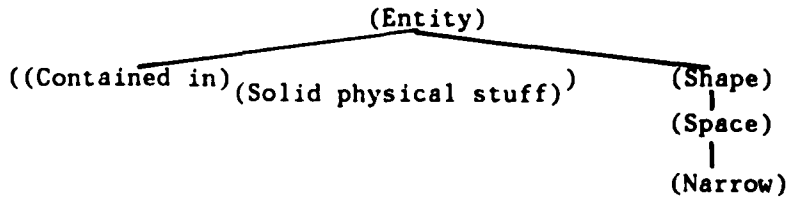


X - [subject]

There are two entities mentioned in the representation: the object undergoing the change and the cracks it contains. Referring to cracks as entities might seem ontologically questionable. Semantically, however, it is not. A semantic view of the world is governed by the meaning of linguistic expressions and the semantic properties and relations they exhibit.² Thus, in order to capture the valid inference that there are cracks in the object at the end of a cracking event, a theory of semantics posits cracks as entities. It does, however, qualify them as special entities, existing only in and by virtue of some solid object or substance containing them. Semantically, there are therefore two arguments in (1). The representation has to be slightly modified to capture this fact: As it stands, the node (Containing cracks) is inappropriate, since it includes both a semantic concept and an argument. The argument should be represented in a way consistent with the representation of other arguments, that is, to the right and slightly below the node that applies to it.

The concept of cracks is complex. Its decomposition is given in the following representation:³

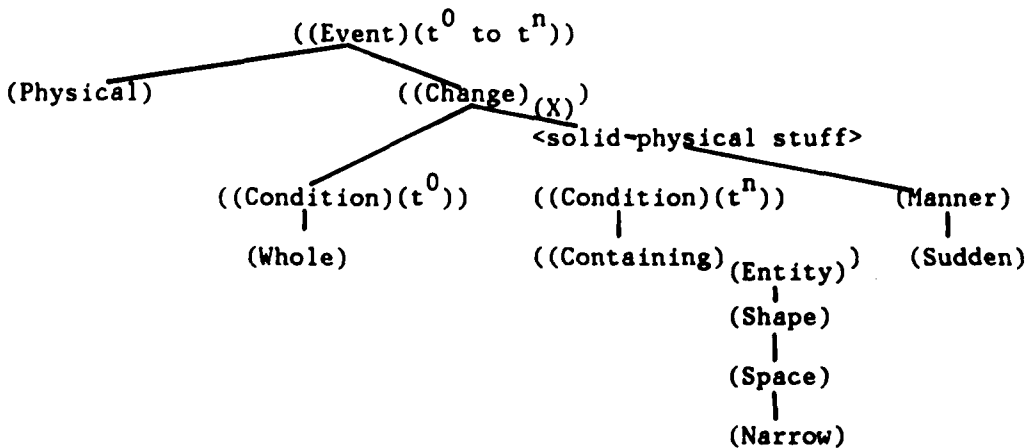
(2) CRACK (noun):



A crack is a "relational" entity, that is, an entity that is definable only by virtue of an object or substance within which it exists. This is captured by the (Contained in) node.

The full representation of the verb crack is therefore the following:

(1') CRACK (noncausative):



X - [subject]

The top node, (Entity), entitles the representation of the noun crack, (2), to figure in an argument position in the representation of the predicate. Note that the (Contained in) node merges with the (Containing) node of the verb, since the relationship expressed by X containing Y is symmetric (hence, synonymous with) the relationship expressed by Y being contained in X.

The two arguments - the object cracked and the cracks - differ in their syntactic realizations: the object broken is obligatorily realized; the cracks are never syntactically realized. This difference in the mapping of arguments onto syntactic forms is captured by the presence or absence of variables. Variables are interpreted as place holders for senses of syntactic complements, that is, for concepts that happen to reside in independent lexical forms. When there is no independent item expressing the argument that can be syntactically combined with the verb, there is no need for a place holder; hence, no need for a variable. From a semantic point of view, however, the fact that the object broken must be referred to by means of a noun-phrase but the cracks cannot does not affect their both being entities participating in the event, and therefore equally represented in the meaning of the verb.

I.II. ARGUMENTS WITH CORRESPONDING OBLIGATORY COMPLEMENTS

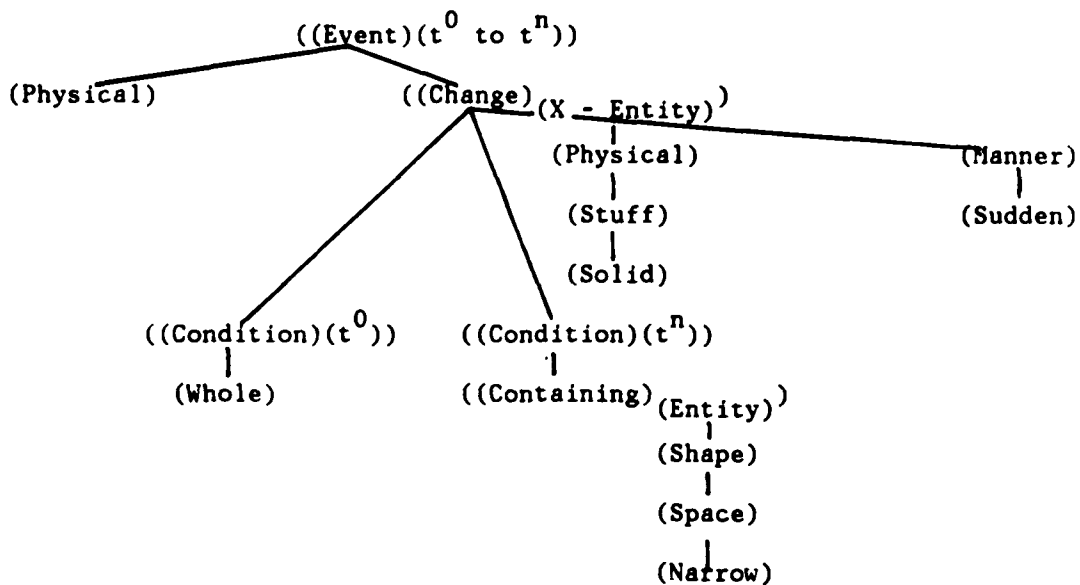
Let us now examine more carefully the representation of an argument that is realized syntactically. Such an argument is represented by means of a variable, to indicate that the semantic information found in the lexical item that expresses it should be embedded with the representation of the verb. The variable is accompanied by selection restrictions. These restrictions capture some of the meaning of its argument. In other words, selection restrictions are but nodes that must occur in the phrase marker representing the sense of the complement. In fact, they constitute an initial tree, to which other nodes, found in the meaning of the complement, will be added. The use of angled brackets to represent selection restrictions is just a shorthand notation for a tree representation, as is illustrated in the following representation of the object cracked:

(3) (X)

(X - Entity)
|
(Physical)
|
(Stuff)
|
(Solid)

The complete representation of the predicate crack, containing its arguments in fully specified form is as follows:

(1'') CRACK (noncausative):



X - [subject]

Note that the meaning of the verb can specify a greater or smaller part of the meaning of its arguments (whether syntactically realized or not): The cracks argument is fairly well specified and consequently applies to a rather small range of entities in the world; the argument for the object cracked is left quite unspecified, and thus free to apply to a much wider range of entities.⁴

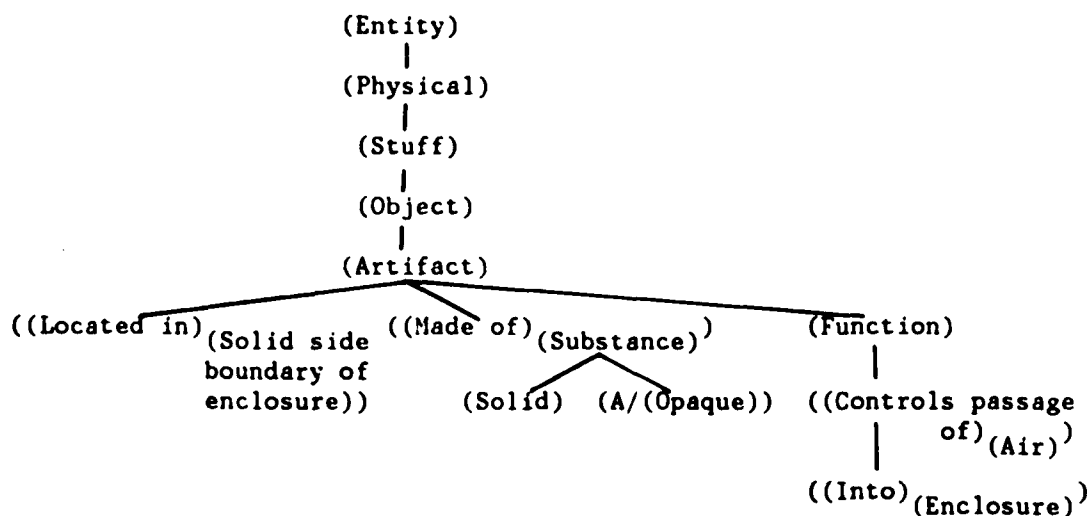
When the verb occurs in a syntactic structure with complements, the semantic representations of the meaning of the complements are embedded in the representation of the verb, by the operation of the projection principle. When a representation of a complement is projected onto the representation of the predicate head, the nodes in the representation of the complement combine with the nodes specified in the selection restrictions. Identical nodes merge, so that duplication is avoided; different nodes are attached to each other according to the semantic relations of superordination that hold among them. Finally, the variable is removed. Thus, after all the projection operations have taken place, that is, when all the representations of the complements have been embedded in the representation of the verb, all arguments (whether realized as complements or not) are represented in identical form: they all consist of subscripted hierarchical trees, to the right of nodes representing constituent concepts of the event.

Let us now illustrate how the representations of complements are incorporated into the representation of the predicate head, first with a simple example:

(4) The window broke.

The representation of window is as follows:

(5) WINDOW:

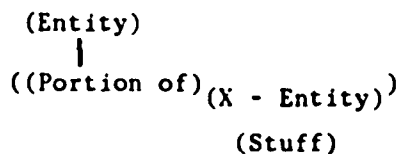


This representation specifies that a window is located in a solid boundary of an enclosed space, such as a wall of a building, a door, or the side of a car. "Side" is included to exclude skylights or sunroofs, which are located on roofs. Unlike shutters, a window is made of transparent or translucent material, which enables the passage of light through it, although it is obviously possible for a window to be painted over and thus become opaque. Finally, the function of a window is to control the passage of air into the enclosed space. The representation of its function is not fully decomposed here: It should specify that when the window is closed, it blocks the passage of air. When it is opened (if it can be opened), it frees this passage.

The representation of the noncausative sense of break, discussed in Chapter 5, is repeated here, as (7), for convenience. A slight modification in the representation of the selections restrictions is introduced, following the discussion in Section I.I: instead of the angled brackets,

partial trees are provided for the arguments. The partial tree for the X argument is similar to that of its parallel argument in (1''). The partial tree for the Y argument, standing for the portions is based on the following, rather simple, decompositional representation of portion:

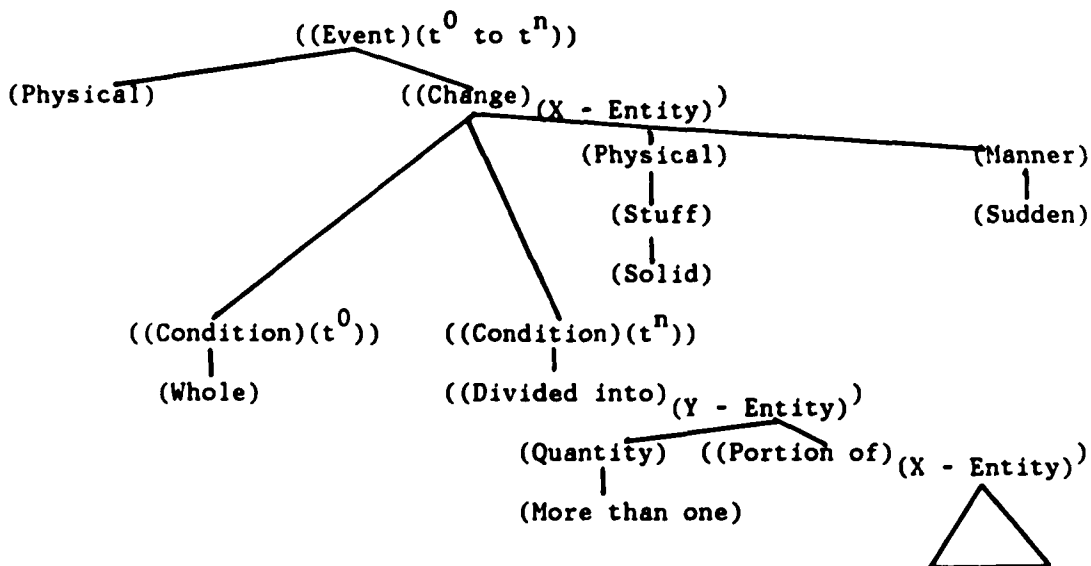
(6) PORTION:



(X - [object of of-PP])

The tree for the Y argument also includes a (Quantity) branch, to assure that the argument refer to more than one portion.

(7) BREAK (noncausative):

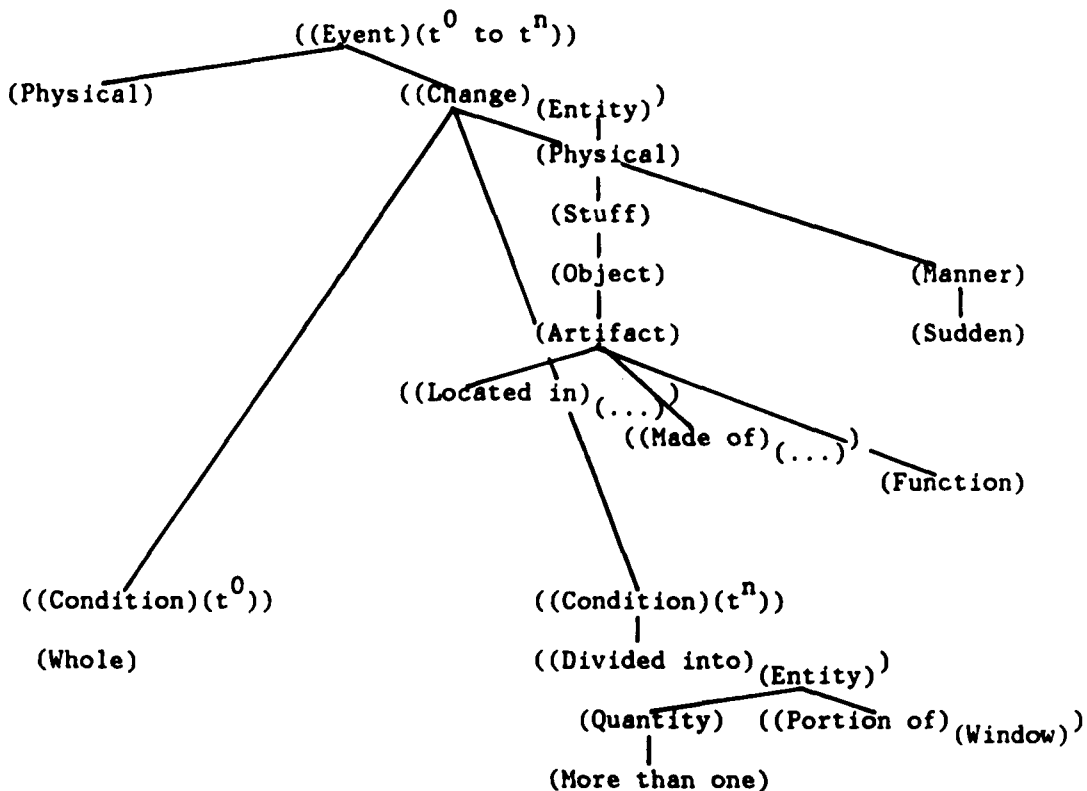


X - [subject] (Y - [object of into/in/to-PP])

The projection principle states that each variable in the representation of the head is replaced by the semantic representation of the complement specified in its syntactic subcategorization mapping. Thus,

the variable X, standing for the object broken in (7), is removed and replaced by the representation of the subject of the sentence, in this case, by (5). Furthermore, the projection principle requires that the nodes specified in the selection restrictions for the argument be either added to the representation of the complement, or, if they are identical to nodes in this representation, be merged with them. The selection restrictions on X include only nodes that are present in the representation of window and so they all merge. The combined representation for sentence (4) is the following:

(8) THE WINDOW BROKE:



Note that since the selection restrictions provide only a partial representation of the argument, the projection of the reading of the

complement may introduce more nodes intervening between the nodes specified by the selection restrictions. Thus, (Stuff) directly dominates (Solid) in (7), but in (8), it dominates (Solid) only indirectly, since (Solid) figures in the (Made of) branch. The introduction of intervening nodes is done in accordance with superordination relations that hold among the concepts represented by these nodes. Whether a semantic marker is superordinate to another is given in redundancy rules in the dictionary. (M_i) is superordinate to (M_j) just in case there is a redundancy rule of the form:

$$(9) \quad (M_j) \rightarrow (M_i).$$

If such a rule exists, the projection principle attaches (M_j) as a daughter to (M_i) . Thus, (Stuff) directly dominates (Object), in accordance with redundancy rule (10):

$$(10) \quad (\text{Object}) \rightarrow (\text{Stuff}).$$

I.III. ARGUMENTS WITH CORRESPONDING OPTIONAL COMPLEMENTS

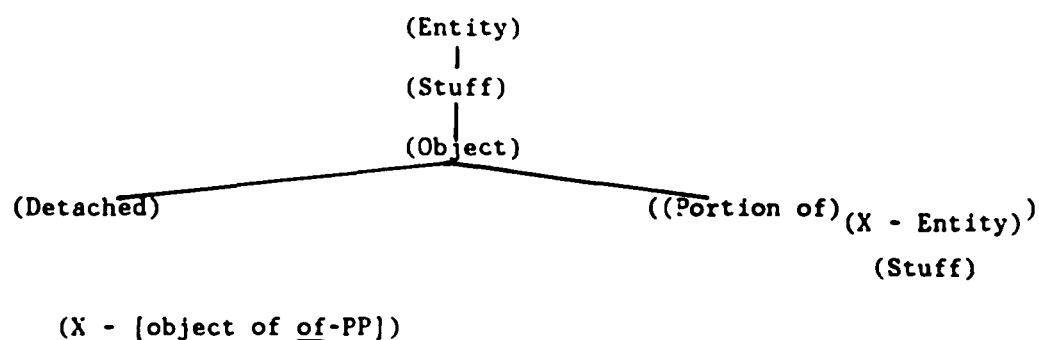
The second argument of (7), referring to the portions, is not replaced by the representation of a complement, since such a complement does not exist in (4). The fact that this complement is optional is marked with parentheses around the mapping frame for the Y argument in (7). The parentheses indicate that in the lack of a syntactic complement, the projection principle applies vacuously: since there is no further semantic information to be embedded in the representation, the tree representing the meaning of the argument provided by the selection restrictions is unaltered, and the variable is erased.

In the sentence

(11) The window broke into pieces

both arguments are replaced by the representations of the complements. Since window behaves as in (4), let us focus on the embedding of into pieces. The representation of the noun piece is the following:

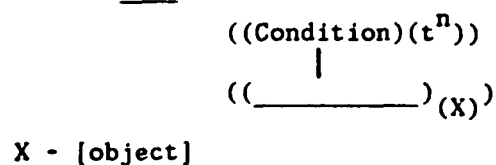
(12) PIECE:



This representation is similar to the representation of portion, given in (6). What differentiates pieces from portions is that pieces are detached objects, whereas the detachment of portions is undetermined.

As for the semantic contribution of into, the preposition basically expresses the final condition of a change: a location reached by movement, as in "walk into the room" or "jump into the water"; a final state, as in "fall into depression"; a final identity, as in "turn into a rabbit", etc. Since its meaning is so general, into is highly unspecified:⁵

(13) INTO:



The particular kind of final condition is not determined by into itself.

Thus, in "turn into a rabbit", the final condition reads

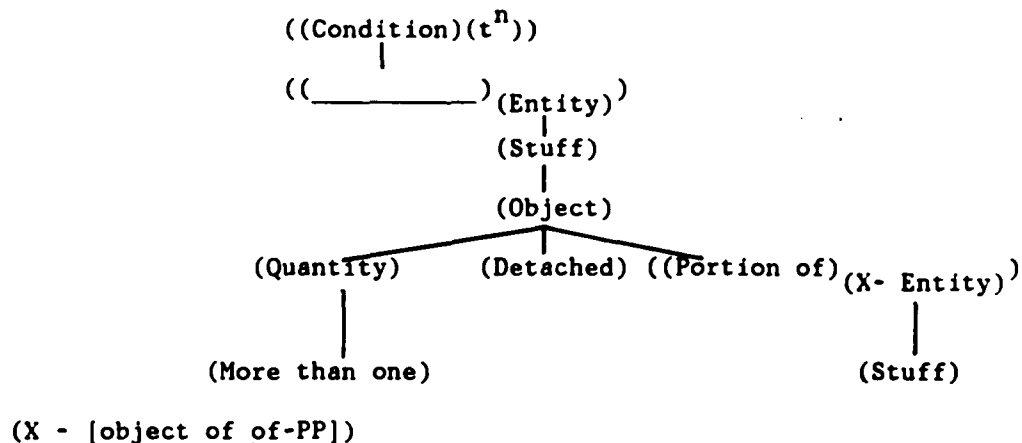
$$\begin{array}{c} ((\text{Condition})(t^n)) \\ | \\ ((\text{Existing as})_{(\text{rabbit})}) \end{array}$$

whereas in "join into one", it is

$$\begin{array}{c} ((\text{Condition})(t^n)) \\ | \\ ((\text{Combined})_{(X)}) \\ \text{<same stuff>} \end{array}$$

The particular final condition is determined by the meaning of the specific predicate. The representation of into pieces results from combining (12) and (13), with the addition of a (Quantity) node, required by the plural marker:

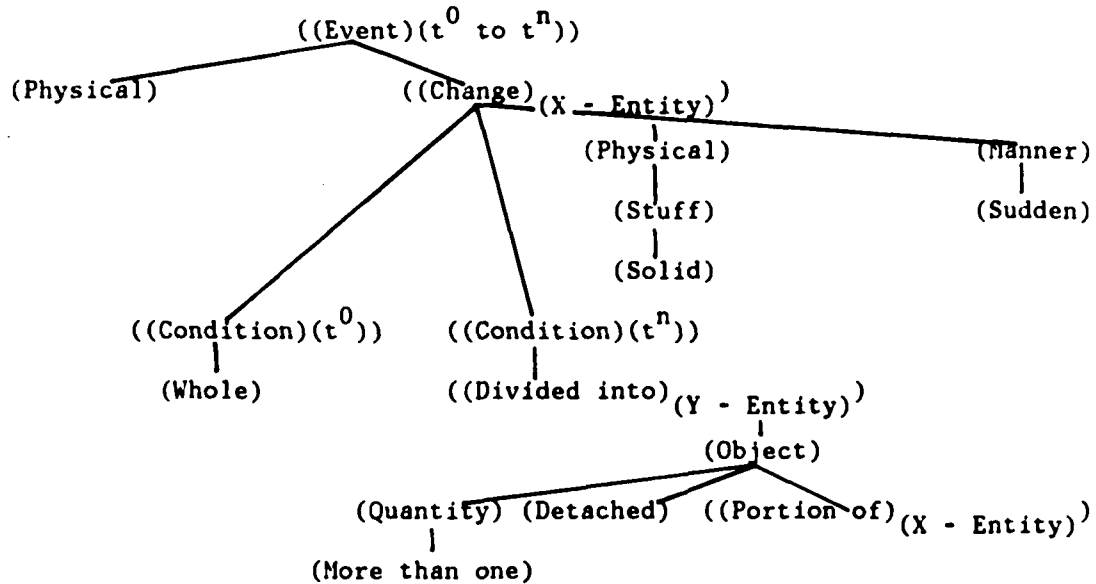
(14) INTO PIECES:



When (14) is combined with (7), most of its nodes merge with the ones specified for the Y argument in (7). Two nodes are added by the projection of the complement: (Object) and (Detached). Thus the addition of the complement into pieces further specifies the meaning of break. It explicitly introduces the existence of pieces, which are detachable new

objects created as a result of the event. The representation of "break into pieces" is given bellow:

(15) BREAK INTO PIECES:



X - [subject]

Note that this is also the representation of one sense of break up. This explains the fact that "break up into pieces" is redundant. An expression is redundant if the information contained in the representation of the complement is already completely contained in the representation of the head. The representation of into pieces is already incorporated in the representation of break up.

