

# Event Structure and Adverbial Modification

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## *Abstract*

*We argue that event structure as a level of semantic representation provides a suitable place to account for the semantic properties of adverbs like slowly, quickly and almost. These adverbs are event modifiers. We also show that causal interpretation in the meanings of some verbs and resultatives is attributed to the structural configuration of events. A particular structure of events is interpreted as causation. Three generative operations on event structure are also proposed to construct correct event structures of resultatives. And we suggest that depictives are adverbial in terms of event semantics but predicative in syntactic structure.\**

*Keywords: event structure, adverb, resultative, depictive*

## **1. Introduction**

The aim of this paper is to examine structural properties of a semantic representation of events, which is referred to as event structure. We assume that event structure is a pure representation of relations among events and it does not include other semantic properties like thematic relations. Furthermore we argue that an event can include subevents and thus event structure is structurally organized. Our argument is based on the examination of certain classes of adverbial items which can modify a subevent, i.e., a portion of an event denoted by a predicate. In the next section we examine the event structure of verbs and its interaction with adverbs which modify eventualities. We will see that pace adverbs like *slowly* and *quickly* and rate adverbs like *almost* are event modifiers and their properties of modification are straightforwardly captured if we assume a structured event representation. In section 3 we extend the subeventual analysis of the event semantics of verbs to resultatives:

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\* I am grateful to Mark Bell, who acted as an informant.


- (1) a. Mary broke the bottle into pieces.  
 b. John hammered the metal flat.  
 c. The runners ran the pavement thin.

Resultatives will be analyzed as having a complex event structure composed of two distinct subevents. We will propose three operations to derive the complex event structure of resultatives. Two of them are operations to compose or fuse two distinct events and the other is a process which coerces an event into a designated type. We will then examine the validity of the subeventual analysis of resultatives in the light of modification patterns of event modifiers in section 4. In section 5 we will propose that depictives as in (2) should be treated as event modifiers and suggest another possible operation on event structure.

- (2) a. John went out of the room angry.  
 b. John ate the meat raw.

The nature of event structure assumed here is based on Pustejovsky (1991, 1995). He extends the neo-Davidsonian view of events, which incorporates an existentially quantified event variable into a semantic structure, and proposes a subeventual analysis for predicates. He distinguishes three basic types of event structures: states ( $E_S$ ), processes ( $E_P$ ) and transitions ( $E_T$ ). A state is a single event which is evaluated relative to no other event. It does not have an internal temporal organization and typically denoted by stative predicates like *know*, *resemble*, and *have*.

A process is a sequence of arbitrary number of homogeneous events and identifies one semantic expression as in (3).

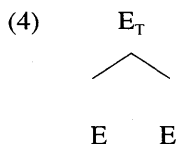
- (3)  $E_P$   
  
 $e_1 \dots e_n$

For example, *run* denotes an event that is conceptualized as a sequence of atomic running activity. In addition to the durable activity like running, an instantaneous activity also can be a process. Flashing is an example of such activities. In *the light flashed*, it is normally interpreted as a process event involving only one atomic event, while in *the light flashed all night*, it is understood as a sequence of flashing events. Note that we do not suppose that atomic events ( $e$ 's in (3)) are subevents of  $E_P$  since the number of atomic events in (3) has nothing to do with determination of the linguistically

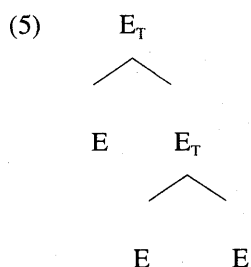
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relevant properties of a process eventuality. Thus a process is a simple event at event structure, which we assume is a level of representation of linguistically relevant aspects of conceptualized eventualities.

A transition is different from the other types in that it is a complex event. It is composed of two subevents and identifies a semantic expression:

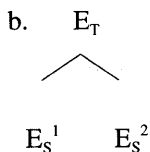


A subevent E in (4) can be of any type. Thus the following structure is also possible:



A typical example of the transition event is a change of state. A change of state is a transition from one state to another state. For example, the event structure of (6a) is (6b).

(6) a. John became fat.



$E_S^1$  is a state of not being fat and  $E_S^2$  is a state of being fat. Note that the linear order of subevents represents their temporal order:  $E_S^1$  temporarily precedes  $E_S^2$ .<sup>1</sup>

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<sup>1</sup> The two subevents may partially or completely overlap in some cases. See Pustejovsky (1995) for discussion.

## 2. Event Adverbs and Complex Event Structures

In this section, we argue that some classes of adverbs modify eventualities denoted by predicates. Those adverbs are referred to as event adverbs. We see that the subeventual analysis of event structure outlined in section 1 provides a straightforward account for properties of modification by event adverbs.

Van Valin and LaPolla (1997: 164) claim that when a pace adverb like *slowly* or *quickly* is used with a lexical causative verb, the sentence is ambiguous as to what is modified by the adverb. For example, they point out that the sentences (7a-b) each have the interpretation either that the boy did some action slowly and the door closed by the action or that the boy did some action and the door slowly closed by the action.<sup>2</sup>

- (7) a. The boy closed the door slowly.  
b. The boy slowly closed the door.

The authors assign the following logical representations to each interpretation:<sup>3</sup>

- (8) a. [**do'** (boy, Ø)] CAUSE [**slow'** (BECOME **closed'** (door))]  
b. [**slow'** (**do'** (boy, Ø))] CAUSE [BECOME **closed'** (door)]

In addition to these two interpretations, the third reading can be identified. It is the interpretation that the boy slowly closed the door and the door closed slowly. The logical representation of this third interpretation is (9):

- (9) **slow'** ([**do'** (boy, Ø)] CAUSE [BECOME **closed'** (door)])

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<sup>2</sup> Pustejovsky (1991) notes that the modification pattern of *slowly* is different from that of *quickly*. He claims that *slowly* in both sentences in (i) refers to the action of walking, while *quickly* in (ii) can refer either to the manner of action or to the duration of the entire event:

- (i) a. Mary walked to the store slowly.  
b. Mary slowly walked to the store.  
(ii) a. Mary walked to the store quickly.  
b. Mary quickly walked to the store.

This difference should be attributed to the idiosyncrasies of each adverb. We assume that these adverbs fall under the same semantic class.

<sup>3</sup> Van Valin and LaPolla (1997) note that when a pace adverb occurs in a sentence-final position as in (7a), both interpretations (8a) and (8b) are readily available, while it is placed in a preverbal position as in (8b), the interpretation (8a) is salient.

