1

A History of Events in Linguistic Theory

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1.1 Introduction

Time, space, change, and causation are things that we expect to encounter as elements of physics; either the scientific physics of deep study and rigor, or the time-tested folk physics of common sense. But the notion that these concepts should figure in the grammar of human language – both explicitly and formally in syntactic and semantic representations – is a relatively new idea for theoretical linguists. This notion is the topic of this book. The papers in this book arose out of a workshop funded by the National Science Foundation in **1997,** on Events **as** Grammatical Objects, from the Combined Perspectives of Lexical Semantics, Logical Semantics and Syntax. The workshop was motivated by the belief that, despite the different tools, approaches, and questions with which these subfields of linguistics are concerned, enough convergence on events as grammatical objects had developed across these fields that dialogue between these areas would be possible and beneficial.

Lexical semantics and logical semantics have traditionally different tools to address distinct aspects of semantic composition. Lexical semantics focuses on the meanings of individual words, while logical semantics studies the compositional properties of propositional interpretations (e.g., attitudes and judgments). **As** events and event structure have entered the field as representational devices, these two approaches have moved closer together: lexical semanticists must look outward from the verb to the sentence in order to characterize the effects of a verb's event structure; and logical semanticists must look inward from the sentence to the verb to represent semantic facts that depend on event-related properties of particular verbs. Concurrently, syntacticians have discovered phenomena in which the se-

Events as Grammatical Objects.
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mantics of events can be seen to interact with syntactic structures, and have had to turn to semanticists for representations of the properties associated with events. The mapping between syntax and event structure has emerged as an important area of research. The discoveries that are being made in these different areas about the role of events in natural language must, in the last analysis, be connected. This volume is intended to take some steps towards an integrated theory of events in the grammar of natural language. Both the diversity and the convergence of these various syntactic and semantic approaches is reflected in this volume of papers. This introduction will attempt to put the papers in a common context, and orient them towards a common vision.

There are two sides from which we can approach the idea of events as grammatical objects in syntax and semantics. First, we can consider whether the grammar of natural language does in fact represent events in some way, apart from any internal structure of that event. What are these events like? How are they represented? To what do these events refer? And, what are the right primitives with which to represent them? This stream of thought goes back to Reichenbach **(1949)** and subsequently Davidson's influential **1967** paper, where it was proposed that predicates of natural language predicate over events; that is, they explicitly take an event as one of their arguments (cf. Parsons, **1981,** Bach, **1981,** Dowty, **1989,** Higginbotham, **1985).**

Secondly, we can consider whether "grammaticalized" events have any internal structure which is also grammaticalized. This stream of thought arises out of several lines of semantic research, from which a picture has emerged of a grammatical event with internal parts, organized around change, causation, and temporal elements. Both sides of the issue are addressed in this volume. Papers in the first three sections focus on the second issue, and papers in the last section speak to the first.

In this chapter we familiarize the reader with the background literature so they can become situated with respect to the history of ideas that have led up to the current research. The reader just starting out in the literature runs the risk of finding himself or herself confused by the many and various uses of the term event, as well as other unstable terminology relating to events. It should be remembered that we refer to events as grammatically or linguistically represented objects, not as events in the world. We hope that this introduction will help to clarify some of this confusion.

1.2 The Aspectual Structure of Verb Meanings.

That verb meanings have aspectual and temporal structure is not a new idea; Aristotle wrote about a typology of events based on their internal temporal structure (cf. Aristotle's *Metaphysics).* These matters were dis-

cussed in the philosophical literature (Kenny 1963, Ryle 1949), and from there they found their way into the linguistic literature. Vendler's highly influential 1967 paper marks the beginning of this tradition in the lexical semantics literature. Vendler laid out a four-way typology of aspectual verb classes, identifying four classes of verbs based on temporal properties such as temporal duration, temporal termination, and internal temporal structure (or the lack of it). In the Vendler classification, verbs may denote states, activities, achievements or accomplishments. *States* have no internal structure or change during the span of time over which they are true (e.g., **love** as in *Boris loves Keiko).* An *activity* is an ongoing event with internal change and duration, but no necessary temporal endpoint (e.g., **walk as** in *Boris walked along the river). Accomplishments* are events with duration and an obligatory temporal endpoint (e.g., **consume as** in *Keiko consumed the pineapple). Achievements,* on the other hand, have an instantaneous culmination or endpoint and are without duration (e.g., **arrive** as in *Keiko arrived in Pittsburgh*). These four classes have been organized by various authors into different subgroups, the most basic distinction being made between statives on the one hand and non-statives (or events) on the other. This use of the term events prompted Bach 1981 to coin the term "eventualities" to include all aspectual types, both stative and eventive. Recent work has adopted the use of 'event' as the cover term for Bach's eventuality, particularly within the computational semantics community (cf. Briscoe et al. 1990, Pustejovsky 1995).

The terminology associated with these ideas can be confusing; we see multiple terms used for similar or identical concepts, and we see the same term being used in multiple ways. The property of an event having or not having a temporal endpoint has been referred to in the literature **as** the bounded/non-bounded distinction (Verkuyl 1972, Jackendoff 1990), the culminating/non-culminating distinction (Moens and Steedman 1988), the telic/atelic distinction (Smith 1991), and the delimited/non-delimited distinction (Tenny 1987, 1994). Dowty 1979 refers to accomplishment and achievement verbs **as** definite change of state predicates. The reader will also encounter the distinction between telic and atelic events defined in terms of homogeneity (cf. Quine, 1960, Hinrichs 1985) or cumulativity (Taylor 1977, Krifka 1992). The idea of homogeneity in the event domain parallels the well-known mass-count distinction from the nominal domain. An activity or a state can be considered a homogeneous event because it may be divided into any number of temporal slices, and one will still have an event of the same kind (i.e, if *Boris walked along the road* is true for ten seconds, then a one-second slice of that walking is still an event of walking along the road). There are obvious problems relating to the granularity of analysis of homogeneity that we will ignore for discussion's sake. An accomplishment is not a homogeneous event however, because if *Keiko consumed*

the pineapple is true over a duration of ten seconds, then a one-second slice of that event is not going to be an event of Keiko consuming the pineapple. It is more likely to be an event of Keiko consuming part of the pineapple. Dowty 1979 uses the following simple adverbial test for the telic/atelic distinction; with certain qualifications, temporal adverbial expressions with *in* modify sentences representing bounded events, and temporal adverbial expressions with *for* modify non-bounded events (cf. also Kenny, 1963):

(1) Boris walked along the road *in ten minutes/ for ten minutes.