When pieces is modified, as in "The window broke into small pieces", the information added by the modifier is first attached to the representation of pieces - a branch of the form

```

graph TD
    Size["(Size)"] --> Small["(Small)"]
  
```

is added as a daughter of (Object); the augmented representation is then projected onto the representation of the predicate, in the same manner discussed above.

In the case of

(16) The window broke in two

the prepositional phrase specifies only the number of entities referred to by Y, but does not carry any semantic information concerning the type of entity it refers to. This information is supplied by the selection restrictions. Thus, the representations of (16) and (17)

(17) The window broke into two portions

are identical. Since the two sentences are synonymous, this is the desired result.

Finally, in cases where the semantic information conveyed by the prepositional phrase clashes with the selection restrictions for the final condition, the result is a violation of the restrictions, that is, semantic anomaly. Such is the case in "The window broke into a piece" or "The window broke into dreams".

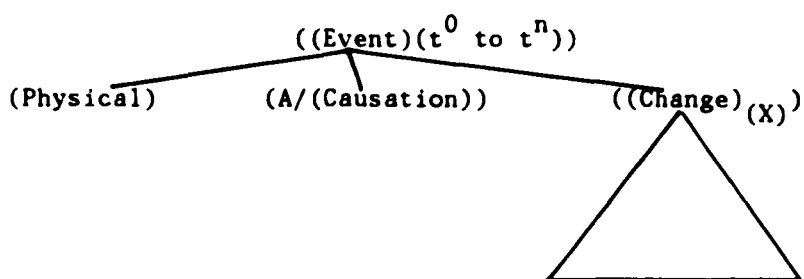
I.IV. COMPLEMENTS WITH NO CORRESPONDING ARGUMENTS

The example of "break into pieces" illustrates the need to distinguish between the semantic arguments inherent in the meaning of the predicate, representing the entities participating in the event, and the syntactic complements that the verb may take, representing the syntactic constituents that can form grammatical structures with it. In the semantic representation of break, a variable with selection restrictions stands

for the pieces which might be created in the process of breaking; in the syntactic subcategorization frame for the verb, the prepositional phrase is listed as an optional syntactic complement. Finally, a mapping frame connects the argument with the noun-phrase dominated by into.

That the semantic structure of predicate and arguments differs from the syntactic structure of verb and complements is further exemplified by syntactic complements that do not correspond to any entity participating in the event depicted by the verb. Recall the representation of break by oneself, given in Chapter 5 and repeated here:

(20) BREAK BY ONESELF:



X - [subject] (Y - [object of into/in/to-PP])
 NULL - [object of by-PP, coreferential with subject]

By oneself is an optional syntactic complement, which contributes to the meaning of the verb but does not refer to an entity. As discussed in Chapter 5,

(21) The window broke by itself

does not mean that the window was the cause of its own breaking. This for two reasons: first, it is not possible to introduce a by modifier expressing a cause into sentences in the active voice. This is clear from the ungrammaticality of *"The window broke by John". Second, if the window were the cause of its own breaking, (21) should have been synonymous with

"The window was broken by itself". It is clear that it is not, and that, furthermore, a window is not an entity which can serve as a cause of breaking, since it is not capable of applying force.

The mapping frame for this complement allows us to capture this fact: on one hand, it states that the presence of the coreferential prepositional phrase is obligatory for the noncausative sense to express the explicit absence of (Cause); on the other, it states that this complement does not correspond to an entity and is therefore not coindexed with any argument (hence the use of NULL).

Note that this use of by is not an isolated case. A coreferential prepositional phrase headed by by is always negative in non-passive sentences and refers to the absence of other participating entities. If the predicate expresses a noncausative event of change, that is, if it is indeterminate with respect to a cause, the complement expresses the explicit absence of one, as in "broke by itself", "opened by itself" "moved by itself", etc. If the predicate expresses a state that is indeterminate with respect to accompaniment, the complement expresses its absence, as in "John stood by himself". Finally, if the predicate expresses an event that is indeterminate with respect to assistance, the complement expresses the absence of assistance, as in "John stood up by himself". Finally, the complement may be ambiguous, as in "The baby ate by herself", which means that she ate either alone or without assistance.

II. OPTIONAL COMPLEMENTS AND THEMATIC REPRESENTATION

In Section I, four types of relations holding between semantic arguments and syntactic complements were described:

(1) Arguments inherent in the meaning of the verb, which are never syntactically realized (as the cracks in the meaning of the verb crack);

(2) Arguments inherent in the meaning of the verb, which are obligatorily realized (as the object cracked or broken);

(3) Arguments inherent in the meaning of the verb, which are optionally realized (as the pieces in break into pieces);

(4) Syntactic complements which never correspond to semantic arguments (as by itself in break by itself).

These four possible relations imply that syntactic subcategorization cannot be inferred from thematic structure or semantic representation and must be represented independently. Recall that Fillmore, Chomsky and Levin all hold an opposite view, namely, that the thematic or semantic presence of an argument is sufficient to determine whether it is syntactically realized or not. How can their theories then handle these four possibilities? The Restrictive theories simply ignore (1). Since they contain neither an independent level of semantic representation nor independent criteria for determining the presence of semantic arguments, the issue of arguments that are never syntactically realized simply does not arise in their context. The meaning of a verb like crack is never decomposed, so that the representation of the containment of cracks does not pose a problem. The criterion for determining its placedness is the number of its syntactic complements. Thus the noncausative crack is viewed as a one-place predicate. It is only when an independent semantic cri-

terion is introduced to determine the placedness of a predicate that the discrepancy between the number of arguments and the number of complements shows. (2) constitutes, in fact, evidence for the Restrictive principle. All arguments that fall into this category are always realized as syntactic complements. Thus, (2) is the only argument-complement relation that does not pose a problem for the Restrictive approach. (3), by contrast, does. Since the arguments that fall into this category are realized syntactically, they cannot be ignored by the thematic theories, as the (1)-arguments are. But since they are not always realized, they cannot predict syntactic configurations in the way (2)-arguments do. In fact, the existence of type-(3) arguments poses unsolvable problems for the thematic theories, as discussed in Section II below. Finally, (4) is also problematic. As discussed in Chapter 5, the Restrictive theories cannot represent syntactic complements like by oneself which do not correspond to thematic roles.

Let us now examine how the thematic theories attempt to handle optional complements. The Restrictive theories encounter syntactic problems in trying to derive optional complements from thematic roles. Jackendoff's theory is not Restrictive and therefore free of the syntactic problems. But his representations of optional complements are semantically inadequate.

II.1 OPTIONAL COMPLEMENTS WITHIN THE RESTRICTIVE THEORIES

Neither Fillmore nor Chomsky discusses sentences such as (11)

(11) The window broke into pieces

but it is clear that both theories will encounter problems in representing such sentences. For Fillmore, the addition of the pieces argument will probably yield the following representation for break:

(18) + [_____ O (F) (I) (A)]

The pieces are assigned the Factitive case since they are "objects resulting from the action identified by the verb". F is enclosed in parentheses to mark that it is only optionally realized. But this Case is different from the other Cases discussed by Fillmore, since unlike A or I, it cannot be chosen by the Subject Selection rule to become a surface subject: *"The pieces broke the window". Treating F as an exception to the Subject Selection rule will not do either, because in other instances, such as "A cake was baked for Lisa", whose lexical representation is probably

(19) + [_____ F (A)],

F does become a subject. This instance is yet another example for the general syntactic problem encountered by Fillmore's theory in connection with optional Cases.⁶

Chomsky's theta-criterion is even less adequate, as it fails to handle any optional arguments. Since all theta-roles must be assigned, either break always assigns a role to the prepositional phrase, and then "The window broke" becomes ungrammatical, lacking an argument for this role; or it never assigns such role, and then (11) is ungrammatical, since it

includes an argument with no role. Since Chomsky claims that prepositions also assign roles, it might appear that this problem can be solved by simply stating that into is the theta-role assigner in this case. However, what is to be accounted for is the optional occurrence of the prepositional phrase as a whole, which is clearly dependent on the verb. Otherwise, it is impossible to explain why sentences like "The window rotated into pieces" are anomalous.

Since these theories fail to account for the presence of the pieces, they obviously cannot account for the intricate semantic relations that hold between this argument and the verb. Thus, they are unable to explain why "The window broke into a piece"; "The window broke into tables"; and "The glass broke into pieces of ice" are semantically deviant.

Levin's position concerning optional complements is different from Chomsky's. She solves the problem of optional arguments by positing as many thematic structures for predicates as the optional arguments they can take. Thus, the noncausative break either assigns one role and then takes only a subject; or it assigns two roles and then takes both a subject and an into prepositional phrase. This solution, however, is very costly, since the number of separate thematic structures that have to be posited to account for all the optional complements verbs can take is very high: there are, as discussed in Chapter 5, break into, break in, and break to; both for the causative and the noncausative senses. To avoid the need to list these different options for each verb, Levin claims that the semantic class to which the verb belongs determines the range of op-

tional complements it can take for all its related senses. Let us consider the implication of this claim. Break seems to belong to the class of verbs of change that involve an initial condition of being whole and a final condition of being (able to be) separated into several detachable portions. This constitutes the most restricted semantic class that can be formed for break. Thus, if the correspondences prove not to hold for this class, they would certainly not hold for any larger class posited. The correspondences will probably be formulated with rules stating that verbs like break are causative and hence transitive; that they have counterparts which are noncausative and intransitive; that they can take an optional into complement; that they can reverse the order of their arguments to express a causative event of creation of a new entity with a from complement ("The bread broke into pieces" can be turned into "Pieces broke from the bread"); and, finally, that they also have transitive/noncausative counterparts (although I do not know how Levin can incorporate the necessary condition of inalienable possession into such a rule). Thus, fracture, fragment, splinter, crush, cut, and many others take an optional into complement. But not all of them take in or to complements. Other verbs, e.g., dismember, cut, batter, and rend, cannot be used intransitively. Still others cannot take a from complement: *"fracture from", *"fragment from", "rend from", "crush from", etc. Finally, only some verbs are noncausative in the inalienable possession sense: "John cut his finger/ crushed his hand/ smashed his glasses", but not *"John dissected his arm/ battered his arm/ fragmented his bone", etc. The full range of syntactic realizations is given in the following table:

VERB	INTRANSITIVE NONCAUSATIVE	<u>INTO</u> -PP	<u>IN</u> -PP	<u>TO</u> -PP	<u>FROM</u> -PP	TRANSITIVE NONCAUSATIVE
break	+	+	+	+	+	+
sever	+	+	+	+	+	+
fracture	+	+	+	+	-	+
splinter	+	+	-	+	+	-
fragment	+	+	-	+	-	-
batter	-	+	-	+	-	-
rend	-	+	+	+	-	+
cut	-	+	+	+	+	+
dissect	-	+	+	+	+	-
crush	-	+	-	+	-	+
dismember	-	-	-	-	-	-

What emerges is not a pattern but a varied array of possible alternations for verbs that are very close in meaning. To account for these intricate differences by means of global rules will not do. Whether the verb can express a noncausative event, whether it can express it transitively or only intransitively, and whether it takes into, in, to, or from, apparently must be specified for each of these verbs in its particular lexical entry.

Since optional complements cannot be derived by means of global rules, the solution offered by Levin cannot be incorporated into the GB theory, and the theta-criterion remains inadequate for handling optional complements.

11.11. OPTIONAL COMPLEMENTS WITHIN JACKENDOFF'S THEORY

Jackendoff's theory does not encounter syntactic problems in the representation of optional complements. It does encounter semantic problems, though, since its representations are artificially restricted by a motion model.

It is not clear how Jackendoff would choose to represent (11). Recall his representation of

(22) The window broke

repeated here:

(23) [_{Event} GO ([WINDOW], $\left[\begin{array}{l} \text{FROM (y)} \\ \text{TO (BROKEN)} \end{array} \right]$)]

In parallel fashion, he could posit

(24) [_{Event} GO ([WINDOW], $\left[\begin{array}{l} \text{FROM (y)} \\ \text{TO (PIECES)} \end{array} \right]$)]

as the representation of (11). But this will produce the strange result that the same sense of break, in (11) and (22), is expressed in two completely unrelated representations, ([TO (BROKEN)] versus [TO (PIECES)]) depending on whether an optional syntactic complement is present or not. Consequently, the valid inference of (22) from (11) cannot be captured. In order to infer (22) from (11), its representation must be completely included in the representation of the (11), which is not the case here.

Alternatively, Jackendoff could represent (11) by means of a double function, as follows:

$$(24) \left[\begin{array}{l} \text{GO ([WINDOW], [FROM (y) TO (BROKEN)])} \\ \text{GO ([WINDOW], [FROM (y) TO (PIECES)])} \\ \text{Event} \end{array} \right]$$

But now, the implication is that two changes occurred in the window: it both broke and went into pieces, clearly at odds with the semantics of the sentence, which specifies that the creation of pieces was part of the breaking.

A third alternative would use the function EX, only briefly mentioned by Jackendoff, (Jackendoff 1983:202), which deals with "expressions like 'be in existence', 'stay in existence', 'come into existence'..." Jackendoff does not discuss this function much and offers no examples, but it is possible to assume that he would use it to represent the creation of pieces in the following way:

$$(25) \left[\begin{array}{l} \text{GO ([WINDOW], [FROM (y) TO (BROKEN)])} \\ \text{Event EX ([PIECES])} \end{array} \right]$$

This is probably as close to an accurate representation as Jackendoff's system can get, but important implications would still escape it: the fact that the pieces do not exist prior to the event; and the fact that they are pieces of the window; that is, that the window has become these pieces. One can read Jackendoff's representation as a representation for "There were pieces (of an undetermined kind) and the window broke", which is a totally different proposition.

By holding a Nonrestrictive view, Jackendoff does not encounter the syntactic problems with the representation of optional arguments, of the kind encountered by Fillmore and Chomsky. But since his semantic representations are very restricted with respect to the semantic information they can capture, they fail to represent the full meaning of the sentences they stand for. Thus, either break and break into pieces receive very different representations, and no inference of the former from the latter is possible; or the representation of break into pieces is artificially made to include that of break, at the cost of semantic accuracy.

III. CONCLUSION

In Chapter 5, semantic concepts were found to be either explicit in or undetermined by the meaning of predicates. Since arguments are semantic concepts, they, too, are either explicit or indeterminate. In Section I of this chapter, four types of argument-complement relations were found to occur in language: arguments that never correspond to syntactic complements; arguments that always correspond to complements; arguments that optionally correspond to complements; and complements that do not correspond to arguments. The two types of arguments (explicit and indeterminate) and the four types of relations they hold with complements yield eight possible logical alternatives:

Explicit and never realized - such is the case with the cracks contained in the object cracked. They are represented by means of semantic markers only, with no mapping frame.

Explicit and obligatory - such is the case with an object broken or cracked. It is realized as a syntactic subject (in the noncausative

sense) and as a syntactic object (in the causative sense). It is represented by a variable and a non-parenthesized mapping frame.

Explicit and optional - such is the case with the portions of the object broken. They are optionally realized as object of the prepositional phrase. They are represented by a variable and a parenthesized mapping frame.

Indeterminate and never realized - such is the case with the causative argument in the noncausative sense of break. This argument does not show in the representation at all. Only a redundancy rule⁷ specifies that it can be added with a by phrase.

Indeterminate and obligatorily realized - This alternative is logically impossible. Indeterminate concepts are by definition not explicit in the meaning of the verb. They become explicit when they are syntactically realized. If a concept is obligatorily realized, then it is always explicit, and cannot be indeterminate.

Indeterminate and optional - such is the case with modifiers expressing the concept of instrument, for example, as in "break the window with a rock". These modifiers are discussed in Chapter 8. They are not represented in the verb at all, since a redundancy rule specifies that they can be added to any verb that contains action.

Obligatory NULL-argument - this is the case with complements such as "by itself", which are obligatory in order to express the explicit absence of a certain entity and therefore cannot stand for any semantic argument.

Optional NULL-argument - this is the case with complements of manner, for example. "Break the window with malice" is an instance of a syntactic complement that does not express an entity. Its representation will be

added to the representation of the verb, with the appropriate mapping frame, but without a corresponding variable.

This enumeration of all the different mapping possibilities indicates quite clearly that the correspondences between semantic arguments and syntactic complements are far more complex than the ones posited by the thematic theories. The correct mapping is often idiosyncratic to the verb. An attempt to derive the mapping from semantic representations, even as detailed as the decompositional ones offered here, is not possible.

FOOTNOTES

1. Throughout I refer, for convenience, to the grammatical subject of the sentence as one of the complements of the verb, although this is syntactically inaccurate; all complements are daughters of the VP while the subject is a sister node.

2. The semantic concept of causation, discussed in Chapter 5, also differs from an ontological view of causation. Semantically, the implication of "The window broke by itself" is that the breaking was not caused by anything. Ontologically, one can either adopt a Humian position, according to which events are never caused, or the converse position, according to which every event must have a cause, and "The window broke by itself" is a misleading statement.

3. Since I am mainly concerned with the meaning of predicates, the representations of all nouns suggested here are only very tentative.

4. It is interesting to compare the meaning of crack to that of break since they are fairly close. The resemblance is captured by the high number of identical nodes that the two representations share. Note, however, the differences: Break specifies that the object broken is divided into portions; crack does not specify a division, but does not exclude this possibility. It is simply indeterminate with respect to the severity of the cracks. A modifier may add such information, as in the case of "crack from one side to the other". In this case, an additional node of ((Divided into)_(portions)) is added as a daughter of the

((Condition)(tⁿ)). Such an addition will make the representation of break totally contained within the representation of "crack from one side to the other". This explains why cases of severe cracking can be referred to as cases of light breaking.

5. The representations of the meaning of prepositions, like the representations of the meaning of nouns, are very tentative.

6. Recall *"The key was opened the door", discussed in Chapter 1.

7. See rule (3), Chapter 5.

DECOMPOSITIONAL CONCEPTS VERSUS THEMATIC ROLES

In Chapters 5 and 6, the decompositional approach to meaning was shown to be better suited for semantic representation than the thematic approaches in several respects: By employing independent criteria for the determination of placedness, the decompositional approach avoids circularity. By representing concepts as either explicit or indeterminate, it succeeds in capturing semantic properties and relations. And by representing the semantic relations that hold among arguments, as well as between arguments and predicates, it captures complex conditions governing the application of certain senses. The thematic theories, by contrast, encounter problems in these areas. The Restrictive theories derive placedness from syntax and are thus circular. All the thematic theories fail to handle indeterminacy and to represent semantic relations among arguments. Consequently, they often yield counter-intuitive and arbitrary representations. The difficulties exhibited by the thematic theories stem from their use of thematic roles. Roles fail to correspond systematically to semantic concepts and therefore yield representations that are flawed.

The next three chapters discuss the semantic concepts that roles are said to express. When compared to the decompositional concepts, thematic

roles are revealed to be arbitrary and counter-intuitive. Chapter 7 deals with the concepts of causation, action and autonomy, that are said to be expressed by the notion of agency; Chapter 8, with the concept of instrumentality, said to be captured by the role of Instrument; and Chapter 9, with the concepts of change and experience said to be captured by the role of Theme (or Patient).

CHAPTER 7 - CAUSATION, ACTION AND AUTONOMY

The Restrictive theories embody a notion of agency, which they take to be intuitively clear.¹ But a close examination of the cases to which it is said to apply reveals that agency is a rather poorly defined notion. Fillmore's Agentive Case forces a conjunction of the concepts of causation, action and autonomy, which, however, do not always co-occur. Levin's role of Agent fails to distinguish between causation and action. Section I discusses how this fusion of independent semantic concepts leads to arbitrary semantic distinctions and spurious ambiguities. When the three concepts are properly differentiated, these undesirable consequences vanish.²

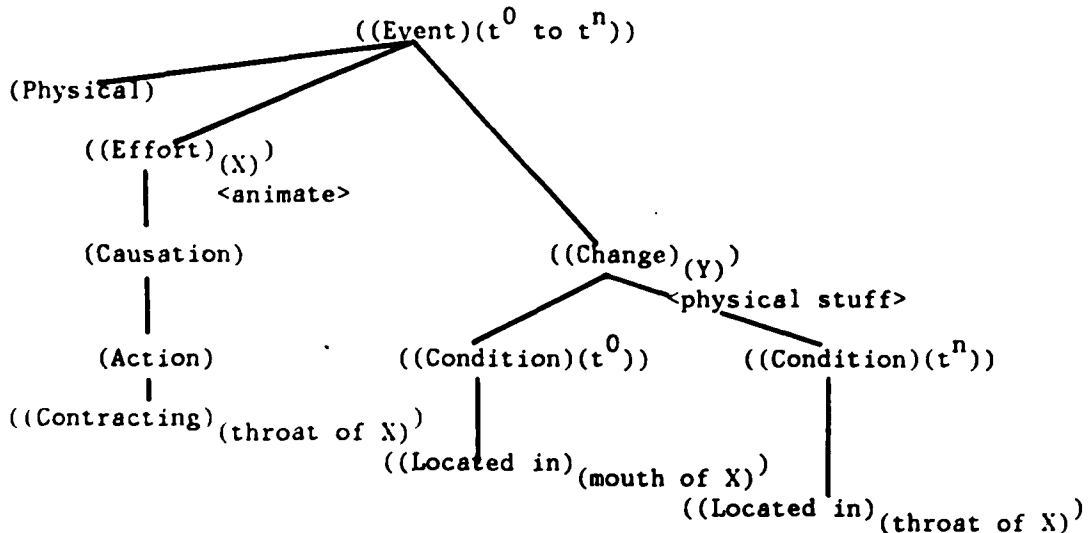
Jackendoff's most recent system of representation differs from the Restrictive theories in that it does not include agency. Jackendoff provides distinct representations of causation, action and autonomy. But since he cannot represent indeterminacy, his representation of these concepts is inferior to the decompositional representation offered here. Moreover, his functional system is too restrictive to capture different relations among the same semantic concepts. In Section II, a comparison of Jackendoff's concepts to the decompositional ones reveals these limitations.

I. CAUSATION, ACTION AND AUTONOMY VERSUS RESTRICTIVE AGENCY

According to Fillmore, Agentive is assigned to the argument referring to "the perceived animate instigator of the action described by the verb". "Perceived" is a vague term: is there an "unperceived" instigator as well? Let us take "perceived" simply to mean expressed by the verb. Fillmore refers to "actions" in contrast with "states". Thus, "action expressed by the verb" probably means a verb expressing an event of action rather than one of state.