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The subeventual analysis of lexical causative verbs like *close* provides a straightforward account for this ambiguity. Assume that the event structure of a lexical causative verb is composed of two subevents: one is a causing event which is associated to a process and the other is a transition which represents a change of state. The bracketed portion in each logical representation in (8) and (9) corresponds to a subevent. Assume further that pace adverbs are event modifiers and can modify any dynamic, i.e., non-stative, event.<sup>4</sup> Then it follows that the interpretation of a pace adverb varies according to which subevent the adverb modifies. The first interpretation represented in (8a) is obtained when the adverb modifies the causing subevent; the second interpretation in (8b) is obtained when it modifies the transition subevent; and the third interpretation in (9) is obtained when it modifies the root transition event. These three interpretations can be roughly represented in event structural terms as (10a), (10b) and (10c) respectively.

- (10) a. [[slow ([E<sub>P</sub>])] [E<sub>T</sub> [E<sub>S</sub>] [E<sub>S</sub>]]  
 b. [[E<sub>P</sub>] [slow ([E<sub>T</sub> [E<sub>S</sub>] [E<sub>S</sub>]])]]  
 c. [slow ([[E<sub>P</sub>] [E<sub>T</sub> [E<sub>S</sub>] [E<sub>S</sub>]])]]

Note that the structures in (10) do not include semantic functions like CAUSE or BECOME. We assume that the interpretation represented by these functions is predictable from the configuration of event structure. Suppose the following rules of interpretation of inter-eventual relations.

- (11) a. [E<sub>T</sub> [E<sub>S</sub>] [E<sub>S</sub>]] is interpreted as a change of state.  
 b. [E<sub>T</sub> [E<sub>P</sub>] [E<sub>T</sub>]] is interpreted that [E<sub>P</sub>] and [E<sub>T</sub>] are causally linked.

If the first subevent of a transition is a state, the complex event represents a change of state. If the first subevent is a process, the two subevents are causally linked, the first subevent being a causing event and the second a result event.

The inchoative counterparts of (7a-b) are unambiguous:

- (12) a. The door closed slowly.  
 b. The door slowly closed.

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<sup>4</sup> Pace adverbs do not co-occur with stative verbs as the following examples illustrate:

- (i) a. \*John quickly/slowly resembles his father.  
 b. \*Mary quickly/slowly knew the answer to the question.



Given this complex event structure, nothing prevents a pace adverb from modifying the causing event (E1). If this prediction were correct, the sentences in (12) would have the interpretation that someone did something slowly and the door closed by that action. But, in fact, such an interpretation is not available.

Levin and Rappaport Hovav's (1995) analysis successfully captures the intuition that when a door closes, some physical force external to the door is implied. However, their formal mechanism is problematic when we take adverbial event modification into consideration. We consider that the event structure of inchoative verbs is (13) and the intuitively implied external cause is obtained by a meaning postulate which dictates the knowledge that some external physical force is usually required for the door to close.

We have seen that pace adverbs are sensitive to the subeventual structure of the verbal event representation. Pustejovsky (1991) points out that rate adverbs like *almost* are also sensitive to the subeventual structure. Consider the following examples:

- (17) a. John almost built a house.  
b. John almost ran.

Both sentences in (17) have an interpretation where the act is intended but never carried out, while (17a) has an additional reading that the action is started but not completed. Our discussion about the pace adverbs can be applicable to this case in the same way. Since the event structure associated to the causative verb *build* is complex, i.e., it is composed of a causing process event and a result transition event, two distinct subevents are available as a modifiee of *almost*:

- (18) a.  $[_{E_T} [\text{almost} ([E_p])] [E_T]]$   
b.  $[_{E_T} [E_p] [\text{almost} ([E_T])]]$

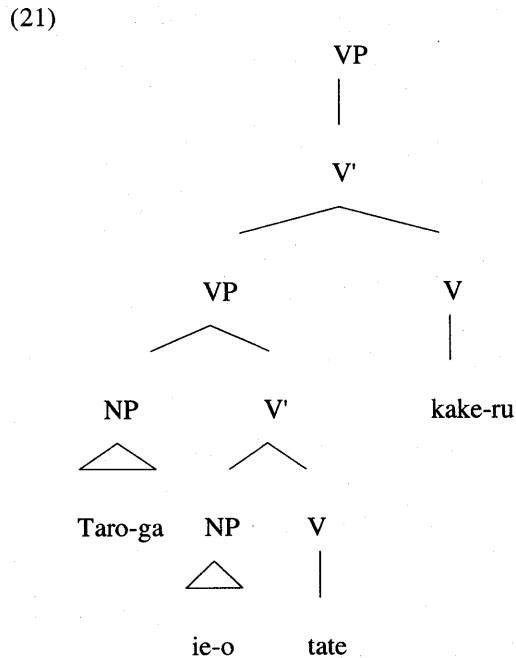
If *almost* modifies the causing subevent as in (18a), the sentence (17a) means that the causing event is not completely started, i.e., John did not carry out the action of building a house; while if *almost* modifies the result subevent as in (18b), the sentence means that the result state did not completely arise, i.e., the house does not yet exist. On the other hand, manner of motion verbs like *run* in (17b) has a simple event structure, and thus the adverb unambiguously modifies that event:

- (19)  $[\text{almost} ([E_p])]$

A similar phenomenon is exhibited in Japanese sentences with a V.*kake-ru* compound:

- (20) a. Taro-ga            ie-o                    tate.kake-ta.  
          Taro-Nom        house-Acc            build.kake-Past  
       b. Taro-ga            wara-i.kake-ta.  
          Taro-Nom        laugh.kake-Past

(20a) means either that Taro intended to build a house but not started building it or that Taro started building a house but never finished, whereas (20b) means that Taro intended to laugh (or made some physical action as if he would start to laugh) but he did not started laughing. Following Kageyama (1993), we assume the syntactic structure (21) for the VP that includes the V.kake-ru compound:

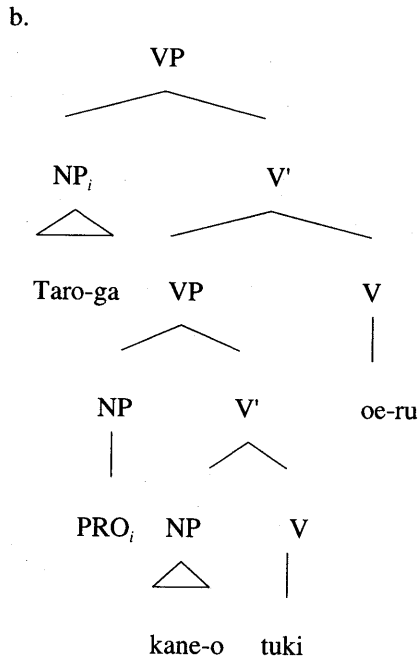


Note that both subject and object are included within the lower VP, which should be contrasted with another V.V compound structure in (22).