(2) Keiko consumed the pineapple in ten minutes/ *for ten minutes.

This type of adverbial distinction appears to be widely available across languages and is generally used as one test for a telic/atelic distinction in aspectual class.

The Vendler typology is the most widely cited aspectual typology for verbs, although a number of revisions and alterations to the typology have been proposed (see Dowty 1979, Mourelatos 1981, Bach 1981, Piiion 1995. See also Smith 1991). Vendler's class of achievements has turned out to be the most problematic, and it is also questionable whether states are as simple as originally believed. (Travis's and Pylkkanen's papers in this volume make some interesting proposals regarding these two classes.) It is also now generally accepted that we must talk about the aspectual properties of the verb phrase or the clause, rather than simply the aspectual properties of the verb, since many factors including adverbial modification and the nature of the object noun phrase interact with whatever aspectual properties the verb starts out with. However, it remains clear that aspect, which deals with the the internal temporal structure of events, must be distinguished syntactically and semantically from tense, which deals with locating an event in time; even though tense and aspect may appear to be merged in some morphologies. (See Comrie 1976 for a more general overview of aspect.)

The aspectual properties and classifications described above, rooted in the inherent aspectual properties of the verb, are sometimes referred to as Aktionsarten. This has been traditionally distinguished from the aspectual properties introduced by grammaticalized morphemes such as the perfective or imperfective verbal morphology found in many languages. Both domains affect, determine, and interact with aspect, yet it remains a question of exactly how or whether they are distinct. Smith 1991 advocates a view of aspect in which these two systems are distinguished. Filip (this volume) advocates a view of Russian aspectual morphology in which these also must be treated as two distinct systems. However, it is not clear whether these are two necessarily distinct systems, or whether they are part of the same system operating at different levels of composition. Aktionasarten has to do with lexical properties, while perfectivity operates more in the

syntactic domain; whether they are ultimately different depends partly on whether this is a gradient or a divide. Obviously, this question cannot be separated from research into the nature of the lexicon-syntax interface.

1.3 Predicate Decomposition and Event Reification

One of the most influential papers in the semantics of events and action is Davidson's **1967** "The Logical Form of Action Sentences". In this work, Davidson lays out a program for capturing the appropriate entailments between propositions involving action and event expressions. For example, consider how to capture the entailments between (a) and the modified versions of the eating event below (cf. also Kenny, **1963,** for similar concerns):

(3) a. Mary ate.
b. Mary ate the soup.
c. Mary ate the soup with a spoon.
d. Mary ate the soup with a spoon in the kitchen.
e. Mary ate the soup with a spoon in the kitchen at 3:00pm.

Davidson does this by reifying events as individuals, thereby allowing quantification over them as though they were entity individuals. The entailments follow from conjunctive generalization. Obviously, a proposal of such scope leaves more questions unanswered than it answers, but this apparently simple idea has had radical consequences for the semantics of natural language utterances. This work together with the taxonomies of aspectual types suggested by Vendler's work provides a rich analytic tool for analyzing word meaning. **A** new synthesis has emerged in recent years which attempts to model verb meanings as complex predicative structures with rich event structures. Early researchers on decompositional models, however, made no ontological commitments to events in the semantics. Rather, events were used only informally as paraphrastic descriptions of propositional content. We review this development in the section below.

Over the past thirty years since Vendler's **1967** paper, a large body of research on the structure of verb meanings has emerged. This research has developed the idea that the meaning of a verb can be analyzed into a structured representation of the event that the verb designates. This literature has further contributed to the realization that the grammar does not treat events only as unanalyzeable atomic units, but recognizes the existence of complex events having an internal structure. Various streams of research have converged on the idea that complex events are structured into an inner and an outer event, where the outer event is associated with causation and agency, and the inner event is associated with telicity and change of state.

Under this view, a canonical accomplishment predicate **as** in *John sliced the bread* for example, can be represented as composed of an inner and an outer event. The inner event is the telic event in which the bread undergoes a change of state in a definite amount of time (such that it becomes sliced where it was not sliced before). The outer event is the event in which John acts agentively (to do whatever is involved in the act of slicing). Since the outer event causes the inner one, it is associated with causation. These approaches naturally raise the question of what the exact nature of causation is, but linguistic tools and representations do not directly address the metaphysics of causation; we must leave that to the philosophers. The linguistic approaches discusssed here generally represent causation **as** a relation, either between (a) two propositional expressions, (b) two events, or (c) between an agent and an event. A brief survey follows below of various means of representing these basic elements of a complex event structure.

Although there is a long tradition of analyzing causation as a relation between two events in the philosophical (cf. Davidson, 1967) and psychological (cf. Schank, 1973 and Miller and Johnson-Laird, 1976) literature, in contemporary models of natural language semantics this idea has only recent currency. For example, Carter 1976, one of the earlier researchers in this area, represents the meaning of the verb *darken* as follows:

(4) x CAUSE ((y BE DARK) CHANGE))
Carter 1976, p.6, example 9b.

paraphraseable as, "x causes the state of y being dark to change". The predicate CAUSE is represented **as** a relation between a causer argument x and an inner expression involving a change of state in the argument y. Although there is an intuition that the cause relation involves a causer and an event, Carter does not make this commitment explicitly.