The description of Agentive implies that in order for it to be assigned, there must be a conjunction of the concepts of animacy, instigation, and action. Few verbs explicitly specify this triple conjunction. Swallow seems to be one, with the following decompositional representation:

(1) SWALLOW:



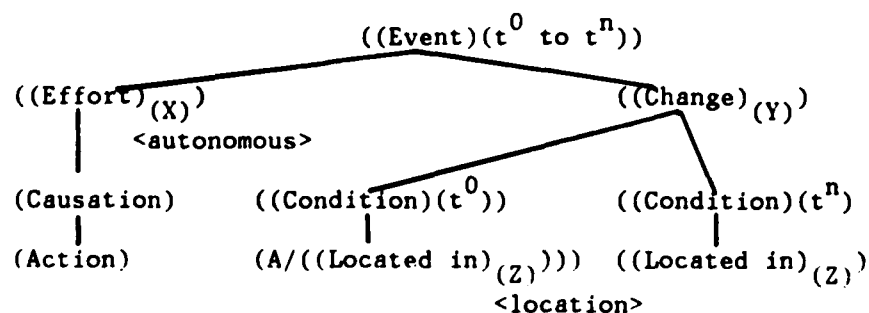
X - [subject] (Y - [object])

Swallowing includes a change - the thing swallowed is made to move into the body of the swallower. Therefore, it is causative. The event speci-

fies the animacy of the causative participant (*"The doll swallowed"), as well as its action. That swallow specifies action is clear from the fact that the meaning of force-feed, for example, in which there is no action on the part of the entity ingesting the food, does not include swallowing. Let us translate Fillmore's Agentive conditions into decompositional terms: Animacy is represented in the selection restrictions for X. Instigation is represented by the (Causation) node, as the cause of an event can be said to instigate it. Action is represented by the (Action) node.

For verbs like swallow, Fillmore's Agentive Case can clearly be defined over their decompositional representations: Event verbs assign Agentive Case to the argument which figures to the right of a (Causation) node and whose selection restrictions include the marker (Animate). However, many verbs do not express the full conjunction. Put, for example, is an event verb specifying causation and action but not animacy. It has the following representation:

(2) PUT:³



X - [subject] Y - [object]

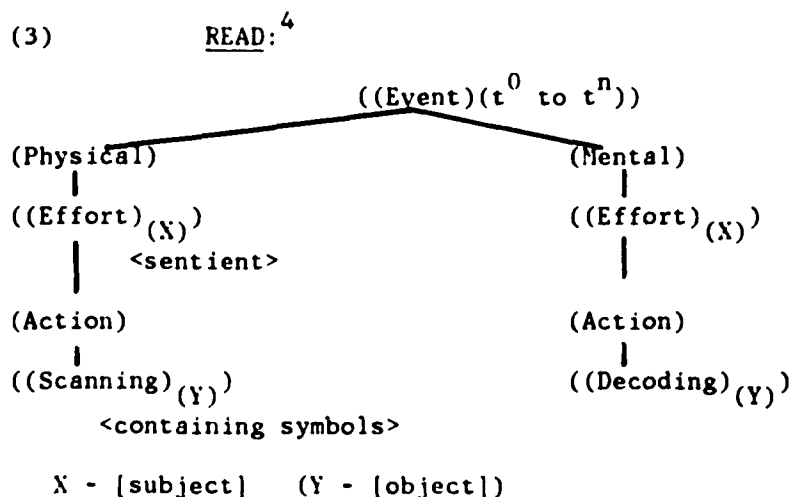
Z - [object of on/in/by/at-PP OR location adverb]

Since put specifies action, it requires that X refer to an entity capable of performing action, that is, capable of exercising some degree of con-

trol over the object displaced. Since only autonomous entities are capable of action, the selection restrictions on X include the marker (Autonomous). The presence of (Action) is what differentiates put from displace, for example, which also expresses a causative change of location in the object, but which does not specify action on the part of the cause. Hence, "The wind displaced the leaves", but not "The wind put the leaves in the yard". Unlike swallow, put does not specify the particular nature of the action: The actor can grasp the object moved and release it at its destination; push it till it reaches its destination; blow on it, etc.

For Fillmore, put is ambiguous, between a "sense" taking an animate autonomous referent and assigning Agentive, as in "John put the paper in the container", and a "sense" taking an inanimate autonomous referent, and assigning Instrumental, as in "The machine put the paper in the container". In a sentence headed by put, for which animacy is not determined by the sense of the subject complement, as in the passive (e.g., "Paper was put in the container"), the ambiguity remains. Fillmore corrects this outcome by relaxing his condition of animacy to include machines and institutions as well as animate beings. The altered condition, specifying a certain capacity for autonomy rather than animacy, disambiguates put, by making it always Agentive. But many verbs do not specify (Autonomous) in the selection restrictions for their subject argument, because they are indeterminate with respect to action. Thus, break, for example, remains ambiguous for Fillmore, between an Agentive sense, in which the entity is autonomous, and a non-Agentive sense, in which it is not.

As for Fillmore's notion of instigation, it has so far been taken as identical with the concept of causation. But it is not clear what it corresponds to in the absence of causation, as with predicates that do not involve change, and, consequently, do not include causation. Read is a predicate expressing action but not causation. Its decompositional representation is as follows:



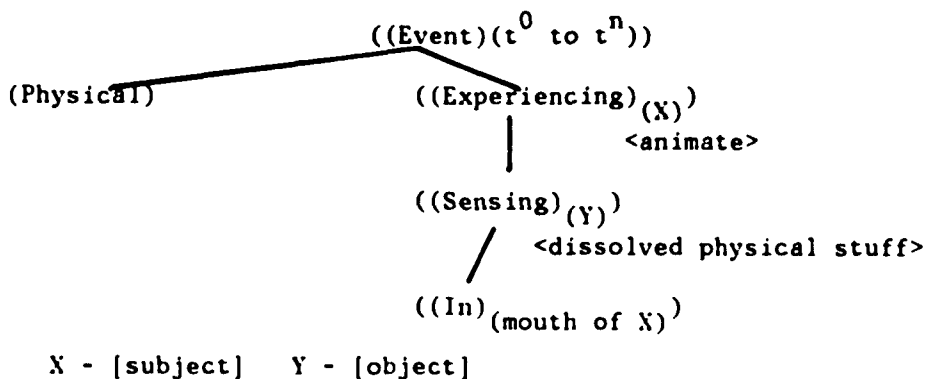
The instigator of the event must be the performer of the action. Otherwise, if instigation is taken to be separate from action, its occurrence cannot be established on the basis of the predicate's meaning alone. One would have to have recourse to factors that lie beyond the meaning of the verb, such as intention, responsibility, and freedom of choice. To determine whether John is the instigator in "John read the book", one would have to know whether somebody enticed him or forced him to read it. But this information is never conveyed by simple verbs of action like read. Consequently, when there is action with no causation, instigation cannot be distinguished from action. Fillmore's Agentive Case will always be assigned if action is specified. Thus, the notion of instigation is reduced to action, in the absence of causation, and to causation, in the

absence of action. "Instigator" does not convey any semantic information not already contained in either (Causation) or (Action).

The discussion of instigation indicates the need for some method of reasoning in order to differentiate between real semantic concepts, such as causation and action, and vague semantic descriptions, such as "instigator". Real semantic concepts are those that are needed in order to represent semantic properties of linguistic expressions and semantic relations that hold among them. Thus, the inspection of minimal semantic pairs establishes which concept is needed in order to differentiate between two senses that would be indistinguishable without it. Causation is what distinguishes the causative sense of break from its noncausative sense. Action is what distinguishes "watch the girl" from "see the girl". But there are no minimal pairs requiring a distinction between the presence and absence of instigation. It is therefore not a real semantic concept.

Let us now consider verbs that determine the animacy of the subject referent but have no causation and leave action indeterminate. Taste, in the experiencing sense represented below, is one:

(4) TASTE (experiencing):



The representation shows that tasting involves a certain sensory experience taking place in the mouth of the taster. A sensation of taste is possible only when the stuff tasted dissolves, thus producing a taste. Taste does not specify causation since it does not involve a change. It is also indeterminate with respect to action. This is clear from the fact that in (5)

(5) John tasted the soup

there is action if John brings the food to his mouth or moves his lips or his tongue. But there is no action when the food is already contained in John's mouth. The decompositional approach represents this fact by not including an (Action) branch in (4), but by allowing such a branch to be added to the representation when specified. Thus, when action is made explicit, as in "John tasted the soup with a spoon", an (Effort) branch, containing (Action) is inserted as a sister node to (Experiencing). A redundancy rule in the dictionary specifies that an (Effort) branch can be added to any (Event) representation, unless it is explicitly marked (A/(Effort)):⁵

(6) (Effort) --> (Event)

Since Fillmore cannot represent indeterminacy, taste is ambiguous for him, between an Agentive "sense", where there is action, and a Dative sense, where there is no action.

Fillmore's Agentive is a complex notion that overlaps with the more primitive semantic concepts of action, autonomy, and causation in a rather complicated way: If action is specified (as in put), Agentive is unambiguously assigned since action always occurs with autonomy. If action is not determined, the predicate is ambiguous. For verbs like taste, it is ambiguous between a "sense" in which action is specified and a "sense" in which the absence of action is specified. For verbs like break, it is ambiguous between a "sense" in which the cause is autonomous and a "sense" in which it is not. Thus, the positing of Agentive forces an arbitrary classification of senses: on one hand, senses which specify action, or causation with autonomy; on the other, senses which specify only causation or only autonomy and are therefore ambiguous. But this classification creates a number of undesirable consequences: First, it not only treats indeterminacy as ambiguity, but also does so only in arbitrary cases: (5) is ambiguous since action is not determined and there is no causation; but

(7) John broke the window

is not ambiguous, although action is just as indeterminate, because there is causation. Thus, the presence or absence of concepts determines ambiguity for Fillmore only in relation to the presence or absence of other concepts that are, in fact, independent of them.

The second undesirable consequence is the loss of meaningful semantic distinctions. By substituting the concept of autonomy for the concept of animacy, Fillmore has no means by which to distinguish between verbs like swallow, that apply to animate beings only, and verbs like put, that apply to autonomous entities. Agentive cannot explain the anomalous or metaphorical sense of "The machine swallowed". Similarly, there is no way to distinguish between verbs that are indeterminate with respect to action but which differ otherwise. Thus taste, which specifies animacy, and break, which specifies causation, will have the same representation of optional agency.

Levin describes Agent as "the person who brings about the action", but, as pointed out in Chapter 3, she weakens this description to include any entity that brings about the action. Thus, unlike Fillmore, she does not insist on the condition of animacy, or even autonomy. "Bringing about the action", though, suffers from the same vagueness as Fillmore's notion of instigation. It either refers to the concept of action, to that of causation, or to the conjunction of the two. Levin clearly states that she does not mean the conjunction, since she does not treat break as ambiguous between a sense conveying action and a sense not conveying it. The implication is that Agent for her is a label attached to the argument of either (Causation) or (Action). But in labeling the two with the same name, Levin cannot differentiate between action and causation, that is, between the meaning of

(8) John read the book,
where there is action but no causation, and the meaning of

(9) The wind broke the window,
where there is causation but no action.

In this case, Levin equates two distinct semantic concepts; but elsewhere she makes rather fine semantic distinctions, as between verbs of surface contact in which contact is achieved ("hit the ball") and verbs of surface contact in which contact is indeterminate ("hit at the ball"). From a semantic point of view, her decisions about what concepts should be differentiated and what concepts should be treated as indistinguishable are arbitrary.

The semantic arbitrariness found in both Fillmore's and Levin's Agentive roles is a consequence of their Restrictive approach, according to which roles are motivated by syntactic considerations. To maintain the generalization that Agents are always found in deep-structure subject position, the semantic content of Agent must become an unexplained mixture of autonomy, action and causation.

II. CAUSATION, ACTION AND AUTONOMY VERSUS JACKENDOFF'S CONCEPTS

Jackendoff uses Agent as a label to refer to the first argument (a thing or an event) in a CAUSE function. But Jackendoff's Agent does not have to be animate or autonomous and does not have to perform any action. Thus Jackendoff, unlike Levin, differentiates between causation and action. As discussed in Chapter 4, he represents events of causative change by means of CAUSE, and events of noncausative change by means of GO, repeated below:

(10) [Event CAUSE ([Event/Thing X], [Event Y])]
 (10) [Event CAUSE ([Event/Thing X], [Ev])]
 Bo(11) [Event GO ([Thing X], [place Y])]⁶ted with action. Their first argument (the Agent in (10); the Theme in (11)) is "decomposed" into an ACTOR argument⁶ and an action argument (represented as i), which are coindexed, as follows:

(12) [Event [Thing ^{ACTOR} X] i, [Action CAUSE (i, [Event Y])]]

(13) [Event [Thing ^{ACTOR} X] i, [Action GO (i, [place Y])]]

Thus, action, according to Jackendoff, can occur independently of agency.

In spite of notational differences, Jackendoff's thematic roles are in a one-to-one correspondence with the concepts represented in the decompositional representations: The first argument of CAUSE, i.e. Agent, corresponds to the argument appearing to the right of a (Causation) node; the first argument of GO, i.e. Theme, to the one appearing next to a (Change) node; and Actor, to the argument appearing next to an (Action) node.

Whether thematic labels are used to refer to these arguments or not is inconsequential. For convenience, such labels are also used here: "Cause" is used to refer to the (Causation) argument; "actor", to the (Action) argument and "instrument", in Chapter 8, to the (Using) argument.

Although Jackendoff represents action as distinct from causation, his concept of action is too broad. Rightfully, he claims that animacy is too strong a condition for action and that all that is required is "a certain

capacity for autonomy" (Jackendoff 1983:181). But to determine whether an event contains action, Jackendoff submits the sentence denoting it to the following paraphrasing test:

(14) What Y did was X.

If the sentence can be paraphrased in the pattern of (14), it expresses action, and the entity it refers to is autonomous. Thus, "John put the book on the table" expresses action ("What John did was put the book on the table"), but "The mail went to Philadelphia" does not ("What the mail did was go to Philadelphia"). However, the test also classifies

(15) The rock rolled down the hill

and

(16) The clouds went over Philadelphia

as conveying action on the part of autonomous entities. Although Jackendoff approves of this classification, it yields a counter-intuitive notion of action. A rolling rock is completely devoid of autonomy. It simply moves, changing its location, but it does not act. The autonomy necessary for action is a characteristic of animate beings and machines only. But (14) fails as a test for action regardless of one's view of autonomy. Both

(17) John slept

and

(18) John stayed in the room

can be paraphrased according to (14) as:

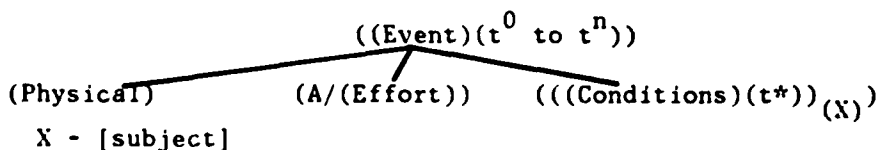
(19) What John did was sleep

and

(20) What John did was stay in the room

but they do not express action. Both sleep and stay express states. The state of sleep should not be confused with how it is brought about, which may involve action. In English, there exist no lexicalized verb to convey such action, but "go to sleep" expresses noncausative action and "put to sleep", its causative counterpart, expresses causative action. Stay expresses the continuation of a previous state. In (18), it expresses the continuation of the state of being in the room. When sleep and stay are provided with sentient arguments, they might appear to involve action. This is because one takes sentences like (17) and (18) to mean that John made some decision, in choosing to sleep rather than read, for example, or in choosing to stay rather than leave. This pragmatic interpretation renders their paraphrases, (19) and (20), meaningful. But a deliberate choice is not expressed by the meaning of these predicates. The decompositional representation of stay, given in (21), captures the fact that the verb does not involve action:

(21) STAY:



The representation specifies an event in which the subject referent remains in the same condition at all times. The condition itself is left undetermined. It is supplied by the representation of a complement ("stay in the room"; "stay frozen"; etc.). The node (A/(Effort)) indicates that the entity involved is passive: it is not causative and cannot perform any action. This explains the ill-formedness of *"He stayed singing" and *"The window stayed opening".

Jackendoff could accommodate sentences like (17) and (18) by simply discarding the paraphrasing test (14). In fact, he acknowledges that "when the variable of an [ACTION] is bound, the result must be an [EVENT]; ... This condition excludes "being tall" or "loving Louise" from expressing [ACTIONS], since binding the variable results in a [STATE] rather than an [EVENT]" (Jackendoff 1983:181). Since (17) and (18) also express states rather than events, they can be treated like the state examples provided by Jackendoff, if (14) is ignored.

(17) and (18) are instances of events involving beings capable of autonomy which do not exercise their autonomy, since the event described by the verb is one of explicit non-action. But autonomous beings do not necessarily exercise their autonomy even if the verb allows action but leaves it indeterminate. Verbs with indeterminate action are not properly represented by Jackendoff. He analyzes (22) and (23)

(22) John rolled down the hill

(23) John broke the window

as necessarily involving action, since their arguments are Theme and Agent, respectively, and since the sentences can be paraphrased according to (14). Jackendoff claims that the "sentences are ambiguous: one can ask whether John acted on purpose or not. In the intentional sense, John performs the action as a result of his own will. In the unintentional sense, he is acting more or less as an inanimate object: he stumbles and falls down the hill or is pushed into the window. This ambiguity can be expressed by the presence or absence of a marker WILLFUL in the semantic structure of the sentence" (Jackendoff 1983:182).

Jackendoff's account is deficient in several respects: first, when John behaves like an inanimate entity, he is not performing any action. Thus, when he stumbles or is pushed, no action is conveyed by the sentence. Second, the distinction between intention and absence of intention runs across the distinction between action and non-action. John can lean against the window with the intention of breaking it. Thus, he can break it intentionally, but without performing any action. In this respect, verbs like break differ from verbs like swallow, which, as indicated, does not apply unless a specific action is performed by the swallower. On the other hand, John can pound on the window with the intention of opening it, or without realizing what he is doing, and thereby break it. Thus, he can act in the process of breaking the window, without intending to do so. Finally, none of these different possibilities represent different senses of (23). The sentence is not ambiguous, but rather indeterminate with respect to both action and intention. If these differences are taken as distinct senses, (23) will be infinitely ambiguous. Each kind of action John can perform and each kind of intention he can have will contribute another sense to (23). To avoid such spurious ambiguity, a semantic theory must be able to represent indeterminacy. Thus the decompositional representation of the causative break, repeated here, does not contain an (Action) node.

```

graph TD
    Root["((Event)(t0 to tn))"]
    Root --- P1["(Physical)"]
    Root --- P2["((Change)(Y))"]
    P1 --- P1_1["((Effort)(X))"]
    P1_1 --- P1_1_1["<physical entity>"]
    P1_1 --- P1_1_2["(Causation)"]
    P1_1_2 --- P1_1_2_1["((Applying)(force))"]
    P1_1_2_1 --- P1_1_2_1_1["(Direction)"]
    P1_1_2_1_1 --- P1_1_2_1_1_1["((From)(X))"]
    P1_1_2_1_1 --- P1_1_2_1_1_2["((To)(Y))"]
    P2 --- P2_1["((Condition)(t0))"]
    P2 --- P2_2["((Condition)(tn))"]
    P2 --- P2_3["(Manner)"]
    P2_1 --- P2_1_1["(Whole)"]
    P2_2 --- P2_2_1["((Divided into)(Z))"]
    P2_2_1 --- P2_2_1_1["<several portions>"]
    P2_3 --- P2_3_1["(Sudden)"]

```

The addition of an (Action) node is assured by a redundancy rule in the lexicon:

This rule states that verbs that are indeterminate with respect to action can acquire an (Action) node if their (Effort) argument refers to an autonomous entity. The addition of the (Action) node in the appropriate place on the tree, that is, as a daughter of (Causation), is assured by rule (26):

The implication is that (Action) can occur either in the absence of (Causation), as it does in put, simply as a direct daughter of (Effort); or it can occur with (Causation), as it does in swallow. Action becomes determinate for break only with the addition of modifiers, such as an instrument modifier ("John broke the window with a rock")⁷ or a by prepositional phrase denoting action ("John broke the window by pounding").

To conclude, there exist verbs of three types: Verbs such as stay, which explicitly deny action. Jackendoff can represent such verbs if he discards his paraphrasing test for action. Verbs such as roll and break, which are indeterminate with respect to action and may remain indeterminate even with arguments capable of autonomy. Jackendoff cannot accurately represent these verbs. He views them as always specifying action and as ambiguous between an intentional "sense" and a non-intentional "sense". He therefore confuses them with the third type of verbs, such as put and swallow, which always specify action.

Jackendoff's system is similarly unable to account for the indeterminacy of causation. It accounts for explicit causation, as conveyed by verbs like break:

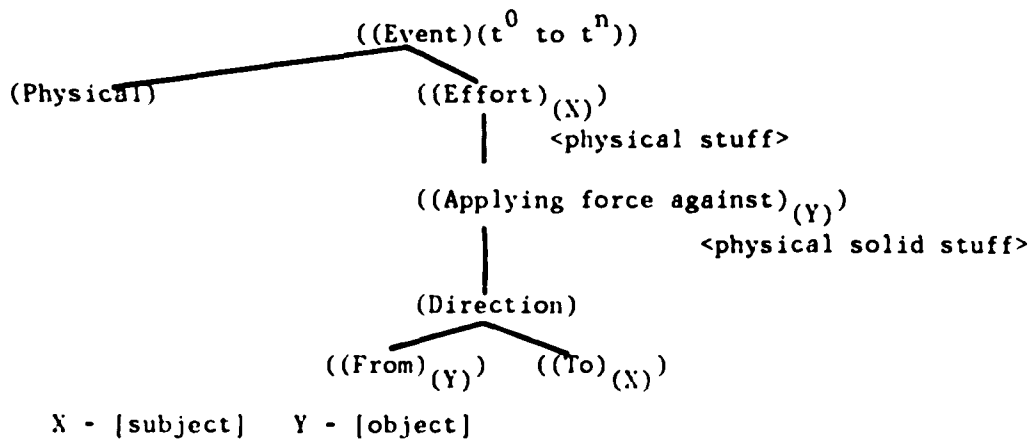
$$(27) \text{[_Event CAUSE([Thing X],[_Event GO([Thing Y], \begin{bmatrix} \text{FROM (Z)} \\ \text{TO (W)} \end{bmatrix})])}]}$$

but it is unable to represent verbs like pull, which do not determine causation. Sentence (28)

(28) The rope pulled John

holds true of states of affairs where no change occurred, as well as of states of affairs where he does. This is indicated by the plausibility of "The rope pulled John but he did not budge", as opposed to the contradiction inherent in "The rope moved John but he did not budge". Thus, change and, consequently, causation are not explicitly conveyed by pull. The decompositional representation of pull captures this fact as follows:

(29) PULL:

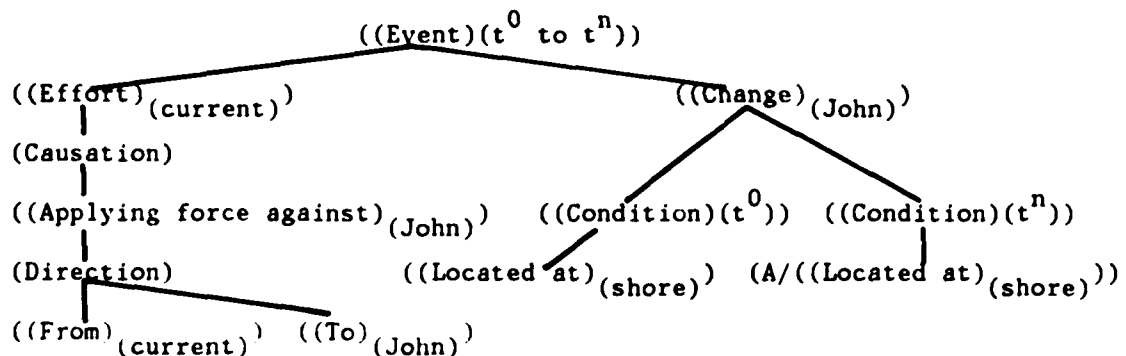


There is no (Change) branch and the (Effort) node dominates neither a (Causation) nor an (Action) node. If complements are added to make change explicit, as in

(30) The current pulled John away from the shore

a (Change) branch is added, specifying the new location of the object moved, and (Effort) acquires a daughter node of (Causation). The representation of (30) is given in (31):

(31) THE CURRENT PULLED JOHN AWAY FROM THE SHORE:



If a complement is added to make action specified, as in

(32) John pulled the branch with a rope

the (Effort) node acquires an (Action) daughter node.⁸

For Jackendoff, indeterminate causation poses a problem. In fact, he discusses only sentences in which causation and change are explicit. It is not clear how sentences like (28) can be represented in his system. Even if Jackendoff were to treat such sentences as ambiguous between a "sense" in which change occurs and a "sense" in which it does not, their representation would remain problematic. First, this would be another case of spurious ambiguity, of the kind discussed earlier in connection with Jackendoff's treatment of indeterminate intentionality. But more severely, since neither GO nor CAUSE can be used to represent the second "sense" of no change, there are no functions available to represent it.

