

# **Aspectual Roles, Modularity, and Acquisition; with a Discussion of Contact Locatives**

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## **1. Introduction**

Modularity in lexical representations has been in the literature to varying degrees and in various forms since the advent of generative grammar. The practice of separating syntactic subcategorization frames from the selectional restrictions associated with a verb or predicate is the most familiar example of modularity in lexical representations. This paper presents a proposal for a different kind of modular representation of the lexical specifications of verbs, in which certain temporally relevant information contained in Conceptual Structure or Lexical Conceptual Structure (LCS) should be specified separately from the LCS. This information is represented in the form of a list of aspectual roles; an aspectual role grid, in fact. The verb's aspectual role grid does not replace its Lexical Conceptual Structure; rather, the two representations act together in modular fashion to determine certain of the verb's properties. It is maintained that the aspectual role grid figures in universal linking constraints, while thematic information (contained in thematic roles or LCS's) are involved in language-particular linking rules. This modularity of lexical information makes interesting predictions for language acquisition.

The theory adopted in this paper is that elaborated in Tenny (1994). The purpose of this paper is to illustrate how this approach can be used to characterize and explain the lexical properties of certain verbs with respect to the contact locative alternation (*Sam hit the fence with the stick/Sam hit the stick against the fence*). The first sections of the paper introduce and explain briefly the aspectual roles approach employed here. A fuller exposition and elaboration of these ideas may be found in Tenny (1994).

The paper is structured as follows. In the first part of this paper, the notion of aspectual roles is introduced. The two centrally important types of aspectual roles a verb may assign, MEASURE and TERMINUS, are introduced and illustrated, and the concept of aspectual role grids put forth. Aspectual roles are compared with thematic roles, and the place of aspectual roles within event structure is discussed. The relevance of aspectual roles for linking is summarized. The second section of the paper presents some arguments for a modular representation of aspectual grid lexical specifications and lexical conceptual structures. The final section of the paper discusses the contact locative alternation in light of these ideas. The five verbs *hit*, *cut*, *break*, *touch*, and *put* are compared, and certain differences between them are explained in terms of the aspectual and thematic information contained in each verb.

## 2. Aspectual roles

### 2.1. Aspectual roles and aspectual role grids

An aspectual role is the role an argument plays in the internal temporal structure of the event described by the verb. Like thematic roles, aspectual roles are assigned by a verb to its arguments. I will assume a tripartite distinction between argument types, as developed in certain of the literature on argument structure: a distinction between external arguments, internal direct arguments, and internal indirect arguments (Marantz 1984; Rappaport and Levin 1988; Williams 1981, and Zubizarreta 1987). Aspectual roles differ from thematic roles in **two** crucial ways. First, aspectual roles are associated only with a verb's internal arguments, while thematic roles may be associated with a verb's external or internal arguments. Secondly, aspectual roles are assigned only to arguments of the verb participating in a certain, narrowly defined, Aspectual Structure, having to do with defining the temporal boundedness of the event described by the verb. The temporally bounded nature of the event (described sometimes as *telicity* or *delimitedness*) is determined within the verb phrase, by the participation of a verb and certain of its internal arguments.

The aspectual property of temporal boundedness has been investigated by many authors, including (as a representative sample) Dowty (1979), Grimshaw (1990), Hinrichs (1985), Pustejovsky (1991), Van Voorst (1988), Vendler (1967), and Verkuyl (1993). Verb phrases describing bounded events (delimited or telic events) are illustrated in (1a,b) and (2a) below.

- (1) a. eat an apple for five minutes/in five minutes.  
b. eat an apple up \*for five minutes/in five minutes.
- (2) a. walk for five minutes/\*in five minutes.  
b. walk to the bridge \*for five minutes/in five minutes.

The verbs *eat* and *walk* in (1) and (2) are illustrated with the *in five minutes/for five minutes* temporal adverbial phrases used by Dowty (1979) as diagnostics for boundedness. The *for five minutes* adverbial phrases cooccur with unbounded events, while the *in five minutes* phrases cooccur with bounded events. The examples in (1) and (2) illustrate how certain internal arguments of the verbs *eat* and *walk* can contribute to the aspectual structure of the event in its bounded interpretation. In (1) it is the direct internal argument, an *apple*, which participates in the bounded event structure. The verb phrase *eat an apple*, in the (1a) example, may have a bounded or unbounded reading. In the (1b) example (where it is followed by the particle *up*, which enforces a bounded reading) the verb phrase describes a bounded event, in which the eating event proceeds by progressing through the apple, and reaches its terminus when the apple is entirely consumed. The direct internal argument, the apple, in a sense, *measures out* the event over time. An entailment about the apple is possible and in fact necessary in the (1b) example, that is only optional in the (1a) example; namely, that at the end of the eating-event the apple is completely consumed. The apple here plays the role of what Dowty (1979) has called an *incremental theme*, and is crucial to defining the temporal end of the event. In (2) it is an indirect internal argument *the bridge*, which participates in the bounded event structure. In the case of the verb *walk* the verb describes an unbounded event when used in isolation as in (2a), but when a goal prepositional phrase such as *to the bridge* is added in the (2b) example, the verb phrase describes a bounded event. The goal *the bridge* participates in defining the temporal endpoint of the event by naming the spatial terminus that correlates with the event's temporal terminus. The examples in (1) and (2) above illustrate how certain privileged internal arguments of a verb participate in defining the temporal end of a bounded event. It is the direct internal argument in (1b) and an indirect internal argument in (2b) which are the privileged arguments in these examples. These are the arguments which bear aspectual roles. Arguments that bear aspectual roles participate in Aspectual Structure.' Aspectual Structure is used in a narrow technical sense here, to mean a certain structure associated with bounded events — the *measuring out* to a terminus. Aspectual Structure is composed at the level of the verb phrase. The verb figures crucially in this composition, but various elements internal to the verb phrase — arguments, adjuncts, and adverbial phrases — may also contribute to the composition of Aspectual Structure. (See Dowty 1979; Hinrichs 1985; Krifka 1992; and Verkuyl 1993, for interesting approaches to the compositionality of aspectual semantics.) Not all verb phrases describe events with these components of meaning, so not all verb phrases have Aspectual Structure. Activities or states (in Vendlerian terms) do not have Aspectual Structure, in the sense the term is used here. Aspectual Structure includes a small subset of all

the kinds of information that have been labeled aspectual; and it is associated only with a subset of verb phrases.