Jackendoff (1983), building on his previous work on predicate decomposition, does in fact introduce explicit reference to events **as** part of the vocabulary of conceptual primitives. He fails, however, to make any explicit reference to the event position in the verb representation, as in Davidson's model; this he does only in Jackendoff (1990). He introduces causation as a relation between an individual and an event, without an interpretation, however.

Levin and Rapoport 1988 follow a similar strategy, with a CAUSE predicate relating a causer argument and an inner expression involving a change of state in the argument y. The change of state is represented with the predicate BECOME:

(5) wipe the floor clean:
x CAUSE [y BECOME (AT) z] BY [**x** 'wipe' y]]

Levin and Rapoport 1988, p.2, example 2a.

(6) x CAUSE [floor BECOME (AT) clean B
Y [x 'wipe' floor]]

Little is made of the explicit role of the event place in these early representations, in spite of the reference to events and states. Nevertheless, the large body of work by Levin and Rappaport, building on Jackendoff's Lexical Conceptual Structures, has been quite influential towards making sense of the internal structure of verb meanings (see Levin and Rappaport 1995).

Jackendoff 1990 revisits his earlier proposals for decomposition and develops an extensive system of what he calls *Conceptual Representations*, which parallel the syntactic representations of sentences of natural language. These employ a set of canonical predicates including CAUSE, GO, TO, and ON, and canonical elements including Thing, Path and Event. Under his system, Jackendoff represents the sentence *Harry buttered the bread* as:

(7) $[_{Event}$ CAUSE $([_{Thing}]i, [_{Event}$ $([_{Thing}$ $]j), [_{Path}$ TO $([_{Place}$ ON $([_{Thing}$ $]j)])])])]$
Jackendoff 1990, p. 54, example (15a)

(The indices i and j indicate the binding of the arguments in the syntactic structure). Again we see the event represented by this sentence analyzed into a CAUSE relation between a Thing and an inner Event. The Thing will be linked to the agent Harry in this case, and the inner event is that of the "butter going onto the bread". In this work we see Jackendoff making explicit reference to the event argument as part of the verbal semantic representation.

The above authors represent verb meaning by decomposing the predicate into more basic predicates. This work owes obvious debt to the innovative work within generative semantics, as illustrated by McCawley's (1968) analysis of the verb *kill:*

(8) kill:

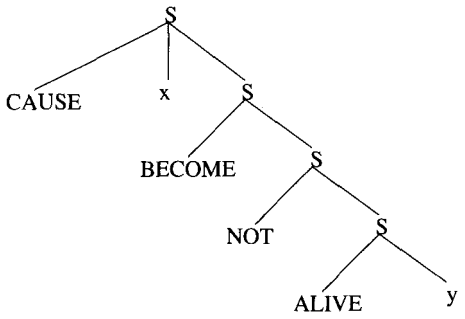
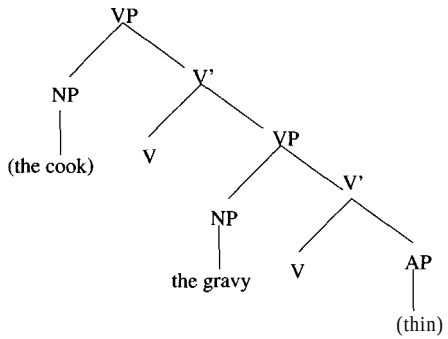


FIGURE 1 McCawley **1968, p.** 73, Figure **3.**

Recent versions of lexical representations inspired by generative semantics can be seen in the Lexical Relational Structures of Hale and Keyser **1993:**

(9) The cook thinned the gravy:



Hale and Keyser **1993,** p. **72,** example **31.**

The representations in (8) and (9) employ syntactic tree structures to capture the same elements of causation and change of state as in the representations of Carter, Levin and Rapoport, Jackendoff, and Dowty. McCawley's tree, as part of the generative semantics tradition which put semantics in the syntax, is both a syntactic and a semantic representation. Hale and Keyser's tree is intended to be a purely lexical representation, employing syntactic tools in the lexicon. In Hale and Keyser's tree, the upper verb is an implicit causative, and the lower verb is an implicit inchoative, or change of state verb. (In fact, this sentence could be paraphrased as *The cook caused the gravy to become thin.)* The lower verb phrase represents that subpart of the event of the cook's thinning the gravy, which is the change of state of the gravy itself; i.e., the gravy's becoming thin. This

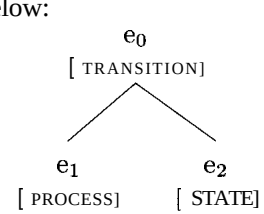
approach makes explicit the resultant state (thin) of the event, treating it as a predicate, as do Levin and Rapoport and Dowty, although with a unclear status in terms of event quantification.

Dowty 1979 differs from the authors above in two respects. Most importantly, he explicitly rejects adopting a subeventual analysis as part of his lexical strategy. The relation of CAUSE in his decompositional semantics takes propositional expressions as its arguments rather than events. There were good reasons for this at the time, considering the relatively recent status of treating events as individuals in natural language semantics. As a result, causation is not a relation between an individual agent and a proposition but stands in relation between two propositions.
This being said, we see how Dowty's decompositional strategy relates propositional expressions.

(10) He sweeps the floor clean:
[[He sweeps the floor] CAUSE [BECOME [*the floor* ***is*** *clean]*]]
Dowty 1979, p. 93, example 105.

The kinds of predicate decomposition we see in Carter, Levin and Rapoport, Jackendoff, and Dowty differ on whether CAUSE is a relation between two propositions, two events, or between an agent and a proposition. Full reification to events and subevents is not yet part of the semantics of these representations.'