- (22) a. Taro-ga            kane-o            tuki.oe-ta.  
          Taro-Nom        bell-Acc            strike.finish-Past  
          ‘Taro finished striking a bell.’



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These two structures (21) and (22b) reflect the thematic relations within VPs. In (22b) the subject NP *Taro-ga* qualifies as an external argument of both the lower V (*tuki-u* (strike)) and the upper V (*oe-ru* (finish)). Thus both Vs are involved in the thematic relation. On the other hand, in (21) the subject NP qualifies only as an external argument of the lower V (*tate-ru* (build)). The upper V *kake-ru* does not have its own external thematic role to assign and the two argument NPs only discharge the thematic roles of the lower verb *tate(-ru)* (build).<sup>5</sup> This thematic irrelevance of *kake-ru* is clarified by the fact that *oe-ru* can be used as a primary verb but *kake-ru* cannot:

- (23) a. *Kare-ga sigoto-o oe-ta.*  
 he-Nom work-Acc finish-Past  
 'He finished the work.'
- b. \**Kare-ga sigoto-o kake-ta.*  
 he-Nom work-Acc *kake-Past*

Since *kake-ru* does not have a thematic role to assign, it cannot occur as a primary verb. Though *kake-ru* is morpho-syntactically categorized as V, it is adverbial from the

<sup>5</sup> See Kageyama (1993) for detailed discussion.

perspective of its event semantic function since it does not take part in thematic relations. Thus it is not unreasonable to assume that the verb *kake-ru* is treated at the level of event structure as an adverbial modifier, putting aside the detailed process of syntax-to-semantics mapping. Under this assumption, *kake-ru* in Japanese can be analyzed in the same fashion as *almost* in English at the level of event structure.

We have seen that the subeventual analysis of verb semantics accounts for modification properties of some classes of adverbs. If a pace/rate adverb is attached to a verb which has a complex event structure, it ambiguously modifies either the causing process or the resultant transition. On the other hand, if such an adverb is attached to a verb which has a simple event structure, it unambiguously modifies the process the verb denotes.

### 3. Event Structure of Resultatives

#### 3.1. Taxonomy of Resultatives

In this section, we examine the event structure of resultatives. It is widely assumed that resultatives are assigned a complex event structure similar to the one discussed in the previous section for inherently causative verbs.

Resultatives are divided into several subclasses according to their syntactic and semantic characteristics. The syntactic distinctive characteristic is the valence of the primary verb, i.e., transitive versus intransitive. The semantic characteristic concerns whether the main verb lexically entails a result state or not. On one hand, the typical class of verbs which lexically entail a result state is change of state verbs like *break*, *paint*, *burn*, *dry*, and *open*. In terms of Vendler's (1967) aspectual classification of verbs, these verbs correspond to accomplishment or achievement verbs. On the other hand, the class of verbs which do not lexically entail a result state includes verbs like *run*, *dance*, *punch*, *float* and *roll*. These verbs are activity verbs in Vendlerian terms. We refer to the former class as transition verbs and to the latter as process verbs since the former is assigned a complex transition event structure while the latter is assigned a simple process event structure as discussed in detail below.

The semantic characteristic sometimes does not affect the grammaticality of English resultatives because English allows a fairly wide variety of resultatives. But some researchers, Kageyama (1997) and Washio (1997) among others, point out that this semantic characteristic is crucial to determine the grammaticality of Japanese resultatives.

The syntactic and semantic distinctions crosscut each other. Below are examples of each class of English and Japanese resultatives based on transitive verbs.

(24) *Resultatives based on transitive transition verbs*

- a. John painted the wall red.  
 b. John broke the bottle to pieces.  
 c. Taro-ga kabe-o aka-ku /aka-ni nut-ta.  
    Taro-Nom wall-Acc red/red-ni paint-Past  
 d. Taro-ga hako-o konagona-ni kowasi-ta.  
    Taro-Nom box-Acc pieces-ni break-Past

(25) *Resultatives based on transitive process verbs*

- a. John punched the clay flat.  
 b. John screwed the lid tight.  
 c. \*?Taro-ga nondo-o taira-ni/hirata-ku nagut-ta.  
    Taro-Nom clay-Acc flat punch-Past  
 d. \*?Taro-ga huta-o kata-ku nejit-ta.  
    Taro-Nom lid-Acc tight screw-Past

In English a result phrase is an AP or an PP, and in Japanese it is a *-ku* marked AP or a *-ni* marked AP and NAP (Nominal Adjective Phrase). The ungrammaticality of the sentences (25c-d) illustrates that verbs which do not lexically entail a result state are not allowed in Japanese resultatives. For example, the verb *nagu-ru* (punch) in (25c) does not entail that the state of its object changes by the action, while the verb *nu-ru* (paint) in (24c) entails a change of state of its object.

Resultatives based on intransitive transition verbs occur in the pattern of NP-V-AP/PP. These resultatives are often referred to as unaccusative resultatives:

(26) *Resultatives based on intransitive transition verbs*

- a. The bread burned black.  
 b. The river froze solid/thick/thin.  
 c. Pan-ga kuro-ku koge-ta.  
    bread-Nom black burn-Past  
 d. Ike-ga kata-ku/atu-ku/usu-ku koot-ta.  
    pond-Nom solid/thick/thin freeze-Past

Resultatives based on intransitive process verbs require 'fake objects'. A fake object is not an argument of the primary verb and interpreted as the subject of the result predicate.

(27) *Resultatives based on intransitive process verbs*

- a. They laughed John off the stage.

- b. They ran the pavement thin.
- c. \*Karera-ga           Taro-o           butai-kara           warat-ta  
       they-Nom           Taro-Acc           stage-off           laugh-Past
- d. \*Karera-ga           hodo-o           usu-ku   hasit-ta.  
       they-Nom           pavement-Acc   thin   run-Past

These resultatives are referred to as unergative resultatives. The grammaticality judgement for resultatives based on intransitive verbs parallels transitive resultatives in (24)-(25). Process verbs are not allowed in Japanese resultatives.