The event's temporal endpoint is crucial to the temporal boundedness of an event. There are two ways an argument of a verb may participate in defining that endpoint, illustrated in (1) and (2) above. The argument may (as in example 1) encode both the endpoint and the progression towards it, in which case it receives the **MEASURE** aspectual role; or it may (as in example 2) be associated with the temporal endpoint of the event alone, and not the progression towards it, in which case it receives the **TERMINUS** aspectual role. **MEASURE** and **TERMINUS** are the two central aspectual roles, which I will discuss here. A verb may assign one or the other, but not both. A third aspectual role, **PATH**, is more peripheral, and will not be discussed here; it may appear with **TERMINUS** in an aspectual role grid, in which case the combination **PATH+TERMINUS** constitutes the aspectual equivalent of the **MEASURE** role.<sup>2</sup> It is a basic thesis of this work, that possible Aspectual Structures may include only one *measuring out*. This idea is also explicit or implicit in much of the literature on *event structure*, which will be discussed in Section 1.3. (See Grimshaw 1990; Moens and Steedman 1988; Pustejovsky 1991; and Van Voorst 1988 for a range of approaches to event structure.) Since Aspectual Structures may include only one measuring out, aspectual role grids may contain either the **MEASURE** or **TERMINUS** aspectual roles, but not both.

Two types of aspectual role grids are possible; either built on the **MEASURE** role or built on the **TERMINUS** role:

- (3)            [MEASURE]  
 (4)            [TERMINUS]

The **MEASURE** role is assigned to an argument which is associated with a distinct parameter along which the event is measured out, as well as with the event terminus. The **MEASURE** aspectual role may be assigned to arguments which 'measure out the event' in a number of different ways. Three canonical types of **MEASURE** arguments are: incremental themes, such as *apple* in *eat an apple*; objects undergoing changes of state, such as *fruit* in *ripen the fruit*; and path objects of route verbs, such as *the Appalachian Trail* in *walk the Appalachian Trail*. In each of these cases the object or direct argument maps both to the temporal endpoint of the event, and the path leading up to it. The apple is consumed incrementally during the eating event; the fruit is ripened *during* the ripening event, whether incrementally or no; and the Appalachian Trail is traversed incrementally during the walking event. A **TERMINUS** aspectual role, on the other hand, is associated only with the temporal endpoint of the event and not with the progression leading up to it. *The bridge* in *float to the bridge* marks the spatial terminus of the floating event

which maps onto the event's temporal terminus; but it does not map onto the progression leading up to that terminus.

Verbs that enter into Aspectual Structure, that is, verbs with aspectual roles to assign, may be represented lexically as having an aspectual role grid. Some examples appear in (5) below:

(5)	melt:	[MEASURE]	(as in <i>melt the butter</i> )
	eat:	[(MEASURE)]	(as in <i>eat the apple</i> )
	play:	[(MEASURE)]	(as in <i>play a sonata</i> )
	Walk:	[(MEASURE)]	(as in <i>walk the Appalachian Trail</i> )
		[(PATH, TERMINUS)]	(as in <i>walk the road to the town</i> )
	float:	[(TERMINUS)]	(as in <i>float the bottle to the bridge</i> )

The verb *melt* is used by most speakers of English as involving an obligatory change of state (taking an obligatory MEASURE argument); while the verbs *eat* or *play* may be optionally used to indicate a bounded event with a MEASURE argument. The verb *walk* may alternatively assign a TERMINUS aspectual role, in which case it will occur with a goal like *the town* in *walk the road to the town*. (In this expression an optional PATH argument, *the road*, appears as well. A PATH can be implicit or overt; its properties will not be discussed here.) A verb like *float* optionally assigns a TERMINUS aspectual role, in which case it requires a goal phrase as in *float the bottle to the bridge*.<sup>4</sup> These two aspectual grid types, [MEASURE] and [TERMINUS], represent the same  $\left[ \begin{array}{c} \text{MEASURE} \\ \text{TERMINUS} \end{array} \right]$  structure in the last analysis, but the different sets of aspectual roles express a different division of labor between the arguments, and between the predicate and its internal arguments. The [PATH TERMINUS] grid has the TERMINUS (or the temporal endpoint of the event) split off from the PATH (or the progression up to that endpoint) as a distinct entity, whereas the [MEASURE] grid has both TERMINUS and PATH represented within a single argument. In the [MEASURE] grid the TERMINUS is not separately distinguished.<sup>4</sup>

## 2.2. Aspectual roles versus thematic roles

Thematic roles have traditionally been used in much of the linguistic literature because they are concise and straightforward to list in the verb's lexical specification. The traditional notion of thematic roles, as labels for a verb's arguments that describe the manner of participation in an event (*agents, themes, goals, sources, locations, instruments*, etc.) has turned out to be problematic. It has been generally acknowledged in the recent literature that thematic roles are not well-defined objects (Dowty 1991; Jackendoff 1987; Rappaport and Levin 1988). Aspectual roles are less problematic in this way, because they are more narrowly defined, compared to this traditional notion of thematic roles. At the same time they have the benefit,

like thematic roles, of being concise and straightforward to list as part of a verb's lexical specification.

Aspectual roles are comparable to thematic roles in that they label an argument by its manner of participating in the event described by the verb. We might ask, what is the relationship between thematic roles and aspectual roles, and what do aspectual roles give us that thematic roles do not? Are aspectual roles simply a subspecies of thematic roles? This is not the case; aspectual roles are not simply a subspecies of thematic roles; they are organized around a particular and precisely explicable kind of information that does not define thematic roles. Aspectual roles contain only a subset of the information that may be contained in a thematic role. Furthermore, some thematic roles contain aspectual role information and some do not. For example, arguments which are labeled with the thematic role of **THEME**, are often arguments which bear the aspectual role of **MEASURE**, but this parallel does break down. Gruber (1965) originally defined the **THEME** thematic role in a way which makes it comparable to an incremental-theme argument or an argument undergoing a change of state, which in turn makes it comparable to a **MEASURE** aspectual role for these cases.<sup>5</sup> The term **THEME** has also been used to refer to arguments undergoing no change. For example, in the following sentence, Jackendoff (1972) analyzes *the* book as a **THEME**:

- (6) \*Five dollars are cost by the book.  
Jackendoff (1972:44, #2.70)

The thematic role **THEME** can apply to a wider variety of things than the aspectual role **MEASURE**. And conversely, *Appalachian Trail* in:

- (7) Susan walked the Appalachian Trail.

might not be called a theme by some authors, although it would be a **MEASURE**. The problem is that inconsistency in the use of thematic role labels makes for imperfect mapping from thematic roles to aspectual roles, in spite of some coarse parallels between them. Aspectual roles, being connected to a precisely explicable semantic or temporal structure, have the advantage over thematic roles that they are more clearly definable than thematic roles. Aspectual roles have the further advantage over thematic roles in that a small and finite set of aspectual roles is more clearly discoverable than a small and finite set of thematic roles has proven to be, in spite of long years of research into the matter (Again: Dowty 1991; Jackendoff 1987; Rappaport and Levin 1988).

