

# Grammatical Morphemes and Conceptual Structure in Discourse Processing

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The present paper analyzes how the semantic and pragmatic functions of closed class categories, or grammatical morphemes (i.e., inflections and function words), organize discourse processing. Grammatical morphemes tend to express a small set of conceptual distinctions that organize a wide range of objects and relations, usually expressed by content or open class words (i.e., nouns and verbs), into situations anchored to a discourse context. Therefore, grammatical morphemes and content words cooperate in guiding the construction of a situation model during discourse comprehension by specifying complementary aspects of described situations. The paper reviews and extends analytical and empirical evidence for this grammatical-conceptual correspondence, and suggests that the correspondence developed in response to the cognitive demands of discourse processing. Thus the distinction between open and closed linguistic categories is interpreted in terms of a fundamental correspondence between conceptual and linguistic structure that helps organize discourse processing.

## 1. INTRODUCTION

Linguistics has traditionally distinguished open- and closed-class linguistic categories. Open-class categories include content words such as nouns, verbs, and adjectives. They have many members, and more can easily be added. Closed-class categories include function words like articles and prepositions, and inflections like tense or aspect markers. They usually have few members and new ones are not easily added (Clark & Clark, 1977).

Psychologists who have investigated this distinction tend to stress the grammatical functions of closed-class categories and the semantic functions of open-class categories. They argue that closed-class units or grammatical morphemes signal the constituent structure of sentences (e.g., an article sig-

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nals a noun phrase, a preposition a prepositional phrase), and play a crucial role in producing and parsing this structure (Frazier & Fodor, 1978; Bradley, Garrett, & Zurif, 1979; Friederici, Schonle, & Garrett, 1982). While open-class words express the meaning of the sentence, closed-class units contribute to sentence meaning only indirectly by signaling a small set of semantic relations between referents (Forster, 1979; Garrett, 1975).

This approach to the open/closed-class distinction has drawn upon the framework provided by generative grammar, which organizes grammar around syntax and stresses the role of grammatical morphemes for signalling this structure (Chomsky, 1965). Within this framework, sentence meaning is primarily construed as information about objects and actions conveyed by nouns and verbs and the plausability of the relations between the objects and actions (Katz & Fodor, 1963).

Other linguistic approaches have placed more emphasis on the semantic and pragmatic as well as the syntactic functions of grammatical morphemes. For example, Talmy (1978b, 1983) has argued that grammatical units express semantic notions that are more schematic or topological than those expressed by content words.

The present paper argues that a failure to integrate the semantic and pragmatic functions of grammatical morphemes into a processing model has hindered the development of adequate psychological theories of discourse processing and representation. A framework is developed that begins to integrate these functions into a psychological theory of language processing. Whereas content words express object and relation categories (e.g., *car*, *run*), grammatical morphemes express a relatively small set of conceptual distinctions that apply to most object and relation categories.<sup>1</sup> These distinctions help organize objects and actions into situations, so they must be considered by language users in order to construct a discourse model, a representation of the described situations. Therefore, grammatical morphemes cooperate with content words in order to express situations.

Sections 2 and 3 of the paper review previous analyses of the semantic and pragmatic functions of grammatical morphemes in order to analyze the correspondence between grammatical units and conceptual distinctions. Section 4 argues that the correspondence developed in response to cognitive demands of producing and understanding discourse. Then Section 5 shows that the failure to consider this correspondence has hindered attempts to

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<sup>1</sup> The present paper does not claim that all grammatical morphemes are meaningful. For example, the grammatical expression of gender may not be semantically based in many languages (Maratsos, 1982). The paper underlines the fact that most grammatical morphemes are meaningful and that this function is important for discourse processing.

The paper focuses on grammatical morphemes in English, although I believe similar motivation will be found across all languages. Different languages may express the same notion with different grammatical morphemes (Slobin, 1982), but these notions are still likely to occur in grammatical rather than other parts of language.

construct theories of sentence and discourse processing. These theories have made little progress in explaining how speakers use linguistic units to express situations and how listeners construct a situation model from the speaker's description. Section 5 also analyzes experimental research on the role of grammatical morphemes in organizing discourse processing and suggests how this function of grammatical morphemes can be integrated into a theory of discourse processing. Thus the paper shows that a semantic-pragmatic analysis of the open/closed-class distinction helps to situate this distinction within a framework relating conceptual and linguistic structure to discourse processing.

## 2. LINGUISTIC ANALYSES OF GRAMMATICAL MEANING

The relation between grammar and meaning has long been an important topic in linguistics. From early generalizations about grammatical-conceptual relations to more recent proposals about the semantic functions of grammatical morphemes, a number of researchers have directly or indirectly argued for a fundamental relation between linguistic and conceptual structure: Distinctions that help organize knowledge because they occur so frequently and widely across many different conceptual domains are coded by grammatical categories, which participate in the most regular, obligatory part of language. According to the localist hypothesis, advanced by Hjelmslev, spatial notions form the foundation for grammatical systems (Lyons, 1977). Categories like tense and modality are basically spatial or locative in nature. Others have noted that grammatical units often express spatial and temporal notions that cut across and organize many conceptual domains (e.g., Traugott, 1974; Bickerton, 1981; Jackendoff, 1983). Whorf even argued that grammatical categories organize conceptual structure (Whorf, 1956).

Similar conclusions have been drawn from research on universal relations between linguistic form and meaning. Much of this work is guided by the assumption that there are regular, often transparent relations between grammatical form and meaning. For example, Bybee (1983) argues that properties that are most relevant or intrinsic to an action tend to be expressed by grammatical particles located close to or fused with the verb that expresses the action. For example, aspectual morphemes, which express the temporal contour of an action (e.g., whether it is complete or in progress), are a more intrinsic part of action than the voice of the verb, which has more to do with participants than the action itself, and in many languages aspect markers tend to be located closer than voice markers to the verb. Langacker (1978) makes similar observations about English auxiliary verbs and their place in verb phrases.

Recent attempts to describe grammatically expressed notions more systematically stem from the work of Sapir (1921), who distinguished content words from relational parts of a sentence (e.g., determiners, inflections,

word order). He argued that the content words express the 'material content' of sentence meaning, whereas the latter express the 'structural mold', which includes relations between actors and action and the time of the situation. Talmy (1978b, 1983) suggests that closed-class categories specify structural properties of the representations expressed by sentences. These properties tend to be topological, whereas the notions expressed by open-class categories are more metric. Thus, they organize a wide range of content. For example, the near/far distinction expressed by demonstratives is invariant across changes in the magnitude of size and distance of objects. Similarly, Langacker (1979) argues that grammatical morphemes tend to express more schematic or general notions than nouns and verbs, and Bybee (1983) argues that a notion must be general (i.e., able to apply to a wide range of objects or actions) before it can be expressed by a grammatical inflection. Jackendoff (1983) notes that major sentence constituents like sentence, verb phrase, and noun phrase, which are signalled by grammatical morphemes, correspond to fundamental conceptual units like event, action, and thing, which subsume all conceptual notions.

The claim that grammatical morphemes express relatively general notions is also implicit in formal semantic theories. In propositional or predicate calculus expressions, the notions expressed by conjunctions, quantifiers, and other grammatical morphemes serve as operators that take propositions and concepts as arguments. They can serve this function only if they are sufficiently general to apply to most kinds of content, so they can take a wide range of concepts as arguments.

All of this work suggests that grammatically expressed distinctions tend to differ from those expressed by content words. First, they are general and pervasive properties of objects and actions (or ways of viewing them), whereas the much larger set of distinctions expressed by nouns and verbs are more specific and define object and action categories.<sup>2</sup> They form a small number of broad categories that cross-classify the more specific knowledge. For example, most actions are either beginning, in progress, or completed and are located in the past, present, or future. Second, they form a 'structural mold' or scaffolding that organizes content into situations anchored to particular contexts (Talmy, 1978b). For example, readers encountering a string of content words such as *woman jump train platform* must resort to general knowledge to guess what situation is being described. Only when grammatical morphemes are added does the content coalesce into a particular situation: *The woman jumped off the train onto the platform*. Now, the

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<sup>2</sup> This is a tendency rather than an absolute distinction because some content words express general notions (e.g., *thing*) and some grammatical notions are fairly specific (e.g., animacy). In addition, grammatical morphemes can be ordered in terms of the generality of the notions they express. Thus, prepositions and conjunctions are more contentful than number or gender inflections.

reader knows that one woman has moved along a particular path from the train to the platform; that the situation is completed and thus occurred in the past; and that the speaker presumes the reader knows the identity of the participants in the situation.<sup>3</sup> Thus, as Sapir suggested, grammatical morphemes provide structure both for sentence form and for the conceptual content the sentence expresses.