In sum, Japanese allows only a subset of resultatives that English does. The restriction on Japanese resultatives is semantic in nature. Only verbs which entail a result state are allowed in Japanese resultatives. This restriction must be accounted for. We focus on this semantic restriction here. Other issues like syntactic and semantic differences of the two types of intransitive resultatives or the nature of fake objects are out of the scope of this paper.

### 3.2. *Event Merger*

Consider first the event structure of resultatives based on process verbs as in (25) and (27). As argued above, process verbs, unlike transition verbs, do not entail a result state of its internal argument. In terms of event structure, they are assigned a simple, not transitional, event structure. If these verbs are used in resultatives, the result state is denoted exclusively by a result predicate. For example, in (28), where a manner of motion verb *hammer* is used as a primary verb, the verb does not denote a result state brought about by the action of hammering. Rather the state is denoted by the result phrase *flat*.

- (28) John hammered the metal flat.

The result phrase, being a predicate, is assigned its own event structure. Then the resultative sentence (28) includes two lexical items which are independently assigned an event structure:

- (29) John hammered the metal flat.  
           [E1]                   [E2]

Now assume an operation on event structure which merges two independent events to derive a complex event: event merger (30).

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- (30) *Event merger*  
Merge two events

When (30) is applied to (29), the complex event E3 is derived:

- (31) [<sub>E3</sub> [E1] [E2]]

If event merger applies freely, it is also applicable to sentences with depictives like (32), because a depictive phrase is an AP and has its own event structure as a result AP does.

- (32) John hammered the metal hot.  
          [E1]                  [E2]

However it is not a desirable consequence that E1 and E2 in (32) merge into a complex event structure because the sentence in (32) does not have a transitional interpretation between the two events. We suppose that the difference in meaning between resultatives and depictive sentences is attributed to the difference of their syntactic structure. Following Carrier and Randall (1992), we assume the following syntactic structures.

- (33) a. *Resultative*
- ```

graph TD
    V_prime[V'] --- V[V]
    V_prime --- NP[NP result phrase]
            
```

b. *Depictive*

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graph TD
    V_prime1[V'] --- V_prime2[V']
    V_prime1 --- DP[depictive phrase]
    V_prime2 --- V[V]
    V_prime2 --- NP[NP]
            