The existence of aspectual roles in the grammar of natural language is further motivated by the distinct nature of aspectual role information as compared with general thematic information. Not only are aspectual roles stated over a clearly definable subset of the information contained in thematic role information, this

subset of information is a very different sort of information from that which is more generally included in thematic information. Aspectual roles refer only to the temporal or aspectual structure of the event described by the verb. This is the kind of information that has been described as *event structure* by some researchers. Aspectual roles refer to the event structure information in the lexical semantics of the verb. I adopt the strong thesis here (argued for more fully in Tenny 1994) that different types of linking constraints are stated over aspectual roles and over thematic structure. Universal linking constraints are stated over aspectual roles, while language-particular linking constraints may be stated over the more general kinds of information included in thematic roles. Under this thesis, aspectual roles and thematic roles (or thematic structure) have a very different status in the grammar.

### 2.3. Aspectual roles, Aspectual Structure, and event structure

In recent years discussion of *event structure* has entered the linguistic literature, as mentioned above. These various works are concerned with articulating the structure of events as they are described by predicates of natural language, and organized by grammatical principles. Temporal, aspectual and causal information plays a large role in these event structures. The notion of aspectual roles follows in the general spirit of this literature, although they do not have an exact counterpart in the works cited above (repeated here from Section 1.1: Grimshaw 1990; Moens and Steedman 1988; Pustejovsky 1991; Van Voorst 1988). Aspectual roles (and aspectual role grids) identify an Aspectual Structure which involves the temporal structure of the events described by verbs. Aspectual Structure (as defined here) refers that portion of event structure which captures the interaction of a verb's internal arguments with the aspectual properties of the verb phrase. The potential aspectual effects of the verb's internal arguments are well known; there is a good deal of literature on the subject (Dowty 1979; Hinrichs 1985; Krifka 1992; Platzack 1979; Verkuyl 1993). There are both syntactic and semantic correlates of this special role played by the verb's internal arguments in aspectual composition.

On the syntactic side, it is only internal arguments which participate in Aspectual Structure: Internal arguments map to syntactic positions within the verb phrase. The verb phrase, in a sense, constitutes a syntactic unit that corresponds to a unit of Aspectual Structure. External arguments, even though they are certainly included in event structure representations as the arguments of **CAUSE** predicates (or associated with 'initial subevents'),<sup>7</sup> map to syntactic positions outside of the verb phrase. They are outside of Aspectual Structure as well, since they do not bear aspectual roles. (8) below illustrates the use of a **CAUSE** predicate taking the external argument as its argument, from Hale and Keyser (1987). This is the Lexical Conceptual Structure assigned by Hale and Keyser to verbs that undergo middle

formation in English. This structure organizes the meaning of the verb into components that mean: 'x (the external argument) causes y (the internal argument) to undergo some change'. The external argument **x** is one of the arguments of the predicate CAUSE. Note that it appears in an outer layer of syntactic and semantic composition here:

- (8) [x CAUSE [y undergo change]]

On the semantic side, aspectual roles are more clearly decomposable into temporal meaning, than are the CAUSE predicates or 'initial subevents' of event structure. A different kind of semantic composition is involved. The examples below briefly illustrate this point:

- (9) The winter temperatures froze *the lake* halfway.

*possible paraphrase:*

half the lake froze

John ate *the apple* halfway.

*possible paraphrase:*

half of the apple was eaten

- (10) *Martha* danced halfway.

*\*possible paraphrase:*

half of Martha danced.

*Thomas* ate halfway.

*\*possible paraphrase:*

half of Thomas ate.

The adverb *halfway* in (9) and (10) distinguishes between internal arguments in (9) and external arguments in (10). In (9), *halfway* can be understood to refer to the internal arguments *the lake* and *the apple*, so that a possible paraphrase of the sentence is that the lake or the apple was halfway eaten or frozen. These internal arguments are *measuring out* the event in this case.<sup>8,9</sup> With external arguments like *Martha* and *Thomas* in (10) on the other hand, *halfway* cannot be understood to refer to the argument as well as to the event. In (9), *the lake* and *the apple* bear the MEASURE aspectual role. In (10) *Martha* and *Thomas* do not bear aspectual roles but are thematic agents, which may be represented as first arguments of CAUS predicates. As arguments of these predicates, they are outside of the semantic composition of 'measuring out' the event to some temporal bound. They do not participate in this precise temporal function as causers or doers. These external arguments are part of event structure but do not participate in Aspectual Structure.

## 2.4. *Aspectual roles and universal linking*

Aspectual roles have another advantage over thematic roles. Aspectual roles are tied to syntax in a direct way that thematic roles are not, because aspectual roles contain only that semantic information that is relevant to universal linking generalizations. There are universal linking principles to be found, constraining the mapping of these aspectual roles, which are more reliable than mapping by thematic roles. The mapping between Aspectual Structure and syntactic structure has three components:

### (11) *Aspectual Interface Hypothesis (Tenny 1994)*

- (i) Measuring-out Constraint on Direct Internal Arguments
- (ii) Terminus Constraint on Indirect Internal Arguments
- (iii) The Non-Measuring Constraint on External Arguments

These constraints arise out of the aspectual or semantic constraints stated over three types of syntactic arguments. In brief, the *Measuring-out Constraint on Direct Internal Arguments* says that direct internal arguments either undergo no change or motion or do so in a way that can 'measure out' the event. The *Terminus Constraint on Indirect Internal Arguments* says that indirect internal arguments can participate in measuring out only as a terminus; and the *Non-Measuring Constraint on External Arguments* says that external arguments do not participate directly and explicitly in measuring out. The *Aspectual Interface Hypothesis* is the hypothesis that it is really aspectual properties that govern universal linking constraints, and the apparent linking regularities of thematic roles are an indirect effect of the aspectual regularities. These linking constraints have the effect of mapping arguments bearing the MEASURE and TERMINUS aspectual roles to syntax in a regular fashion:

### (12) Linking of Aspectual roles:

- (i) a MEASURE must be an internal direct argument
- (ii) a TERMINUS must be an indirect internal argument

In sum, those arguments of a verb that bear aspectual roles are always mapped to positions within the verb phrase. Linking rules operate over these aspectual roles in a clear and simple way; and a set of universal linking rules is stated over these aspectual roles.

## 3. *Modularity of aspectual structure and lexical Conceptual Structure*

This section of the paper presents the idea that Aspectual Structure is equivalent to a subpart of (Lexical) Conceptual Structure; and part of (Lexical) Conceptual

Structure reduces to Aspectual Structure. Furthermore, aspectual and non-aspectual information in (Lexical) Conceptual Structure should be represented modularly.