These pervasive object and relation properties must be continually marked in order to talk about situations because most objects and relations possess them and they are necessary for interpreting the objects and relations as situations viewed in a particular way. Sections 3 and 4 show that they provide a necessary level of situation structure that helps answer questions such as whether or not a situation occurred and where and when it occurred. They must be considered before going on to the more specific information conveyed by content words.<sup>4</sup> Because they must be continually taken into account by language users, it is important that they are expressed by the most structural and obligatory part of language. Section 5 will discuss one consequence of this function: Grammatical notions are necessary for constructing a model of the described situations.

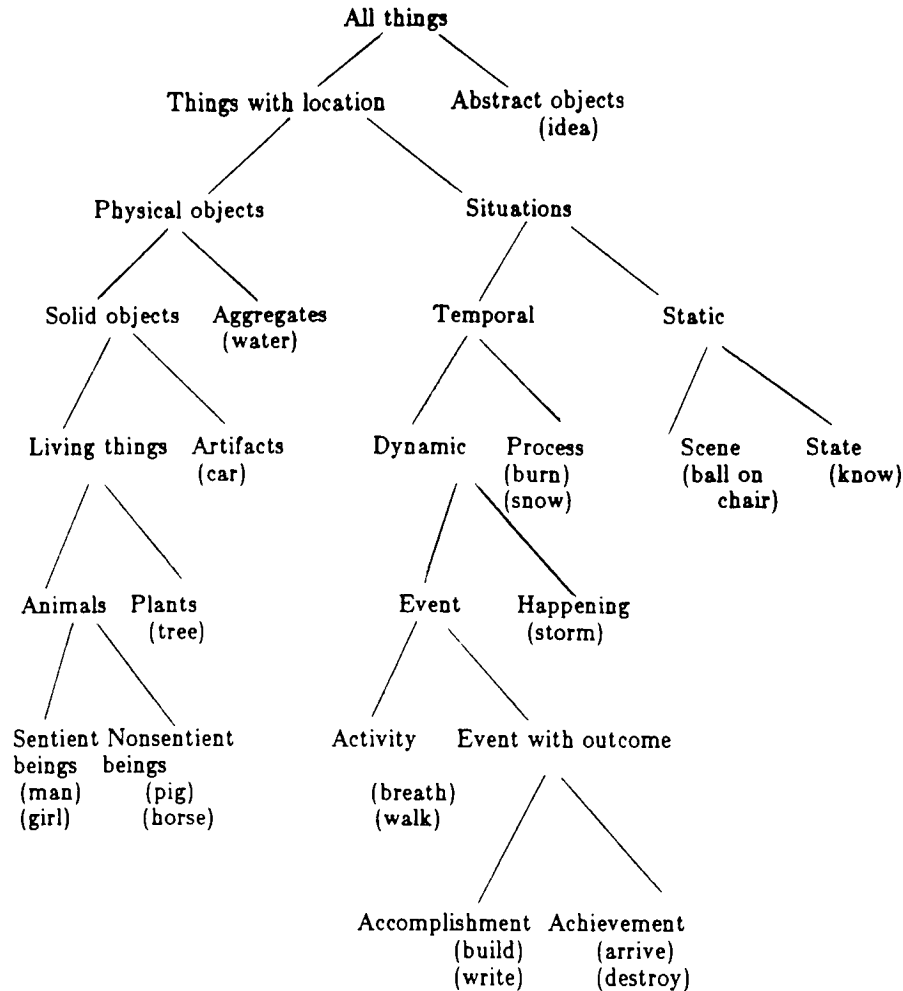
To illustrate and further specify the claim that grammatically expressed notions are more general than content notions, Figure 1 presents a hierarchically organized conceptual structure. The top node, labeled *All things*, subsumes all conceptual entities, and divides into *Abstract objects*, and *Things with location*, which in turn subdivide into more specific categories. The tree is adapted from Keil's theory of ontological categories (Keil, 1979). The situation and action categories are adapted from linguistic analyses of verb and verb aspect types (e.g., Vendler, 1967; Langacker, 1982; Dowty, 1979; Mourelatos, 1978). The hierarchy categorizes situations rather than relations because relations can be thought of as defining situations since they entail participants, location and other aspects of situations. For example, *run* denotes either a relation or the situation containing the relation and the participants the relation entails. Thus, when grammatical morphemes specify properties of relations such as number and location, these properties also apply to the situation containing the relation.

The hierarchy is intended to illustrate differences between grammatically and lexically expressed distinctions; it is not a theory of how people actually

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<sup>3</sup> I do not claim that only grammatical morphemes express structure because it is clear that nouns and verbs express spatial and temporal structure. However, grammatical morphemes are specialized for this purpose, whereas content words are likely to express more specific, content notions.

<sup>4</sup> Although grammatically expressed distinctions may often be logically prior to content distinctions in organizing situations, language processing need not reflect this logical priority. Comprehension may involve either serial or parallel/interactive processing of the two kinds of information.



**Figure 1.** The conceptual hierarchy.

organize and represent knowledge. If grammatical distinctions are more general than content distinctions, they should apply to higher level classes in the hierarchy. Thus, they have a wider scope of application, cutting across more types of objects and situations. They should also be important for defining broad conceptual classes forming the upper branches of the tree.

Section 3 reviews linguistic analyses of grammatical notions and shows that they apply to higher order nodes in the conceptual tree. The section both clarifies and further supports the distinction drawn in the present paper.

### 3. DISTINCTIONS EXPRESSED BY GRAMMATICAL MORPHEMES

Grammatically expressed distinctions enable a wide range of objects and relations to participate in situations by providing three kinds of situation structure. First, there is internal structure, or the structure of the situation itself. This includes the participants and the relations binding them together. Second, there is external structure, the relations that anchor the situation to the discourse and communicative context. Third, there is perspective structure, or the way the situation is viewed, especially for purposes of communication. These claims are an extension of work showing that grammatical morphemes are important for expressing the roles of participants in the situations described by sentences (e.g., Fillmore, 1968, 1977; Talmy, 1975; Hopper & Thompson, 1980).

Perspective is closely connected with both internal and external structure. Speakers think about situations from a particular vantage point, so perspective helps define the situation itself. In addition, speakers connect the situation to the speaking and discourse context from a perspective, so it is also important to external structure. The close relationship between perspective and other situation structure is mirrored by the fact that many grammatical morphemes indicate perspective as well as internal and external structure. Therefore, the present section analyzes perspective with respect to internal and external structure.

#### 3.1. Internal Structure

Many grammatically expressed distinctions apply to most types of participants and relations in both static and temporally organized situations. Participants are usually expressed by nouns, which identify the specific types of objects serving as participants (e.g., *boy, tree, car*). Individuation, or whether or not something has spatial and temporal integrity, is basic to the notion of participant (Jackendoff, 1983). Not only do solid objects differ from aggregates in terms of individuation (*ball* vs. *sand*), but bounded situations, such as events, differ from unbounded ones, such as activities and processes, in the same way (*walk to school* vs. *walk*) (Talmy, 1978b; Mourelatos, 1978; Langacker, 1982). Individuation is marked by pronouns, determiners, quantifiers, and other grammatical morphemes (Talmy 1978b; Hopper & Thompson, 1980). Unindividuated things can be individuated by bounding. Thus, *sand* becomes *a cup of sand* and *walk* becomes *walked for an hour* (Talmy, 1978b). Thus, individuation applies to the top node of the conceptual hierarchy presented in Figure 1. It can also be lexically expressed because it is part of the meaning of nouns, such as *object*, and verbs, such as *arrive*. However, much of the lexicon is concerned with making finer distinctions among kinds of objects and actions.