Pustejovsky (1988,1991) extends the decompositional approach presented in Dowty (1979) by explicitly reifying the events and subevents in the predicative expressions. Unlike Dowty's treatment of lexical semantics, where the decompositional calculus builds on propositional or predicative units (as discussed above), a "syntax of event structure" makes explicit reference to quantified events **as** part of the word meaning. Pustejovsky further introduces a tree structure to represent the temporal ordering and dominance constraints on an event and its subevents. For example, a predicate such as *build* is associated with a complex event such as that shown below:

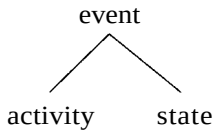


The process consists of the building activity itself, while the State represents the result of there being the object built. Grimshaw (1990) adopts

[1] In recent work, Levin and Rappaport Hovav (1995) adopt a view consistent with the subeventual analysis proposed by Pustejovsky and Grimshaw as discussed below.

this theory in her work on argument structure, where complex events such as that represented by *break* are given a similar representation:

(11)



(Grimshaw **1990,** p. **26,** example **(44))**

In this structure, the activity consists of what **x** does to cause the breaking, and the state is the resultant state of the broken item. The activity corresponds to the outer causing event as discussed above, and the state corresponds in part to the inner change of state event. Both Pustejovsky and Grimshaw differ from the authors above in assuming a specific level of representation for event structure, distinct from the representation of other lexical properties. Furthermore, they follow Higginbotham **(1985)** in adopting an explicit reference to the event place in the verbal semantics.

The articulation of an internal structure of events using logical tools has also come from focusing specifically on the inner event, **as** it demonstrates a special relation between the direct object (or the verbs' direct internal argument) and the temporal structure of the event (Hinrichs **1985,** Verkuyl **1972** and subsequent works, Krifka **1992,** Tenny **1987** and **1994).** To return to Levin and Rapoport's representation for *wipe the floor clean,* the inner event of the floor's becoming clean, is represented as:

(12) [floor BECOME (AT) clean]

The direct object, the floor, represents the event participant that undergoes the change of state defining the inner event. As the event progresses, the floor becomes cleaner; when the event is complete, the floor is clean. Krifka in his work has characterized this as a mapping from objects to events. Since Krifka's work is semantic and not syntactic in intent, this is a mapping to events from objects **as** individuals, rather than from syntactic objects. Krifka addresses properties of the incremental theme verbs in the context of a lattice model structure (following Link **1983).** Incremental theme verbs, which have direct objects that are consumed or created in increments over time, as in *drink a glass of wine,* can be represented as a homomorphism from objects to events which preserves the lattice structure. Krifka's **1992** representation of this homomorphism is shown below. This formula expresses the idea that, for an event e and an object *x* of which the mapping-to-events relation holds, every part of the object consumed in the event corresponds to a part of the event.

(13) (mapping to events)
$\forall R[\text{MAP-E}(R) \leftrightarrow \forall e, x, x' [R(e, x)$ **A** $x' \leq x \rightarrow \exists e'[e' \leq e \wedge R(e', x')]]]$

(where ' represents a two-place relation part)
Krifka **1992,** p. **39,** example **P30.**

If, for example, the object is a glass of wine, and the event is a drinking of a glass of wine, this formula says that "every part of the glass of wine being drunk corresponds to a part of the drinking event" (Krifka **1992,** p. **39).** This relation assumes an inner event in the semantics of a sentence such as *Samantha drank a glass of wine.* The logical form above focuses entirely on the consumption of the object – a glass of wine – as a property separable from whatever other semantics are necessary to describe a sentence containing the expression drink a glass of wine. Even though such a sentence would necessarily have a drinker too, the activity of the drinker is not relevant to this homomorphism from objects to events. The disappearance of the wine (which defines the inner event) is implicitly treated here as a separable, distinguishable property of the semantics of the entire sentence. Krifka's logical representations articulate a finer structure internal to the grammatical component of the inner event, for incremental theme verbs, than do the other representations discussed above. Tenny **1994** argues that mapping from objects to events should include the other main types of accomplishment predicates as well: change of state verbs and verbs of motion. Ramchand **(1997)** formalizes an extension of Krifka's approach to these verb types.

From this brief survey it should be clear that a variety of approaches in lexical and formal semantics have converged on the idea that the grammar of natural language structures certain of the events represented by verbs into complex events, with a causative outer event and a change of state inner event. We will now point out a number of open research questions and areas of disagreement.

Open Research Questions

As already mentioned, some authors postulate a distinct and separate level of representation for event structure (see for example, Pustejovsky **1991,** Grimshaw **1990,** Tenny 1994), adopting the view that event structure information concerning time, space, and causation has a different status from other kinds of thematic, conceptual, or lexical information. Other authors assume that event structure information is part of, or is implicit in, a more general conceptual or logical semantic representation (see for example, Jackendoff **1990,** Levin and Rappaport **1995).** In evaluating these claims about levels of representation, the reader must ask exactly what different predictions these claims make. In some cases this is not an easy question to answer. Our model of grammar may be simplified by taking the more modular approach of distinguishing a level of event structure, but what predictions follow may be harder to see. The answer to the question

of whether event structure information is treated differently in any way from other kinds of semantic or thematic information may emerge from facts about acquisition, processing, or even language change (see Tenny 1994 for some predictions in this vein).

A second open question concerns the issue of what kinds of verbs get what kinds of representation. The canonical verb having a complex event structure is the accomplishment verb that involves an agentive change of state, where an agent does something to cause a change of state in some object; for example *Maggie broke the cup (by throwing it on the floor).* In this example the causer Maggie is also an agent, one who willfully does some action or exerts some control. Krifka treats incremental theme verbs (as in *Samantha drank a glass* of *wine)* as having at least the inner change-of-state-event postulated in a complex event structure. But as mentioned above, some researchers have argued for extending the complex event analysis more generally. Tenny 1994 argues for unifying three canonical types of accomplishment and achievement verbs: change of state verbs, incremental theme verbs, and verbs of motion-to-a-goal, e.g., *Jean pushed the cup to the edge* of *the table.* The question remains however, whether all three of these types of verbs are always causative in the same way, and if not, how they should be represented – bringing us back full circle to the question of the nature of causation as represented by grammar.