### 3.1. Argument structure alternations and Aspectual Structure

(Lexical) Conceptual Structures of various kinds have made their way into the linguistic literature as a means of representing syntactically relevant parts of lexical meaning. I will focus in this section on (Lexical) Conceptual Structures employed by Levin and Rapoport (1988) and Jackendoff (1990).<sup>10</sup> I will look at how they figure in two argument structure alternations: resultatives and manner-of-motion verbs. In the resultative construction *wipe the dishes dry*, a secondary predicate *dry* has been added which acts in concert with the verb to yield entailments about the object at the end of the event. *Wipe the dishes dry* entails that the dishes are dry at the end of the wiping event, whereas *wipe the dishes* entails nothing about the dishes at the end of this event. Levin and Rapoport (1988) capture the difference between *wipe the dishes* and *wipe the dishes dry* through their respective (Lexical) Conceptual Structures:

- (13) a. Evelyn wiped the dishes.  
       wipe<sub>1</sub>: Conceptual structure: [x'wipe' y]  
       b. Evelyn wiped the dishes dry.  
       wipe<sub>2</sub>: Conceptual structure: [x CAUSE [y BECOME (AT) z] BY  
       [x'wipe'y]]

*Wipe*<sub>1</sub>, the verb in the non-resultative sense, has a conceptual structure with no structure, as in (13a). *Wipe*<sub>2</sub>, the verb in the resultative usage, has acquired a (Lexical) Conceptual Structure involving the structured predicates CAUSE and BECOME, as in (13b). The [y BECOME (AT) z] portion of the representation imparts the resultative sense into the representation. Levin and Rapoport apply the same treatment to other classes of verbs, including sentences like:"

- (14) George scraped the putty off.  
       Dora floated the box into the harbor.

The manner-of-motion alternation has also been cast in Conceptual Structure terms. This alternation is found with verbs describing some manner-of motion, e.g. *float*:

- (15) The bottle will float under the bridge.

Carter (1984:173, #19)

This sentence has **two** possible senses: one in which the bottle is understood to float around for awhile in some location under the bridge, and another in which the bottle is understood to travel along a trajectory towards the bridge until it arrives

in some location beneath the bridge. In the first sense a goal phrase does not occur; in the second sense a goal phrase is possible or necessary. The alternation is productive among a large class of verbs, as Jackendoff shows:

- (16) Willy **wiggled/danced/spun/bounced/jumped** for hours,  
 without ever leaving the same spot.  
 Willy wiggled/danced/spun/bounced/jumped into Harriet's arms.  
 Jackendoff (1990:223, #28-29).

It is also productive in that new verbs may be coined which undergo the alternation:

- (17) **Bill** pogo-sticked (down the street) to school.  
 We Toyota'd (across the country) to the west coast.  
 The pioneers ox-carted to Nebraska.

However, some semantic constraints do apply to this alternation. Jackendoff shows that only verbs which have some semantic component of describing a manner of motion may undergo the alternation:

- (18) a. Willy sang for hours.  
 b. \*Willy sang into Harriet's arms.

Levin (1989) shows that verbs of sound emission also undergo this alternation, and may be considered to have a manner-of-motion component:

- (19) The elevator groaned slowly upwards.

Jackendoff expresses the manner-of-motion alternation with a correspondence between syntactic structure and Conceptual Structure, his *GO-Adjunct Rule*:

- (20) *GO-Adjunct Rule* Jackendoff (1990:224#32)  
 [VP V<sub>h</sub>...PP] may correspond to  
 GO([α], [PATH])  
 .....  
 [WITH/BY [MOVE ([α])]<sub>h</sub>]  
 (where ..... indicates irrelevant portions of the Conceptual Structure that are omitted here.)

When we consider the fragments of (Lexical) Conceptual Structure that are added to existing (Lexical) Conceptual Structures in the resultative and the manner-of-motion alternations, it becomes apparent that what is added is related to event structure and Aspectual Structure in a fundamental way. In the case of the resultatives, CAUSE [y BECOME (AT) z] is acquired in the alternation, providing structure that was not there before. The pre-existing undecomposed predicate 'wipe' is embedded under a BY predicate. The CAUSE predicate is provided by event struc-

ture (as discussed above), while the [y BECOME (AT) z] portion of the representation is provided by Aspectual Structure. The expression [y BECOME (AT) z] encompasses various changes that an argument bearing the MEASURE aspectual role undergoes in 'measuring out' the event. (For example *eat an apple* might have as part of its LCS [apple BECOME consumed]; or *ripen the fruit* might have as part of its LCS [fruit BECOME ripe].) The disjunction built into this LCS (represented by the parentheses around AT) reflects the difference between a MEASURE aspectual role grid and a TERMINUS aspectual role grid. The AT is necessary in the LCS just when z is an argument bearing the TERMINUS aspectual role. (For example *float the box into the harbor* might have as part of its LCS [box BECOME AT harbor].) Levin and Rapoport miss the unifying role played by time in their LCS's by not correlating the endstate or end-location z with the temporal endpoint of the event. Entailments about y do not follow from these LCS's without extra stipulations that include time in an ad hoc fashion. Since the endstate entailment is built into the MEASURE aspectual role, it follows automatically for arguments bearing the MEASURE role.

Just as the [y BECOME (AT) z] portion of Levin and Rapoport's LCS's must be seen as provided by Aspectual Structure, the GO([ $\alpha$ ], [<sub>PATH</sub>]) portion of Jackendoff's Conceptual Structure is aspectual in nature. This part of the structure, referring to going along a path toward a terminus, also involves the temporal boundedness of the event. The manner-of-motion alternation involves an alternation between a semantic structure involving a path and a goal, and a semantic structure lacking in a path or goal. But this corresponds to an alternation between a temporally bounded and an unbounded event, as we can see in (16). The GO([a], [<sub>PATH</sub>]) structure is crucially added to the Conceptual Structure in the manner-of-motion alternation, just as is the [y BECOME (AT) z] portion of the Lexical Conceptual Structure is added for the resultative alternation. Under the approach taken here, it is temporal or aspectual structure that, in a deep way, organizes these fragments of conceptual structure. The resultative and manner-of-motion alternations illustrate optional semantic structures in which Aspectual Structure is either present or is lacking.