Finally, Jackendoff's system is also unable to differentiate between internal and external causation. As discussed in Chapter 4, Section 111, verbs like break specify internal causation, while verbs like cause and force describe external causation. The difference is made clear by comparing

(33) John broke the window

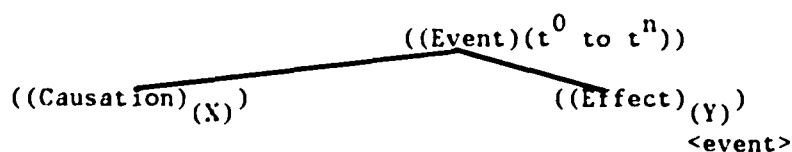
with

(34) John caused the window to break.

(33) includes causation as part of the event of breaking. Therefore, "John broke the window, but he didn't break it" is contradictory. (34) does not include causation as part of the breaking. Therefore "John caused the window to break, but he didn't break it" is very plausible. John could have arranged for somebody else to break the window, or even for the window to break by itself.

To capture the differences between the meaning of (33) and (34), the decompositional theory allows the same marker - (Causation) - to be used in two distinct relations to other markers in the representation of the predicates. In the representation of the causative break, given in (24), (Causation) is dominated by the (Event) node. In (36), which is the representation of cause, it is a sister of the (Event) node:

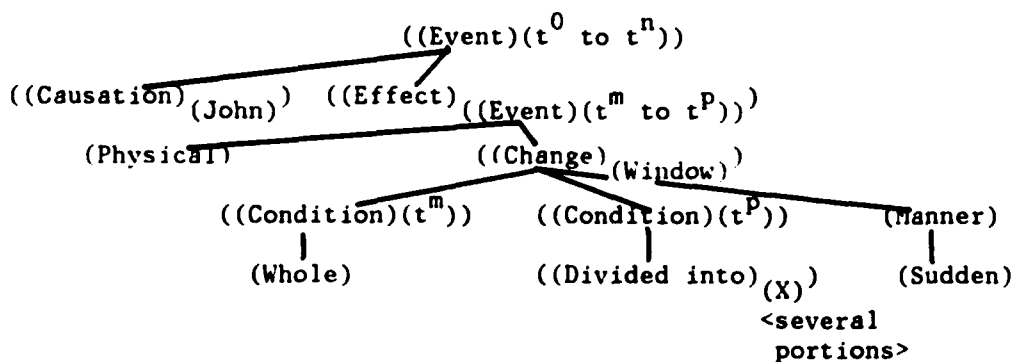
(35) CAUSE:



X - [subject] Y - [object]

The verb is represented as an event involving two arguments, a cause and an effect. The meaning of these is left unspecified. There are no selection restrictions on X since it can be filled by any kind of noun: "The water/storm/problem caused the damage". Y, though, must be an event: *"The storm caused the table/ the color". The representation acquires further meaning only with the addition of the semantic representations of its complements. The compositional meaning of (34) has the following representation:

(36) JOHN CAUSED THE WINDOW TO BREAK:



m greater than or equal to 0
p greater than or equal to n

The representation captures the fact that John's causation is external to the event of breaking. The breaking cannot start before the causation has started, and it cannot end before the causation has ended. Thus, *"John will cause the window to have been broken". Whether the breaking event itself is causative or not is left undetermined in (36). The breaking is represented by the noncausative sense of break, which as was discussed in Chapter 5, is indeterminate with respect to causation. This representation will be included in the representations of both

(37) John caused the window to be broken by Paul
and

(38) John caused the window to break by itself.

Jackendoff's functions, in contrast to the decompositional analyses cannot distinguish between the representations of (33) and (34). Since this was discussed at length in Chapter 4, I will not repeat the argument here. What prevents Jackendoff from being able to capture the difference is his system of semantic functions. Unlike tree representations, functions do not permit the same concepts (in this case those of causation and event) to relate to each other in different ways. Thus Jackendoff's representations of causation is always external.

III. CONCLUSION

The comparison between the decompositional concepts of autonomy, causation and action, and the thematic notion of agency reveals that the Agent role posited by the restrictive theories fails to correspond to any clear semantic concept. Rather, it either imposes a conjunction of the

concepts of causation and action (and autonomy for Fillmore) or treats them as interchangeable. But since these concepts do not always co-occur and since they are independent of each other, forcing such a semantic link among them, yields undesirable semantic results: on one hand, spurious ambiguity is posited when these concepts are indeterminate. Thus, when no autonomy is specified, sentences are ambiguous for Fillmore. On the other, important semantic distinctions are not made. Thus, causative predicates and action predicates are indistinguishable for Levin.

Jackendoff's role of Agent is a mere label for the first argument of his CAUSE function. As a label, it permits him to distinguish between causation and action and to represent them separately. In this, his theory resembles the decompositional theory. However, Jackendoff's functional notation is too limited. It prevents him from representing different kinds of causation. His motion model is too restrictive. It prevents him from representing verbs that do not include change.

Finally, all three thematic theories (whether Restrictive or not) fail to handle semantic indeterminacy. The consequences of this are usually spurious ambiguity and a failure to capture inferences and other semantic relations among propositions. To avoid these, causation, action and autonomy should be treated as separate concepts, and their explicit or indeterminate occurrence specified on the basis of the particular sense involved.

FOOTNOTES

1. "Agency" is used here as a technical term, qualifying a certain type of predicate argument. It is not used as a word in the language. Thus, whether the meaning of the word "agency" is clear to speakers or not is irrelevant to the determination of whether they have a clear notion of when an Agent role is assigned.
2. Since Chomsky says little about the semantic content of his theta-roles, the following discussion does not refer to LGB.
3. As discussed in Chapter 5, the antonymy operator, (A/...), converts a semantic marker into its logical complement. In (2), the logical complement of ((Located in)_(Z)) is any one of the members of the n-tuple antonymy class of location, represented as ((Located in)_(V)), where V is not equal to Z. The logical complement in this case is not the simple negation of the (Located in) predicate, since every entity, by definition, must be located somewhere. For a full discussion of n-tuple antonymy classes, see Katz 1972:160-161.
4. This representation implies that reading, as all other mental activities, is done by sentient beings. The question of machines' ability to read is left open. If machines are taken to be able to perform "mental" activities as well, the selection restrictions in the representation of these activities should be modified accordingly.
5. As in the representation of stay, discussed in Section II .
6. It is not clear why Actor is not represented like the other arguments, by means of a variable enclosed in square brackets with a Thing label.
7. Instrument modifiers are discussed in Chapter 8.
8. See Chapter 8.

CHAPTER 8 - INSTRUMENT

This chapter examines the concept of instrumentality. Instrumentality, unlike agency, does correspond to a single semantic concept, which is compositionally represented by means of a (Using) node. But in spite of this one-to-one correspondence between the compositional concept and the thematic role of Instrument, the thematic representation of instrument is inferior to the compositional one, since it gives rise to spurious ambiguities and fails to represent important semantic distinctions. Moreover, the presence or absence of an instrument is not always expressed by a complement, but can be inherent in the meaning of the verb. The Restrictive theories, which address only semantic concepts expressed by complements, fail to handle this phenomenon. Thus, they arbitrarily divide instrumentality into linguistic instances (when the concept is syntactically expressed) and non-linguistic instances (when the concept is inherent). The Nonrestrictive approach does not exhibit this arbitrariness. It represents all instances of instrumentality, whether syntactically manifested or not.

Section I discusses the problems encountered by the thematic theories in their attempts to handle the concept of instrument. Section II proposes a compositional alternative that is free of these problems. Section III discusses the various senses of the preposition with, which is crucial

to the representation of instrumentality. Section IV analyzes the inherent presence or absence of an instrument, as expressed by the meaning of verbs. Section V deals with the valid and invalid inferences drawn from propositions involving the concept of instrumentality.

1. THE THEMATIC ROLE OF INSTRUMENT

The Instrumental Case is described by Fillmore as applying to "an inanimate force or object causally involved in the action or state identified by the verb". The term "involved", like "perceived" in Fillmore's description of Agentive, is vague. By definition, a causative entity referred to in the meaning of the verb is involved in the event. Perhaps Fillmore intends to establish a contrast between mere involvement and instigation, that was specified as a condition for Agentive. Since, according to Fillmore, a single argument can be assigned only one Case, Instrumental must be distinguished from Agentive. The two must be mutually exclusive, so that whenever one applies, the other does not; thus, the description of Instrumental probably includes "involved" to differentiate it from the "perceived" Agentive. But, as discussed in Chapter 7, the notion of instigation is not a real semantic concept, since it is reduced to either causation or action. Consequently, causal involvement cannot contrast with causal instigation, and the notion of mere involvement can be ignored. "Action or state" can be taken to mean eventhood, since events, for Fillmore, involve either actions or states. (He takes the notion of experience, as in the meaning of taste, to be a state too.)

Fillmore's description of the Instrumental Case requires a conjunction of inanimacy, causation and eventhood. Inanimacy, too, is probably mentioned to differentiate Instrumental from Agentive, which applies to animate beings. But, as seen in Chapter 7, Agentive can also apply to inanimate entities, if they are autonomous. Therefore, sentences that include causative, inanimate, but autonomous entities, such as

(1) The car broke the window

are ambiguous according to Fillmore. On one sense, car is Agentive; on the other, Instrumental. But it is hard to conceive of what this distinction corresponds to in the states of affairs represented by these two assignments. Could it be taken to differentiate instances where the car functions on its own, as when it rolls down without a driver, as opposed to instances when the car is driven or being pushed by an Agent? Such a distinction, however, is not genuine ambiguity, for the same reasons discussed in the previous chapters. If the presence of a driver constitutes one sense, the presence of an entity pushing the car should constitute another; the presence of two Agents, one driving and the other pushing should constitute a third, and so on, indefinitely.

This artificially induced ambiguity could be avoided by a modification of the conditions on Instrumental, specifying non-autonomy instead of inanimacy. (Note, however, that Fillmore mentions car specifically as an example of Instrumental.) Such a move will reduce the number of sentences exhibiting Agentive/Instrumental ambiguity but will not reduce the number of ambiguous predicates. (1) will become unambiguously Agentive,

but break will remain ambiguous, to provide for the Instrumental sense of (2)

(2) The bat broke the window.

Moreover, passive sentences with no explicit causative complement, will remain ambiguous. "The window was broken", for example, would be Agentive if the causative entity is autonomous ("The window was broken by John"), but Instrumental otherwise ("The window was broken by the wind"; "The window was broken by the tree").

These cases of spurious ambiguity are due, as indicated in Chapter 7, to the inability to represent indeterminacy. (1) and (2) do not determine whether the causative entity functions as an instrument or not. All that is determined by the causative sense of break is that the cause must be physical. It can thus be an animate being, a natural force, a natural phenomenon (such as a storm or frost), a machine, or an inanimate object. Fillmore's dichotomy between autonomous causes and non-autonomous ones forces a classification of causative entities into two mutually exclusive classes of Agentive entities versus Instrumental entities. This yields the following false result: Since, according to Fillmore, Instrumentals, but not Agentives, are expressed as complements headed by with,

(3) John broke the window with Paul

is ill-formed when Paul is used as an instrument, having an autonomous entity functioning as an instrument. Although it is probably true that the preferred reading of (3) is that of shared action, where John and Paul break the window together, the instrumental reading is nevertheless plausible and meaningful.

Fillmore's dichotomy distinguishes between two kinds of causative participation: that exhibited by autonomous entities and that exhibited by natural forces and inanimate objects. But such a distinction simply does not hold. Entities capable of autonomy may not exercise it and hence may behave in ways similar to that of inanimate objects. Thus either John or the hammer can fall on the window, be thrown or pushed against it, and consequently break it. That John is capable of autonomy but the hammer is not is irrelevant. By contrast, natural forces can never behave in this way.

Considerations of this kind lead Chomsky, Levin and Jackendoff to treat the notion of instrument differently from Fillmore. Since any entity (autonomous or not) can be used as instrument, Chomsky does not specify the condition of non-autonomy for the Instrument role. Hence, any causative sentence that does not contain an explicit instrument complement is ambiguous.

(4) John broke the window
is ambiguous, according to Chomsky, between a sense in which John is Agent and a sense in which he is Instrument. Levin, on the other hand, observes that any inanimate entity can either be used as an instrument or not. Her conclusion is the complete opposite of Chomsky's: there is no need for an Instrument role at all.

(5) The rock broke the window
is unambiguously Agentive according to her, and the fact that it could have been used as an instrument is not semantic but forms part of one's knowledge of the world. Levin only acknowledges instrument as an adjunct.

that is, when it occurs in a with prepositional phrase. Jackendoff, too, represents the use of instrument only as a possible modification of the CAUSE function. Thus, like Levin, he does not posit an Instrument role for the subject argument. Like Levin, he does not capture the fact that (5) can have an instrumental interpretation. What these representations lack is a way to handle indeterminacy. Since both (4) and (5) are indeterminate with respect to how the causative entity functions, any attempt to determine it is arbitrary. Chomsky represents this indeterminacy as ambiguity. Levin and Jackendoff see it as a non-linguistic distinction made on the basis of knowledge of the world.

The problem faced by the thematic theories is that, on one hand, both Agents and Instruments are causative. Therefore, (4) and (5) should receive the same Agentive representation. But, on the other hand, the sentences differ in that (4) may be further modified to yield

(6) John broke the window with an instrument

and then

(7) The instrument broke the window

as a valid inference from (6), while (5) cannot be so modified. To account for the difference, (4) and (5) should have different representations. Fillmore chooses to ignore the causal similarity in order to be able to account for the inference; Levin and Jackendoff choose to account for the causal similarity, at the expense of accounting for the inference. Chomsky chooses to represent both the similarity and the inference. But by doing so, he renders (4) and (5), and many other causative sentences like them, spuriously ambiguous.

There is a further complication involved: the inference of (7) from (6) does not hold for all combinations of causative verbs and instruments.

Thus, one cannot infer

(8) The glasses watched the girl
from

(9) John watched the girl with glasses.

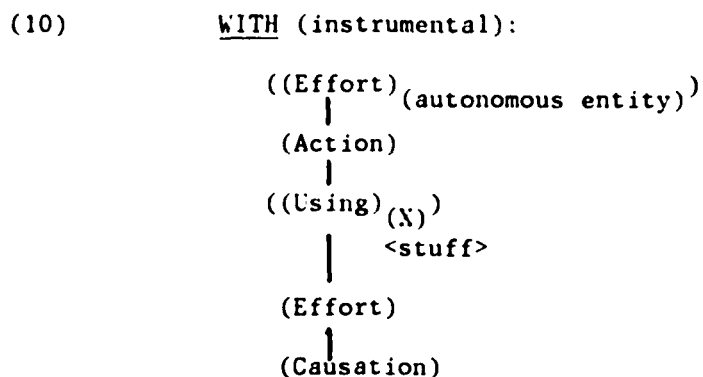
Fillmore, who accounts for the valid inference of (7) from (6) cannot account for the invalid inference of (8) from (9). Neither can the other theories, since they do not account for the inference at all.

The confusion at the root of the Agent/Instrument distinction stems from the fact that roles prevent the thematic theories from capturing the intricate relationships that hold among the distinct semantic concepts involved: first, the concept of instrumentality is not dependent on the autonomy or non-autonomy of the entity involved. Any object or substance can be used as an instrument ("John broke the window with a rock/ with Paul/ with steam"). Second, the presence of causality alone does not determine instrumentality, and verbs that specify causality are indeterminate with respect to instrumentality. Causal entities can participate in an event by either functioning as instruments, manipulated by another entity; by simply exercising some effort that does not include action, such as falling or leaning; or by performing action. However, the converse is not true. The presence of instrumentality does require causality on the part of the instrument. Thus, verbs that do not specify causality at all, or specify it for an entity other than the instrument, acquire a causal instrumental meaning with the addition of an instrumental comple-

ment, as is shown in Section II. Third, since instrumentality implies the manipulation of the instrument by some other entity, it also requires the explicit specification of action on the part of that entity. Thus, verbs that do not explicitly express action acquire a meaning of action with the addition of an instrumental complement.

II. THE DECOMPOSITIONAL CONCEPT OF INSTRUMENT

This section illustrates how the decompositional theory captures the relationships among the concepts of instrumentality, causation and action, with the analysis of break with a rock. The representation of the preposition with, which heads the instrumental complement is the following:¹



X - [object]

The representation shows that the use of an instrument is part of an effort involving action, in specifying (Using) as a daughter node of (Action). In other words, the use of an instrument is a further modification of action. The representation also captures the fact that an instrument is necessarily a cause. Two redundancy rules in the dictionary state these relationships as follows:

$$(11) \quad ((Using)_{(X)}) \rightarrow ((Action)_{(Y)})$$

The representation of a rock is the following:

```

graph TD
    Entity["(Entity)"] --> Physical["(Physical)"]
    Physical --> Object["(Object)"]
    Object --> PieceOf["((Piece of)"]
    PieceOf --> Substance["(Substance)"]
    Substance --> Solid["(Solid)"]
    Substance --> Natural["(Natural)"]
    Substance --> Mineral["(Mineral)"]

```

The projection of (13) onto (10) is straight forward:

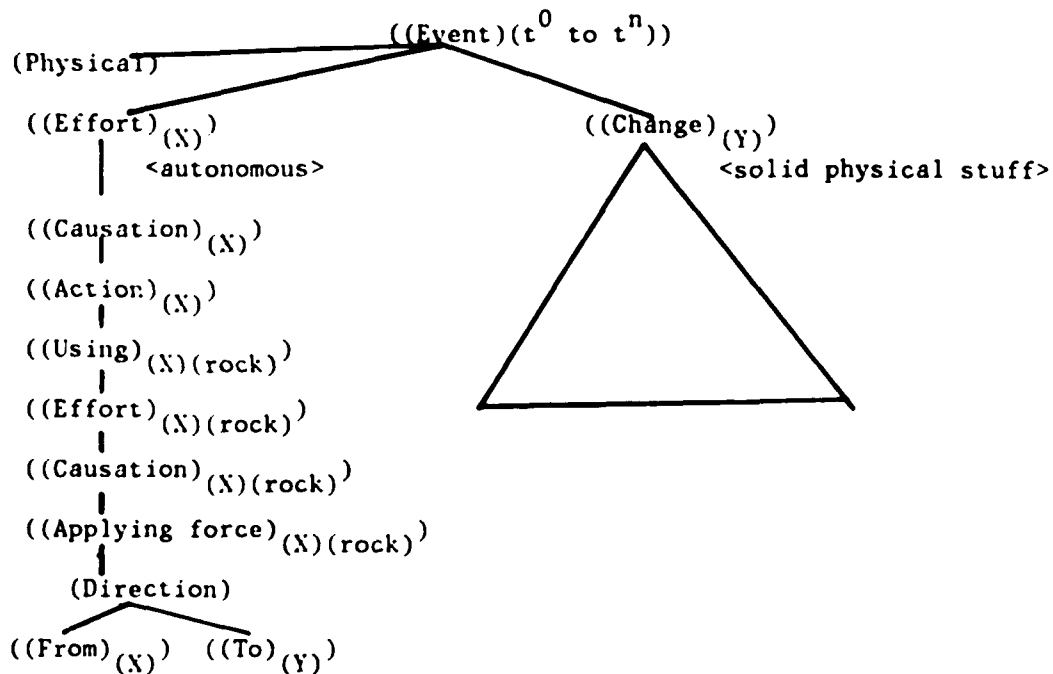
```

((Effort) (autonomous entity)')
|
(Action)
|
((Using) (Entity)')
|
(Physical)
|
(Object)
|
((Piece of) (Substance)')
|
(Solid) (Natural) (Mineral)
|
(Causation)

```

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(15) BREAK WITH A ROCK:



X - [subject] Y - [object] (Z - [object of into/in/to-PP])

In previous representations, a shorthand convention was used, according to which arguments and their selection restrictions were specified only once for each branch of the tree, next to the topmost node of that branch. But, in fact, each daughter node of that topmost node is understood to be predicated of the same arguments. Since the focus here is on the particular relations that hold between the arguments of the (Effort) branch and its various nodes, the arguments are explicitly marked, in order to make the result of the projection operation clearer.

Note, first, that the topmost node of (14) - (Effort) - is identical to that of break. These identical (Effort) nodes merge under (Event). Second, (14) introduces an (Action) node under the top (Causation) node. This is in accordance with the redundancy rule (26) of Chapter 7, which

states that a (Causation) node can be further modified by an (Action) node, provided the selection restrictions on their shared argument specify autonomy. Since the verb lacks an explicit (Action) node, it is introduced by (14). Since the selection restrictions provided by the verb specify <physical entity> only, (14) introduces further specification, i.e. an (Autonomous) node. Note, also, that second nodes of (Effort) and (Causation) are introduced. They do not merge with the top nodes, since they are predicated of the rock (as well as of X), whereas the top nodes are only predicated of X. This double causative effort represents the state of affairs expressed by causative verbs with an actor using an instrument. The actor is the primary cause of the change, performing action and using an instrument. But his effort is mediated by the effort on the part of the instrument, which can be viewed as a secondary cause in the application of force. In fact, the presence of an instrument does not require a top (Causation) node at all. As shown in Section IV below, verbs such as watch, which are not causative, can nevertheless be modified by an instrumental complement. The complement specifies causation only for the effort on the part of the instrument, but the effort on the part of the actor remains noncausative.

In (15), the nature of the joint effort of the actor and the instrument is not determined. In some cases the actor applies force to the instrument and then the instrument carries this force and applies it to the object broken. This is the case when John throws the rock at the window. In other cases, the actor applies force directly to the object broken, together with the instrument. This is the case when John holds the rock in his hand

and hits the window with it. Action modifiers, such as "by throwing it", or state modifiers, such as "by holding it", make the nature of the action more explicit.

Finally, note that the representation of (5), repeated here,

(5) The rock broke the window

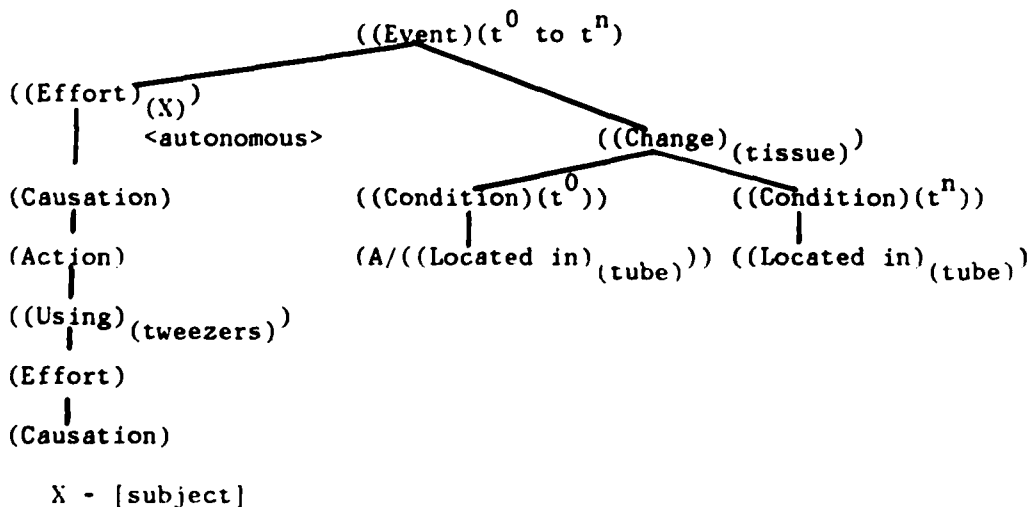
is completely contained in the representation of

(16) John broke the window with a rock

enabling the inference of (5) from (16). By virtue of being an instrument used by an actor, the rock is a cause in the event. But, by itself, (5) remains indeterminate as to whether the rock was used as an instrument.