Several general properties enable an individuated thing to participate in situations. Any individual can be counted, and number of participants is grammatically expressed in most languages. The distinction between one and more than one participant is expressed by singular and plural markers. A distinction between the individual and the set or group is made possible when there is more than one participant, and the prominence of the two levels of organization depends on the number of participants. Individuals are more prominent than the group when they are few because they are readily individuated and easily counted. The group or collection becomes more important with many individuals. The two levels of organization and number of participants giving rise to them are expressed by several grammatical systems. For example, some grammatical systems go beyond a simple singular/plural distinction to express more differentiated notions of plurality: The preposition *between* specifies two objects used to locate something, *among* specifies a few referent objects, and *amidst* specifies many objects, where *few* refers to a number of individuals that can readily be counted and *many* to a number where the group is more important (Talmy, 1983).

Focus on the group, its members, or a particular individual is also specified. The quantifiers *all*, *each*, and *every* express plurality, but *all* focuses on the group as a whole whereas *every* and *each* enumerate the individual members (Langacker, 1983; Vendler, 1967). Moreover, *each* and *every* differ in terms of how much they emphasize attention to individuals: *Each* stresses attention to individuals more than *every* does. Because only a small number of individuals can be attended to within a limited amount of time, *each* often specifies a smaller number of individuals because *every* does not stress individual attention and therefore does not imply a limit in number. For example, *John examined every tree in the forest* sounds better than *John examined each tree in the forest*, presumably because *each* specifies a small number of individuals that can be attended to within the limited amount of time implied by the sentence, and the typical number of trees in a forest exceeds this limit.

Focus on the group is emphasized by the construction *an X of Ys*, where *X* is the level of the group or collection and the *Ys* are its members. Thus, *a forest of trees* or *a crowd of people* focuses on the group rather than members. On the other hand, group members are emphasized by *trees in the forest* and *people in the crowd* (Talmy, 1978b).

Because most things are countable, grammatical morphemes expressing number apply to a wide range of nouns and verbs (Bybee, 1983). General properties of things are often selected in order to count them. In some languages, objects are counted by first classifying them in terms of a few broad categories and then enumerating them. Shape is selected by many of these numeral classifier systems, with objects classified as long, round, or flat (Adams & Conklin, 1973; Clark, 1978). For example, to count poles, many



languages would say *three long-things poles*. Thus, objects are construed as geometric idealizations in order to be counted. More differentiating notions, such as how long or round an object is, are not grammatically indicated.

Objects must be spatially oriented to serve as situation participants. Whereas number enables objects to become group members, location, density, and other spatial relations anchor them to spatially articulated situations. Density helps determine whether things are considered as individuals or as a group within a situation. The expression *here and there* indicates low density and tends to indicate few participants, and both factors discourage relating individuals into a group that is considered independent of its members. In *John saw a tree here and there. The grove covered the canyon floor*, the small number and low density make it improbable that the trees described by the first sentence would constitute a grove, so the second sentence is an inadequate continuation. Density seems the more important determinant because an expression indicating small number but neutral with respect to density allows grouping: *John looked at each tree. The grove covered the canyon floor* is a coherent sequence. Also, an expression indicating higher density allows grouping: *John saw tree after tree. The grove covered the canyon floor* is also a coherent sequence.

Participants are located by the same geometric conceptions that enable them to be counted. A small set of conceptions that define relations for locating one object relative to another is expressed by locative prepositions (Talmy, 1975, 1983; Herskovitz, 1985). Reference objects are viewed as points defining a region of proximity by the preposition *at* (*The man was at the field*). They are viewed as surfaces contacting and supporting located objects by *on* (*The man stood on the table*). They can also be surfaces near to, but not touching, the located object, and this relation is specified by *off*. They are viewed as bounded regions containing located objects by *in* (*The man stood in the field*). The relation of being near to, but not contained by, the locating object is expressed by *out*.

The same conceptions are used in dynamic situations. Reference objects are viewed as points defining the source, path, and goal in motion events by *from*, *past*, and *to*; as surfaces in contact with the moving object (at some point in the event) by *off of*, *across*, and *onto*; and as a bounded region containing the located object by *out of*, *through*, and *into* (Talmy, 1975; Fillmore, 1971).

Other geometrical aspects of participants are expressed. Both *through* and *along(side)* often express length (e.g., *Mary walked through/alongside the train*: The long axis of the train tends to be emphasized in both cases, but *through* also emphasizes the train's volume and *across* views it as a line). Objects are viewed as two-dimensional surfaces and their width is emphasized by *across* (*The leaf skidded across the stream*). They are also viewed as

surfaces by *over*, which unlike *across* does not require contact between the reference and located objects (Brugman, 1981). The height and width of three-dimensional objects is also expressed (*John walked over/around the hill*). The front/back and left/right axes of objects is also expressed in order to define locations. Relatively invariant properties of the perceived environment also locate participants. For example, the vertical dimension defined by gravity and prominent geographical features are used as reference points (e.g., *upriver, leeward*; Clark, 1973; Casad & Langacker, 1982; Fillmore, 1982).

Therefore, a network of largely geometric properties that are relatively invariant across changes in participant identity is expressed by prepositions, numeral classifiers, quantifiers, and other grammatical morphemes (Talmy, 1983; Lindner, 1982; Brugman, 1981; Bennett, 1975). They help individuate and spatially relate participants into either static or temporal situations.

In addition to location, grammar expresses a small set of participant roles, such as agent and patient, that anchor participants to situations. The number of roles in a situation is expressed by the valence of the verb describing the situation, and the identity of the roles is expressed by prepositions in English and inflections in other languages (Fillmore, 1968; Slobin, 1982). A wide range of participants can serve these roles. For example, any animate object can serve as agent. Moreover, the roles cut across many domains. For example, in addition to location and motion, the roles of mover, source, path, and goal organize change in time (*The lecture lasted through the whole day, from morning to night*), change in possession (*The letter sent to me through the mail was from an old flame*), and change in state (*The water changed from liquid to steam*; e.g., Jackendoff, 1983). The roles also help define broad types of situations. For example, events involve agents, and happenings involve patients or experiencers (Chafe, 1970; Chatman, 1978), and accomplishments and achievements differ from activities because they contain an intrinsic goal or outcome (Dowty, 1979).

The distinctions applying to participants also apply to relations and the situations the relations organize. Whereas verbs tend to identify particular actions and other kinds of relations (*run, hit, hate*), grammatically expressed distinctions apply to a broad range of these relations. They can apply to relations and situations as well as objects because of our ability to individuate action and treat it as a thing (Talmy, 1978b). Thus, relations as well as objects can be counted and located. An action can either occur once or be repeated, and verbal inflections in many languages mark whether an action is iterated (Hopper & Thompson, 1980; Comrie, 1976). Finer distinctions are also marked. Thus, *I sneezed at the beginning of the lecture* specifies a single action, *I sneezed now and then during the lecture* specifies a few actions, and *I kept sneezing during the lecture* specifies many actions. The number of participants has important consequences for the organization of

action in situations, so some languages have inflections to indicate the number of participants an action is distributed over. For example, American Sign Language has separate inflections for marking action with respect to two, three, or multiple recipients. In the latter case, inflections mark whether all members of a group or only a subset are recipients (Klima & Bellugi, 1979). The interdependence of participant number and action is grammatically signaled in many languages by marking number agreement between the nouns and verb of a clause.

Situations are distributed and oriented in time just as objects are distributed in space. They are located relative to a temporal reference point, such as the timeline of a narrative or the time of speaking (see Section 3.2). Once an action is repeated, its density of occurrence can be marked. In English, *now and then* specifies low density and one use of *kept x-ing* specifies high density. Density affects individuation, and American Sign Language indicates the degree of individuation of each replication of an action, whether the series of actions are construed as a single event or a set of individual events (Klima & Bellugi, 1979). When an action is performed frequently over a long time span, it can be thought of as habitual, where the set of actions is more important than any one occurrence. This is marked in many languages, and English often marks it with the present tense (e.g., *He walks to school [everyday]*).

Individuated actions or situations are construed in terms of the same geometric categories used to conceptualize objects (Talmy, 1978b). In the above examples *during* marks the lecture as a temporally bounded region and *at* specifies the beginning of the lecture as a point. The same conceptualizations are expressed by verb aspect markers. Completed situations can be viewed as a point without internal structure, and this view is expressed by perfective categories like simple past and past perfect tense (Comrie, 1976). Situations can also be viewed as unfolding, unbounded durations, and this is expressed by progressive markers (Talmy, 1978b; Langacker, 1981). The same views are expressed by adverbial constructions with prepositions. Thus actions are viewed as unbounded durations (*John walked on and on*), bounded durations (*John walked for an hour*), or points (*John walked at noon*) (Talmy, 1978b).