```

In (33) the result phrase is in the complement domain of V, while the depictive phrase is not. Then we suppose that event merger is activated when a predicative category occurs in a complement domain of another predicative category. Thus it is activated in (33a) but not in (33b).

As we have seen in section 3.1, resultatives in Japanese are ungrammatical if a primary verb is a process verb. This restriction is accounted for if we assume that event merger is not available in Japanese or that event merger is still available but its syntactic restriction differs from English. We leave it for a future research to determine where the parametric variation resides.

### 3.3. Transitional Property of Result Events

In the previous section, we assumed that resultatives based on process verbs are assigned complex event structures and the primary verb corresponds to the first subevent and the result AP/NAP/PP corresponds to the second subevent. Consider the commonly assumed semantic structure for resultatives:

(34)  $[_{E1} [_{E2} x \text{ ACT (ON } y)] \text{ CAUSE } [_{E3} y \text{ BECOME } z]]$

It is assumed that the primary verb is linked to E2, the causing event, and the result phrase is linked to the z position. Namely the primary predicate is linked to an event, while the result predicate is linked to an event variable. These linking correspondences are asymmetric since one predicate is linked to an event while the other predicate is linked to a variable within an event. This asymmetry of linking calls for a further explanation. Instead of investigating the explanation of the asymmetry, however, we will propose another possibility of more transparent linking correspondence between the entities in event structure and those in syntactic structure. Assume that the result phrase is linked to the event E3, not to the variable z, in (34). Then the linking becomes simple and symmetric: the primary predicate is linked to the first subevent and the secondary (result) predicate to the second subevent, providing a one-to-one correspondence between events and predicates.

The result event (E3 in (34)) is a transition since it represents a change of state. It is interpreted as "y changes over from not being the state of z to being the state of z". Thus, in purely event structural terms, (34) should be represented as follows:

(35)  $[_{E1} [_{E2} [_{E3} [_{E_S1}]] [_{E_S2}]]]$

In (35), E1 is a transition composed of two subevents E2 and E3, and E3 is also a transition composed of two states S1 and S2. Since E1 is a transition composed of a process and a transition, it is interpreted as causative by the interpretation rule (11b) repeated here as (36).

(36)  $[_{E_T} [_{E_P}]] [_{E_T}]$  is interpreted that  $[_{E_P}]$  and  $[_{E_T}]$  are causally linked.

Event merger assures that resultatives have a causative interpretation because it constructs a configuration which is causally interpreted by the general rule of event interpretation (36).

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However, this hypothesis raises a problem concerning the type of the result event. Because the result event (E3 in (35)) is a transition, the predicate which it is linked to must denote a transitional eventuality. But the result phrase of resultatives is an inherently stative predicate. The problem is made clear when we consider resultatives with adjectival result phrases:

- (37) a. John painted the wall *red*.  
b. The bread burned *black*.

Adjectives are in general stative predicates which denote states and do not express a dynamic eventuality. For example, the sentence *I saw a man dead* does not mean I saw a man dying. The occurrence of stative adjectival result phrases in (37) apparently shows that the result phrase cannot be linked to the dynamic transition E3 in (35).

As for prepositional result phrases, one may consider that the prepositions encode a dynamic eventuality as part of their lexical meaning, based on the fact that the most typical prepositions in result phrases are directional like *to*, *into*, and *off*:

- (38) a. He ground the coffee beans *to* a fine powder.  
b. John kicked Bill *into* the kitchen.  
c. They laughed Mary *off* the stage.

The following minimal pair may also suggest the relevance of the meaning of prepositions:

- (39) a. They shouted Mary on the stage.  
b. They shouted Mary onto the stage.

(39a) cannot be interpreted as a resultative. The difference between the sentences in (39) is that the preposition in (39a) is locative while the one in (39b) is directional. Directional prepositions imply a change of location of something, and therefore it can be assumed that directional PPs correspond to transition events. Then (39b) is a possible resultative because the result PP can be linked to a transition event, while (39a) is an impossible resultative because a locative PP cannot be linked to a transition event.

However, Goldberg (1995) points out that the prepositions which favor a locative, not directional, interpretation can occur in the caused-motion construction, which is similar to resultatives in that both are assigned complex event structures composed of two causally linked subevents:

- (40) a. Fred stuffed the papers in the envelope.  
 b. Sam pushed him within arm's length of the grenade.  
 c. Sam shoved him outside the room.

Goldberg argues that it is impossible to attribute the causal interpretation of the caused-motion construction to the semantics of prepositions because a preposition in the construction can be locative. She claims that the preposition in itself should not be necessarily directional; but when it occurs in the caused-motion construction, a locative preposition is coerced to have a directional reading. Thus the dynamic reading of a result PP is not inherent in its head, but in a sense, derived by application of a semantic coercion.

We accept Goldberg's basic idea of the semantic coercion and extend it to cover resultatives. We assume that the preposition which heads a result phrase in a resultative is either inherently transitional or coerced into being transitional. We also assume that the same coercion process applies to adjectival and nominal adjectival result phrases. Some adjectives and nominal adjectives are inherently transitional but others are not.

This transitional/non-transitional distinction is parallel with the well-known stage-level/individual-level distinction argued by Milsark (1974), Carlson (1977) and Kratzer (1995) among others. The stage-level property is temporary, i.e., transitional, whereas the individual property is enduring, i.e., non-transitional. For example, *awake*, *hungry*, *drunk*, *sick*, and *tired* are stage-level predicates; while *big*, *fat*, *intelligent*, *red*, and *smart* are individual-level predicates. The coercion under discussion can be regarded as a process which coerces an individual property into a stage-level property. As Kratzer (1995) points out, the stage-level/individual-level distinction is not rigid, but sensitive to contexts, both linguistic and non-linguistic. She writes, as an example of the sensitivity to non-linguistic contexts, that having brown hair is usually an individual-level property since we do not think of persons dying their hair capriciously, but if someone dyed his/her hair every other day, his/her property of having brown hair would be stage-level.

Along the same way, an individual-level property can be coerced into a stage-level property in certain linguistic contexts. We assume that the resultative is one of such linguistic contexts. Thus if an individual-level predicate occurs as a result phrase in (37), it is coerced into a stage-level predicate.

Based on the discussion so far, we propose an event type coercion (41), which coerces a state into a transition:

- (41) [S1] – [<sub>ET</sub> [S0] [S1]]



Alternatively assume that a certain class of stative eventualities is potentially transitional. For example, color is usually a static property of objects. But if you see a wall whose color changes at regular intervals and say *The wall is red now*, the color of the wall is a transitional property. We can consider the event structure of potentially transitional state as the following:

$$(42) \exists [S_0]([E_T [S_0] [S_1]])$$

Then the event type coercion is regarded as a process to eliminate the existential closure of (42).