The projection of an instrument modifier onto the representation of a verb that specifies action is straight forward. Put, discussed in Chapter 7, specifies action but is indeterminate with respect to instrumentality. "Put the tissue in the test tube with tweezers", represented below, is an instance where it combines with an instrumental modifier.

(17) PUT THE TISSUE IN THE TEST TUBE WITH TWEEZERS:



Note that (17) leaves the nature of the action and the manner in which the tweezers were used indeterminate. Most likely, the actor picked up the tissue with the tweezers (since tweezers are by definition an instrument used for this purpose), moved it in the air and released the grasp of the tweezers over the test tube, thus dropping the tissue into the tube. But he could have released his grasp in the tube, thus depositing the tissue at the bottom of the tube, rather than dropping it. He could also have pierced the tissue with the point of the tweezers, using them more like a fork; he could have pushed the tissue across the table, using the tweezers to direct its movement till it reached the tube, etc. For this reason, there appear no further nodes under the lower (Causation) node in (17).

Recall sentences such as

(18) The door opened with a key

mentioned by Dougherty as an example of an Agentless verb taking an instrument modifier. Fillmore cannot account for it because according to his Case Hierarchy, (18) should be passive. Levin cannot account for it because she maintains that only Agent verbs can take an Instrument adjunct. A close examination of the meaning conveyed by (18), however, reveals that the sentence differs from all other event sentences considered so far. (18), as opposed to (15), does not express an event. This is clear from the ill-formedness of

(19) *The door is opening with a key

as opposed to the well-formedness of

(20) John is opening the door with a key

and of

(21) The door is opening;

and from the deviance of

(22) At five o'clock, the door opened with a key

as opposed to the non-deviance of

(23) At five o'clock, John opened the door

and of

(24) At five o'clock, the door opened.

(19) to (24) suggest that (18) expresses a property of the door, rather than an actual opening event. It conveys the door's ability to participate in potential opening events.² It can be paraphrased as

(18a) The door could open with a key.

This property sense is common to many verbs of change - "Fresh cake cuts well"; "The shirt buttons easily", etc. It has the following general representation:

(25)

((Property)_(X))
|
(Ability)
|
((Participate in)_(Y - event))
|
((Change)_(X))

X - [subject] Y - [predicate]

This representation specifies that the subject referent has the ability to participate as the entity changing in an event expressing a change. The exact nature of the event is determined by the meaning of the predicate. Thus, in

(26) The door opens easily

Y is replaced by the noncausative sense of open, since a cause is not specified. (20) is indeterminate between a sense on which the door opens easily by itself and a sense on which it is easily opened by an actor. In (18), by contrast, Y is replaced by the causative sense of open, since the presence of an instrument requires the presence of a cause capable of action, as illustrated in (15). In "The cake cuts easily", Y is replaced by the causative sense of cut, since there is no noncausative sense.³

III. THE MEANING OF WITH

With is highly ambiguous. Apart from its instrumental sense, it also has a sense of shared action, as in "John discussed the matter with Paul"; a sense of accompaniment, as in "John ran home with Paul"; a sense of containment, as in "John filled the tub with water", and probably others.⁴ In this section, some principles that operate on ambiguous propositions containing a with complement are examined. Sub-section III.I deals with the results of the projection operation which combines the representations of a with complement with the representations of various predicates. Some of these projections result in semantic anomaly; others are semantically well-formed. In cases of ambiguity, pragmatic considerations are often used to select the most likely sense. Sub-section III.II discusses the issue of ambiguity versus indeterminacy. The decompositional representations of the concepts of instrumentality, shared action and containment reveal that these are distinct senses rather than different possible interpretations of the same indeterminate sense.

III.1 THE PROJECTION OF WITH-COMPLEMENTS

When the representation of a with complement is projected onto that of a predicate, many possible readings result, due to the ambiguity of the prepositional phrase. Not all readings are acceptable, though. When the sense of the complement fails to match the sense of the predicate, the reading becomes anomalous. (15) acquires an instrumental reading since break can take an (Action) node. But other verbs, either state verbs, such as sleep, or event verbs for which the absence of action is determinate, such as stumble (in the meaning of tripping), cannot acquire an instrumental reading since they do not involve action. The result of the projection of a complement like (14) onto the representation of these predicates is semantically deviant on this sense: *"He slept with pills" or *"He stumbled with a rock".⁵

(15) is unambiguously instrumental, since its shared-action reading is anomalous. John cannot share his action with the rock, since a rock is not an autonomous entity and cannot act. (15) cannot have a containment sense either, as explained below. Many propositions resulting from the projection of a with complement remain ambiguous, though. Sentence (3), repeated here,

(3) John broke the window with Paul
is ambiguous between a sense of share action and an instrumental sense. To determine which reading is more plausible, one makes pragmatic decisions based on the meaning of the noun and knowledge of the world. These pragmatic considerations lead one to prefer the sense of shared action to the instrumental sense, since it is much more common to use other

people for help than to use them as mechanical instruments. The reliance on knowledge of the world assumed here differs from Levin's conception of it. Levin claims that knowledge of the world determines whether the sentence has an instrumental meaning or not. The decompositional claim is that the semantics of the sentence do that. Knowledge of the world comes into play only in order to choose the most likely reading among the various senses of the sentence. This is made clear by a sentence like

(27) John broke the window with paper.

Like with (15), the sense of shared action is anomalous here, since paper is not an autonomous entity. Thus, (27) is unambiguously instrumental. But, unlike (15), its pragmatic plausibility is low, since the consistency of paper is not rigid enough to apply the amount of force needed to break glass. One's reaction on hearing (27) is one of wonder at how paper can be so used. This indicates that the instrumental sense is well understood, but perhaps not easily believed.

The third meaning of with, that of containment, combines with verbs like fill, as in

(28) He filled the tub with water.

This sense is semantically impossible for verbs like break, since the concept of contained substance is not part of their meaning. Thus,

(29) He filled the tub with Paul

is three-way ambiguous: It most probably conveys the sense of shared action, but it can also mean that Paul was used as an instrument (albeit, pragmatically, not in any obvious fashion); or that he was the substance that filled the tub, being placed inside it.

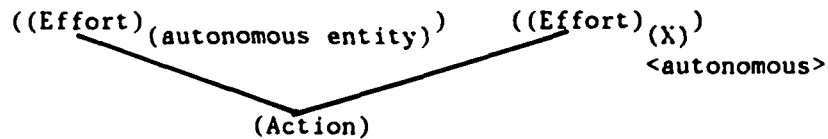
III.II THE AMBIGUITY OF WITH-COMPLEMENTS

A question arises as to whether these three interpretations of with constitute three different senses, or whether with is simply indeterminate with respect to the type of modification it supplies the predicate with. A lexical item, X, is indeterminate with respect to some semantic concept Y, if Y does not figure as a label of a branch in X's representation, but labels a branch that can be added as a daughter to X's representation. Whether a Y-branch can be added or not is determined by redundancy rules in the lexicon, which specify that Y is a subordinate concept to one of the concepts explicitly expressed by X. Two interpretations, A and B, fall under the (indeterminate) sense of X, if what distinguishes them is the presence or absence of Y. Thus, the representations of A and B fully contain the representation of X. As shown in Chapter 5, the causative sense of break is indeterminate with respect to action. An (Action) branch does not appear in its representation, but a redundancy rule determines that it can be added as a daughter of (Causation). John's breaking the window by pounding and John's breaking the window in leaning on it are two interpretations that fall under this sense of break. Their representations completely contain the representation of break. The former includes an (Action) node as daughter of the (Causation) node. The latter, a (State) node instead.

This, however, is not the case with with. What distinguishes instrumentality, shared action and containment is not the simple addition of different daughter nodes under the same higher node. The represen-

tation of instrumental with was given in (10) above. The representation of the shared-action sense is given in (30):⁶

(30) WITH (shared action):

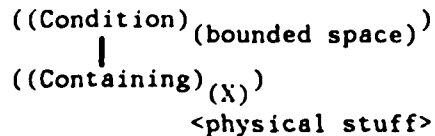


X - [object]

The two (Effort) nodes capture the fact that two distinct entities perform the action.

The representation of the containment sense is the following:

(31) WITH (containment):

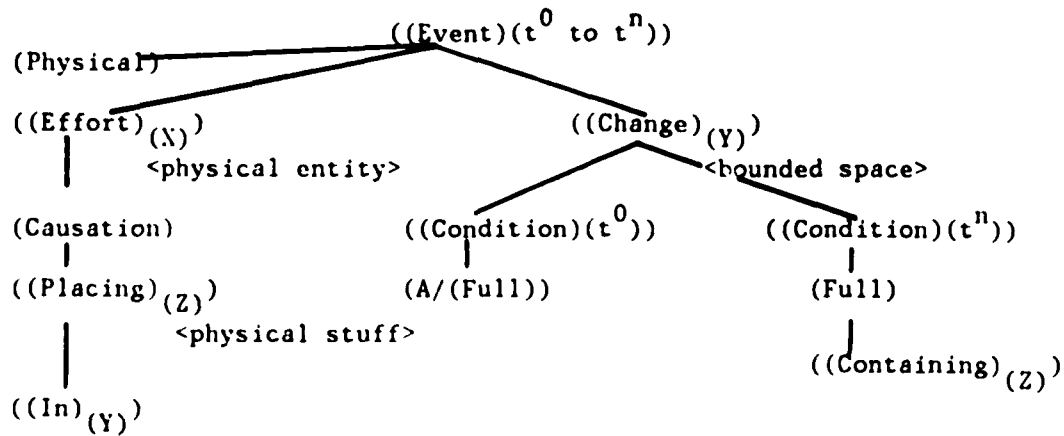


X - [object]

Note that this sense of with can occur with either verbs (e.g., "fill with water") or with nouns (e.g., "I want a room with furniture"). Therefore the representation does not specify that (Condition) must be a daughter of a (Change) node.

Let us examine how these different senses are projected onto the representation of fill. Fill has the following representation:

(32) FILL (causative):

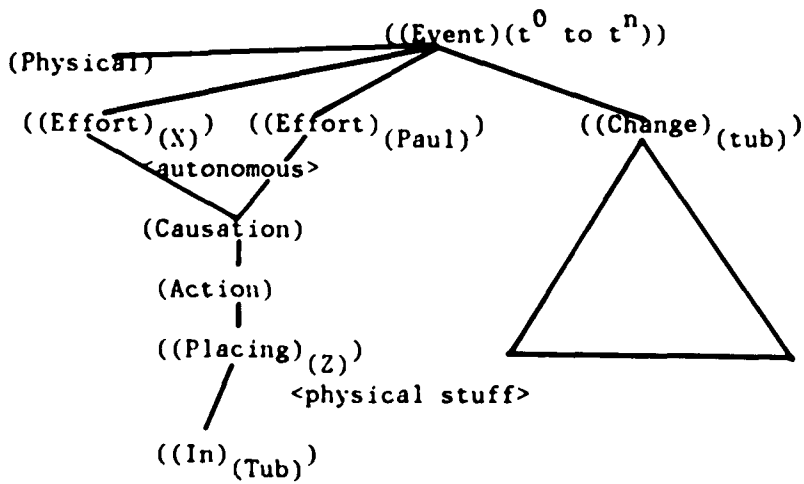


X - [subject] Y - [object] (Z - [object of with-PP])

Fill, like break, does not specify action. This explains why non-autonomous entities can also function as causes in an event of filling ("The wind filled the room with leaves"). (32) combines with the representation of an instrumental complement in the same way break does: The nodes of (Action), (Using), (Effort) and (Causation) are attached as daughters of the top (Effort) node, which is further restricted to refer to an autonomous entity.

When the representation of shared action given in (30) combines with (32), as in "fill the tub with Paul", the result is represented as follows:

(33) FILL THE TUB WITH PAUL:



X - [subject] (Z - [object of with-PP])

When (30) is merged with (32), one (Effort) node merges with the (Effort) node of (32) contributing stricter selection restrictions of autonomy to it. The second (Effort) node is attached as a sister to the merged one, and as a daughter of (Event).

The projection of the containment sense onto (32) is trivial, since all its nodes fully merge with the nodes specified for the ((Condition)(tⁿ)) node in (32). One last remark should be made concerning the stylistic oddity found in sentences such as

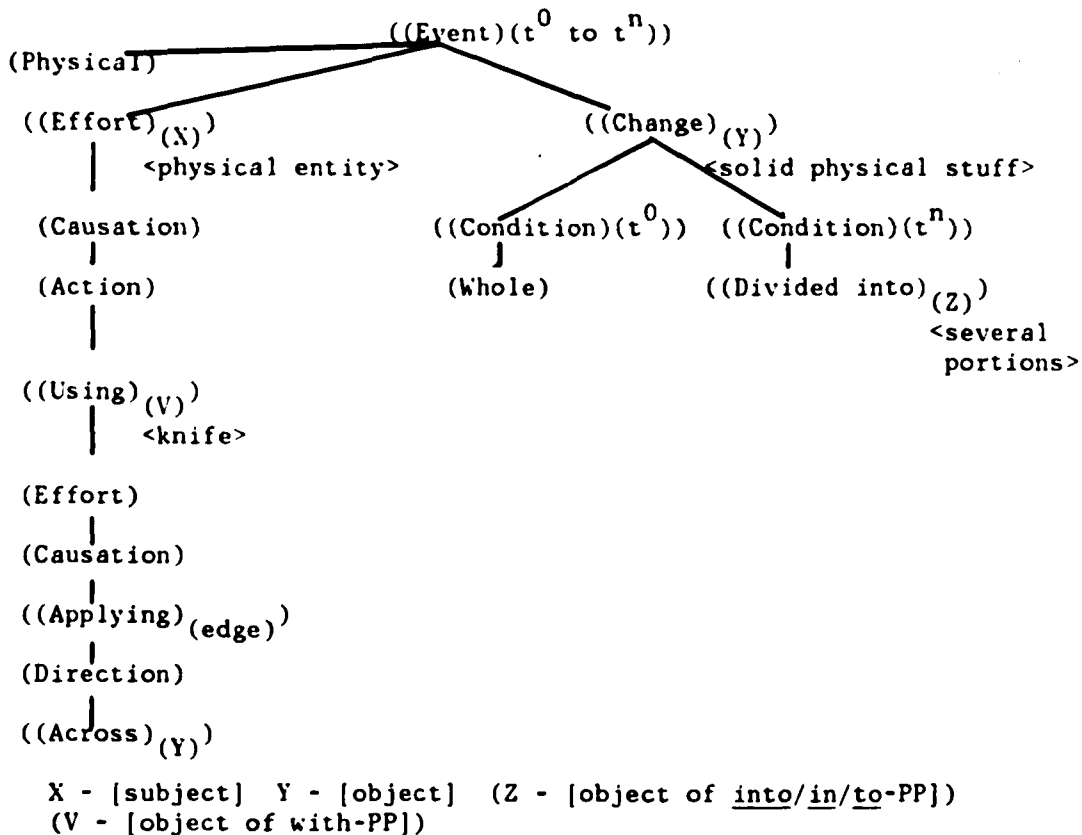
(34) John filled the tub with water with Paul.

Such sentences are theoretically possible but are usually avoided in use, since they involve the repetition of the same lexical items expressing different senses and are thus very likely to confuse the hearer.

IV. INSTRUMENT AS AN INHERENT CONCEPT

The discussion so far has concentrated on instrumentality conveyed by the meaning of with, but the concept of instrumentality can also be inherent in the meaning of verbs. Knife (in the sense of cut with a knife) and hammer (in the sense of beat or drive with a hammer) include an instrument as part of their meaning. The representation of knife is the following:⁷

(35) KNIFE:

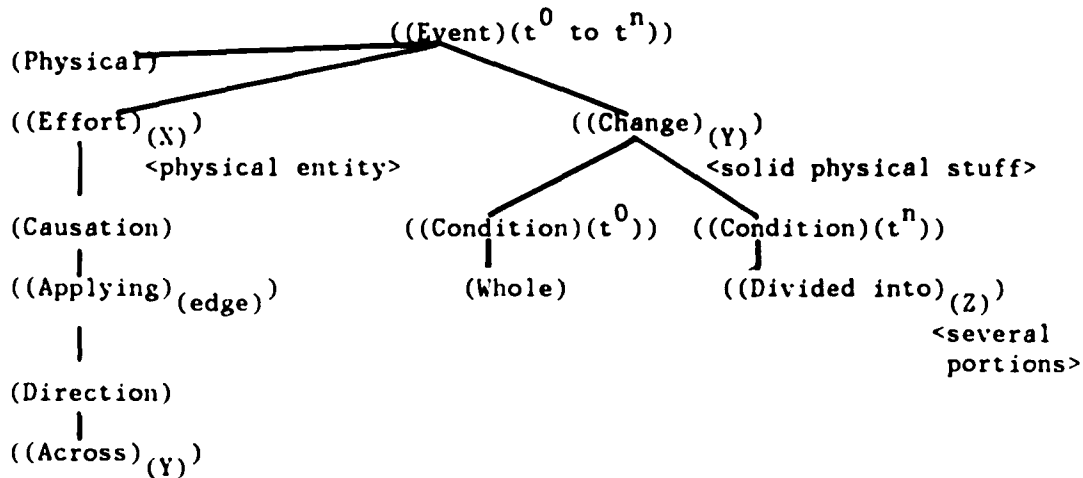


The representation of knife is fairly similar to that of the causative break: both verbs involve the concept of application. Break expresses the application of force from the cause to the (surface) of the object broken; knife (and cut) expresses the application of a solid, sharp edge across some area of the object knifed. This movement across is what

differentiates knife and cut from the verb pierce, for example, which does not specify such movement. Thus, pierce (but not knife or cut) holds true of states of affairs in which an edge is applied to a point. Knife, like break, specifies a change in the object knifed, which is similarly divided to an undetermined extent. The final condition can involve only the existence of dividing cuts in the object that remains otherwise whole; or it can result in the existence of separate pieces, that can be specified by an optional complement. Knife differs from break, though, in that it specifies the use of an instrument (V), and its exact nature (<knife>). The mapping frame for V indicates that its replacement by a complement is optional. Since the meaning of the verb already contains the concept of knife, a mere replacement by "with a knife" will be completely redundant; that is, the representation of the meaning of the complement will be completely specified by the representation of the meaning of the verb. This is why "She knifed it with a knife" is redundant and sounds stylistically flawed. However, if the complement carries additional meaning, not specified by the verb, the sentence sounds much better, as in "She knifed it with a rusty knife". The inherent specification of a knife as the instrument also explains the semantic deviance of *"She knifed it with a rock".

The meaning of cut is similar to that of knife, except for explicit action. Its representation is the following:

(36) CUT:



X - [subject] Y - [object] (Z - [object of into/in/to-PP])

Cut does not specify action, since the causative entity does not have to exercise autonomy. Its causative argument can refer to any kind of physical stuff.

(37) The broken window cut John's finger
holds true of a state of affairs in which John brushes his finger against the glass, without the window's acting in any way. Since cut does not specify action, it obviously does not specify the use of an instrument, which can occur only when action does. The causative entity, though, must be able to apply an edge to the object broken. Autonomous entities apply either instruments with edges or an edge of their own body. Non-autonomous entities that contain edges cut by virtue of applying force.

(38) The wind cut John's finger
is interesting in this context. It is semantically meaningful but pragmatically puzzling, since the wind does not have edges. (38) holds true of the somewhat unlikely but possible state of affairs where the wind moves some sharp object against John. The projection of with a knife onto cut introduces an (Action) branch with a (Using) node. Its representation

is therefore identical to that of knife. This is in accordance with the decompositional principle that requires identical representations for synonymous expressions.

The decompositional representation of knife has no equivalent in the Restrictive theories. These theories can handle the instrumental meaning of with a knife when it occurs with cut but cannot represent the very same meaning in knife, since it is not realized as a syntactic complement. This arbitrary treatment of semantic concepts is objectionable. The same concept of instrumentality is considered linguistic if it happens to be found in a noun-phrase, but non-linguistic when it is found in a verb.

Other verbs, contrary to knife, inherently specify the absence of an instrument. Since such verbs violate the general redundancy rule stating that (Action) can be further modified by a (Using) node, they are specifically marked with an (A/(Using)) node. Thus, the representation of swallow, given as (1) in Chapter 7, should be modified to contain explicit non-instrumentality:

```

graph TD
    Root["((Event)(t0 to tn))"]
    Root --- P1["(Physical)"]
    Root --- P2["((Effort)(X)  
<animate>"]
    Root --- P3["((Change)(Y)  
<physical stuff>"]
    P2 --- C1["(Causation)"]
    C1 --- A1["(Action)"]
    A1 --- U1["(A(Using))"]
    U1 --- C2["((Contracting)(throat of X))"]
    P3 --- C3["((Condition)(t0))"]
    P3 --- C4["((Condition)(tn))"]
    C3 --- L1["((Located in)(mouth of X))"]
    C4 --- L2["((Located in)(throat of X))"]
    
```

X - [subject] (Y - [object])

The Restrictive theories cannot represent the inherent absence of an instrument for the same reasons discussed above. Thus, they cannot account for the semantic deviance of "He swallowed the food with a spoon", on its instrumental reading.

In Section I, two types of inferences were mentioned that need to be accounted for: On one hand, (7) can be validly inferred from (6):

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therefore

(7) The instrument broke the window;

On the other, (8) cannot be validly inferred from (9):

(9) John watched the girl with glasses

but not

(8) *The glasses watched the girl.

This difference between verbs like break and verbs like watch is due to break's indeterminacy with respect to action versus watch's specified action. Verbs that do not determine action may have either autonomous or non-autonomous participants. Thus, break can take either John or a rock. But verbs that specify action cannot take non-autonomous actors, since action implies the exercise of autonomy on the part of the actor. Thus, (8) is anomalous: the selection restrictions on the acting argument are violated by the nodes found in the representation of glasses.

Verbs like put require careful examination in this light. On one hand, since put is analyzed as a verb specifying action, it should not be able to combine with complements referring to non-autonomous causes; on the other hand, sentences like

(40) The tweezers put the tissue in the tube

do not seem anomalous (at least, not as anomalous as (8)). This is because the status of sentences like (40) is special: they do not have a literal event meaning but are rather metonymies, where the instrument substitutes for the actor who, in fact, manipulates it. These metonymies are so commonly used in the description of events, that they seem quite

literal at first sight. One's knowledge of the world (in this case, one's knowledge that tweezers are an instrument that cannot move under its own control) prevents confusion when one encounters such metaphorical renditions of events. That (40) is not literal becomes evident when it is compared to (5), repeated here:

(5) The rock broke the window.

First, note the oddity that results with the addition of a time adverbial to (40):

(40a) ?At five o'clock, the tweezers put the tissue in the tube
versus the lack of such oddity for (5):

(5a) At five o'clock, the rock broke the window.