Speakers and writers conceive of situations from a perspective or vantage point. When their perspective is external to the situation, they narrate the situation but do not participate in it. When their perspective is located in the situation, they take the perspective of one of the situation participants. The importance of participant perspective is signaled by the pronouns used in narration. When the participant is narrator, first-person narration directly presents the participant's awareness to the reader, who is likely to adopt his perspective. The relevance of participant perspective to the reader is also signaled by devices such as a shift from past to present or timeless tense.

The combination of a shift from past to present tense and from third- to first-person narration is a common way of switching from impersonal narration to the direct report of monologue, and the shift makes the participant's perspective more important (Fillmore, 1974; Chatman, 1978; Leech & Short, 1981). For example, in *Peter walked down the street. He was jostled by the crowds thronging the sidewalk. I hate crowds. It's time to get out of this crazy city*, the last two sentences are from Peter's perspective.

Another cue to participant perspective is the voice of the verb, which indicates that the perspective of the participant mentioned as grammatical subject is important (e.g., Bates & MacWhinney, 1982; Zubin, 1979). Grammatical constructions such as the possessive also indicate perspective. For example, *Mary's husband John left the house* describes the situation from Mary's perspective (Kuno, 1976). The location of the narrator's perspective on motion situations is expressed by verbal inflections in many languages and by the lexical contrast *come/go* in English (Fillmore, 1974; Delancey, 1981).

Other parts of the situation are defined as more or less focal relative to the perspective points. Objects close to this vantage point are focal (Morrow, 1985b), and parts or dimensions of objects are more or less focal depending on their relationship to the perspective. For example, *Matilda walked through/around the house* focuses on the inside or outside of the house, and on the volume or width of the house, respectively.

In summary, grammatical morphemes express general properties of participants and relations that help organize them into situations. At the same time, the morphemes indicate how the situations should be viewed, or what perspective to use and what to focus on from that vantage point.

### 3.2. External Structure

To describe a situation, a speaker or writer must anchor it to a larger context: It must be integrated with the previous discourse and connected with the ongoing communicative context. The role of participants in described situations is often identified relative to their role in the communicative context. Deictic morphemes often express external structure by exploiting invariant aspects of the environment. For example, pronouns not only specify the number and gender of participants in scenes and events, they associate them with participant roles in the speech situation: either the speaker, addressees, or others. Deictic prepositions and demonstratives often indicate places in the external context relative to the speaker's location (e.g., *here/there*) or to reference directions originating from the speaker's location (e.g., *in front/behind, to the left*). This location also defines aspects of the perceived world that can be exploited for externally anchoring parts of described situations. For example, the sentence *The ball is beyond the tree*, locates the ball in a region beginning at the side of the tree farthest from the

speaker's position. Whether the object is in or out of the speaker's visual field or whether all of it can be viewed by the speaker is indicated by locative particles and demonstratives in several languages (Fillmore, 1982; Casad & Langacker, 1982). These examples show that deictic morphemes connect the described situation to the external context by using participant perspective. Thus, perspective is critical for coordinating the described situation with the speech or external situation.

Situation participants must also be anchored to the previously established discourse context. 'Extended deixis', where the reference point is the location of the narrator or character rather than the speaker, locates event participants within the world established by the discourse (Fillmore, 1982). Definiteness indicates whether participants have already appeared in prior discourse or are in the current external context. Thus, it involves locating participants or situations relative to the knowledge state of speaker and listener. It is marked by pronouns, articles, or other grammatical morphemes in most languages (e.g., Chafe, 1976; Hopper & Thompson, 1980). These morphemes not only define the existence of participants relative to prior discourse and knowledge state of speaker and listener, they also indicate how focal or prominent the participants should be in the discourse (Chafe, 1974; Givón, 1983).

Situations are usually located relative to the time that the sentences describing them are uttered. Tense markers indicate whether situations occur at, prior to, or after speaking time, although not all languages mark all three times by the use of tense. Other morphemes indicate temporal distance from the present to the past. The phrase *just now* indicates a point in the past that is closer to the present than the time indicated by *then*. Also, the present perfect tense (*John has already gone to school*) indicates that a past situation is still relevant to the present, while the past perfect tense (*John had already gone to school*) locates the situation prior to a reference point occurring before the present, so the situation is less relevant to the present (Comrie, 1976; Miller & Johnson-Laird, 1976).

Situations are located relative to the narrative timeline as well as to speaking time. In English, the simple past tense usually expresses situations located on the timeline, and these situations form the plot (Hopper, 1979; Labov, 1972). The occurrence of each situation advances the now, or present moment of the narrative. Progressive and other imperfective verbs express situations that do not advance the timeline, instead they occur at the time of the last-mentioned plot event. Past perfect verbs express situations occurring prior to the narrative now. Finally, the present tense in narratives tends to express situations occurring at the time of narration (Kamp, 1979; Almeida & Shapiro, 1983; Chatman, 1978). However, when used as the historical present, the present tense marks the present moment in the narrative world rather than moment of speaking (Comrie, 1976). For example, the follow-

ing situations occur in the narrative present, prior to speaking time: *John wakes up. He drinks coffee and reads the paper and then goes to work. At work he fights with his boss.* Verb aspect indicates how the situation should be viewed when it is located relative to the narrative timeline. With simple past verbs, situations are viewed as points that advance the narrative now, whereas with past progressive verbs, situations are viewed as extended durations occurring at the time of the last-mentioned foreground event (Hopper, 1979; Kamp, 1979). Situations are also viewed as durations to serve as regions for locating other situations, and this is expressed by progressive verbs in combination with *during*, *while*, and *as*. They are construed as points for locating other situations when marked by perfective (e.g., simple past) verbs with conjunctions such as *before* and *after* (Miller & Johnson-Laird, 1976; Talmy, 1978a).

Temporal and causal relations that link situations together in terms of the temporal framework of the discourse world are expressed by conjunctions. For example, partial or complete temporal overlap of two situations is expressed by *while* and *as*, priority of occurrence by *before*, and subsequent occurrence by *after*. Causal relations are expressed by *because* and *since*, and unexpected causal relations by *although* (Miller & Johnson-Laird, 1976).

Situations are also located relative to the knowledge state of speakers because they must mark whether they think a situation actually occurred, or how likely it is to occur. Notions relating to existence and possibility are expressed by modal auxiliaries and negatives such as *might have* and *could not* (*I almost went to the game* vs. *I could have gone to the game*) (Langacker, 1978; Hopper & Thompson, 1980).

Finally, situations are located relative to the intentions of speakers by indicating what they intend to accomplish with the utterance describing the situation (e.g., used as a statement, question, or command). This is conveyed by the grammatical category of mood, which is expressed by a number of devices such as auxiliary verbs and word order in English.

Thus, grammatical systems express several kinds of external structure, locating situations relative to speaking and narrative time, relative to the discourse world and to the knowledge state and intentions of speaker and addressees. Properties that are exploited to indicate this structure, such as definiteness, existence and possibility, and location, apply to all things.

#### 4. THE BASIS FOR THE GRAMMATICAL-CONCEPTUAL CORRESPONDENCE

##### 4.1. The Correspondence

Distinctions that tend to be grammatically expressed are characterized by three properties:

1. They are general dimensions that apply to a broad range of objects and relations in situations. This small set of distinctions is organized into paradigms to form a conceptual grid that organizes more specific world knowledge (Talmy, 1983; Bickerton, 1981). For example, situation participants are usually cross-classified according to their role in the speech situation as well as to their number and gender.
2. They tend to have few values (e.g., one vs. many; near vs. far; before, at, or after speaking time). Talmy's claim that grammar expresses topological notions incorporates both the generality and low resolution of these distinctions (Talmy, 1978b, 1983).
3. They are also critical for structuring situations because they help organize the objects and relations expressed by nouns and verbs into situations (Sapir, 1921; Talmy, 1978b).