Because  $E_T$  is a transition composed of two states, it is interpreted as a change of state by the general rule of event interpretation (11a). Given the event type coercion, the transparent correspondence between a predicate and an event can be established.

### 3.4. Event Fusion

We turn to the examination of the event structure of resultatives based on transition verbs as in (24) and (26) repeated below as (43) and (44).

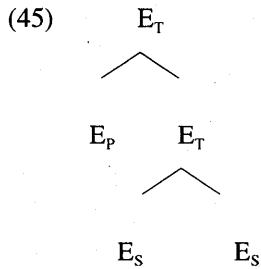
(43) *Resultatives based on transitive transition verbs*

- a. John painted the wall red.
- b. John broke the bottle to pieces.
- c. Taro-ga            kabe-o            aka-ku /aka-ni    nut-ta.  
Taro-Nom           wall-Acc           red/red-ni        paint-Past
- d. Taro-ga            hako-o            konagona-ni      kowasi-ta.  
Taro-Nom           box-Acc            pieces-ni         break-Past

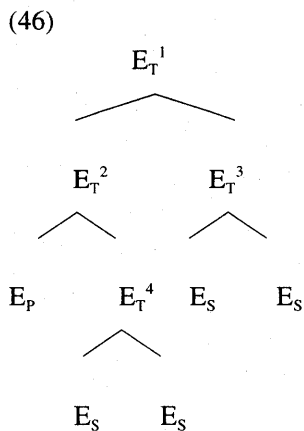
(44) *Resultatives based on intransitive transition verbs*

- a. The bread burned black.
- b. The river froze solid/thick/thin.
- c. Pan-ga            kuro-ku            koge-ta.  
bread-Nom        black                burn-Past
- d. Ike-ga            kata-ku/atu-ku/usu-ku    koot-ta.  
pond-Nom        solid/thick/thin        freeze-Past

As we argued in section 2, the event structure of transition verbs is complex and composed of two subevents. The first subevent is a process and the second is a transition, which is in turn composed of two static subevents as in (45).



The result phrase inherently has a stative event structure, but it is coerced into a transition to represent a change of state as we have seen in section 3.3. There are two distinct events in a resultative in question and each event is linked to a predicate. It is the same situation as resultatives based on process verbs. But the relation between the two events is not identical to the one in resultatives based on process verbs discussed in section 3.2. Because inherently complex event structure of the primary verb assures the causative interpretation in this case, event merger is not necessary to obtain a causal interpretation. It is lexically encoded in the event structure of the primary verb. To put it differently, the sentence with a transition verb is interpreted as causative even without the presence of a result phrase, while in the case of process verbs, the presence of a result phrase and the operation of event merger are necessary to assure causative interpretation of the sentence. If event merger was applied to (45), the following event structure would be derived:



$E_T^1$  is a complex event derived by the application of event merger.  $E_T^2$  is a transition denoted by the primary verb.  $E_T^3$  is a transition created by the application of the event type coercion to the stative event of the result phrase.  $E_T^1$  then includes two change of state events ( $E_T^3$  and  $E_T^4$ ).

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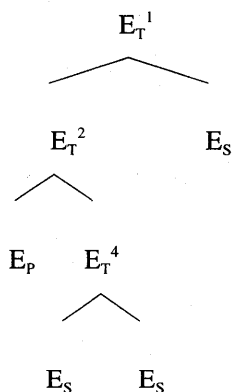
However, Levin and Rappaport Hovav (1995), following Tenny's (1994) suggestion, propose a constraint that an eventuality may have only one delimitation. For example, (47) does not have a resultative meaning:

(47) Willa arrived breathless.

The verb *arrive* is a verb of inherently directed motion, and thus lexically entails a change of location. If a result phrase, which entails a change of state, is attached to it, the sentence includes both a change of location and a change of state. Both of these transition events function as an event delimiter. But the unacceptability of (47) as a resultative suggests that it is impossible for a sentence to include two event delimiters. Levin and Rappaport Hovav (1995) claim that "given that verbs of inherently directed motion are lexically delimited, since their meaning involves an achieved change of location, they may not take a second syntactically encoded delimiter specifying a change of state" (p. 58). If this restriction is correct, the event structure (46) should be ruled out because it involves two change of state events.

Note that if the event type coercion did not apply to the event structure of the result phrase, the event structure after event merger would be (48), which includes only one change of state event.

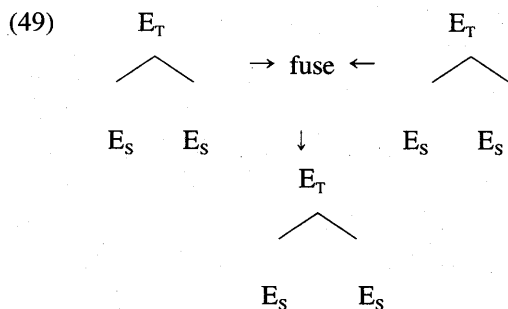
(48)



However, event merger is not avoidable since it was defined in section 3.2 to be necessarily activated when a secondary predicate is in a complement domain of a primary predicate. Since the result phrase is in a complement domain of the primary verb in resultatives, event merger always applies.

Given that the event merger analysis, which we proposed for resultatives based on process verbs, is not effective for resultatives based on transition verbs, we need another

solution. Assume that the two change of state events in (46) fuse together into a single transition:

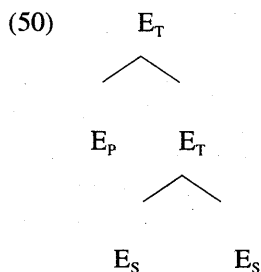


Event fusion turns two distinct events into one inseparable event. This means that the fused events are closely tied to each other. In the case of resultatives based on transition verbs, the change of state portion of the event structure of the primary verb ( $E_T^3$  in (46)) and the change of state event structure (created by the event type coercion) of the result phrase ( $E_T^4$  in (46)) fuse together. The resultant event structure is exactly the same as that of the primary verb's (exemplified in (45)).

We see in the next section that the operations on event structure proposed in section 3 provide natural explanation for the semantic behavior of event adverbs discussed in section 2 when they occur in resultatives.

#### 4. Event adverbs in resultative constructions

In this section, we examine modification by event adverbs in resultatives based on the subeventual analysis of event structure in the preceding sections. Resultatives in general are assigned a complex event structure in (50).



The event structure (50) is composed of two dynamic subevents. The first is a process and the second is a transition. This is structurally identical with the inherent event

structure of transition verbs argued in section 2. The difference between the two is their morpho-syntactic manifestation. In the case of transition verbs, the complex event structure is associated to a single lexical item, while in the case of resultatives, the two subevents are associated to two distinct syntactic items.

If the event structure of resultatives is complex as in (50), and if our conclusion in section 2 that modification by event adverbs is accounted for at the level of event structure is correct, then modification by event adverbs in resultatives should be parallel with the sentences involving transition verbs. We see that this prediction is borne out.

Since a pace adverb can modify any dynamic event, it can modify  $E_p$  or either of the two  $E_T$ 's in (50). Thus the sentence will be three-way ambiguous. First consider resultatives based on transition verbs.

- (51) a. He painted the wall red slowly.  
 b. He slowly painted the wall.  
 c. The wall slowly became red.

(51a) entails (51b) or (51c) or both. Thus neither (52a) nor (52b) is contradictory:

- (52) a. He slowly painted the wall red, but the wall became red instantly.  
 b. He slowly painted the wall red with quick strokes of a tiny paintbrush.

The same ambiguity is observed in Japanese resultatives:

- (53) Kare-ga          yukkuri          kabe-o          aka-ku    nut-ta.  
          he-Nom          slowly          wall-Acc          red-ku    paint-Past

(53) means that he slowly painted the wall, that the wall slowly became red, or that he slowly painted the wall and the wall slowly became red.<sup>6</sup>

A rate adverb *almost* shows a more limited ambiguity.

- (54) He almost painted the wall red.

---

<sup>6</sup> Note that English and Japanese differ as to which of the possible readings is salient. In English the most favorable reading, at least for some speakers, is the one where slowly modifies a change of state. In Japanese the reading where *yukkuri* modifies an action is the most salient. Namely slowly favors a transition-oriented reading while *yukkuri* prefers a process-oriented reading.