The resultative and the manner-of-motion alternations crucially involve the addition of Aspectual Structure. The difference between *wipe the dishes* and *wipe the dishes dry* is that the latter necessarily entails a change of state that provides a temporal bound to the event; it therefore necessarily introduces a MEASURE aspectual role. The difference between *The bottle floated* and *The bottle floated to the sea* is that the latter necessarily entails a temporal bound introduced by *the sea*; it therefore necessarily introduces a TERMINUS aspectual role. Since Aspectual Structure (and event structure if the CAUSE predicate is included) is the crucial difference between the forms of these alternations, the resultative and manner-of-

motion alternations are more simply represented as operations over aspectual role grids. In the case of resultatives, a non-resultative verb has no aspectual roles (it has an empty aspectual role grid) and when converted to the resultative form of the verb it acquires a MEASURE aspectual role:

- (21) Evelyn wiped the dishes.  
 wipe<sub>1</sub>: Aspectual Structure: [ ]  
 Evelyn wiped the dishes dry.  
 wipe<sub>2</sub>: Aspectual Structure: [MEASURE]
- (22) wipe<sub>1</sub> → wipe<sub>2</sub>: [ ] → [MEASURE]

In the case of the manner-of-motion alternation, the verb without the motion-along-a-path-to-a goal sense has no aspectual roles and no aspectual role grid. By acquiring an aspectual role grid it acquires the motion-along-a-path-to-a-goalsense:

- (23) The bottle floated.  
 float<sub>1</sub>: Aspectual Structure: [ ]  
 The bottle floated to the sea.  
 float<sub>2</sub>: Aspectual Structure: [PATH TERMINUS]
- (24) float<sub>1</sub> → float<sub>2</sub>: [ ] → [PATH TERMINUS]

### 3.2. Modularity

Section 3.1 has shown that a subset of the information in (Lexical) Conceptual Structures is relevant when new structure is added to these structures in certain argument structure alternations, of which the resultative and manner-of-motion alternations are two examples. That relevant information and that added structure is part of Aspectual and event structure. The aspectual portion of the (Lexical) Conceptual Structure is the basis of argument structure alternations like these. In these alternations, the material added to an LCS is information about the temporal bounded structure of the event, which results in the predicate acquiring aspectual roles. This suggests an even stronger thesis: new structure introduced into (Lexical) Conceptual Structures through argument structure alternations is always and only Aspectual Structure and event structure. This strongest version of the thesis I will leave as a proposal for a research direction.

The fact that the new structure introduced in these alternations is Aspectual Structure and event structure constitutes one argument that Aspectual Structure and (Lexical) Conceptual Structure should be represented in modular fashion. Aspectual Structure in a sense is a privileged subpart of Conceptual Structure. But what about the non-aspectual portions of Conceptual Structure? What function do they serve?

We can distinguish the aspectual subpart of a (Lexical) Conceptual Structure from the non-aspectual portions (which I refer to as thematic information). This

is a distinction between those parts of the (Lexical) Conceptual Structure having to do with the temporal boundedness or temporal structure of the event, and those parts not having to do with the temporal structure of the event. Non aspectual parts of the (Lexical) Conceptual Structures discussed above are:

- (25) BY [x'wipe'y] (Levin and Rapoport 1988)  
 (26) [WITH/BY [MOVE ([ $\alpha$ )]<sub>H</sub>] (Jackendoff 1990)

These fragments of the Conceptual Structures are not necessary for a statement of the new semantic structure added in these alternations, nor do they encode directly any kind of event structure or Aspectual Structure information. Although the predicate BY or WITH/BY is introduced in the new Conceptual Structure, it does not itself import any structure that decomposes the meaning of the original verb. However, some of the information these fragments contain is necessary in order to describe the application of the rule for the argument structure alternation. For example, Jackendoff's Conceptual Structure includes conditions on *which* verbs may undergo the manner-of-motion alternation; namely, that only verbs whose meaning contains the primitive predicate MOVE may undergo the alternation. This restricts the alternation to verbs describing some manner of motion, so that examples like (18b) will not be generated. The thematic information in (26) does not describe new structure acquired in the alternation, but it does identify the predicates to which the alternation may apply."

Aspectual Structure is a privileged subpart of Conceptual Structure, but the thematic information contained in Conceptual Structure is also necessary for certain purposes. This leads to the thesis that lexical processes should be viewed as resulting from the interaction of these two modular kinds of information. In these argument structure alternations, thematic information and aspectual information play very different roles. The aspectual information is a source of the new structure introduced into (Lexical) Conceptual Structures, while the thematic information defines the verb classes these (Lexical) Conceptual Structures may apply to.

Thematic information is also necessary for the various functions traditionally ascribed to thematic roles; such as the specification of how many and what kinds of arguments a verb might be expected to take. Carrier and Randall (1993) also capture a kind of modularity in their lexical representations of resultatives. In their system, all resultatives share the property of being created by the addition of a change-of-state clause. However, transitive resultatives (The *gardener watered the tulips flat*) assign a thematic role to the object argument (*the tulips*), while intransitive resultatives (The *joggers ran the pavement thin*) do not have a thematic role assigned to the object (*the pavement*). Carrier and Randall's representations illustrate how a distinction between thematic and aspectual/event structure information is necessary in order to characterize these resultative expressions.

As summarized in Section 2, Universal Linking Principles are stated over Aspectual Structure and aspectual role grids. They are not stated over thematic information. This leads to the strong thesis that the modularity of Aspectual Structure and (Lexical) Conceptual Structure (or the thematic information in the conceptual structure) correlates with a distinction between universal and language-particular constraints on argument structure. What we have is the familiar distinction between possible and actual forms, well-attested in phonology and morphology, at work in the domain of argument structure. The Universal Linking Principles based on event structure and Aspectual Structure give us a range of possible forms for argument structures cross-linguistically. Other language-particular, non-universal linking patterns may be stated over non-aspectual thematic information in (Lexical) Conceptual Structures. Both representations are necessary for a complete account of linking in any particular language. Language-particular variants of these constraints on argument structure are stated over the more comprehensive range of information in Conceptual Structures, including thematic information. The thesis is that there is a distinction between universal and language-particular constraints on argument structure, and this distinction is reflected in the modularity of Aspectual Structure and Conceptual Structure.

#### 4. Acquisition

Pinker (1989), in his study of the acquisition of argument structure, has observed a distinction along similar lines, between broad-range and narrow-range rules, where broad-range rules are universal rules of argument structure or linking, which are not violated either by adults in careless speech, or by children acquiring language. Narrow-range rules are language-particular rules, and numerous violations of these are attested, both by adults and by language acquirers. Pinker proposes two tiers of conditions on argument-structure alternations, for possible and actual forms. A modular representation of Aspectual Structure and (Lexical) Conceptual Structure provides a means of representing this distinction between broad-range and narrow-range rules.