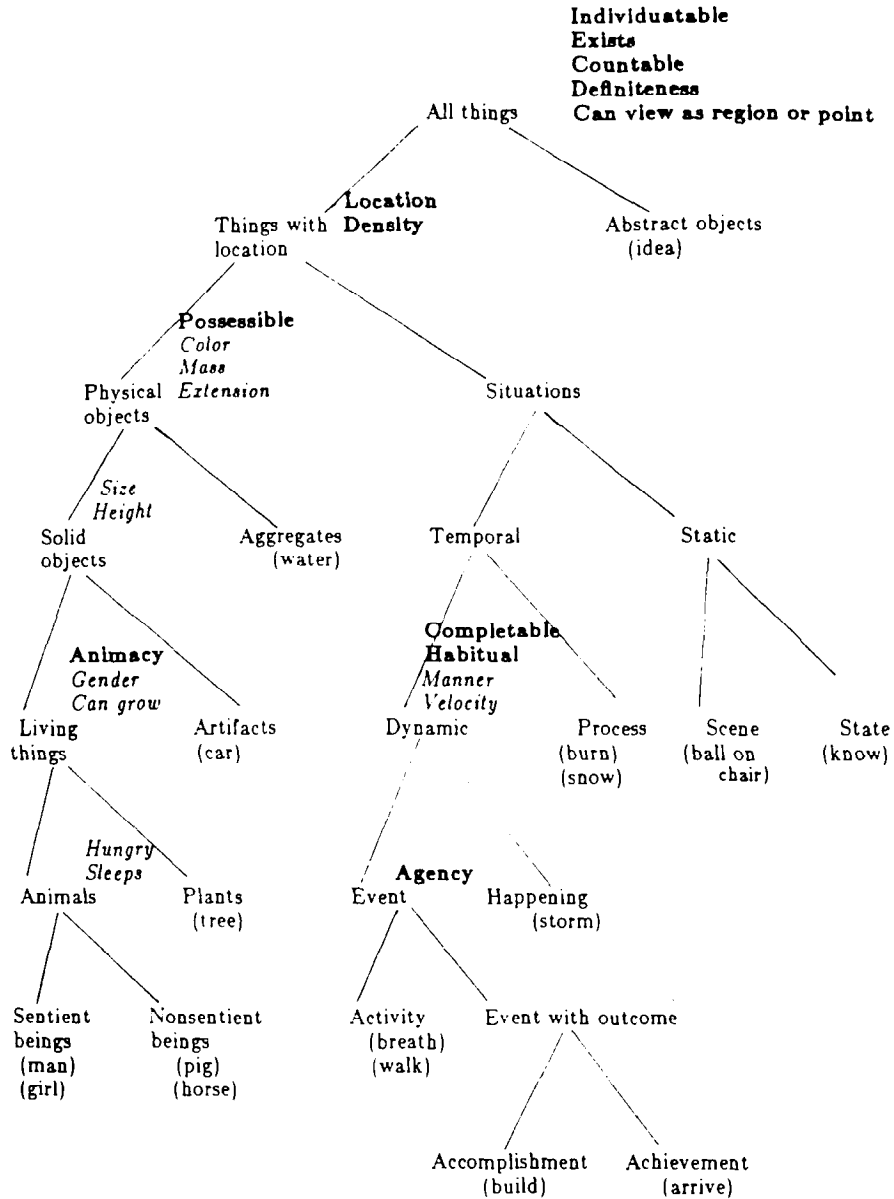
The more of the above three properties that a distinction has, the more likely it is to be grammatically coded. For example, a dimension that is general but also has many values, such as the set of cardinal numbers, is usually expressed by content words. Also, a dimension that is both general and has low resolution but is not very important for organizing content into situations, such as *light/dark* or *big/small*, tends to be expressed by content words.

Section 3 provides evidence for each of these properties. Figure 2 illustrates the generality of grammatical distinctions. Grammatically and lexically expressed distinctions are presented at the highest level of the hierarchy that they apply to. Grammatical distinctions tend to span more object and situation types than content distinctions do. For example, most individuated things (either objects or situations) have number and location, they can be construed as points, regions, or other geometrical categories, they can be focused on, and are known or new in discourse. Most situations are categorized as about to start, in progress, or completed, and as occurring before, at, or after the time of speaking. Content distinctions tend to be less general. Distinctions such as *big/small* or *light/dark* apply to physical objects but not to all things, and distinctions such as *fast/slow* or *neat/sloppy* apply to temporal situations or to events, but not to all situations. Thus, content distinctions tend to apply to particular kinds of objects and situations, whereas grammatical distinctions tend to apply to all things. There are exceptions, because grammatically marked animacy and gender apply only to physical objects.

A fuller investigation of the claim that grammatical distinctions are more general than content distinctions will require sampling a larger set of content distinctions and then asking subjects to judge which kinds of objects and situations the grammatical and content distinctions apply to. For example, which of the following verbs does *completable* (a grammatical distinction) or *velocity* (a content distinction) apply to: *run*, *borrow*, *recognize*,

*destroy*? Grammatical distinctions should be judged as applying to a larger set of objects and situations.

Section 3 also shows that grammatical distinctions provide necessary situation structure. Grammatical morphemes specify whether the situation



**Figure 2.** Level of generality of distinctions expressed by grammatical morphemes and content words. (Grammatical morphemes are in bold print and content distinctions are in italics.)



exists, where it takes place (both in the discourse world and relative to the speech situation), and when it takes place (relative to discourse timeline and speaking time). They also specify important constraints on who is involved, indicating whether identity is previously known or is being introduced, and what role the participant plays in the discourse world and the speaking situation. They also help specify causal and temporal relations that help explain why a situation occurred. Finally, they help indicate how the speaker or writer views the situation. Thus, grammatical and content distinctions differ in terms of how important they are for expressing situation structure as well as in terms of generality. Grammatical distinctions tend to be properties anchoring objects and relations into situations, whereas content distinctions help define types of objects and relations. For example, location is not very useful for defining types of objects or relations, but they help anchor objects into situations, and color may help define types of objects but not how they relate to situations.

Because grammatically expressed distinctions tend to be general and help structure situations, they are likely to play a fundamental role in cognition. For example, many of the distinctions reflect pervasive constraints in the world because they are invariant across such a broad range of objects and relations. Therefore, they organize perceptual processing. They are often processed before the perceptual system goes on to identify particular objects and relations in a situation. According to many theories of object and scene recognition, a situation is first represented in terms of general geometric categories so that only structural properties such as contours and regions are included (e.g., Waltz, 1975; Marr, 1982). Thus, the geometrical structure of objects and their arrangement in a situation is basic to perceptual representation (Shepard, 1982). Moreover, properties such as number, density, occlusion, and support are emphasized by theories concentrating on perceptually relevant aspects of the world (e.g., Gibson, 1966; Kimchi & Palmer, 1982). Therefore, the same distinctions that organize the perception of situations are necessary for describing situations and tend to be grammatically expressed.

It is critical that this organizing world knowledge play an important role in the linguistic system because language functions in part to describe the world and to enable language users to act in the world (Shepard, 1982; Jackendoff, 1983). The present paper suggests that much of the responsibility for expressing such structure lies with the grammatical part of language. This argument is implicit in work relating perceptual and semantic structure. Clark (1973) argues that basic perceptual notions, reflecting the organization of the biological structure of the body and the environment it interacts with, are mapped onto a primary level of semantic structure and that relational morphemes like spatial adjectives (e.g., *long*, *tall*) and prepositions are important for expressing these notions. Gee and Kegl (1982) argue that notions concerning location and motion are expressed by the structural core of

American Sign Language. Research on the development of pidgin and creole languages shows that spatial and temporal notions are often expressed by function words in pidgins and by grammatical inflections in the more grammatically complex creole languages that develop from pidgins (Traugott, 1974; Kay & Sankoff, 1974; Slobin, 1977; Bickerton, 1981). These researchers argue that spatial and temporal notions have become grammaticized because they are cognitively fundamental. Thus, they extend the localist position that grammatical systems are organized around spatial notions (Lyons, 1977).

This section has shown that a small set of conceptual notions playing a pervasive role in organizing world knowledge are expressed by a small set of linguistic categories serving as obligatory parts of sentences that occur with a wide range of content words. Section 4.2 suggests why the conceptual notions tend to be expressed by grammatical rather than lexical units.