Authors also differ on how achievement verbs differ from accomplishment predicates. As mentioned above, some authors unify certain achievements and accomplishments, treating them as essentially the same from the point of view of certain grammatical phenomena. Others treat them **as** grammatically distinct (see Travis this volume). Achievement predicates, in Vendler's original classification, differ from accomplishments in that they denote events with little or no duration. Interestingly, however, a lack of temporal duration seems to correlate with a lack of agentivity, and vice versa. (Compare *John broke the branch* where it might seem to have taken some straining and pulling, with *The wand broke the branch* where it might seem to have happened at some instantaneous moment.) Because of this, achievement predicates are sometimes identified as non-agentive changes of state. Dowty 1979's class of achievement predicates is represented as not involving any CAUSE predicate. On the other hand, Chierchia 1989, Levin and Hovav 1995, and Pustejovsky 1995 have argued that unaccusative verbs (which are often change of state verbs, and always non-agentive verbs) are semantically causative. (See also Davis and Demirdache, this volume.) These authors would say that achievements have a cause but not an agentive causer.

So whether the lexical semantics of achievement predicates involves causation or a causer, whether they should be identified with a lack of agentivity, and whether they should be distinguished as a grammatical class,

are current questions. The answer to these questions will depend in part on a greater understanding of the role of cause and agentivity in grammar.

One necessary task in working out these questions is to understand which semantic elements are independent and which are not, or if not, how they are related. Consider the relation between cause and agentivity. Cause and agentivity at first glance, seem to have some grammatical correlation if only because both causers and agents are mapped to the subject position in syntax. (This is an issue for linking theory, which is concerned with how the arguments of a verb are linked to syntactic subject or object positions, and which we return to shortly.) Nevertheless, cause and agent are clearly semantically independent in the sense that they can occur independently of one another in the lexical semantics of a verb. We can have an event without a causer as we do in activity verbs; in *Rosie chewed on a big stick,* nothing is caused, but Rosie takes an agentive action in chewing on the stick. We can also have a causer without an agent, if we have nonvolitional or nonagentive causers of achievements (e.g., *the wind,* in *The wind broke the branch).* Causers and agents must be represented separately, although they often coincide. In Dowty's 1979 aspectual classes, for example, we find two separate predicates, DO and CAUSE, where DO represents agentivity. The important question remains whether cause and agent belong to different systems, and if so, what different systems? The answer to this question holds larger consequences for the organization of lexical semantic information. (See also Croft 1991 on the idea of causal chains.)

The relation between agentivity and more general event structure is a larger question. Agentivity and aspect have been dissociated in the work of a number of authors; in Jackendoff 1987 and Pustejovsky 1988, agentivity and aspect are completely dissociated. However agentivity clearly interacts with elements of event structure. Besides the achievement/accomplishment distinction, agentivity may also figure in other aspectual or event structural distinctions. A kind of agentivity has been argued to relate to stativity. Even though certain verbs with a volitional or agentive ingredient in their meaning have traditionally been regarded as statives (e.g., *love, know),* Ter Meulen 1991, for example, has identified the genuine stative verbs as those involving no agentivity (or following Comrie 1976, requiring no input of energy in order to continue). The interaction of agentivity with event structure raises interesting questions for the view that event structure is a distinct level of representation having only to do with time, space, and causation, and not with other thematic material.

Finally, another open question is the relation between cause and telicity. Some authors have observed phenomena in which a causative interpretation seems to depend on telicity, in that it seems to require a telic predicate (see Travis, Ritter and Rosen, and Davis and Demirdache, this volume). However, other authors have disagreed that telicity and cause are related

(Van Valin and LaPolla **1997;** Hay, Kennedy and Levin **1999).** All of these kinds of questions are part of what needs to be sorted out in order to understand how event structure information is organized.

1.4 Mapping to Syntax

Most representations of verb meaning involving predicate decomposition are semantic representations rather than syntactic ones (with the exception of McCawley for whom these were both semantic and syntactic representations; and with the possible exception of Hale and Keyser who regard their representations as a kind of lexical syntax). However, these semantic representations of verb meanings figure importantly in the syntax/semantics interface. One of the motivations for the research that led to this kind of predicate decomposition came from efforts to understand transitivity alternations, or the systematic patterns of variation in how a verb's arguments are realized syntactically. The patterns presented by transitivity alternations are a part of the larger, more general, problem of the linking between lexical semantics and syntax.

Transitivity Alternations

Transitivity alternations are some of the most well-studied phenomena in the lexical semantics literature (See Levin **1993** for a thorough overview). The causative/inchoative transitivity alternation is illustrated below. Many of the verbs with a change of state meaning can appear alternately in causative (a) or in inchoative (b) sentences:

(14) a. The cook thinned the gravy.
b. The gravy thinned.

These observations go back to Lakoff (1965), Gruber (1967), and the generative semanticists.

In fact, the causative version of the alternation in (a) above has a causative paraphrase, *The **cook** caused the gravy to be thin.* The inchoative alternant (b) is a simple change of state. The causative/inchoative alternation is quite productive though not perfectly so. The existence of this alternation shows that the causer, and the caused inchoative event, must be separable in some way for these verbs. The events represented by the causative verbs must be linguistically decomposable into at least the events represented by the inchoative verbs. The set of possible syntactic frames these verbs may be used in supports their analysis as complex events composed of an inner and an outer event.

Transitivity alternations pose the problem of what determines whether or not a given verb undergoes a certain transitivity alternation. Not all

verbs enter into the causative/inchoative alternation, but it has been suggested that a complex event consisting of an outer cause and an inner inchoative is necessary in the verb's lexical representation for this type of alternation to be possible. Lexical semanticists have found enough generalizations such as these to propose that what determines the potential syntactic frames for a verb is explainable in terms of verb classes with similar lexical semantic representations, rather than in terms of properties of individual verbs (Levin 1993). (But see Hopper and Thompson 1980 for a different view of the determinants of transitivity.)