This evidence is not conclusive, but it does suggest that (40) is not a complete description of an event, and thus, when it is modified in a way that regular descriptions of events are modified, it seems strange. The implication of (40a) is that the tweezers have suddenly acquired some autonomy. Note, also, that the oddity is not with the verb put itself, since

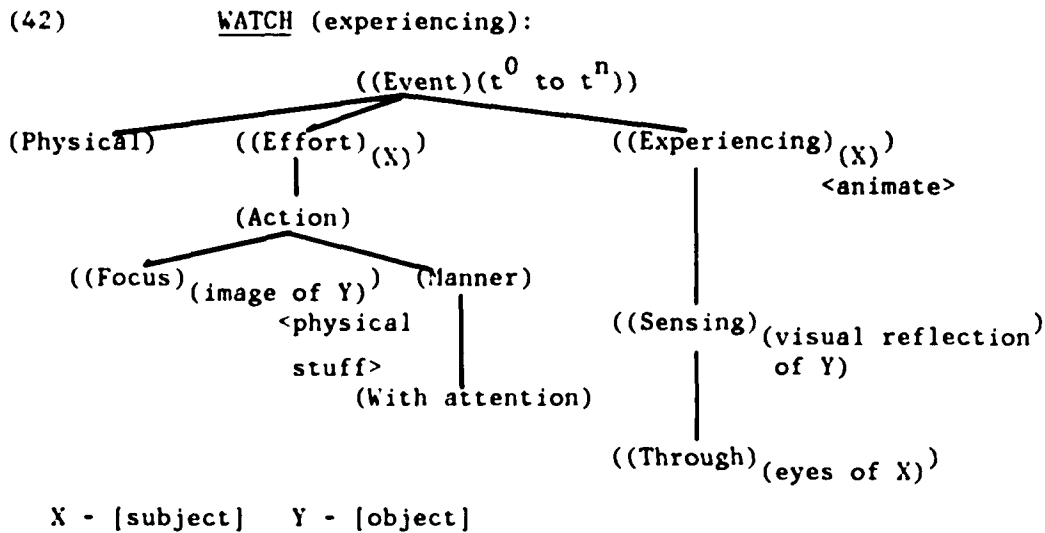
(41) At five o'clock, John put the tissue in the tube
is perfectly natural. (40) becomes even odder when an indefinite article is used:

(40b) (A pair of) tweezers put the tissue in the tube
while

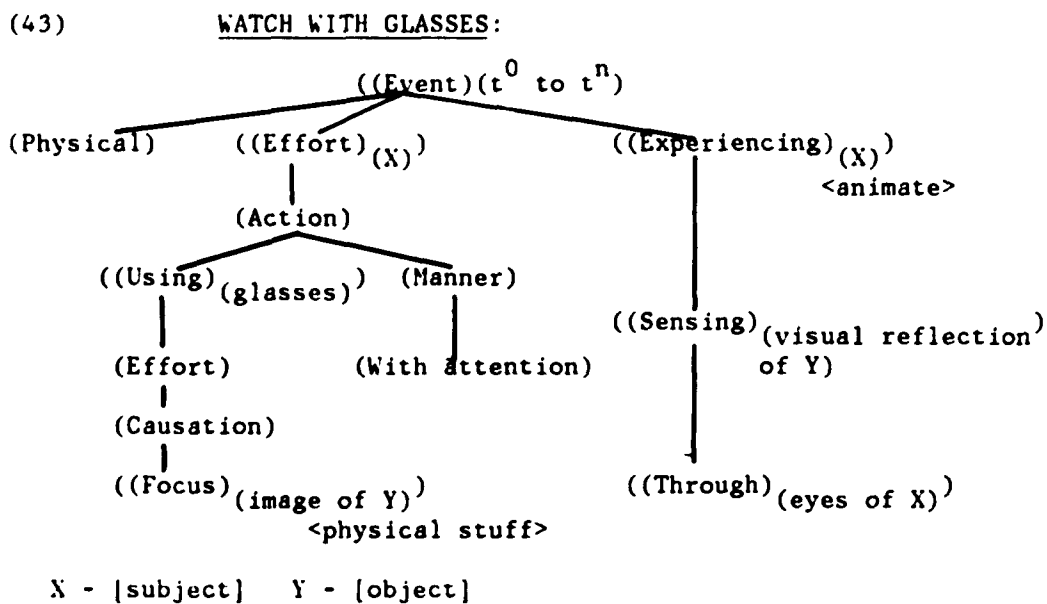
(5b) A rock broke the window
is as natural as (5).

The representation of metaphorical expressions requires intricate modification of the semantic structure inherent in the literal meaning of these expressions. Such modification can therefore be investigated only on the basis of a much more advanced knowledge of literal meaning than that which we now possess. It should be noted, though, that the violation of selection restrictions specified in the literal sense of expressions is one of the most common processes that generate metaphors ("to break an engagement", "to cut diplomatic ties", "to knife the water", etc). These metaphors are in such common use, that they are often treated as literal meanings. Thus, it should not be surprising that non-autonomous causes used as instruments are often referred to as if they were autonomous. But as far as literal meaning is concerned, verbs specifying action cannot take non-autonomous participants in place of autonomous actors.

It remains to explain why a sentence like (8) is much less acceptable than a sentence like (40). This is because the meaning of watch includes other nodes, apart from (Action), that cannot apply to an entity like glasses. Consider its representation:



The verb specifies an (Experiencing) node which is predicated of X but not of an instrumental argument, whose representation is attached under the (Action) node, as follows:



Thus, there are two reasons for the ill-formedness of (8), that is, for replacing X in (42) by the representation of glasses: one is their inability to perform action; the other is their inability to have visual experiences. Since the selection restrictions for an experiencing entity

(i.e., animacy) are even stronger than simple autonomy, (8) cannot even acquire a metonymic sense. Metonymies substituting an instrument for the actor seem much more acceptable than those substituting an instrument for the experiencer. This can be explained by the structure of the decompositional tree. (Using) is a direct daughter of (Action); its argument is much closer on the tree to the (Action) argument than it is to the (Experiencing) argument. It is therefore more likely to substitute for the (Action) argument than for the (Experiencing) one. Thus, it seems that the more distant a phrase marker is from another, the less likely it is to substitute for it in metaphorical uses.

A last point should be made concerning the relationships among the concepts of instrumentality, causation and action, as they are manifested in (42): Since an instrument is always causative, in the case of (42), the glasses cause the experience of seeing, which might otherwise be impossible for the experiencer. But the actor using the instrument does not have to be causative on his own. Since the (Causation) node of the instrument is subordinate to the (Action) node, the actor becomes somewhat causative, by virtue of using the causative instrument, but the rest of his action is not causative.

VI. CONCLUSION

Although the role of Instrument in the Restrictive theories corresponds to a single semantic concept of instrumentality, its Restrictive treatment is not free of the semantic problems noted in the treatment of Agency. The positing of an Instrument role gives rise to spurious ambi-

guities; it fails to account for valid inferences; and it arbitrarily limits the representation of Instrument to instances where it is realized as a syntactic complement. There are several reasons for these undesirable consequences: First, the assignment of Instrument is dependent on the assignment of Agent, since these two roles cannot be assigned to the same argument. Thus, when Agent is assigned to a causative argument, Instrument must be barred. Since the correspondence between Agent and causation was shown to be ill-defined, the correspondence between Instrument and causation is bound to be ill-defined, too. In fact, the Restrictive theories disagree over how Agent, Instrument and causation are related. Fillmore divides causative arguments into two mutually exclusive classes of Agentives and Instrumentals. His division is based on the presence or absence of autonomy. He is thus unable to account for the fact that "John broke the window" may have either an instrumental or a non-instrumental interpretation. Levin treats all causative arguments as Agents only. She is thus unable to account for the valid inference of "The rock broke the window" from "John broke the window with a rock". Chomsky treats all causative arguments as ambiguously Agents or Instruments. He thus stipulates spurious ambiguities. These arbitrary classifications are caused by the failure to handle indeterminacy. Since every argument must be assigned a definite role, indeterminacy is not possible within the Restrictive context. They are thus compelled to choose between representing a possible instrument interpretation as an explicit sense and ignoring it. Finally, the Restrictive theories do not have access to the compositional meaning of predicates. Thus, they cannot capture the concepts of instrumentality, causation and action separately. They are unable to

represent these concepts at all when the concepts are inherent in the meaning of the predicate and not realized as complements.

The decompositional account is free of these problems. It allows the presence of an instrument to remain indeterminate, provided that action on the part of the user of the instrument is possible. Thus, all verbs explicitly expressing action can acquire further instrumental modification. Exceptions, such as swallow, are explicitly marked. All verbs that are indeterminate with respect to action are also indeterminate with respect to instrumentality. When they acquire an action sense, they may further acquire an instrument sense. Since an instrument is a causative participant in the event, when causation with no action is specified, the instrumentality of the causative participant is not determined. Thus, "The rock broke the window" could have an instrument reading, if action is undertaken on the part of some autonomous entity. But it could also have a non-instrumental interpretation.

Finally, whether the presence or absence of an instrument is specified by a complement (as with a knife) or by the verb itself (as in to knife or to swallow) is irrelevant to the decompositional analysis. Both types of occurrences receive identical representations. Thus, semantic relations, such as synonymy and sense inclusion, and semantic properties, such as redundancy and contradiction, can be captured regardless of syntactic structure.

FOOTNOTES

1. With has other meanings as well, such as shared action and containment. These are discussed in Section III.
2. Other differences between event verbs and property verbs are mentioned in Keyser and Roeper (1984): event verbs can take the imperative ("Sink, boat!") while property verbs (referred to as "middle" verbs by Keyser and Roeper) cannot (*"Wax, floor!"). Similarly, event verbs can occur in sentential complements of perception verbs ("I saw boats sink"), whereas middle verbs cannot (*"I saw bureaucrats bribe easily"). See also Fiengo (1974).
3. This property sense is a rather complex semantic phenomenon: On one hand, it is not confined to verbs of change only (e.g., "Policemen bribe easily"); on the other, it does not exist for all verbs of change (*"Animals die with a gun").
3. The exact meaning of shared action and what differentiates it from accompaniment are not easily established. The complexity involved in the meaning of these concepts is discussed in detail in Harnish (1976). For the purpose at hand, they are treated somewhat inaccurately as one sense.
4. As was pointed out to me by P. Postal, when action is indeterminate, as in "He fell asleep", the presence of an instrument is possible: "He fell asleep with pills" and "He fell asleep by using pills".
5. But see fn 4.
6. Only the sense of cutting with a knife is addressed here. The verb's other literal senses, such as spreading with a knife or stabbing with a knife, are ignored. So are its more metaphorical senses of moving like a knife or trying to defeat by underhanded means.

CHAPTER 9 - CHANGE AND EXPERIENCE

This chapter addresses the third major role posited by the thematic theories. For convenience, it is generally referred to here as Theme, although it appears under various names in the different theories: Fillmore refers to it as the Dative Case, for animate beings, and as the Objective Case, for inanimate objects; Jackendoff (following Gruber) calls it Theme; Levin accepts Jackendoff's Theme for motion verbs and introduces Patient for other verbs.¹ Like Agent, Theme does not clearly correspond to a single semantic concept. To some extent, it refers to entities undergoing change. In Fillmore's theory, it also refers to experiencing entities. When the application of Theme is restricted to verbs expressing change or experience only, many other verbs, not expressing these concepts cannot be accounted for. If Theme is allowed to apply to these other verbs as well, it fails to correspond to any clear semantic concept and becomes meaningless. But even for verbs that do express change or experience, Theme, like Agent and Instrument, is a source of arbitrariness and ambiguity.

In Section I, the decompositional representation of change and experience is compared with Fillmore's thematic representation of Dative and Objective. Fillmore's treatment of these Cases is shown to suffer from similar problems noted in his treatment of Agentive and Instrumental.

Section 11 compares the decompositional representation of change with Jackendoff's representation of Theme. The role of Theme is central to Jackendoff's theory, since it is at the heart of the motion model. Motion verbs are represented as necessarily involving Theme, which is the role assigned to moving entities. By analogy, all verbs depicting events necessarily involve Theme as well. But this motional view of events is shown to be untenable. At best, it is irrelevant to the representation of non-motional changes. For other non-motional changes, it yields representations that are too narrow. Most severely, it prevents the theory from representing any non-motional verb that does not include change.²

I. CHANGE AND EXPERIENCE VERSUS FILLMORE'S DATIVE AND OBJECTIVE

The concepts of change and experience are said to be captured by Fillmore's Dative and Objective Cases. The Dative is assigned to "an animate being affected by the state or action identified by the verb"; the Objective is identical, except that it applies to inanimate objects: "conceivably... things which are affected by the action or state identified by the verb". The same problems discussed in connection with Fillmore's Agentive and Instrumental Cases arise here too. First, "affected" is a vague term. It probably applies to the entity undergoing change in verbs depicting change, such as break or cut. The entity changing is Dative, if animate; and Objective otherwise. According to Fillmore's examples, Dative also applies to the experiencer in verbs depicting experience, such as taste or see. The experiencer is always Dative, since inanimate objects cannot have experiences. Thus, verbs expressing change or experience assign Dative/Objective, but it is not at

all obvious if the role is assigned by other verbs as well. This depends on the interpretation of "affected". Is the book affected in

(1) John read the book?

Is the food affected in

(2) John tasted the food?

And is the water affected in

(3) John filled the tub with water?

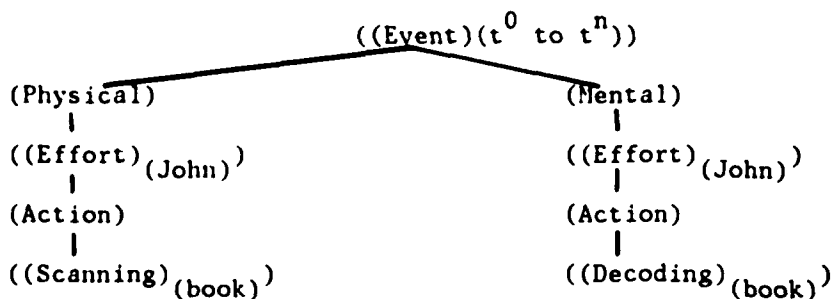
Since these three arguments are identically realized as direct objects, there is strong motivation for a Restrictive theory to assign the same role to all three. Since, moreover, Fillmore's semantic description of Objective is very vague - "the semantically most neutral case ... whose role is identified by the semantic interpretation of the verb itself; conceivably ... limited to things which are affected by the action or state identified by the verb" - there is good reason to believe that he considers all three to be Objective. But such a view renders the notion of affect meaningless. The term ranges over so large and varied a set of semantic concepts that the notion of affect evaporates completely. To accommodate book in read, the concept of being scanned or being mentally processed by a sentient entity counts as a type of affect. To accommodate food in taste, the concept of being sensed counts as such; to accommodate water in fill the tub with water, the concept of being contained is included, too. The more concepts included under the notion of affect, the less semantic content it has.

If, on the other hand, the entities referred to in (1), (2) and (3) (i.e., books, food and water) are not "affected", then Fillmore's system

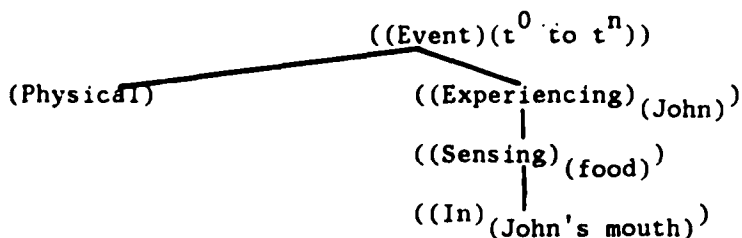
cannot account for them. They cannot be Agentive since, among other things, they are not autonomous. They are not Instrumental since they are not causative. Fillmore's only other options are Factitive, which does not apply since it is reserved for entities "resulting from the action identified by the verb"; and Locative, which is reserved for "the location of the state or action identified by the verb".

The decompositional approach, by contrast, encounters no difficulty in providing (1), (2) and (3) with semantic representations. These are given in (4), (5) and (6), respectively.

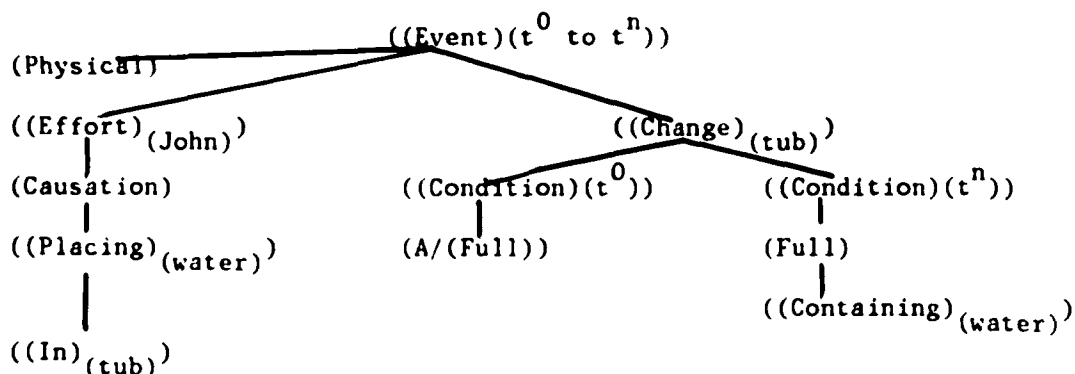
(4) JOHN READ THE BOOK:



(5) JOHN TASTED THE FOOD:



(6) JOHN FILLED THE TUB WITH WATER:



From the non-thematic point of view assumed under the decompositional approach, there is little similarity among (4), (5) and (6), as far as the meaning of their respective predicates is concerned. Read explicitly conveys action, whereas both taste and fill are indeterminate with respect to it. Fill is explicitly causative, whereas read and taste are explicitly noncausative.³ The decompositional representations formally capture the fact that (1), (2) and (3) do not share any semantic concepts. A system like Fillmore's, which imposes some relation of semantic similarity among them thus necessarily misrepresent their meaning.

But even when Fillmore's notion of affect is restricted to verbs conveying change or experience only, it gives rise to ambiguities in indeterminate cases. Thus, verbs like push or pull, which do not specify whether a change takes place or not, are ambiguous between an Objective sense, when a change occur, and an unclear sense, when it does not. Similarly, verbs like taste, which are indeterminate with respect to action, are ambiguous between an Agentive sense, if the experiencer performs action, and a Dative if he does not.

Taste also exemplifies the now familiar problem of arbitrary semantic distinctions. The Cases of Agentive and Dative, like all other Cases, are mutually exclusive: when one applies, the other does not. Thus, when John performs action in his tasting, (2) is Agentive, and as a consequence, the fact that he also experiences something is not captured. Only when he does not perform action, his experience is captured. Similarly, verbs that specify explicit action and experience, like watch, are not represented as including experience, although this very same experience is captured in verbs that convey no action (i.e., see). The fact that the representation of experience is dependent on the non-representation of action is an arbitrary consequence of Fillmore's system of Cases. It points again to the inadequacy of creating dichotomies between concepts that are independent of each other and can therefore either co-occur or not, according to the meaning of the particular verb. Note the strange classification of meanings that results from the Agentive/Dative opposition, according to Fillmore's system of representation:

- (7) John saw the book D___0
- (8) John broke his glasses D___0 (in the noncausative sense)
- (9) John watched the book A___0
- (10) John broke her glasses A___0

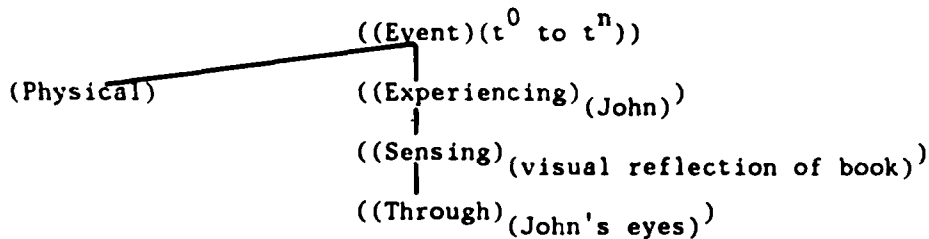
Thus, "see the book" and "break his glasses" are represented as closer in meaning than either "see the book" and "watch the book" or "break his glasses" and "break her glasses". Fillmore's counter-intuitive classification is the consequence of his Restrictive approach, which ignores inherent concepts shared by the two senses of break in (8) and (10), such as the initial condition of wholeness, the final condition of division,

the sudden manner, etc. It is also the consequence of his arbitrary classification of concepts under Cases - causation and action under Agentive and change and experience under Dative. The decompositional classification of these sentences, by contrast, is the following:

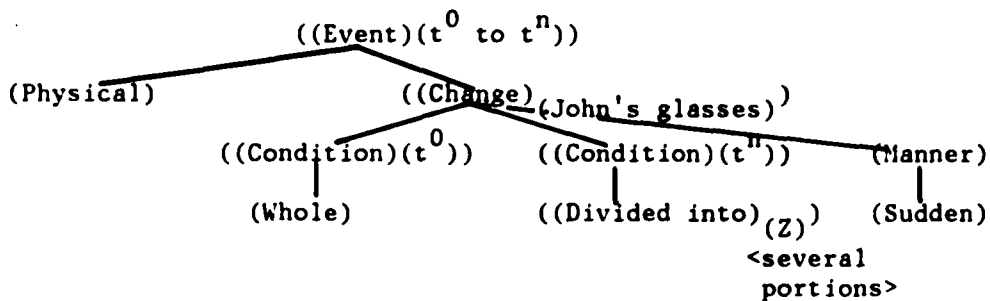
- (7a) John saw the book - Experience
- (8a) John broke his glasses - Noncausative Change
- (9a) John watched the book - Action and Experience
- (10a) John broke her glasses - Causative Change

The decompositional representations of (7a) to (10a), given in (11) to (14), successfully capture the similarities and differences in the meaning of these propositions.

(11) JOHN SAW THE BOOK:

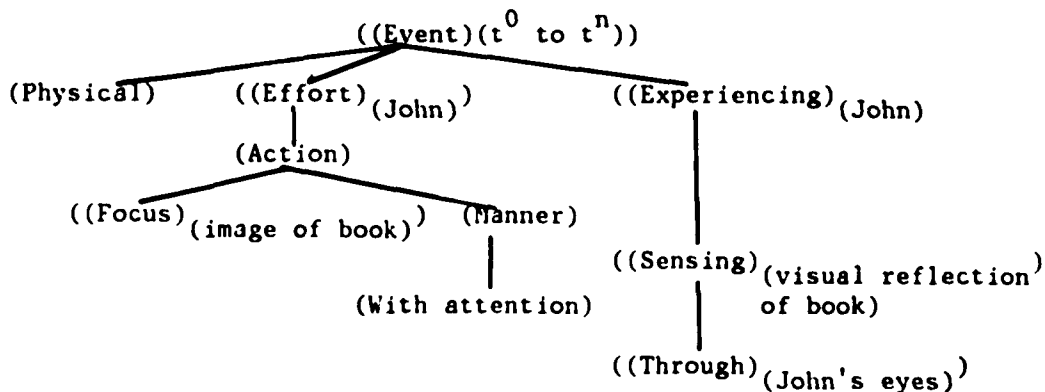


(12) JOHN BROKE HIS GLASSES:

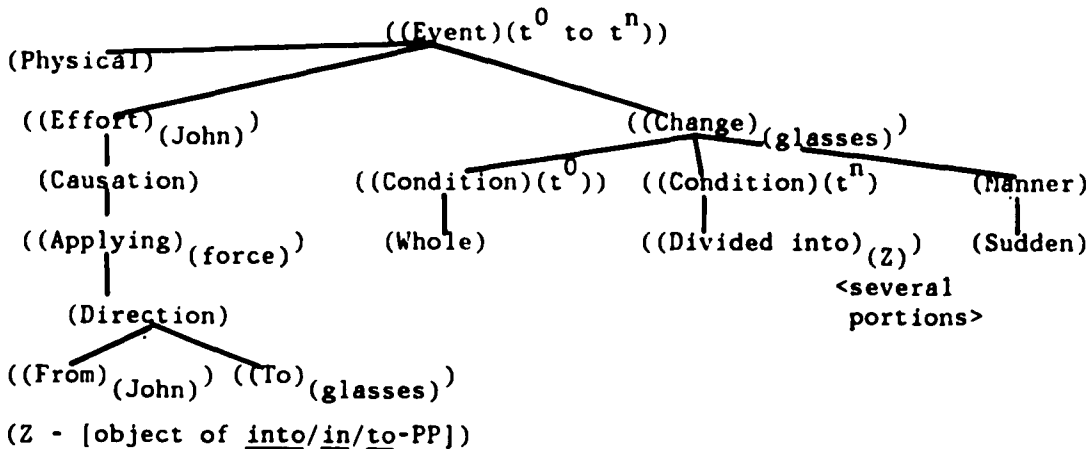


(Z - [object of into/in/to-PP])

(13) JOHN WATCHED THE BOOK:



(14) JOHN BROKE HER GLASSES:



(11) and (13) share an identical (Experiencing) branch. In fact, (11) is completely contained in (13). This explains why

(15) John watched the book and saw it
is redundant; why

(16) John watched the book but didn't see it
is contradictory; and why (7a) can be inferred from (9a). (12) and (14) share an identical (Change) branch, except for the referents of their change arguments - "his glasses" in (12); "her glasses" in (14). When the referent is the same, as in (14) and (17)

(17) She broke her glasses (in the possessive, noncausative sense)

the representation of (17) is completely included in (14). Thus, (17) is a valid inference from (10).