#### **4.2. Why Does the Correspondence Exist?**

The grammatical-conceptual correspondence may have developed in response to the cognitive demands of communication. It contributes to the efficiency of linguistic processing in several ways. Describing situations requires accessing from memory large amounts of information about the described entities, deciding how to linguistically code the information, and linearly arranging the linguistic units (e.g., Chafe, 1979). Furthermore, all of this must be done rapidly. The correspondence may facilitate the access of this information. General properties of situations must be continually accessed and expressed because they are necessary for organizing a broad range of situations. For example, regardless of the type of participant in a situation, speakers and listeners need to know whether it is new or old, or in focus in the discourse, and where and when the situation it is participating in takes place. These properties can be readily accessed if they are functionally separated from the rest of world knowledge and associated with grammatical morphemes. They will be accessible because they are a small set of dimensions with few values that tend to be organized into paradigms. Thus, they form a small set of broad conceptual categories that provide little information about their members (e.g., knowing something is a bounded region gives little information about its identity). The small amount of information they carry enables them to be accessed with relatively little effort (Rosch, 1978). Talmy (1983) and Herskovitz (1985) interpret the function of prepositions in a similar way: A small set of prepositions express a small set of geometrical views of objects. Access is also facilitated because the same grammatical morpheme often expresses more than one dimension of a situation, so language users do not have to search separately for each dimension. For example, pronouns in English not only specify the number of participants and their role in the speech situation, they often indicate focus

and perspective as well. Thus, the multiple functions of grammatical morphemes reduces the amount of access required during processing.

Second, the correspondence increases efficiency because the grammatical distinctions provide critical situation structure once they are accessed. Without them, language users may have a lot of information about objects and actions, but they won't be able to organize them into situations anchored to the discourse situation. Speakers and listeners may deal with situations at this level of description before fleshing them out into particular objects and relations. This also increases the effectiveness of communication because grammaticized distinctions are essential for coordinating speakers and listeners because they help discourse participants keep track of important distinctions during communication. For example, they concern what is old and new, what is in focus, and which situations are at the discourse now or occur before or after it.

Third, the correspondence helps map the situation representation onto the linear medium that expresses it. Because the distinctions are expressed by grammatical morphemes and the syntactic structure that the morphemes signal, they are associated with rules for ordering units in the sentence. Therefore, the correspondence helps provide a direct link between situation structure and linear ordering in surface expression.

In summary, the grammatical-conceptual correspondence facilitates comprehension by providing rapid access to a small set of general conceptual distinctions that help organize a large amount of content into identifiable situations anchored to the discourse world and speaking situation. Several theorists have suggested that the special access of grammatical morphemes results from cognitive demands involved in communication (e.g., Slobin, 1977; Bradeley, 1980; Lapointe, 1983). They tend to focus on the role of grammatical morphemes in signaling syntactic structure. The present approach argues that the special access of grammatical morphemes also reflects their role in expressing a set of conceptual notions essential for describing situations. By considering the function of grammatical morphemes within a framework relating conceptual and linguistic structure to discourse processing, the approach helps explain several properties of grammatical categories. First, they have few members because they express conceptual distinctions with few values. Second, they occur as frequent, often obligatory, parts of sentences because they express notions that are pervasive parts of described situations. Third, they occur with a broad range of nouns and verbs because they express general notions that apply across many kinds of objects and actions denoted by nouns and verbs (Bybee, 1983). Finally, their members are frequently organized into paradigms because they express notions that cross-classify more specific knowledge. Section 5 shows how grammatical morphemes help readers and listeners construct a representation of described situations.

## 5. THE GRAMMATICAL-CONCEPTUAL CORRESPONDENCE ORGANIZES PROCESSING

The present section shows that the grammatical-conceptual correspondence provides constraints on theories of language processing and representation. Section 5.1 argues that failure to recognize this has hampered previous research. Section 5.2 analyzes research on the role of grammatical morphemes in discourse processing in terms of the present framework. It adds empirical evidence to the analytical evidence presented in Sections 3 and 4 for the existence of the grammatical-conceptual correspondence and its role in language processing. Section 5.3 suggests how the semantic and grammatical functions of grammatical morphemes can be integrated into a theory of discourse processing.

### 5.1 Grammar and Meaning in Language Processing Research

Much work in language processing has relied heavily on the description of linguistic knowledge provided by generative grammar (e.g., Chomsky, 1965). According to this view, sentence interpretation is guided by a system of rules that combine the meaning of lexical items according to the syntactic relations between them (Katz & Fodor, 1963). The semantic component interprets the major lexical items (i.e., the content words), and grammatical morphemes primarily signal the syntactic structure that combines these words. Thus, grammatical morphemes are only indirectly related to sentence meaning.

Several psychological theories have adopted these basic assumptions and assume content words primarily convey meaning and grammatical morphemes primarily signal syntactic structure (e.g., Fodor, Bever, & Garrett, 1974; Clark & Clark, 1977; Forster, 1979). Therefore, they gloss over the semantic and pragmatic role of grammatical morphemes. Instead, they concentrate on the way that the meaning of content words is accessed from the lexicon and how syntactic structure is parsed; and they assume that a semantic component uses the latter to assign semantic relations among word meanings in order to create the semantic representation of the sentence. This allows the understander to distinguish between *John hit Mary* and *Mary hit John*. The semantic representation is then interpreted in terms of knowledge of context in order to determine the message that the sentence conveys (e.g., Forster, 1979).

This view of language processing has had several unfortunate consequences. First, psychological theories have not developed an adequate description of grammatically conveyed meaning that would unify previous work on the semantic and pragmatic functions of grammatical morphemes. Second, because they focus on meaning conveyed by content words, the theories tend to think of meaning exclusively in terms of knowledge about typical

relationships between types of participants and relations in situations. Thus, meaning has been defined in terms of the objects and relations referred to by the sentence, which focuses on those parts of sentences that are most obviously referential (nouns and verbs).

The semantic and pragmatic contribution of grammatical morphemes may have been slighted because of the generality of the notions they express. Although they enable a sentence to describe a situation, they do not themselves refer to objects or relations. Therefore, when they are the only interpretable part of a sentence, as in *Twas brillig and the slithy toves did gyre and gimble in the wabe* (from Lewis Carroll's poem *Jabberwocky*), or *Colorless green ideas sleep furiously* (from Chomsky, 1965), it is tempting to say the sentence is meaningless. However, such sentences are still meaningful: They may express situations that violate our expectations of what is usual or even possible in the world, but the content is still recognizable as a situation because of the grammatical notions. Restricting meaning to the words denoting objects and actions ignores a set of distinctions that plays a crucial role in specifying the described situations. Perhaps the most dramatic indication of this is the fact that the theories do not consider how the objective situation is viewed by speakers and listeners. Thus, they ignore perspective and focus, information that grammatical morphemes are specialized for conveying.

The tendency to map content words onto meaning and grammatical morphemes onto syntactic structure precludes an adequate analysis of the relationship between linguistic properties of sentences and the message the sentences express. This in turn has clouded issues related to sentence processing and discourse representation. A central issue in sentence-processing research concerns the processing of syntactic and semantic aspects of sentences. One view holds that the two kinds of information are processed independently (e.g., Forster, 1979; Garrett, 1975). Alternatively, processing of the two kinds of information may interact (e.g., Marslen-Wilson & Tyler, 1980). The controversy has generated many experiments (Flores d'Arcais & Schreuder, 1983), but interpreting the results as support for either position is complicated by the failure to consider the semantic and pragmatic functions of grammatical morphemes. For example, Forster claims to separate effects of syntactic structure and sentence meaning on comprehension by varying the plausibility of relations among the entities and actions that the nouns and verb of a sentence express. He compares *The doctor cured the patient* with *The patient cured the doctor*, which differ in semantic relations and plausibility but not in syntactic structure. He claims to demonstrate an effect of syntactic structure independent of meaning if the sentences have the same effect on processing. However, the sentences share aspects of meaning as well as syntactic structure: Both describe an event occurring prior to the time the sentence was uttered, in which a single participant, pre-

sumed to be known by the addressee, performs a completed action affecting another participant. Thus, similarities in processing may reflect either invariant syntactic or semantic and pragmatic properties of sentences.

Research generated by the interactive as well as the serial processing view also founders on ill-defined relationships between grammatical morphemes and meaning. It implicitly accepts the claim that syntactically but not semantically well-formed sentences isolate syntactic structure from meaning. When the processing of these sentences is compared to the processing of normal sentences, the former is assumed to afford syntactic but not semantic analysis (e.g., Marslen-Wilson & Tyler, 1980). This ignores the fact that both kinds of sentences express situations, although the normal sentences express plausible ones. Thus, when processing is enhanced by the normal context, the poorer performance in the semantically anomalous sentences may either reflect the absence of semantic processing, or an inability to use expectations to make sense of and predict the described situations.