The articulation of event structure is interconnected with questions about the syntax/lexicon interface. The interactions between elements of event structure are quite commonly thought of as verb-internal, but depending on the language, these may also be interactions between syntactic or morphosyntactic units. Travis's paper in this volume tackles this problem head on. Several authors have also suggested that the causer or external argument is not part of the verb's lexical representation, but its attachment is mediated through other more syntactic means. This idea was first proposed by Marantz 1984. Kratzer 1996 and Ritter and Rosen 1994 have taken the approach that the external argument is attached through the mediation of a Davidsonian event argument or through event structure. At any rate, the lexicon/syntax interface may not be as clear, distinct, and monolithic as sometimes thought, and event structure adds one more ingredient to the mix at this interface.

Linking

The larger problem of explaining in a general way, the patterns of mapping the semantic arguments of a verb into syntactic structure, is the problem of linking the arguments in a lexical semantic representation to syntax. How to account for generalizations about the disposition of predicates and their arguments in syntactic structure has been a central problem at the intersection of lexical semantics and syntax. The problem can be put crudely in terms of why specific thematic roles get linked to the specific syntactic positions of subject or object as they do. Stated in these terms, the question becomes, for example: why is it an overwhelming cross-linguistic generalization that agents are subjects and themes are objects? A number of approaches to the problem have been proposed. (See Dowty 1991, Baker 1988, Jackendoff 1990, Bresnan and Kanerva 1989, Perlmutter and Postal 1984 for a diverse sampling.)

In order to explain the linking between lexical semantics and syntax it is necessary to figure out what are the correct primitives over which this linking should be stated. On the syntactic side, the problem can be stated with somewhat more refinement using the ideas of internal and external arguments (Williams 1981). Internal and external arguments are elements

of argument structure which can be thought of as interfacing with syntax in the following way. External arguments surface as subjects in unergative and transitive verbs, while internal direct arguments surface as direct objects in transitive verbs, and as subjects in unaccusative verbs. Unergative verbs select a single external argument, and unaccusative verbs select a single internal argument. Stated in terms of internal and external arguments, the problem becomes: why are themes internal arguments and agents external arguments? Why are unergative verbs generally agentive, and unaccusative verbs generally non-agentive? On the semantic side, as it has become apparent that thematic roles are inadequate tools in many ways (see Rappaport and Levin 1988, Dowty 1991, Jackendoff 1987), more sophisticated representations of thematic information have appeared, including the various types of predicate decompositional structures discussed in the previous section. Principles of linking theory are stated by various authors over these different kinds of primitives.

Work in the area of linking theory entered the stream of event structure literature in a bigger way, when proposals appeared that this linking depended on event structure. In recent years a body of literature has emerged arguing that event structure constitutes one modular component of argument structure (for example, Grimshaw 1990, Tenny 1987 and 1994, Van Voorst 1988) and furthermore, that it is the event structure component of argument structure that is responsible for the linking of arguments to syntactic positions. Grimshaw 1990, and Tenny 1987 and 1994 have argued generally for versions of this hypothesis (but see also Van Valin 1990 for another view). Van Hout (this volume) argues for a strong version of this. It was well-recognized that the mapping required associating the cause or agent with the subject, but Tenny introduced the idea that a restriction on the aspectual properties associated with the direct object was a fundamental driving force in this mapping (as discussed in the previous section on Krifka's work).

1.4.1 Phrase Structure

As syntacticians began to take note of the emerging literature on the role of event structure in the mapping from lexical semantics to syntax, they began to think about event structure being reflected more directly in syntax. This has led to the idea that elements of event structure are explicitly represented in syntactic phrase structure. Two other developments in syntax made the time ripe for this idea: the articulation of verb phrase structure (see Travis' paper this volume for a thorough discussion), and the greater role played by functional features and projections in the syntactic phrase structure of minimalist theory. These developments provided the syntactic units and tools for representing the component parts of a structured event; in particular, the outer causative event and the inner telic event. Borer

and Travis, among others, have begun work on general models of syntactic phrase structure in which the syntax of certain functional heads, as well as the disposition of arguments, is determined partly by event structure (Borer 1994, Borer 1996; Travis 1994 and 1991.) Borer and Travis take the strong position that syntactic structure is in a large measure derived from (if not isomorphic to) event structure. Whereas a separate syntactic projection defined over the outer causative event was a well-accepted idea, these approaches introduce the newer idea of a special syntactic representation for an inner telic event. Although there are different versions of this general approach, there is loose agreement on approximately where in the phrase structure hierarchy elements of event structure are expressed. Authors have located elements of event structure in the verb phrase(s) or in functional projections near or adjacent to the verb phrases.

The papers in the second section of the volume (Travis, Ritter and Rosen, and Van Hout) argue for slightly different versions of how phrase structure encodes event structure. Other syntactic elements are also proposed to have event structure correlates. The special role of the object noun phrase in determining event structure is apparent in case distinctions such as the accusative/partitive distinction, and has been captured by syntacticians through a weak/strong case distinction (Van Hout this volume); and through assignment of accusative case resulting in raising of the object DP (Ritter and Rosen this volume). Elements of aspectual meaning such as telicity have been assigned status as functional features by some authors (Van Hout this volume, Sanz 1996, among others), which means they participate fully in the syntax in a minimalist model. Concurrently with these developments and discoveries a growing number of syntactic phenomena have been discovered which are sensitive to properties of events, and this has spurred more syntactic analyses of event structure. How much of event structure should be represented syntactically and how it should be represented promises to be a lively and productive area of research.

1.5 Stage-Level and Individual-Level Predicates

One other significant property of events, having to do with their atemporal and contingent nature must be mentioned here: the distinction between stage-level and individual-level predicates. Carlson 1977 introduced this distinction, where stage-level predicates are predicated of stages, and represent a temporary or transitory quality (a), while individual-level predicates are predicated of individuals, and represent more permanent qualities (b):

(15) a. Firemen are available.
b. Firemen are intelligent.