Violations of narrow-range rules for the locative alternation are illustrated in (27) and (28) below for adults, and in (29) below for children:

- (27) fill the mug with coffee  
\*fill coffee in the mug
- (28) Take a little of the mixture at a time and fill it into the zucchini  
[Quoted by Rappaport and Levin 1985; from a cookbook]  
It's not just **all** that water filling up. . .  
[in the basement; describing why someone is upset: Pinker 1989]

- (29) Mommy, I poured you ...Yeah, with water  
[Pinker 1989, from Bowerman 1982]

Candidate verbs for the locative alternation, as far as universal constraints are concerned, are verbs having **two** internal arguments, either of which might be construable as 'measuring out' the event. (Or alternatively, such verbs may have one argument construable as a **MEASURE**, and another that undergoes no internal change or motion.) The combination of one argument that is a material and one that is a container or flat surface fits the bill. *Fill* and *pour* are candidates for this alternation as far as universal constraints (or broad-range rules) are concerned, but narrow-range rules limit which verbs actually undergo it in English. Although *fill* and *pour* do not undergo the alternation, adults and children sometimes use them as if they do, thus violating narrow-range rules but not broad-range rules.

(30) illustrates a violation of narrow-range conditions on the manner-of-motion alternation. As discussed above, Jackendoff (1990) maintains that the verb must include some component of motion for it to undergo the alternation. Levin (1993) observes that verbs of sound emission may also undergo it. (30a) obeys Levin's conditions on the rule, although not Jackendoff's. (30b) violates both those conditions, as the verb *expostulate* is not necessarily a verb either of movement or of sound emission. (30b) is borderline acceptable:

- (30) a. The old car rattled down the street to the university.  
b. ?The old professor expostulated down the street to the university.

By contrast with these narrow-range rules that seem to be relatively violatable, broad-range rules are not violated. Some hypothetical violations of universal linking constraints, or broad-range rules are illustrated below in (31):

- (31) a. \*John<sub>i</sub> pounded on the metal<sub>i</sub> flat<sub>i</sub>.  
b. \*John<sub>i</sub> pounded the metal exhausted<sub>i</sub>. (with the intended meaning that John pounded the metal until he became exhausted)

In (31a) *the metal* bears the **MEASURE** aspectual role since it undergoes the change that is entailed at the completion of the event. Since *the metal* is an indirect rather than a direct argument of the verb, this construction is impossible by universal linking principles. In (31b), John bears the **MEASURE** aspectual role, yet John is the external argument. This again is ruled out by universal or broad-range rules. The prediction is that these rules will not be violated by adults in careless speech, or by children acquiring language, in the same way that the narrow-range rules illustrated above may be violated.

### 5. A Case Study: contact locatives

A closer look at one alternation, the contact locative alternation, illustrates the interaction of aspectual and thematic information. Pinker (1989), following Laughren, Levin and Rappaport (1986), discusses the semantic constraints on what he calls the contact locative alternation, possible with verbs like *hit*, but not possible with verbs like *cut* or *break* or *touch*. (The alternation is ungrammatical in the relevant reading for *cut* and *break*):

- (32) Sam hit the fence with the stick  
Sam hit the stick against the fence
- (33) Martha cut the cake with the knife.  
\*Martha cut the knife against the cake.
- (34) Susan broke the plate with the hammer.  
\*Susan broke the hammer against the plate.
- (35) Phil touched the glass with his hand.  
\*Phil touched his hand against the glass.

Pinker observes (following Laughren, Levin and Rappaport) that three semantic conditions are necessary for a verb to undergo this alternation. The meaning of the verb must include some notion of motion and of contact, and it must not include a notion of effect (on its direct argument). The four verbs are analyzed along these lines:

- (36) hit: +motion, +contact  
cut: +motion, +contact, +effect  
break: +effect  
touch: +contact

The verb that undergoes this alternation must have a sense of motion followed by contact, without 'effect'. An effect is a resultant change in the direct argument - something becoming broken or cut - and verbs with 'effect' as part of their meaning are verbs with the aspectual role MEASURE to assign. Simple motion and or contact does not translate into an aspectual role grid. These four verbs have the aspectual role grids below:

- (37) hit [ ]  
cut [MEASURE]  
break [MEASURE]  
touch [ ]

*Cut* and *break* impose a change of state on their direct arguments while *hit* and *touch* do not (an observation also made by Fillmore 1967). *Cut* and *break* therefore have MEASURE aspectual roles to assign and *touch* and *hit* have none. The objects of *hit* and

*touch* do not receive MEASURE aspectual roles because they do not, simply by virtue of being contacted, undergo any internal change or motion that defines the temporal duration of the event. The object of *hit* may be translated in space (more on this later) but this is not an *internal* change in the object. This is only one of many ways in which verbs like *hit* and *touch* part company with verbs like *cut* and *break*.

These aspectual role grids predict that *cut* and *break* will not be able to undergo the alternation. They have obligatory MEASURE roles to assign, which must be assigned to direct arguments. In sentences such as *Martha cut the knife against the cake*, and *Susan broke the hammer against the plate*, the direct arguments *knife* and *hammer* will bear the MEASURE aspectual role and consequently be forced to be interpreted as undergoing some change of state. (This is in fact the only possible interpretation for these sentences.) The interpretation in which the indirect arguments *cake* and *plate*, undergo the change of state are unavailable; consequently, *cut* and *break* do not behave like *hit* and *touch* in undergoing the alternation. The difference between *cut* and *break* on the one hand and *hit* and *touch* on the other hand is a difference in aspectual grids, and therefore rooted in universal linking constraints. As long as *cut* and *break* maintain their Aspectual Structure, the prediction is that they will not be able to undergo the alternation. Children are not predicted to use these verbs in the contact locative alternation once they have acquired the correct Aspectual Structure for the verbs.

The difference between *hit* and *touch* is not a difference in obligatory aspectual roles; both verbs have empty aspectual grids in (37). *Hit* has a component of motion-before-contact while *touch* includes the notion of contact, not necessarily preceded by motion. It would be more precise to say that 'motion' here means 'motion in some direction towards'; i.e., a potential path. This ingredient of meaning which distinguishes *hit* and *touch* means that *hit*, but not *touch*, has the *potential* to have a [PATH TERMINUS] aspectual role grid

- (38)            hit:        [     ] → [PATH TERMINUS]  
                   touch:   \* [     ] → [PATH TERMINUS]

The sentence:

- (39)            John hit the ball to the end of the field in five seconds.

can have the interpretation that it took five seconds for the ball to reach the end of the field, starting from where John hit it.<sup>13</sup> Compare this with the sentence:

- (40)            \*?John touched his hand to the top of the bookshelf in five seconds.

in the interpretation that it took five seconds for the hand to arrive at the top of bookshelf (from some starting point). This reading is much harder to get with the *touch* sentence than with the *hit* sentence. The necessary meaning associated with

*touch* in this sentence includes no sense of a traversal of a path to a terminus at the top of bookshelf.