In summary, research on the way in which syntactic and semantic knowledge is deployed during sentence processing has been hampered by an inadequate analysis of the relationship between linguistic units in sentences and the syntactic, semantic, and pragmatic information they convey.

Theories of discourse representation have also been hindered by an inadequate view of the role of grammatical morphemes during processing. Propositional theories emphasize content words over grammatical morphemes. When they deal with grammatical morphemes, they represent them as logical operators over arguments (Kintsch, 1974). Thus *John was working* is represented as *(past(progressive(work(John))))*. Although this approach implicitly recognizes the generality of the scope of application of some grammatical notions across content domains, it explicitly considers neither which properties grammatical distinctions share nor their role in organizing discourse understanding. Therefore, it does not unify the semantic and pragmatic contributions of grammatical morphemes and content words within an adequate theory of discourse processing.

Theories focusing on the background world knowledge necessary for discourse understanding have amplified the emphasis on content words by developing scheme or frame representations of action- and object-centered knowledge relevant to understanding (e.g., Schank & Abelson, 1977). They, too, ignore the crucial role played by grammatically expressed properties of objects and relations that organize the situations described by discourse. For example, several theories argue that some parts of narratives are more central or important than others, so that understanders are more likely to focus on and remember these sections. These sections include the causal chain of events forming the narrative plot (Trabasso, Secco, & van der Broek, 1983; Mandler & Johnson, 1977). These theories have ignored the crucial role that conjunctions, verb-aspect markers, and other grammatical

morphemes play in signaling the distinctions that help organize discourse in terms of these sections. By paying more attention to the role of grammatical morphemes in specifying situation structure, these and other discourse and sentence processing theories could more adequately explain how linguistic units guide understanding.

### **5.2. The Role of Grammatical Morphemes in Discourse Processing**

Section 3 showed that grammatically expressed notions are crucial for structuring described situations, and Section 4 suggested that the grammatical-conceptual correspondence developed in response to the demands of producing and understanding discourse. The present section has so far shown that research failing to recognize this fact has not adequately accounted for the way in which a representation of the described situations is constructed from discourse.

Recently, theories have begun to explore the representation of the particular situations described by discourse in addition to the representation of general knowledge about types of objects and actions. They assume that discourse understanding results in a mental model of the described situations. The situation model is constructed by combining general knowledge of the described objects and actions, specific knowledge of the referent situation, and linguistic knowledge (Johnson-Laird, 1983; Sanford & Garrod, 1981; van Dijk & Kintsch, 1983). This approach provides a means for incorporating the role of grammatically expressed distinctions into a discourse processing theory. Because these distinctions provide an important level of situation structure, they should be crucial for constructing a situation model during discourse comprehension. The present section reviews evidence showing that grammatically expressed notions help guide the construction of models. It will also show how content and grammatical parts of sentences cooperate in specifying the situations the model must capture.

The production of spatial descriptions is organized around grammatically expressed distinctions. Describing layouts such as apartments or towns requires expressing the layout structure. In describing their apartment, people often describe an imaginary tour through the layout, consisting of a sequence of focuses, each focus being a major room of the apartment (Linde & Labov, 1975; Linde, 1979). Thus, spatially organized scenes and events are mapped onto a linear sequence via temporal properties of narrated events. Consider the following example:

You walked in the front door,  
There was a narrow hallway.  
To the left, the first door you came  
to was a tiny bedroom.  
Then there was a kitchen . . .

The spatial layout, temporal properties of the tour, and perspective and focus of attention are grammatically expressed. Pronouns and demonstratives not only refer to participants and their spatial location, but also indicate the appropriate perspective from which to view the scene (e.g., the use of *you* to engage the addressee's perspective). The location of parts of the apartment relative to this perspective are expressed by prepositions, verbal inflections, and other morphemes (*To the left. . .*). Direction and other dynamic properties of the tour that move the perspective point are also expressed (*Then there was a kitchen. . .*). Thus, grammatical morphemes help indicate what listeners should focus on at each point of the description in order to construct a model of the layout.

In room descriptions, the perspective point remains at one place and the tour consists of a series of gazes around the room, rather than a tour with a perspective point moving from room to room as in the apartment descriptions (Ehrich, 1982). Consider the following example:

On the right side of the wall there is a table,  
A square oblong table.  
On it is a lamp.  
On the right side next to the table there is a red couch.  
Next to the couch is a floor lamp.

These descriptions tend to contain sentence subjects mentioning places where objects are located rather than the moving addressee, static verbs combining with static locative rather than directional prepositions, and prepositions and adverbial expressions locating objects relative to the reference objects in the room rather than to the addressee.

In route directions, the location of landmarks defining the route and the direction and extent of motion along the route are expressed by demonstratives and directional particles in German (Wunderlich & Reinelt, 1982; Klein, 1982). Thus, differences between room, apartment, and route layouts determine the kind of tour strategy in the description, and the different spatial and temporal properties of the described layout tend to be grammatically expressed.

Comprehension of layout descriptions is organized around grammatical structure. The relations expressed by prepositions that organize objects into a scene (e.g., *The chair is behind the table. The table is to the left of the cabinet. . .*) help determine how well the description is understood. Descriptions that are indeterminate in that more than one layout can fit the description are harder to remember than determinate descriptions. Presumably, a model of the layout is harder to construct when the prepositions do not uniquely specify the layout (Mani & Johnson-Laird, 1982). Thus, grammatically expressed notions such as location, path, and direction of motion, which constitute a necessary level of structure in layout descriptions, help indicate



what listeners and readers should focus on in order to construct a situation model.

Narrative comprehension is partly organized around grammatically expressed spatial and temporal distinctions. Focus on prominence among situations and situation participants is partly determined by situation structure. Narratives are often organized around protagonists, which tend to be more prominent than other characters. This status is signaled by grammatical cues such as subject position and the pattern of referential devices that refer to them (Karmiloff-Smith, 1981; Marslen-Wilson, Levy, & Tyler, 1982; Francik, 1985). The protagonist's perspective is often adopted by readers, so the location of the protagonist helps determine what else is prominent in the narrative. This location is expressed by preposition/aspect combinations. For example, *John walked from the living room into the kitchen* makes the kitchen prominent, while *John was walking from the living room to the kitchen* makes the living room prominent, where prominence is measured by the probability that a room or an object in the room will be chosen as referent for a referring expression in the following sentence (Morrow, 1985b). Prominence of the path or goal of motion situations depends on the particular prepositions and verbs that combine to specify location and other spatial and temporal aspects of the situation. The goal is focused by *walked into*, which specifies the goal as a region and locates the character inside it as the outcome of a completed achievement. It is also focused by *walked from/to*, which locates the character there as the outcome of a completed accomplishment. The path is focused by *walked past/to* or *walked through/to*. These constructions also express a completed accomplishment, but they emphasize the path by explicitly mentioning it. The path is also focused by progressive aspect because it expresses a motion event in progress. Thus, past progressive sentences with *into* or *from/to* make both path and goal prominent, whereas those with *past/to* or *through/to* make the path more prominent than their simple past-tense versions (Morrow, 1985b).

Character location also serves as a reference point for other situation participants. *This*, when used deictically in a narrative, refers to participants located close to the character and thus prominent, whereas *that* refers to entities located further away (Morrow, 1985b). More generally, *this* often refers to entities that are prominent or focal in discourse, whereas *that* refers to less prominent entities (Linde, 1979; Reichman, 1978). Thus, readers combine the spatial and temporal specifications of grammatical morphemes in order to create a model of dynamic situations with a particular prominence organization.

A study in progress explores the location information expressed by preposition/verb aspect combinations (Morrow, 1985c). Subjects read sentences describing motion situations occurring in a house and then indicated on a diagram of the house where the character was located in each situation.