Spurious ambiguity also results from the distinction drawn between the Dative and the Objective. Many verbs have to be marked as having two senses, Dative and Objective, since they do not specify whether they take animate or inanimate referents. Thus, move, lift, bring, etc., have two representations: one for "John moved"; "He lifted the baby"; "He brought Mary"; and another for "The chair moved"; "He lifted the cup"; and "He brought the book". It is not clear why this distinction between animate affected entities and inanimate affected entities is made at all, since it is not expressed by the meaning of the verbs involved, but by the meaning of their complements. The decompositional approach has one representation for each of these verbs, in which the selection restrictions on the change argument require only that its referent be some physical stuff.⁴

II. CHANGE VERSUS JACKENDOFF'S AND LEVIN'S THEME

In Jackendoff's system, the distinction between animate and inanimate affected entities is not made. Theme refers to any entity that undergoes change, whether animate or not. Thus, it removes this source of ambiguity found in Fillmore's system.⁵ Another problem encountered by Fillmore is remedied by Jackendoff: Since Jackendoff does not insist on one role per argument but allows arguments to bear more than one role at the same time, he is able to capture change when the entity changed also performs some action. It is then assigned two roles: Actor and Theme.⁶

Jackendoff's Theme is more formally defined than Fillmore's "affected" entity, as the first argument of a GO function (whose second argument, a Path function, corresponds more or less to the decompositional (Condition) nodes). This formal definition makes Jackendoff's concept of change better defined than Fillmore's affect, but, consequently, renders the representational limitations of the theory more acute. Jackendoff cannot, for example, represent verbs of experience at all (whether they include action or not), since it is not possible to capture the concept of experiencing as GOing from one condition to another. GO would lose all meaning if the Actor in taste were depicted as GOing from not tasting to tasting or if the food were depicted as GOing from not being tasted to being tasted. GO would suffer from the same vagueness observed for Fillmore's "affected" Objective. Thus he cannot account for verbs like see, watch, smell, understand, want, etc. Obviously, like Fillmore, Jackendoff cannot represent the meaning of other event verbs that express neither change nor experience, such as read, play, work, speak, explain, find, fight, meet, copy, and countless others. There is a principled difference between the source of these limitations in Fillmore's theory and in Jackendoff's. Fillmore's set of Cases is limited as a consequence of his Restrictive approach. New Cases can be posited only if they give rise to distinct syntactic patterns. Therefore, it is only natural that Cases fail to draw many semantic distinctions. There are, obviously, many more semantic concepts than there are distinct syntactic patterns of complementation. But since Jackendoff's theory is Nonrestrictive, it is not bounded by syntactic considerations. The inability to represent the meaning of event verbs that do not involve change derives from the very

rationale driving Jackendoff's theory: the motional model. Since motion verbs necessarily involve change, Jackendoff is committed to represent all other events, by analogy, as involving change too. The variety of verbs that obviously do not involve change should provide sufficient evidence for questioning the motional model. That Jackendoff does not do so is inexplicable. Jackendoff concentrates solely on verbs that involve change. But even within this limited range, the motional model fails. As is shown in the following discussion, the model is irrelevant to the representation of temporal changes and is misleading in the representation of possessional transfers.

Jackendoff justifies the analogy to motion by observing that the use of many motion verbs is extended to other fields, to express propositions about time, possession, identity, and other subject matters. This is true. Verbs such as move, turn, rise, and many others, are used across semantic fields: "We moved the date of the meeting", "He turned into a pumpkin", "The temperature rose", etc. But this observation has little to do with the claim that non-motional meaning can be represented analogously to motional meaning. The fact that motion verbs can be used to express events in other semantic domains does not logically imply that the representation of their non-motional meanings should be modeled after their motional meaning. Nor does it imply that the representation of non-motional verbs should be modeled after it. The irrelevance of the extension hypothesis becomes clear when Jackendoff's representations are compared to parallel decompositional representations. His representation of non-motional change turns out to be completely independent of motion.

Jackendoff offers two representations for the meaning of the causative move: (18) for the sense of spatial change of location and (19) for the sense of temporal change.

(18) [_{Event} CAUSE (X, [_{Event} GO([_{Thing} Y], [_{Path} FROM (Z) TO (W)])))]

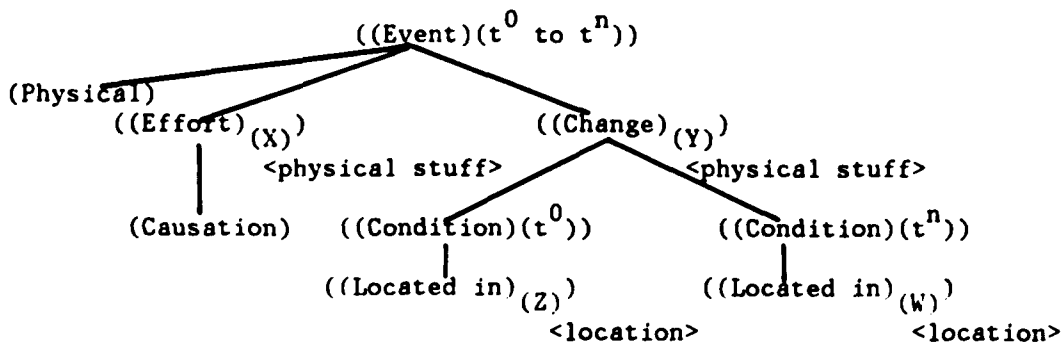
and

(19) [_{Event} CAUSE (X, [_{Event} GO_{Temp}([_{Event} Y],
 $\left[\begin{array}{l} \text{FROM}_{\text{Temp}} ([\text{Time } Z]) \\ \text{Path TO}_{\text{Temp}} ([\text{Time } W]) \end{array} \right]])))]$

(Jackendoff 1983:172, 190). Thus, there are two representations, that is, two senses, for move but probably only one sense for postpone, which, not being a verb of motion, has only a temporal sense. Its representation would probably also be (19).

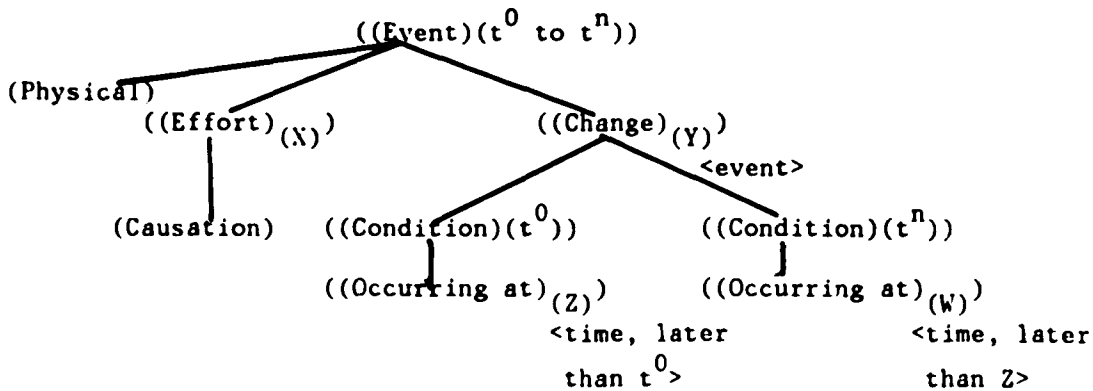
The decompositional theory, which does not consider motion verbs any more prototypical as event verbs than temporal verbs, has very similar representations:

(20) MOVE (locational, causative):



X - [subject] (Y - [object of from-PP])
 (Z - [object of to-PP OR location adverb])

(21) MOVE (temporal, causative)/ POSTPONE:



X - [subject] Y - [object] (Z - [object of from-PP])
 (W - [object of to-PP])

(20) and (21) parallel (18) and (19). The same concepts are represented in both systems: the concept of change (marked by (Change) and GO respectively); the concept of location (decompositionally captured by (Located) and <location>; unmarked GO for Jackendoff); the concept of time (decompositionally captured by (Occurring) and <time>; marked by GO_{temp} and Time by Jackendoff).

Jackendoff's choice of primitives makes it seem as if the representation of temporal verbs is modeled after that of motional ones. He uses "go", a motion term, as the name for his change function and labels it with a subscript only when used non-motionally, thus implying that the unmarked GO is somehow more primary than the marked one. But the decompositional representations capture the similarities between (20) and (21) just as easily by using more general terms. Instead of GO, (Change) is used, which makes it clear that the concept of change is not particular to motion; and all kinds of change (motional or temporal) are marked with appropriate selection restrictions of either location or time. Thus, in order to represent the similarity shared by senses from different semantic

fields, a semantic theory does not have to accord motion a privileged semantic status.

The decompositional representations of move and postpone show that the phenomenon of extension is irrelevant to the accuracy of semantic representations of either motional or non-motional senses. Jackendoff's representations do not capture any semantic concepts that are not captured by the decompositional representations. Thus, the motional model governing Jackendoff's approach must have some other explanatory value. What seems to follow from the extension hypothesis is that motion verbs have some unique semantic properties, due to the process of extension they undergo. For example, they should be more ambiguous than other verbs, since they are used to express other non-motional meanings, while verbs from other domains are not extended. This generalization holds for move versus postpone, but does not hold for most other verbs. Many non-motional verbs, such as make, do, and get are highly ambiguous, while many motional verbs, such as fly, ride and swim are not. Levin attempts to refine the extension hypothesis by separating motion (and other extendable) verbs into finer semantic classes. Thus the claim is that verbs close in meaning follow similar extension patterns. That is, near motional synonyms should be expected to extend to the same semantic fields. But, in fact, there are very weak correspondences between meaning and extension patterns, and verbs close in meaning do not exhibit uniform extensions. Thus, "He raised the temperature" but not *"He lifted the temperature" ; "We moved the meeting" but not *"We displaced the meeting" or *"We relocated the meeting".

The extension hypothesis is not uniform enough to explain the semantic properties of motion verbs. Its explanatory value is limited to predicting which types of verbs are more likely to be extended than others. It explains, for example, why move, is more likely to acquire a temporal sense than postpone is to acquire a motional sense. But this fact does not grant motion verbs any special semantic status, and does not justify their use as a model for the representation of all other verbs. Many verbs denoting concrete events are potentially extendable and may acquire additional, more abstract or more metaphorical senses over time. Thus, "cut diplomatic ties", "break an engagement", "see the meaning", and many more. If the extension hypothesis is evoked to explain the historical development of ambiguity, it should not treat motion verbs differently than other verbs depicting concrete events.⁷ Finally, even if extension provides an explanation for how verbs acquire additional senses through time, such an explanation is external to a semantic theory, whose purpose is to capture the synchronic, literal senses of lexical items and the relations that hold among them, without tracing the historical derivations that have contributed to produce these relations.

The discussion of locational and temporal changes illustrated that a motional model is irrelevant to the representation of the similarities exhibited by verbs from these two domains, since Jackendoff's "motional" representation of time does not differ significantly from the non-motional decompositional representation. In representing changes in other domains, the motional model can be misleading. This is illustrated by

Jackendoff's treatment of verbs of transfer of possession. Jackendoff represents the meanings of lose, used in sentences like (22)

(22) Beth lost the doll

as (23):

(23) [_{Event} ^{GO}_{Poss} (X, [_{Path} ^{FROM}_{Poss} (Y)])]

(23) represents lose as a change in the object lost, which moves in some abstract fashion from being in the possession of Y to not being in its possession. But the change expressed by lose is more accurately rendered as a change occurring to the possessor rather than to the thing possessed. This is clear from the use of the verb in other semantic domains, as in (24)

(24) The plane lost altitude

where the change occurs in the condition of the plane and not in the condition of some altitude. To represent (24) as the altitude going away from the plane seems odd. This is further exemplified by the use of lose in sentences such as

(25) He lost his sight

and

(26) He lost his life

which are synonymous with

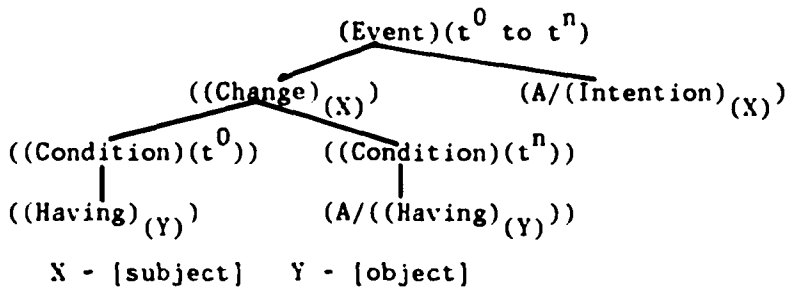
(27) He became blind

and

(28) He died

clearly depicting a change in the condition of the referent, and not in the attribute itself. Thus the decompositional representation of the possessional lose marks the change as occurring to the possessor:

(29) LOSE:⁸



(29) avoids the oddity of representing (24) as an abstract motion of the altitude and gains in generality over (23). It captures a general sense of lose, which is applicable in many domains, since it is indeterminate with respect to the (Having) relation it specifies. (Having) can be further modified in four different ways, as indicated by the following four redundancy rules in the dictionary:

(30) ((Owning)_(X) (Y)) --> ((Having)_(X)(Y))
 <sentient> <stuff>

(31) ((Possessing)_(X) (Y)) --> ((Having)_(X)(Y))
 <animate> <physical stuff>

(32) ((Possessing)_(X) (Y)) --> ((Having)_(X)(Y))
 <entity> <attribute of X>

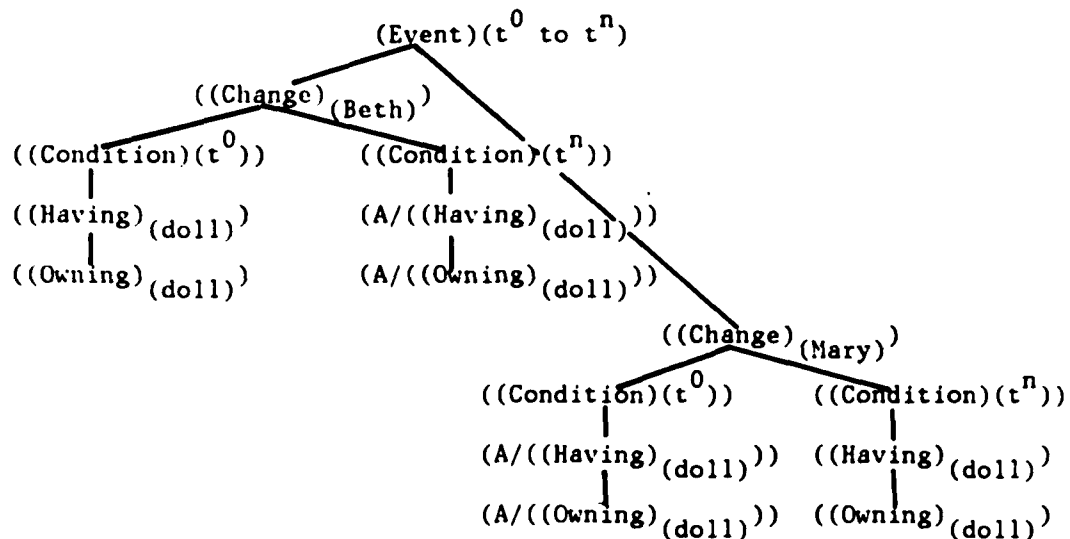
(33) ((Containing)_(X) (Y)) --> ((Having)_(X)(Y))
 <entity> <part of X>

(30) specifies the relationship that holds between a sentient being capable of ownership and an object or substance he can own. Note that the thing owned does not have to be physical: one can own the rights to a book, an idea, etc. Moreover, when the initial ownership is terminated, a new ownership can be established. New ownership is expressed in

(34) Beth lost the doll to Mary

When the representation of new ownership is projected on (29), the result is as follows:

(35) BETH LOST THE DOLL TO MARY:



A slight digression is needed here, to explain the formal conditions allowing the introduction of a second (Change) node into (29). (29) is indeterminate with respect to a second change of possession. The implication of the antonymy relation specified in it, repeated here as (36),

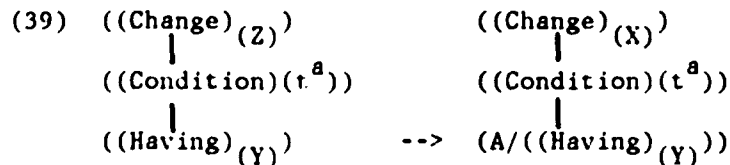
(36) (A/((Having)_(X) (Y)))

is that Y is either not possessed by anybody, or it is possessed by somebody other than X.⁹ The implication of (22) is that (at tⁿ) the doll is either not possessed by anybody, or it is possessed by somebody other than Beth. Thus, the following is logically possible:

(37) ((Having)_(Z) (Y)) --> (38) (A/((Having)_(X) (Y)))

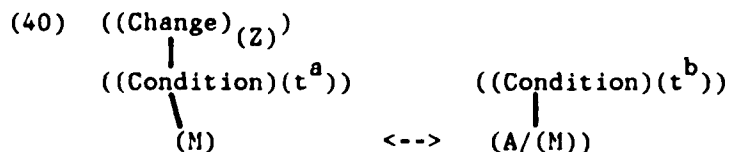
That is, if X does not possess Y, it is possible for Z to possess it. Formally, the presence of (38) in any representation allows the presence of (37) as well. (If Beth does not possess the doll, it is possible for Mary to possess it.) In (29), (38) is dominated by a (Condition) and a

(Change) nodes. Similar nodes must dominate (37), if it occurs. Thus, a redundancy rule is needed in the lexicon, in order to specify these superordination relations:

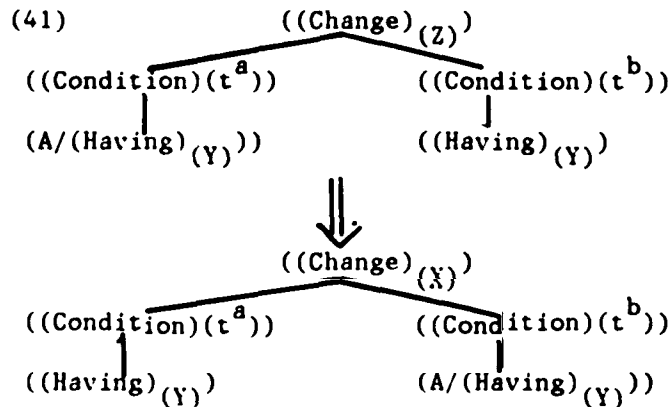


In terms of (22), if at time t^a , Beth's condition is one of not possessing the doll, it is possible for Mary to be in a condition of possessing it at that time.

The remaining question is how is the second condition of the change in Z inserted. Its presence is logically implied by the presence of (Change): For a change to occur, the entity changed must be in two different initial and final conditions. The representations of these different conditions form an antonymy-tuple, since they must be mutually exclusive. Thus, the following must apply:



This formally captures the fact that when a change occurs in Z, if (M) is predicated of Z under one condition, then (A/(M)) must be predicated of it under the second condition. In terms of (22), if Mary is in possession of the doll at the end of the change, she must not be in possession of it at the beginning of the event. The combination of the redundancy rule (39) and the logical equivalence (40) yield the following:



Thus, an event verb depicting a change in the relation between X and Y can be further modified to include another (Change) branch, depicting a change in the relation between Z (a member of the complement of X) and Y. This seems to be a general principle.

(31) specifies physical possession, established by virtue of holding the object or being in close proximity to it. The selection restrictions on X specify <animate>, since animals can also hold objects; and the selection restrictions on Y specify that it must be a physical object. The relation between X and Y is represented by (Possessing). Thus (22) is indeterminate between the ownership sense, according to which Beth no longer owns the doll; the sense of physical possession, according to which she is no longer in physical contact with it; or a combination of the two.

(32) specifies the possession of an attribute, which is the sense specified by sentence (24). Transfer of an attribute is not possible:

(42) *The plane lost altitude to the other plane.

The possible addition of a second (Change) branch should be barred in such cases. This is achieved by the selection restrictions on Y in (32). The

restrictions specify that Y is an attribute of X. Thus, the representation of (42) includes contradictory restrictions: Under the (Change) node for X, Y is specified as an attribute of X. Under the (Change) node for Z, it is specified as an attribute of Z. Consequently, no reading is obtained for (42).

(33) specifies the relation between a whole and its parts. Thus,

(43) Beth lost a tooth

is indeterminate between a sense of physical possession ("Beth lost the tooth she was holding") and the sense of containing a part.

The decompositional representation of lose captures a general sense of the verb, which ranges over a variety of semantic domains. Jackendoff's representation of it, by contrast, is limited to instances of ownership or physical possession only. This is due to his representation of lose as a change occurring in the entity lost, motivated by the motional model. Similar arguments can be made in connection with Jackendoff's representation of receive, which is also unnecessarily limited by the motional model:

(44) [_{Event}^{GO}_{Poss} (X, [_{Path} FROM_{Poss} (Y) TO_{Poss} (Z)])]

(44) specifies receiving as an event in which the entity received goes from the possession of a source to the possession of a goal. But this characterization is ill-suited to represent the senses of sentences such as :

(45) John received a lot of money from the sales of his book

and

It is rather odd to represent (45) as an event in which the money goes from possession by the sales to possession by John. Similarly, (46) is not an event in which a name is in the possession of the publisher and moves to be in possession of the book. Here, too, the various applications of the verb are better captured under one general sense, representing the change as one in the condition of the receiver. The particular (Having) relation holding between the receiver and the entity received is further specified by the complements referring to these entities, as illustrated with lose. The decompositional representation of receive is the following:

```

graph TD
    Root["((Event)(t0 to tn))"]
    Root --- Left["((Effort)(X))"]
    Root --- Right["((Change)(Y))"]
    Left --- Causation["(Causation)"]
    Right --- Cond0["((Condition)(t0))"]
    Right --- CondN["((Condition)(tn))"]
    Cond0 --- Having0["(A/((Having)(Z)))"]
    CondN --- HavingN["((Having)(Z))"]
    style Left fill:#f0f0f0
    style Causation fill:#f0f0f0
    style Having0 fill:#f0f0f0
    style HavingN fill:#f0f0f0
    style Root fill:#f0f0f0
    style Cond0 fill:#f0f0f0
    style CondN fill:#f0f0f0
    style Right fill:#f0f0f0
  
```

Unlike (44), (47) is causative, since the event of receiving does, in fact, involve causation. In order for one entity to receive something, another entity must provide it. The causative entity can be realized syntactically as a complement of a from prepositional phrase. It refers to either an entity or an event, as illustrated by the complements of (45) and (46). Note, however, that it cannot be a location. "John received money from Paris" does not mean that Paris is the cause in the event. This fact falls naturally from (47). The mapping frame for X allows from Paris to replace X, but the selection restrictions on X are violated by such a

replacement, making the causative reading deviant. From Paris can only figure as a location modifier, which is optional with any event verb, unless explicitly barred. Like in lose, the addition of a second (Change) branch is possible, as in "John received money from Mary".