(54) means either that he intended to paint the wall red but he did not carry it out or that he began to paint the wall red but he did not complete it. In the former reading, *almost* modifies the root event (the upper  $E_T$  in (50)). In the latter reading, it modifies the change of state subevent (the lower  $E_T$  in (50)). This behavior of *almost* may imply that it can only modify a transition. However it is incorrect because *almost* can modify a root process as in (55).

(55) John almost shouted.

Since *shout* is a process verb, it has a simple event structure [ $E_P$ ]. Thus *almost* can modify a process when it is a root event. Then we assume that *almost* modifies a transition or a root dynamic event. The same is true for Japanese V.*kake(-ru)* compounds in resultatives:

|      |         |          |        |                 |
|------|---------|----------|--------|-----------------|
| (56) | Kare-ga | kabe-o   | aka-ku | nuri.kake-ta.   |
|      | he-Nom  | wall-Acc | red-ku | paint.kake-Past |

(56) is ambiguous in the same fashion as (54).

Next go on to the resultatives based on process verbs. Rappaport Hovav and Levin (1999) claims that (57a) entails (57b) but not (57c).

- (57) a. Clara quickly rocked the baby to sleep.  
 b. The baby quickly fell asleep.  
 d. Clara quickly rocked the baby.

However there are speakers who can find the entailment (57c) in (57a). For those speakers both sentences in (58) are not contradictory.

- (58) a. Clara quickly rocked the baby to sleep with a few slow rocks of the cradle.  
 b. Clara quickly rocked the baby to sleep but it took her a long time to make it sleep.

If the reading in (57c) is possible, even if it is less acceptable, then we can regard that (57a) is three-way ambiguous as expected.

*Almost* exhibits a two-way ambiguity in the same way as (55). (59a) is not ambiguous since the verb is a process verb, while (59b) is ambiguous since it is a resultative. The event structure of (59a) is simple but that of (59b) is complex.

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- (59) a. The police almost shot the robber.  
b. The police almost shot the robber to death.

The following construction, where a process verb is followed by a directional PP, exhibits a particular property as to event modification.

- (60) a. Robin danced out of the room.  
b. The rabbit ran into the garden.

Rappaport Hovav and Levin (1999) claim that (61a) is unambiguous and entails both (61b) and (61c). And thus both (62a) and (62b) have a contradictory meaning.

- (61) a. Robin quickly danced out of the room.  
b. Robin danced quickly.  
c. Robin went out of the room quickly.  
(62) a. Robin danced quickly out of the room but it took her a long time to get out since she danced with short steps.  
b. Robin danced quickly out of the room but her dance was very slow and elegant.

On the other hand, Van Valin and LaPolla (1997: 164) claim that the sentences in (63a-b) are ambiguous. They assign the logical representation (63c-d) to each sentence.

- (63) a. The rabbit ran into the garden quickly.  
b. The rabbit quickly ran into the garden.  
c. **do'** (rabbit, [**run'** (rabbit)]) & **quick'** (BECOME **be-in'** (garden, rabbit))  
d. **quick'** (**do'** (rabbit, [**run'** (rabbit)]) & BECOME **be-in'** (garden, rabbit))

These contradictory judgements of ambiguity suggests the necessity of further empirical examination of this construction. In (64) the sentence can be interpreted as *Mary was about to dance* or *Mary was about to get out of the room while she was dancing*.

- (64) Mary almost danced out of the room.

On the former reading *almost* modifies a process denoted by the verb, while on the latter reading it modifies a change of location denoted by the prepositional phrase. Thus the ambiguity illustrates that (64) should be assigned a complex event structure along

the analysis by Van Valin and LaPolla.

We have seen that modification by event adverbs in resultatives is parallel with the simple sentences involving transition verbs. Therefore resultatives and transition verbs are assigned the same event structure.

## 5. Depictives

In this section, we depart from the discussion about full-fledged event adverbs and examine semantics of another class of expressions which is not usually considered as adverbial: depictives.<sup>7</sup>

Depictives are adjunct APs which hold a predication relation with a sentential subject or object:

- (65) a. John went out of the room *angry*.  
 b. John ate the meat *raw*.

(65a) means that John was angry when he went out of the room, and (65b) means that the meat was raw when he ate it. Presumably because of their categorial status as APs and their predicative relation with verbal arguments, depictives are widely supposed to be predicative. They fall under the category of secondary predicates because they are additional predicative element in a clause. This supposition is, however, not incorrect, but insufficient. We will see that depictives count as adverbials at the level of event structure similar to event adverbs discussed in the preceding sections and that they count as predicates at the level of semantic representation which represents thematic relations. In other words, if we assume two distinct semantic representations, event structure and thematic structure, the semantic behavior of depictives is straightforwardly accounted for.

Maruta (1995) proposes that depictives are modifiers of action- or motion/change eventualities. An example of adverbs which modify action eventualities is *carefully* in (66a), and an example of adverbs which modify motion/change eventualities is *fast* in (66b).

- (66) a. He drove the car *carefully*.  
 b. He drove the car *fast*.

---

<sup>7</sup> The inquiry in this section is yet preliminary. We can only suggest an outline of explanation.



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An adverbial which has both of the above functions, i.e., an example of modifiers of action- or motion/change eventualities is a locative PP *over the lake* in (67):

(67) Agatha is flying her kite *over the lake*.

The locative PP tells either the location where Agatha's activity takes place or the location of the motion of her kite. Thus it modifies an action or a motion eventuality. In our inventory of event types, an action eventuality is a process and a motion/change eventuality is a transition. Maruta claims that depictives function in the same way as this type of locative PPs. The subject-oriented depictive in (68a) modify John's action of eating and the object-oriented depictive in (68b) modify the quantitative change of the meat:

- (68) a. John ate the meat naked.  
b. John ate the meat raw.

Maruta's analysis provides an account for the semantic restrictions on depictives. As pointed out by Rapoport (1991, 1993a, 1993b), the primary verb of the sentence which include a depictive must not be stative:

- (69) a. \*Noa<sub>i</sub> owns chickens young<sub>i</sub>.  
b. \*Noa<sub>i</sub> knew the answers drunk<sub>i</sub>.

Furthermore, the depictive predicate itself must be a stage-level predicate:

- (70) a. \*Ayala sold the book<sub>i</sub> interesting<sub>i</sub>.  
b. \*Mixa broke the glass<sub>i</sub> blue<sub>i</sub>.

Under the assumption that depictives are action- or motion/change modifiers, the sentences in (69) are ungrammatical because stative verbs denote neither an action nor a motion/change. The depictive is semantically incompatible with stative verbs since they do not have an eventuality to modify. On the other hand, the depictives in (70) are individual-level predicates depicting permanent properties of some individual entity. The permanent, timeless property of the entity cannot interact with a particular eventuality denoted by a primary verb. For instance, it is semantically bizarre that Ayala sold the book while it is interesting. Hence the sentences in (70) are ungrammatical. This sensitivity of depictives to event types suggests that the adverbial nature of depictives be captured at the level of event structure.

Maruta's account may be reformulated to attribute the relevant semantic restriction to a selectional restriction between event types. Suppose that an event denoted by a stative verb or a individual-level predicate is a state, while an event denoted by a stage-level predicate is dynamic (i.e., a process or a transition). We may devise a process of event adjunction analogous to syntactic adjunction:

- (71) a. [E<sub>1</sub> ...]  
 b. [E<sub>1</sub> [E<sub>1</sub> ...] [E<sub>2</sub> ...]]