Constructions clearly focusing the goal in the previous experiment (*walked into*) locate the mover inside the goal area, whereas constructions making the path prominent (*walking to, walking toward*) locate the character on the path, heading toward the goal. The particular path location is specified by the second preposition in the sentence. For example, *John was walking through the kitchen to the bedroom*, where there is a living room connecting the kitchen and bedroom, locates John in the kitchen, while *John was walking out of the kitchen to the bedroom* locates him at the kitchen exit and *John was walking from the kitchen to the bedroom* locates him in the living room. Morrow (1985b) found that some simple past sentences with *to* focused the path whereas others focused the goal. In Morrow (1985c), most *to* sentences located the character at the entrance to, but not inside, the goal room. This reflects the fact that whereas *into* specifies the goal as a region, *to* specifies it as a point, so a completed event expressed by a sentence with *into* will locate the mover inside the specified region, and a completed event expressed by a *to* sentence will locate the mover in a neighborhood defined by the goal entrance construed as a point. Other factors, such as explicit mention of the path, determine whether the path or goal is more focal when the motion sentences occur in a narrative. This study shows that the geometrical information conveyed prepositions and verb aspect combine to specify location and focus in dynamic situation models.

Prominence of the properties of participants is also specified by prepositions and verb aspect. For example, *walking over* focuses the height of an object while *walking around* focuses its width, which is shown by the fact that people reading *John was walking over the hill and . . . chose he thought it was very high* rather than *he thought it was very wide* as the most appropriate continuation. However, when the preposition in the first clause of the sentence is changed to *around*, the preferred continuation reverses. Similarly, *The children walked across/along the stream* focused on either the width or length of the stream, respectively (Morrow, 1982). Thus, grammatically expressed geometrical properties that anchor objects into situations help determine what readers and listeners should focus on when constructing the situation model. This, in turn, helps readers decide how to integrate new information into the unfolding model.

Temporal relations between situations organize understanding by indicating which situations are most prominent. The location of situations relative to the narrative now, or present moment in the narrative, helps determine prominence. This location is expressed by aspect morphemes and conjunctions (e.g., Hopper, 1979; Almeida & Shapiro, 1983). Readers focus on the situations in the plot more than those constituting the background to the plot, choosing characters from foreground events as referents when possible (Morrow, 1985a). The prominence of the backgrounded situations depends on their relationship to the narrative now. Background situations that are

simultaneous and thus temporally close to a foreground situation are more prominent than situations that occur previous to, and temporally far from, the situation occupying the narrative now. Thus, when reading *Tom walked toward the ferris wheel while Harry was walking toward the exhibit hall*, readers sometimes chose Harry, the character in the background situation, as referent for a pronoun in the next sentence, but in *Tom walked toward the ferris wheel after Harry had walked toward the exhibit hall*, they almost always chose the character in the foreground situation (Morrow, 1985a). Townsend (Townsend, 1983; Townsend & Bever, 1978) shows that conjunctions expressing temporal and causal relations between situations indicate which situations can be fully processed when the listener encounters them. Background situations are not immediately processed if their relation to the plot cannot be determined. Therefore, the temporal distinctions expressed by aspect markers and conjunctions determine the prominence of situation participants by helping to specify their location within the situation, and the prominence of situations by specifying their location relative to the narrative now point.

In summary, grammatically expressed distinctions help organize the production and comprehension of discourse by indicating the situation structure that listeners and readers use to construct a situation model. Previous approaches to discourse understanding do not account for these findings because they pay little attention to the semantic and pragmatic functions of grammatical morphemes (e.g., Kintsch & van Dijk, 1978). Thus, they cannot explain the role of grammatical morphemes in organizing the production and comprehension of linguistically described situations. For example, they do not explain the different effects that the prepositions *to*, *into*, and *toward* have on narrative comprehension (Morrow, 1985b). They assume the prepositions simply express a goal relation instead of accounting for the different way each one structures the described situation. They also do not explain how conjunctions specify prominence by relating situations to the narrative timeline (Morrow, 1985a; Townsend, 1983).

### 5.3. Constraints on a Theory of Discourse Processing

The present paper suggests several ways in which the semantic and pragmatic functions of grammatical morphemes can be integrated into a discourse processing theory that accounts for the results reviewed in the present section. Content words and grammatical morphemes specify complementary aspects of situations, so they cooperate in guiding the construction of the situation model. Content words help flesh out situations because they are associated with schema representing large amounts of knowledge about object and action types. They specify the identities of the objects and relations, the content that the situation model must capture. However, it is only through grammatically specified distinctions that content words refer to sit-

uations because these distinctions tend to be properties that instantiate a situation anchored to a context from the knowledge expressed by content words. Thus, grammatical morphemes enable content words to function as units that guide the construction of a situation model. For example, in most languages, the specifications of articles and number markers enable nouns to refer to individuals in the model (Heim, 1982). Furthermore, by occurring with a grammatical element like a preposition and by occupying a position in a grammatical construction, a noun phrase refers to the individual's role in the situation. Tense and aspect specifications enable verbs to refer to actions in situations with a temporal contour and located relative to discourse and speaking time (e.g., Kamp, 1979). Thus, grammatical parts of sentences help tell listeners and readers how to construct a discourse model and to update it with new situations involving old or new participants that either advance the narrative timeline, or take place at the time of the last-mentioned foreground event. Because they play such a pervasive, structuring role in describing situations, they have been functionally separated from more specific knowledge and associated with grammatical morphemes, which are accessed relatively quickly.

The present approach may shed new light on several phenomena related to the processing of grammatical morphemes. Section 4 has already suggested that the processing status of these units reflect their role in a grammatical-conceptual mapping. It may also help us understand the deficits involved in Broca's aphasia. People suffering from this syndrome have lost at least part of their command of closed-class categories both in production and comprehension. It's been suggested that they have lost the ability to process the syntactic structure that closed-class categories signal (Bradeley, Garrett, & Zurif, 1979). For example, several studies have shown that these aphasics interpret sentences by finding the referents of nouns and verbs and then using world knowledge to infer relations among them. This has been interpreted as evidence that syntactic knowledge is lost, but knowledge of lexical meaning remains. However, the aphasics' performance may reflect an inability to map situation structure onto linguistic structure during production, or to interpret grammatical morphemes as specifying the structure of their models during comprehension. Of course they still know about the notions that would be expressed by grammatical morphemes and can use them to infer relations among referents during comprehension, and they may even be able to map them onto individual grammatical units when considering them in isolation (Friederici et al., 1982), but they have lost the ability to recognize grammatical structure of sentences as symbolic, the part of the sentence that specifies structural properties of the situation expressed by a sentence. This suggests that they may still be able to deal with syntax if they consider it as nonsymbolic. In fact, Linebarger, Schwartz, and Saffron (1983) have shown that aphasics are very good at making grammaticality judgments. The researchers suggest that tasks requiring aphasics to seman-

tically interpret sentences produce deficits because aphasics fail to map grammatical structure onto a semantic representation. This is similar to the present proposal that Broca's aphasia involves a loss of the ability to treat grammatical structure as symbolic.

Finally, the present framework may help to decide among competing theories of language processing. Section 5.1 argued that a failure to consider the semantic and pragmatic functions of grammatical morphemes has hindered attempts to evaluate theories of sentence processing. However, considering these functions calls into question the tenability of the theory that assumes sentence processing must involve an initial stage of lexical and syntactic processing that produces a syntactic description of the sentence before the message is interpreted (e.g., Forster, 1979). It seems more likely that content words and grammatical morphemes and the syntactic structure they signal are processed at the same time and treated as instructions for constructing a discourse representation. Some accounts of parsing have reached a similar conclusion, rejecting a purely syntactic level of representation and assuming that grammatical morphemes directly participate in specifying the discourse representation (Johnson-Laird, 1977; Marslen-Wilson, Tyler, & Seidenberg, 1978; Clark & Carlson, 1982).

## 6. CONCLUSION

The present paper has argued for the existence of a fundamental relationship between grammatical and conceptual structure. This relationship helps explain several properties of grammatical morphemes and the way they are processed. Thus, the nature of grammatical morphemes has been shaped at least in part by their role in the cognitive system, becoming specialized for expressing a subset of conceptual notions that are crucial for organizing discourse processing. This approach is in line with proposals that grammatical categories have a functional basis, serving a variety of conceptual and communicative purposes (e.g., Bates & MacWhinney, 1982). The present framework is a step toward a unified description of these functions and how they are manifested in grammar. By doing this, the paper helps to develop a theory that more closely integrates linguistic properties of discourse with discourse processing and representation.

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