The conclusion that emerges from the analysis of lose and receive is that these verbs have a meaning that is more general than that of ownership or physical possession. In order to account for their wider meaning, their representations should not be modelled after those of change of location. Ironically, what motivates Jackendoff's motional model is the observation that certain verbs express meanings that range over several semantic domains. The motional model is supposed to capture this fact. But it is, on the contrary, what prevents Jackendoff from accounting for the larger meaning of possessional verbs.

III. CONCLUSION

From the three thematic roles discussed in these chapters, Theme is perhaps the most obscure. In principle, it is said to correspond to the semantic concept of change (and experience, according to Fillmore). But when it is taken to represent change (and experience) only, many verbs that do not express change fail to be represented thematically. Fillmore ignores this problem by holding a very vague notion of affect, which is free to apply to any syntactic object in the absence of a more suitable role. But by doing so, he obviously deprives his Objective Case of any semantic meaning. If Cases are meant to account for speakers' semantic judgements, the Objective Case fails to do so, since it is made to cor-

respond to any semantic concept. Jackendoff attempt to solve this problem in a principled way. According to his extension hypothesis, all verbs can be represented on the basis of motion. Since motion necessarily involves change, all other event verbs involve it too. Jackendoff's Theme is less vague than Fillmore's affected entity, but it only makes the problem more apparent. Verbs that do not express change receive a meaningless Objective representation in Fillmore's theory but receive no representation at all in Jackendoff's. Jackendoff's failure to address this fundamental flaw in his theory is puzzling. Levin, who accepts Jackendoff's model, also avoids a discussion of the limitations of the motional model. She merely notes that non-motional verbs, such as verbs of cognition and feeling, have a thematic structure that is similar to that of motion verbs. The similarity, however, seems to be mainly syntactic.

Theme is therefore completely unsuitable for the representation of verbs not expressing change. But even for verbs expressing change (or experience), it fails to provide accurate semantic representations. Fillmore's representations fail to handle verbs that express both action and experience on the part of the same participant, arbitrarily assigning Agent rather than Dative in those cases. And his distinction between Dative and Objective represents verbs that can take both animate and inanimate referents as spuriously ambiguous. Jackendoff represents motional change by means of a GO function, whose first argument is labelled Theme. As far as motion goes, he is able to represent the meaning of predicates expressing motion, since they necessarily involve the concept of change. But the extension hypothesis leads him to represent all other

change events as including a motion-like Theme. His representation of temporal changes is accurate, but only because it does not involve any motional concepts. His representation of possessional changes is unnecessarily limited by the motional model. Thus, at best, the motional model is irrelevant. At worst, it is a principle that prevents the theory from accounting for non-change verbs. Since it does not account for any semantic property or relation that is not accounted for by a non-motional approach, and since it creates severe representational problems, a Non-restrictive theory, committed to a full semantic representation of meaning should not be governed by it.

FOOTNOTES

1. Chomsky does not discuss this role.
2. Since Levin's role of Theme/Patient is very similar to Jackendoff's, the discussion in Section II refers to her theory as well.
3. The fact that read and taste are explicitly noncausative needs not be specified by an explicit (A/(Causation)) node, since there is no redundancy rule that would apply to add (Causative) to their representations otherwise. Recall that an explicit (A/(M)) marking is required only if there exists a redundancy rule that allows the addition of (M). The redundancy rule governing the optional addition of a (Causation) node, given as (3) in Chapter 5, is:

$$\begin{array}{ccc} ((\text{Causation})_{(X)}) & \text{-->} & (\text{Event}) \\ & & \downarrow \\ & & ((\text{Change})_{(Y)}) \end{array}$$

It allows (Causation) to be added only to verbs that specify change. Since neither read nor taste specify change, they cannot acquire a causative meaning.

4. See the decompositional representation of locational move in Section II, below.
5. Levin adopts Jackendoff's Theme role in its entirety. She makes a minor nominal distinction between Theme and Patient: the former applies only to verbs of motion, that express change in location; the latter to all kinds of verbs expressing physical change. Jackendoff uses the term Theme to refer to all verbs of change - whether motional or not. Since the distinction bears no significant semantic implications, the following discussion of Theme refers to both Jackendoff's and Levin's Theme/Patient role.
6. See discussion in Chapter 7, Section II.
7. Processes of extension are discussed in length in Lakoff and Johnson (1980:25): "Just as the basic experiences of human spatial orientation give rise to orientational metaphors, so our experiences with physical objects (especially our own bodies) provide the basis for an extraordinarily wide variety of ontological metaphors, that is, ways of viewing event, activities, emotions, ideas, etc., as entities and substances."
8. As was pointed out to me by P. Postal, lose differs from most verbs that can take sentient referents in that it specifies lack of intention. Is is therefore explicitly so marked. Lack of intention differentiates it from other verbs denoting deliberate cessation of possession, such as throw away or give. Thus the following inference:
Mary threw away her book --> Mary lost her book
is invalid.

9. To be precise, (36) specifies the following disjunction:

$(A/(\text{Having})) \vee (A/(X)) \vee (A/(Y))$

corresponding to three possible complements: either the relation holding between X and Y is not one of (Having), but some other relation; or the relation of (Having) holds between Y and the complement of X; or the relation of (Having) holds between X and the complement of Y. (29) does not specify which of these holds in fact. The first and third disjuncts are irrelevant to the present discussion. The first simply allows any other relation to hold between X and Y. Thus, X can be near Y; X can desire Y; etc. The third simply allows X to have things other than Y. The following discussion concerns the second disjunct, which specifies that Y is possessed by the complement of X - that is, either by nobody at all or by somebody other than X.

CONCLUSION

The main claim of this dissertation is that meaning is best captured by a semantic theory that is Nonrestrictive and non-thematic. Negative support for this claim was presented in the first four chapters, where the Restrictive and thematic principles of the four theories examined were shown to give rise to syntactic and semantic problems. Positive support was presented in Chapters 5 to 9, where decompositional representations modelled after Katz's Semantic Theory, which is Nonrestrictive and non-thematic, were shown to be free of these problems.

The discussion of Fillmore's Case Theory, Chomsky's Theory of Government and Binding and Levin's Lexical Semantics revealed the limitations imposed on thematic representation by an underlying Restrictive approach. The Restrictive approach divides semantic content into two parts: semantic relations that hold between a predicate and its arguments on one hand, and semantic concepts inherent in the meaning of the predicate on the other. The former, referred to as thematic relations and represented by thematic roles, are said to be part of speakers' competence and are represented by the Restrictive theories; the latter are said to constitute extra-linguistic knowledge and are not represented by these theories. The justification for this division is syntactic: according to the Restrictive view, there is a strict correlation between the semantic arguments

of a predicate and its syntactic complements, whereas no connection exists between other semantic concepts inherent in the meaning of the predicate and its syntactic behavior. Thus, the syntactic relevance of arguments is the reason for representing them as linguistic phenomena, while the syntactic irrelevance of other semantic concepts disqualifies them from being considered linguistic.

The use of a syntactic criterion for determining the nature of semantics and the extent to which it should be accounted for by the theory yields semantic representations that are arbitrary, vague and circular. Arbitrariness manifests itself on all levels: As was discussed in Chapter 1, Fillmore acknowledges that semantic judgements are part of speakers' competence, but in the absence of a semantic criterion, his notion of these judgements is arbitrary. It fails to distinguish linguistic judgements, such as whether a participant in an event performs action or not, from extra-linguistic ones, such as whether a participant is held morally or legally responsible for the result. Arbitrariness is also found in the Restrictive choice of what semantic concepts to represent. Thus, Fillmore represents animacy, since he distinguishes between animate Datives and inanimate Objectives; but he does not represent change, since he does not distinguish between Objectives that are altered as a result of the event and Objectives that remain unchanged. The arbitrary choice of concepts to be represented results in an arbitrary classification of predicates. As was noted in Chapter 1, "break the window" and "watch the ball" receive identical Case representations (both are Agentive and Objective); whereas "watch the ball" and "watch Mary" receive different ones

(the former is Agentive and Objective; the latter, Agentive and Dative). Thus, similarity of thematic representations does not reflect similarity in the meaning of the predicates represented. Finally, there is arbitrariness in the treatment of different instances of the same semantic concept. Both Fillmore and Levin represent and account for instrumentality when it is expressed by a with prepositional phrase (as in "with a knife") but do not account for it when it is inherent in the meaning of the verb (as in "to knife").

From a semantic point of view, Chomsky's representation of thematic relations is the most arbitrary among the Restrictive theories. As discussed in Chapter 2, theta-roles need no semantic content at all in order to operate within the Government-and-Binding context. Roles only mark positions as theta-positions, thereby assuring that these positions are occupied by lexical noun-phrases. This theta-marking stands for an abstract relation between the head predicate and its syntactic complements, which can be captured by means of a single abstract theta-role. Chomsky's attempt to equate this abstract relation with thematic relations of the kind posited by Fillmore, Gruber and Jackendoff, was found to be totally unmotivated.

Vagueness is another consequence of employing a syntactic criterion for semantic representations. The Restrictive theories hold that there are regular correspondences between thematic roles and syntactic structures. In order to maintain these correspondences in spite of factual counter-evidence, the theories must successively redefine the semantic

content of their thematic roles, until the roles become completely vague. As discussed in Chapter 1, Fillmore's Objective Case is devoid of any semantic content, since it has to apply to all syntactic objects that are neither Dative nor Factive; that is, to all noun-phrases in object position that refer neither to animate affected beings nor to newly created entities. To accommodate this variety of referents, the Objective Case is said to be "semantically neutral". Levin, too, posits roles whose semantic content is too general to be meaningful. Thus, in order to maintain the generalization that Agents are always realized as subjects of transitive verbs (such as "break", "love" and "find"), Levin implicitly abandons her initial semantic description of Agent as a person causally involved in the event and allows it to apply to any participating entity that can appear in subject position. As for Chomsky's theta-roles, since, as discussed in Chapter 2, they are devoid of any semantic content, the question of vagueness does not arise.

The third consequence of adopting the Restrictive approach is circularity. The proponents of this approach reject independent semantic criteria for establishing the presence or nature of roles: semantic intuitions are said to be non-linguistic, vague and unreliable; more formal criteria are not available since the theories do not have an independent semantic component, where such criteria can be formulated. By incorporating syntactic criteria instead, the theories become circular. This was noticed most strikingly in the discussion of Levin's correspondences. The fact that "The window broke" includes a Theme, whereas "John ate" includes an Agent is said to correspond to the difference in

the deep structures of these sentences: "window" is deep object, but "John" is deep subject. This syntactic difference is then used to determine thematic structure in less obvious cases: "John walked", "John went" and "John swam" (where "John" is deep object) are said to include Theme, whereas "John slept" and "John dined" (where "John" is deep subject) are said to include Agent. Thus, the correspondence between thematic structure and syntactic structure holds by definition. When Levin claims that the former serves to predict the latter, the theory becomes circular.

The Restrictive theories reveal syntactic problems as well. Even when the semantic content of thematic roles is ignored, in accordance with the syntactic needs, the roles still fail to provide accurate syntactic predictions. Fillmore's Cases fail to generate well-formed sentences such as "The door opened with a key" and do generate ill-formed ones such as "The key was opened the door". Chomsky's theta-criterion cannot account for optional complements such as "into pieces" in "break into pieces"; and Levin's principle of extension fails to account for participation in syntactic alternations, such as the Dative alternation, discussed in Chapter 3.

The adoption of a syntactic criterion to determine the extent of semantics which must be accounted for by the theory is puzzling: why should a difference in the syntactic realization of two concepts indicate a difference in their semantic nature? Since, intuitively, form does not necessarily reflect meaning, one would expect the Restrictive theories

to provide some justification for using a syntactic criterion to determine the range of their semantic representation; but they offer none. Instead, they simply assume the existence of strong correspondences between thematic roles and syntactic complementation and proceed to describe them. In Chapters 1 to 3, factual evidence was provided to refute the existence of these correspondences. This factual evidence explains why theories that are based on these correspondences fail both semantically and syntactically. The conclusion drawn from the discussion was that in order to provide accurate syntactic representations and consistent semantic representations, a linguistic theory should be Nonrestrictive. That is, it should not attempt to derive syntactic configurations from the semantic relations that hold between a predicate head and its arguments, but rather generate them independently of semantics. As for its semantic representations - it should represent all semantic concepts, regardless of their syntactic realization and should employ independent semantic criteria for determining the nature of these concepts and their relations.

Jackendoff's theory is Nonrestrictive. As such, it differs from the Restrictive theories in two important respects: its syntactic structures are not derived from semantic representations but linked to them by means of mapping rules. Thus, the theory does not exhibit the syntactic problems encountered by the Restrictive theories. Semantically, although the theory is based on a thematic model, it does not employ thematic roles in its representations. Instead of using Agent, for example, Jackendoff represents action, causation and intention as three separate concepts. His concepts are thus more precise than those of the Restrictive theories.

However, in spite of being Nonrestrictive, Jackendoff's theory is severely constrained by its adherence to a motional model. In this respect, it is even more restricted than the Restrictive theories: it attempts to represent all verbs by means of concepts taken from the semantic field of motion, whereas the other theories are not bound by the semantic relations of motion.

Jackendoff's theory is based on two conflicting principles: on one hand, there is a commitment to full semantic representation of all concepts conveyed by the meaning of any lexical item; on the other, there is a commitment to representation by means of motional functions. In Chapter 4, evidence was provided against the limitations imposed by the motional model. It was shown that state predicates, such as "be to the left of" cannot be represented by means of Theme, which refers to moving entities, since such representations do not reflect the synonymy of symmetric spatial relations, as the one holding between "The cat is to the left of the dog" and "The dog is to the right of the cat". More severely, it was shown that event verbs which do not (necessarily) express change, cannot be represented at all within Jackendoff's system. Since this inability to represent events where no change occurs is caused by the motional model, the conclusion that emerges is quite clear - a motional model should not be adopted by a semantic theory that is committed to the representation of events in general.

Jackendoff's semantic representations were also found limited by their formalism. Functions define the semantic categories of their arguments.

Thus, the second argument of CAUSE is always an event. This makes CAUSE suitable for the representation of external causation, as conveyed by the verb "cause", but unsuitable for the representation of internal causation, as conveyed by "break". By always treating parts of causative events as being events themselves, Jackendoff fails to differentiate between external and internal causation and provides a single CAUSE representation for both "break the window" and "cause the window to break". Furthermore, functions require a fixed number of arguments, but the meaning of predicates can involve any number of semantic concepts. Since CAUSE allows for one event only, Jackendoff cannot represent the multiple changes expressed by "sell" or "trade". In order to represent these verbs, Jackendoff is forced to relax the constraints on his formalism. These limitations of the functional formalism discussed in Chapter 4 led to the conclusion that semantic functions are not an appropriate form for semantic representation.

In the second part of the dissertation, the nature of a Nonrestrictive and non-thematic theory, as exemplified by Katz's Decompositional Theory, was discussed. The theory is committed to provide full representations of the meaning of linguistic expressions; that is, to account for every aspect of their inherent meaning. The theory provides these representations by decomposing the inherent meaning into primitive concepts, thus capturing both meaning similarities between items (such as the fact that both "break" and "crack" express a sudden change in the wholeness of some solid physical stuff) as well as differences in meaning (such as the fact

that "break" includes a division of the object into several parts, whereas "crack" only includes the containment of cracks).

The particular concepts inherent in the meaning of a lexical item are determined on the basis of semantic intuitions. These intuitions about the semantic content of lexical items are checked against the semantic properties and relations that result from positing them. A candidate concept is found to be a genuine concept if it serves, for example, to differentiate between the meanings of otherwise identical items. Thus, causation is a genuine concept since it differentiates between the causative and the noncausative senses of "break". Further confirmation for it comes from the fact that the proposition "John broke the window" entails "The window broke". The relation of entailment is possible only when the sense of the premise completely includes the sense of the consequence. Entailment holds in this case since the sense of the premise includes the concept of causation, which the sense of the consequence lacks.

The concepts not explicitly mentioned in the decompositional representation of a certain lexical item are as important as as it is to note those explicitly mentioned. Concepts that are not mentioned and are subordinate to the concepts mentioned are interpreted as undetermined by the meaning of the lexical item represented. Thus, the absence of a causation node in the representation of the noncausative sense of "break" signifies that this sense does not determine whether causation occurs or not. Therefore, both "Something broke the window" and "Nothing broke the win-

dow" are compatible with "The window broke". As discussed in Chapter 5, indeterminate concepts can become explicit with the addition of modifiers or complements. Thus, "The window broke by itself" explicitly determines the lack of a causative entity. The representation of indeterminacy is crucial for a semantic theory because indeterminacy is a major semantic phenomenon. But as shown in Chapter 5, this feature is unique to the Decompositional Theory. Neither the Restrictive theories nor Jackendoff's theory account for indeterminacy. They consider some cases of indeterminacy to be instances of ambiguity. Thus, Fillmore posits ambiguity for "break", between a sense on which an instrument causes the change and a sense on which an agent does it. They fail to account for other cases. Thus, Jackendoff fails to account for the difference between "The window broke", where causation is indeterminate, and "The window broke by itself", where lack of causation is explicitly marked.

The decomposition of senses into primitive concepts, the determination of explicitly inherent or indeterminate concepts, and the distinction among various senses of the same lexical items were the issues discussed in Chapter 5. They were illustrated with the representations of several senses of "break". The discussion clarified the aspects in which the Decompositional Theory is semantically superior to the thematic theories. First, it is not arbitrary in the choice of the concepts represented, since it accounts for every concept inherent in the meaning of lexical items, whether predicated of an argument or not. Thus, it represents both the fact that "break" refers to a sudden event (although the suddenness is not predicated of any entity participating in the event) and the fact

that "break" includes causation. Moreover, it is not arbitrary with respect to the representation of different instances of the same concept. Thus, the division into parts is represented in the meaning of "break", whether the parts are expressed by a syntactic complement (such as "into pieces") or not. This inherent division into parts is necessary to explain the difference in meaning between "break" and "crack".

Unlike the Restrictive theories, the Decompositional theory does not contain vague notions because it differentiates among concepts that can occur independently of each other. For example, instead of using the notion of agency, as a vague term marking action, causation, and autonomy, it represents each of these concepts individually. As discussed in Chapter 7, the Restrictive failure to distinguish among these concepts forces Fillmore to always require the co-occurrence of these concepts. This requirement is too strong. It forces Levin, on the other hand, to stipulate a mere disjunction. This stipulation renders Agent too vague. The Decompositional treatment, by contrast, is accurate: on one hand, these concepts are represented individually, to provide for their independent occurrences; on the other, redundancy rules are formulated to capture certain dependencies that do exist among their occurrences. These rules specify, for example, that action always co-occurs with autonomy, without requiring autonomy to occur only in the presence of action.

Finally, unlike the Restrictive theories, the Decompositional Theory is not circular. By employing semantic intuitions, it does not base its semantic representations on syntactic structures. For example, it re-

presents both "John broke his arm" (on one sense) and "John's arm broke" as noncausative, although one is transitive and the other is not. When semantic concepts are determined independently of syntactic criteria, the lack of correspondence between the two becomes obvious. This was discussed in Chapter 6, with respect to the number and nature of semantic arguments versus the number and nature of syntactic complements that they map onto. When semantic arguments are determined on the basis of meaning rather than on the basis of syntactic configurations headed by the predicate, different mappings of arguments onto complements can be accounted for. The Decompositional Theory accounts for semantic arguments in a consistent fashion, regardless of their syntactic realizations. All arguments inherent in the meaning of a predicate figure in its sense representation. When they are expressed as syntactic complements, a process of composition takes place, to unify the representation of the predicate with the representations of the complements. As was discussed in Chapter 6, any additional semantic content conveyed by the complements is added to the argument representations already existing in the representation of the verb, in accordance with the projection principle. After the process of composition has taken place, and all the variables in the representation of the predicate are removed, composed semantic representations have the same structure as non-composed ones. Thus, the semantic representation of "break into many small pieces" is identical to that of "fragment", although the former is composed of a predicate and complement and the latter consists of a single lexical item.

The thematic theories, by contrast, do not handle all arguments consistently: They completely ignore arguments that are never syntactically realized, such as the cracks in the meaning of "to crack". And they cannot represent arguments that are only optionally realized. Fillmore can accommodate them only at the expense of syntactic accuracy. Thus, he can account for "The window broke into pieces" only at the expense of allowing the generation of "The pieces broke the window" as a possible alternative surface structure. Chomsky must list every optional complement as constituting a separate entry for the verb, since the theta-criterion cannot handle optionality. Thus, "break" will be listed once as assigning a role to "pieces" and once as not assigning such a role. As for Jackendoff, since his semantic representations are not fully decomposed, his treatment of optional arguments remains obscure.

The conclusion drawn in Chapter 6 was that the mapping of semantic arguments onto syntactic complements is much more complex than the simple correspondences assumed by the Restrictive theories. To be able to capture these complex relations, a linguistic theory must generate independent syntactic configurations, independent semantic representations, and mapping rules to link individual configurations to the senses they express.

The need for an independent level of semantic representation and for mapping rules is an argument against the Restrictive approach but not against theories like Jackendoff's, that are Nonrestrictive yet thematic. As was discussed in Chapter 4, Jackendoff's theory is thematic to the extent that it uses the thematic structure of motion as a model for the

semantic representation of events in general. Thus, the role of Theme, which refers to the entity in motion, is assigned by definition in any non-motional event (or state). As justification for the motional model, Jackendoff cites the phenomenon of lexical extension, according to which, it is claimed, verbs of motion are used to refer to non-motional events as well.

In Chapter 9, this claim was brought into question. Although it is true that some motion verbs have other non-motional senses, this observation does not suffice as justification for the adoption of a motional model. Logically, the fact that motion verbs have meanings in other semantic domains does not imply that these are to be represented in motion terms. Factually, the extension phenomenon is more general than the one described by Jackendoff: it applies to various concrete verbs ("break an engagement" and "cut diplomatic ties"). Moreover, the extension is not regular enough to predict which concrete verbs are extended and to which other semantic domains. Thus, no advantage is gained by adopting this model. There is no gain in explanatory power: the model cannot serve to predict the semantic properties of verbs. It cannot determine, for example, that the motional "move" or "rise" are more ambiguous than the non-motional "make" or "transform". It does not increase the economy or efficiency of representation: the representation of a non-motional sense of a certain lexical item is independent of the representation of its motional sense. Thus, "move" has a temporal representation, independently of its spatial representation. On one hand, the motional model is devoid of semantic significance. On the other, it severely restricts the power

of a semantic theory based on it. Since motion is a type of change, the model prevents the theory from providing representations for events that do not include change. Thus, simple verbs like "read", "watch", "push", and "taste", cannot be represented at all. As for the representation of change, the motion model is either irrelevant to the representation (as in the case of the temporal "move") or too narrow (as in the case of "lose", described in Chapter 9).

The conclusion drawn from the discussion of Theme in Chapter 9 is that a thematic theory, based on the extension of the thematic structure of one domain to all other domains, fails as a semantic theory. It cannot explain any semantic phenomena not already explained by a non-thematic theory, and it fails to explain, or even describe, meanings across semantic domains. Thus, not only Restrictive thematic theories, but also Nonrestrictive thematic theories are linguistically inferior because of their underlying principles. In order to provide a full description of the semantics of linguistic expressions, as a formal expression of native speakers' knowledge of meaning, a semantic theory must be both Nonrestrictive and non-thematic. To provide a general account of meaning and of the semantic properties and relations of linguistic expressions, it must be compositional. And in order to explain the productive ways by which new meanings are created as combinations of old meanings, it must provide composition (or projection) rules. As was shown in this dissertation, a semantic theory that embodies these three characteristics will succeed where theories based on other approaches fail.

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