The difference between *touch* and *hit* is clearer if we compare the two verbs with respect to their ability to take a delimiting secondary predicate. Secondary predicates like *upstairs* are goal-like, delimiting expressions:<sup>14</sup>

- (41) hit the ball upstairs  
\*touch your hand upstairs

*Hit* naturally takes a goal predicate whereas *touch* does not, because *hit* but not *touch* can optionally take an aspectual role grid with a TERMINUS argument.

Consider these sentences with *hit* and *touch*, repeated from (32) and (35) above:

- (42) Sam hit the stick against the fence.  
(43) \*?Phil touched his hand against the glass.

The optional PATH-TERMINUS reading helps to make these sentences felicitous. It is naturally available with *hit* in a way that it is not with *touch*. *Hit* has more potential to be used as a verb of imparting motion than does *touch*. No universal constraints rule out *stick* and *hand* as direct arguments, or *fence* and *glass* as non-terminus indirect arguments. In fact the PP's in these sentences might be interpretable as locations and not as goals. However, whatever kind of 'motion' it is that makes the PATH-TERMINUS reading more available for *hit* than for *touch*, also makes these sentences more natural with *hit* than with *touch*. The *touch* sentence is ruled out not for reasons of universal aspectual constraints on argument structure. It is more infelicitous than ungrammatical, and in fact, it is qualitatively much better than the comparable sentences with *cut* or *break*.

*Hit* is a verb that can optionally have a PATH-TERMINUS Aspectual Structure. We can compare it with a verb like *put* which has an obligatory TERMINUS to assign.

- (44) put: [TERMINUS]

*Put* is ungrammatical without the TERMINUS role assigned to something:

- (45) Sam put the dishes on the counter.  
\*Sam put the dishes.

*Put* takes a secondary predicate providing a TERMINUS:

- (46) put the ball upstairs

*Put* reveals its own pattern with respect to the contact locative alternation. *Put* is grammatical with the second form of the alternation, where the PATH-TERMINUS reading is favored, but ungrammatical with the first form of the alternation, where no TERMINUS is assigned:

- (47) \*Sam put the fence with the stick  
       Sam put the stick against the fence
- (48) \*Phil put the glass with his hand.  
       Phil put his hand against the glass.

The behavior of the classes of verbs represented by *hit*, *touch*, *cut*, *break*, and *put* with respect to this contact locative alternation illustrates the interaction of aspectual grids with non-aspectual thematic information. This analysis also predicts that these patterns of the contact locative alternation with respect to *put*, *cut* or *break* will not be violated by adults in careless speech, or by children acquiring language, so long as the Aspectual Structure of *put*, *cut* or *break* is preserved.

## 6. Conclusion

This paper has presented an approach to lexical specification in which Aspectual Structure is represented in modular fashion, as distinct from (Lexical) Conceptual Structure. Aspectual Structure is represented through aspectual roles, lexically specified aspectual role grids, and assignment of aspectual roles by predicates to certain of their internal arguments. Universal linking constraints are stated over Aspectual Structure and event structure, while language-particular constraints may be stated over the additional thematic material found in (Lexical) Conceptual Structure. The difference between universal and language-particular constraints on argument structure is apparent in language acquisition; universal constraints are respected by children acquiring language, while language-particular constraints are not. Both kinds of lexical information are important in determining a predicate's properties and behavior. The case of the contact locative alternation illustrates the interaction between Aspectual or event structure on the one hand, and conceptual or thematic information on the other hand.

## Notes

1. Aspectual Structure is represented in capital letters to indicate its use in this paper as a technical term.
2. See Tenny (1994) for further discussion.
3. Note that the moved object, *the bottle*, receives no aspectual role. Entailments about moved objects do not follow directly from Aspectual Structure but are an indirect result of it. See Tenny (1994) for more discussion.
4. This provides a partial account of why verbs of motion are special in so many ways. Verbs describing translational motion in space have the potential for a [PATH TERMINUS] grid.

More accurately, they have the potential for splitting off the TERMINUS — or conversely splitting off the PATH — from the MEASURE. Spatial change along a distance or direction provides a natural scale for *measuring* out an event, where the endpoint of the scale can be described in absolute rather than relative terms. A location is a spatial endpoint that is describable in absolute terms. This makes it possible for a location to be represented as a Noun Phrase argument bearing the TERMINUS aspectual role. We could take a canonical verb with a MEASURE role, and give it a TERMINUS stated in absolute terms:

(i) *The apple ripened to the point of ripeness.*

But this sounds redundant and clumsy, because the terminus of the ripening is already included in the verb *ripen*. It takes spatial distance as the measuring scale to be able to felicitously split off the TERMINUS as an absolute independent entity. (Route verbs like *walk* in *walk the Appalachian Trail vs. walk to town* are interesting because they can go either way, depending on whether the TERMINUS is inside or outside of the MEASURE.)

See Tenny (1995) for a detailed discussion of the special properties of verbs of motion.

5. Gruber's use of THEME however is not comparable to the MEASURE aspectual role in the case of verbs of motion, since a moved object like *the bottle* in *The bottle floated under the bridge* does not receive a MEASURE aspectual role, but would receive a THEME thematic role.
6. This is argued for in Tenny (1994: 1–125), and space limitations prevent my including those arguments here. However, related ideas may also be found in Hale and Keyser's (1993) notion of the 'inner VP' and in Moens and Steedman's (1988) notion of the 'core event'. Both of these notions may be thought of as roughly (though not exactly) equivalent to the idea that certain inner arguments of the verb play a privileged role in the aspectual semantics of the event described by the verb.
7. See Grimshaw (1990) for a clear exposition of these ideas.
8. Subjects and external arguments must not be confounded. Unaccusative or ergative verbs which have internal arguments as subjects, will have the adverb *halfway* predicated of the subject: *The lake froze halfway*. (See Burzio 1986 and Perlmutter and Postal 1984 on unaccusativity.)
9. The adverb *halfway* is lexically particular, in that it does not apply equally felicitously to all cases of measuring out. It is awkward with changes of state: *The apple rotted halfway*. If this sentence is interpretable in its change-of-state sense, it would mean 'The apple rotted to a degree which was half that of being perfectly rotten'.
10. I refer to these as (Lexical) Conceptual Structures because Levin and Rapoport call them Lexical Conceptual Structures and Jackendoff labels them Conceptual Structures. For present purposes, these are the same kind of representations.
11. Carrier and Randall (1993) also represent the Conceptual Structure formed by the creation of a resultative verb in a similar fashion to Levin and Rapoport (1988). Their Conceptual Structure for the newly formed resultative is:
 

CAUSE ([ ], [INCH BE (y, [PLACE AT [z]])])

where INC BE refers to the inchoative of becoming, and where the first argument under Cause (marked with a blank underline) is inherited from the base verb. The new material added to form the resultative is the inchoative clause argument:

[INCH BE (y, [PLACE AT [z]])]

This is very much in the spirit of Levin and Rapoport, except that the Cause predicate is not part of the material added to form the resultative here.
12. Jackendoff (1990) captures some modularity in his Conceptual Structures by distinguishing an action *tier* from a *thematic tier*. The action tier involves relations between actors and

patients, while the thematic tier involves motion and location. While this modularity introduces some advantages in Jackendoff's system, it is not exactly the modularity argued for here, which is based on the idea that the sparsest information associated with the temporal boundedness of the event is split off from the rest of the lexical semantic information. The thematic tier, while it includes motion and location which can translate into temporal boundedness, does not include temporal boundedness itself. Boundedness is a feature that may appear as part of the instrumental BY clause (Jackendoff 1990:214–215); and the instrumental BY clause is part of the action tier rather than the thematic tier (Jackendoff 1990:142). Aspectual roles are only applicable to temporally bounded events; the thematic tier may represent either bounded or unbounded events. While Jackendoff's approach introduces an interesting and fruitful modularity, it does not segregate all (and specifically) information about temporal boundedness from the rest of the lexical semantics.

13. A possible and perhaps more felicitous reading is that it took five seconds to hit the ball. This sentence may be ambiguous between these two readings. It should be interesting to look for other reflexes of this ambiguity.
14. Tenny (1987, 1994) discuss the delimiting properties of these structures.

## References

- Bowerman, M. (1982). "Reorganizational processes in lexical and syntactic development," in E. Wanner & L.R. Gleitman (eds.), *Language acquisition: The state of the art*. Cambridge University Press, New York
- Burzio, L. (1986). *Italian Syntax, A Government and Binding Approach*. Reidel, Dordrecht.
- Carrier, J., & Randall, J. (1993). "Lexical Mapping," in W. Abraham & E. Reuland (eds.), *Knowledge and Language II*. Kluwer, Dordrecht.
- Carter, R.J. (1984). "Compositionality and Polysemy," in B. Levin & C. Tenny (eds.), *On Linking: Papers by Richard Carter [Lexicon Project Working Papers 25]*, 167–204, MIT Center for Cognitive Science, Cambridge, MA.
- Dowty, D. (1979). *Word Meaning and Montague Grammar*. Reidel, Dordrecht.
- Dowty, D. (1991). "Thematic Roles and Argument Selection," *Language*, September 1991.
- Fillmore, C. (1967). "The Grammar of Hitting and Breaking," in R. Jacobs & P. Rosebaum (eds.), *Readings in English Transformational Grammar*, 120–133, Ginn and Co., Waltham, MA.
- Grimshaw, J. (1990). *Argument Structure*. MIT, Cambridge, Massachusetts.
- Gruber, J.S. (1965). *Studies in Lexical Relations, MIT, Ph.D. dissertation*, in J.S. Gruber (1976), 1–210, *Lexical Structures in Syntax and Semantics*. Amsterdam: North Holland.
- Hale, K. & Keyser, S.J. (1987). "A View from the Middle," *Lexicon Project Working Papers 10*. Center for Cognitive Science at MIT, Cambridge, MA.
- Hale, K. & Keyser, S.J. (1993). "On Argument Structure and the Lexical Expression of Syntactic Relations," in K. Hale & S.J. Keyser (eds.), *The View from Building 20. Essays in Linguistics in Honor of Sylvain Bromberger*. MIT, Cambridge, Massachusetts.
- Hinrichs, E. (1985). *A Compositional Semantics for Aktionsarten and NP Reference in English*. Ph.D. dissertation, Ohio State University.
- Jackendoff, R. (1972). *Semantic Interpretation in Generative Grammar*. MIT, Cambridge, Massachusetts.
- Jackendoff, R. (1987). "The Status of Thematic Relations in Linguistic Theory," *Linguistic Inquiry* 18, 369–411.

- Jackendoff, R. (1990). *Semantic Structures*. MIT, Cambridge, Massachusetts.
- Krifka, M. (1992). "Thematic Relations as Links between Nominal Reference and Temporal Constitution," in I. Sag & A. Szabolsci (eds.), *Lexical Matters*. Center for the Study of Language and Information, Stanford.
- Laughren, M., Levin, B., & Rappaport, M. (1986). What's behind theta-roles: What **syntax** tells us about lexical representation. Center for Cognitive Science at MIT, Cambridge, MA.
- Levin, B. (1993). *English Verb Classes and Alternations*. University of Chicago Press, Chicago.
- Levin, B. & Rapoport, T. (1988). "Lexical Subordination," *Proceedings of the Chicago Linguistics Society*, 24.
- Marantz, A. (1984). *On the Nature of Grammatical Relations*. MIT, Cambridge, Massachusetts.
- Moens, M. & Steedman, M. (1988). "Temporal Ontology and Temporal Reference," *Computational Linguistics* 14, 15-28.
- Perlmutter, D. & Postal, P. (1984). "The 1-Advancement Exclusiveness Law," in D. Perlmutter & C. Rosen (eds.), [*Studies in Relational Grammar* 2], 81-125, University of Chicago Press, Chicago.
- Pinker, S. (1989). *Learnability and Cognition: The Acquisition of Argument Structure*. MIT, Cambridge, Massachusetts.
- Platzack, C. (1979). *The Semantic Interpretation of Aspect and Aktionsarten: A Study of Internal Time Reference in Swedish*. Dordrecht, Foris.
- Pustejovsky, J. (1991). "The **Syntax** of Event Structure," *Cognition* 41, 47-81.
- Rappaport, M. & Levin, B. (1985). *A case study in lexical analysis: The locative alternation*, ms. Cambridge, MA: MIT Center for Cognitive Science.
- Rappaport, M. & Levin, B. (1988). "What to do with Theta-Roles." in W. Wilkins (ed.), *Thematic Relations [Syntax and Semantics 21]*, 7-36. Academic Press, New York.
- Tenny, C. (1987). *Grammaticalizing Aspect and Affectedness*, Ph.D. dissertation, MIT.
- Tenny, C. (1994). *Aspectual Roles and the Syntax-Semantics Interface*. Kluwer, Dordrecht.
- Tenny, C. (1995). "How Motion Verbs are Special," *Pragmatics & Cognition* 3(1), John Benjamins, Amsterdam.
- Voorst, J. van (1988). *Event Structure*. John Benjamins, Amsterdam.
- Verkuyl, H. J. (1993). *A Theory of Aspectuality*. Cambridge University Press, Cambridge.
- Williams, E. (1981). "Argument Structure and Morphology," *Linguistic Review* 1, 81-114.
- Zubizarreta, M. L. (1987). *Levels of Representation in the Lexicon and in the Syntax*. Foris, Dordrecht.