Individual and stage level predicates are represented formally in Carlson **1977** as in **(16)** and **(17)** respectively:

(16) Jake is intelligent.

(paraphraseable **as:** The property of intelligence is predicated of an individual, jake)

(17) Jake is sick.

λ Y [R(y,j) & sick' (y)]
(paraphraseable **as:** There is a stage y, which is a realization of the individual jake, and which is a stage of being sick.)

Further analyses of this distinction have appeared in the logical semantics literature (Kratzer **1995,** Chierchia **1995).** Kratzer has proposed that stage level predicates differ from individual level predicates- in having an extra event argument in their representations. Diesing **1988** has also noted some syntactic reflexes of the semantic distinction between stage and individual level predicates, in extraction facts in German. She has argued that the stagelindividual level distinction correlates with a difference in the base-generated position of syntactic subjects. Diesing argues that subjects of stage-level predicates are generated in the position of Specifier of the Verb Phrase [Spec, VP], while subjects of individual-level predicates are generated in the position of Specifier of the Inflectional Phrase [Spec, IP], a hypothesis that explains a number of syntactic facts about German.

At this writing, it is not clear exactly how the stagelindividual contrast relates to the grammatical components of complex events, nor is it clear how to articulate a place for the stagelindividual contrast within a general grammar of events. There has been some recent work attempting to frame stage level predication in terms of an event structure, see for example Busa **1996** and Pustejovsky, **1995.** But it is clear that there is valuable work to be done here. Pylkkanen and Katz address the stagelindividual level contrast in the context of this volume.

Part I. Morpho-semantic Composition of Event Structure

The two papers in this section focus on the semantics of verbal morphology in Slavic and Salish. In particular these papers are concerned with the compositional elements of meaning contributed by aspectual, transitivizing, and intransitivizing affixes.

Filip's paper comes at issues of event structure from certain problems in the semantics of aspectual prefixes in Slavic, a language family rich in aspectual morphology, and one that has generated much literature on aspect. Her paper argues that, although the Slavic (Russian) system of

aspectual prefixes and suffixes appear (at first) to belong to the same semantic system, they must still be differentiated as two separate systems, where the prefixes are 'inside' or closer to the verb. The suffixes clearly belong to the system of perfective and imperfective verbal morphology well-known in Russian, but Filip argues that the prefixes do not belong to this system. Specifically, Filip examines two accumulative and attenuative prefixes in Russian, which translate more or less as 'a lot of' and 'a little of'. (Quantificational and measure prefixes such as these are common in other languages besides Slavic. Tenny's paper also addresses measure modifiers in the adverbial domain.) These two Russian prefixes pose a problem because verbs marked with these prefixes behave like perfective verbs in all respects, except for two things: they have peculiar interactions with temporal adverbial expressions meaning 'for a while' and 'in a while'; and they do not satisfy the definition for perfectivity based on the traditional notion of quantization (which is based on the idea of cumulativity). Filip's first undertaking is to use the ideas of extensive measure functions and maximal events to revise the definition of quantization so as to capture the common semantics of the aspectual prefixes and the perfective verbs. Her second undertaking is to show nevertheless, that the telic-atelic (prefixal) and perfective-imperfective (suffixal) distinctions in Slavic are formally and semantically independent of each other, and hence must be regarded as two separate systems. Filip leaves us with a picture of a hierarchical, layered, system; where the prefixes and the perfective suffixes belong to different layers.

Filip's interesting work on Slavic aspectual affixes is integrally connected with the problem mentioned earlier, of the nature of the lexicon-syntax interface. Her work on Russian shows us that we have some kind of layering in the affixal system, but the question remains whether the difference between the more lexical and the more syntactic layers is part of an absolute or a graded distinction. If there is a single discrete boundary between the lexicon and the syntax, then these may be two formally independent systems. But if the boundary is a fuzzy one, then the difference between the prefixal and suffixal systems must be one of degree, from the relatively more lexical to the relatively more syntactic affixes. If the boundary actually consists of several different discrete boundaries, then the relation between these two systems may be more complex.

Davis and Demirdache examine the lexical semantics of the Salish language of St'át'imcets, a language which demonstrates quite a bit of morphological transparency in its causative-eventive structure. Davis and Demirdache maintain that all verb roots in St'át'imcets are morphosyntactically unaccusative and morphologically primitive or underived, but nevertheless they are also semantically causative. They show through various tests, that a 'cause' is underlyingly present in unaccusative roots, and can be referred

to in various ways. (In fact, this is a language in which agentive verbs have unaccusative alternants.)

According to Davis and Demirdache, all transitive and unergative verbs in St'at'imcetsare derived from unaccusative roots, and these verbs and unaccusative verbs alike are derived in parallel from an underlying causative representation, without derivational direction. The morphology simply foregrounds one or the other part of the event structure, in the different types of roots. In Davis and Demirdache's view, both causatives and unaccusatives have underlying causative event structure, but in the causative both the causing process and the resulting event are foregrounded; in unaccusatives only the final resulting event is foregrounded. In unergatives, only the process is foregrounded. This is essentially consistent with the theory presented in Pustejovsky and Busa (1995), where *event headedness* operates over a core lexical semantic form, to derive either causative (left-headed) or unaccusative (right-headed) forms. Davis and Demirdache's approach also suggests a universal underlying semantic representation of event structure, such that more of the load of cross-linguistic variation is put on the morphosyntax and less on the underlying semantic representations. Furthermore, Ritter and Rosen (this volume) develop a language typology based on activating different parts of a functional/eventive structure.

The Davis and Demirdache paper gives us a fruitful insight into the relation between cause and agentivity. They propose a clear separation of cause and agentivity, based on data from an interesting kind of phenomenon known as 'out of control' morphology in Salishan literature. This is a kind of verbal morphology which suppresses agentivity without suppressing cause, yielding an accidental or non-volitional agent. Davis and Demirdache suggest that the cause, but not the agent, is part of the underlying causative event of unaccusatives. Salish also demonstrates a connection between telicity and cause. When the 'out of control' morpheme is attached to an atelic predicate in Salish, it gives an abilitative reading; when it is attached to a telic predicate it gives an accidental causer reading. These fascinating phenomena need to be integrated into a general picture of event structure.