Adjunction of an event E<sub>2</sub> to E<sub>1</sub> creates an event structure (71b). Assume further that an adjoined events are interpreted as contemporaneous with each other:

(72) *Interpretation of event adjunction*

If an event A is adjoined to an event B, A and B are linked contemporaneously.<sup>8</sup>

(72) states that when there are two events A and B which are related by adjunction, the whole event is interpreted as *B while A*. In other words, events A and B have the same time reference in that both are anchored to the same point on time. If either or both of the events are stative, the event interpretation rule (72) provides an ill-formed semantic interpretation because stative events do not have a particular interval of time to refer to, and thus contemporaneous interpretation is impossible.

Maruta's original account and this explanation differ from each other with respect to at least one significant point. The former supposes a depictive to be an event modifier, which does not have an inherent event structure, while the latter supposes that a depictive is a predicate, which has its own event structure. Further study is required to determine which of the two is the more reasonable explanation. We leave the matter open here and continue to assume that depictives are event modifiers.<sup>9</sup>

Note that even if we accept the hypothesis that depictives are event modifying adverbials, it does not mean that they are represented as adverbs in syntactic structure. The distribution of depictives and event adverbs is not identical as (73) illustrates.

<sup>8</sup> See Wunderlich (1997) for discussion of contemporaneously linked events.

<sup>9</sup> See Koizumi (1996) for yet another line of explanation of the semantic restrictions on depictives.

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- (73) a. John ate the meat slowly.  
b. John slowly ate the meat.  
c. John ate the meat raw.  
d. \*John raw ate the meat.

Under the quite reasonable assumption that distribution of lexical/phrasal items is represented in syntactic structure, depictives and event adverbs should fall under distinct syntactic categories respectively. The former are APs and the latter are AdvPs. Then it follows that depictives are adjectival at the level of syntactic representation but they are adverbial at the level of event semantic representation. This conclusion suggests that event structure is a distinct level of representation from syntactic structure, and their interaction is not transparent in that not all APs qualify as event modifiers and conversely not all event modifiers are AdvPs.

Note also that the reason why many researchers have regarded as depictives as not adverbial but predicative is that we find, intuitively at least, a predicate-argument relation between a depictive and an argument of a primary verb. For example, (74a) obviously entails (74b):

- (74) a. John ate the meat raw.  
b. The meat was raw when John ate it

The NP *the meat* and the depictive *raw* hold a predicate-argument relation. In other words, a depictive is thematically related to an argument of a verb. Recall that we assumed in section 2 that adverbials are not involved in thematic relations in a sentence. If so, depictives are again not adverbial, but predicative with respect to thematic relations. Thus it is suggested that thematic relations be represented at a separate semantic representation from event structure. If we refer to such a representation as thematic structure, then we need two distinct semantic representations: event structure and thematic structure.

We have seen in this section that depictives are modifiers in event structure but predicates in syntactic and thematic structures. This two-faced character of depictives calls for three distinctive levels of grammatical representation: event structure to capture the adverbial modification by depictives, syntactic structure to represent their distribution, and thematic structure to account for their thematic relations with arguments.

## 6. Conclusion

We argued that postulation of event structure (a level of structured semantic representation) provides a suitable place to account for the semantic properties of event adverbs. Pace adverbs and rate adverbs are event adverbs, which modify eventualities. We also showed that by supposing that a particular configuration of events is interpreted in a principled way, the notion of causation and change of state, which are usually represented as abstract semantic functions like CAUSE or BECOME, can be attributed to the structural configuration of events. Causal interpretation is represented as a transition from a process to another transition: [<sub>E<sub>T</sub></sub> [E<sub>P</sub>] [E<sub>T</sub>]]. Change of state is represented as a transition from a state to another state: [<sub>E<sub>T</sub></sub> [E<sub>S</sub>] [E<sub>S</sub>]].

Event structure can be altered by operations like event merger, event fusion and event type coercion. These generative devices proposed here must be properly constrained. We suggested event merger is constrained by syntactic structure, but other restrictions are left open for future study.

## References

- Carlson, Gregory N. (1977) *Reference to Kinds in English*, Doctoral Dissertation, University of Massachusetts, Cambridge, MA.
- Carrier, Jill, and Janet H. Randall (1992) "The Argument Structure and Syntactic Structure of Resultatives," *Linguistic Inquiry* 23, 173-234.
- Dowty, David (1991) "Thematic Proto-Roles and Argument Selection," *Language* 67, 547-619.
- Goldberg, Adele E. (1995) *Constructions: A Construction Grammar Approach to Argument Structure*, University of Chicago Press, Chicago.
- Hasegawa, Nobuko (1998) "Syntax of Resultatives," *Researching and Verifying an Advanced Theory of Human Language (2-A)*, (Grant-in-Aid for COE Research (08CE1001) Report 2), 31-57.
- Kageyama, Taro (1993) *Bunpo to Gokeisei (Grammar and Word Formation)*, Hituzi Syobo, Tokyo.
- Kageyama, Taro, ed. (1997) *Verb Semantics and Syntactic Structure*, Kuroshio Publishers, Tokyo.
- Koizumi, Naoshi (1996) "The Stage-Level Restriction and the Peculiar Status of Depictive Predicates," *English Linguistics* 13, 121-139.
- Kratzer, Angelika (1995) "Stage-Level and Individual-Level Predicates," *The Generic Book*, eds. by Gregory N. Carson and Francis J. Pelletier, 125-175. University of Chicago Press, Chicago.

## EVENT STRUCTURE AND ADVERBIAL MODIFICATION

- Levin, Beth, and Malka Rappaport Hovav (1995) *Unaccusativity: At the Syntax-Lexical Semantics Interface*, MIT Press, Cambridge, MA.
- Maruta, Tadao (1995) 'The Semantics of Depictives,' *English Linguistics* 12, 125-146.
- Milsark, Gary (1974) *Existential Sentences in English*, Doctoral dissertation, MIT, Cambridge, MA.
- Parsons, Terence (1990) *Events in The Semantics of English: A Study in Subatomic Semantics*, MIT Press, , Cambridge, MA.
- Pustejovsky, James (1991) "The Syntax of Event Structure," *Cognition* 41, 47-81.
- Pustejovsky, James (1995) *The Generative Lexicon*. Cambridge, Mass.: MIT Press.
- Rapoport, Tova Rebecca (1991) "Adjunct-Predicate Licensing and D-Structure," *Syntax and Semantics 25: Perspectives on Phrase Structure: Heads and Licensing*, ed. by Susan D. Rothstein, 159-187, Academic Press, New York.
- Rapoport, Tova Rebecca (1993a) "Stage and Adjunct Predicates: Licensing and Structure in Secondary Predication Constructions," *Knowledge and Language Volume II: Lexical and Conceptual Structure*, eds. by Eric Reuland and Abragam, Werner, 157-182. Kluwer, Dordrecht.
- Rapoport, Tova Rebecca (1993b) "Verbs in Depictives and Resultatives," *Semantics and the Lexicon*, ed. by James Pustejovsky, 163-184, Kluwer., Dordrecht.
- Rappaport Hovav, Malka, and Beth Levin (1999) *Two Types of Compositionally Derived Events*, ms., Bar Ilan University and Northwestern University.
- Tenny, Carol L. (1994) *Aspectual Roles and the Syntax-Semantics Interface*, Dordrecht: Kluwer.
- Van Valin, Robert D. Jr., and Randy J. LaPolla (1997) *Syntax: Structure, Meaning and Function*, Cambridge University Press, Cambridge.
- Vendler, Zeno (1967) *Linguistics in Philosophy*, Cornell University Press, Ithaca.
- Washio, Ryuichi (1997) "Resultatives, Compositionality, and Language Variation," *Journal of East Asian Linguistics* 6, 1-49.
- Wunderlich, Dieter (1997) "Cause and the Structure of Verbs," *Linguistic Inquiry* 28, 27-68.