Part 11. How Phrase Structure Encodes Events

The three papers in this section each contribute to the discussion of how event structure is encoded in syntactic phrase structure and reflected in elements of Syntax.

Travis' paper begins with an excellent introduction and overview of ideas about encoding the internal structure of events syntactically, and the progression of these ideas from lexical and generative semantics to syntax and phrase structure. She takes the view that phrase structure explicitly encodes event structure. Travis focuses on lexical and productive causatives

in two Western Malayo-Polynesian languages, Malagasy and Tagalog, both languages in which the causative/eventive structure is clearly seen in the morphology (similarly to the Salish language discussed by Davis and Demirdache). Travis argues for two functional projections, based on Malagasy and Tagalog. The first is a projection for Aspect between the upper and lower VPs, which takes scope over only the representation of the temporal endpoint of the event, and not over the initial point. The second is a projection for Event, which marks the boundary between lexical and productive causatives. (See example **(28)** in Travis, this volume.) This boundary marks the edge of the 'possible word', Travis argues, which can represent at most one event, defined representationally as containing one cause, one agent, and two verbal projections. She claims that this structure (which she calls the s-word) is universal, although it may be differently instantiated across languages. Different languages may break up the s-word into different numbers of morphological words or m-words. Following Hale and Keyser (1993), Travis makes a distinction between the structure below the Event projection (1-syntax) and the structure above the Event projection (s-syntax), putting the syntax/lexicon distinction in a new light.

Travis' proposals regarding phrase structure can easily accomodate the facts discussed in Filip's paper on Slavic aspect, with the Russian aspectual prefixes in Travis' inner aspect, and the perfective located above the event projection. This is a happy coincidence of semantic and syntactic arguments for structure.

There are a number of interesting features to point out about this paper. First, Travis treats the class of achievement verbs as having a distinctive syntactic structure. Whereas a volitional or agentive causer is represented in the Specifier position of the upper VP, a non-volitional (non-agentive or accidental) causer of an achievement verb is represented as occupying the Specifier of Aspect Phrase. All the arguments of the achievement verb are discharged in the domain of the Aspect Phrase. State and achievement predicates are unified in consisting only of projections below the upper VP. Thus in Travis' system there is a syntactic distinction between causers with and without agency, and there is also the unification of achievements with states.

Secondly, Travis' paper discusses an apparent relationship between telicity and cause in Malagasy. In this language, a telic morpheme may be added to an inchoative, which then can take an additonal (non-volitional) causer argument. In fact, Travis maintains that the telic morpheme is what assigns the thematic role to the causer, explicitly linking telicity with the causer argument, and not the agentive argument. Thirdly, Travis observes that the hierarchical system of functional projections encoding event structure places limits on the syntactic and semantic interactions of elements between levels. This issue is also addressed by Tenny in her paper. Some

of the facts in Malagasy discussed by Travis are reminiscent of the facts in Salish discussed by Davis and Demirdache. The two papers – and the two languages – could profitably be carefully compared.

Ritter and Rosen, in their paper, argue that event structure is encoded syntactically through the functional projections of AgrS (subject agreement) and AgrO (object agreement), which are responsible for case and agreement, respectively. They take a strictly temporal view of events, assuming that canonical events, in the linguistic sense, consist of temporal initiation, duration, and termination. (Temporal duration is the property that an event has of continuing over or consuming time, as manifested in the activity and accomplishment classes of Vendler. Termination is the property of having a temporal culmination or endpoint, as illustrated by accomplishments and achievements.) Ritter and Rosen, following Van Voorst 1988, assume that initiating temporal bounds, or the event's beginning point in time, should figure in event structure as well as the termination point. Under Ritter and Rosen's view, the temporal initiation and termination points are the temporal elements of events which are grammaticalized. AgrS is identified as the functional projection relating to initiation and AgrO as the functional projection relating to termination. Languages may 'activate' one or the other of these functional projections, an idea which they claim underlies an important typological distinction.

The idea of activating either the AgrS or AgrO projection to get this distinction is similar in spirit to the idea of foregrounding in Davis and Demirdache (this volume). Davis and Demirdache and Ritter and Rosen have independently proposed the idea that there is a cross linguistic nonvarying event structure, but different languages instantiate it differently by activating or foregrounding different parts of it.

The typological distinction they propose is the central thesis of Ritter and Rosen's paper. They propose an event-structure typology of languages, based on a distinction between endpoint or delimitation languages (or D-languages) and initiation point languages (or I languages), depending on which functional projection is activated. They argue that this typology accounts for the existence of two kinds of ergative splits, claiming that languages with a tense/aspect based split are endpoint languages, and languages with a NP-based split are initiation point languages. They illustrate their theory focusing on seven languages: Finnish, English, Chinese, Haitian, (D-languages); and Icelandic, Irish, and Japanese (I-languages).

The Ritter and Rosen typology plays out as affecting the event/non-event distinction, in a taxonomy of the Vendler classes, in the following way: D-languages group achievements and accomplishments together as eventive; and I-languages group accomplishments and activities together as eventive (and achievements and states together as non-eventive). A host of other syntactic properties are claimed to follow from this difference in

how languages organize their aspectual information. Ritter and Rosen thus have a typology yielding a relative definition of the eventive/non-eventive distinction in typology; one which can vary from language to language, depending on which functional projection the language highlights.

Ritter and Rosen make several interesting testable predictions. Their typology makes some interesting predictions that appear to fall out for Malagasy, as discussed by Travis. Travis treats states and achievements similarly in Malagasy, and she also claims that the language grammaticalizes the agentive/non-agentive causer distinction. Ritter and Rosen predict that these sets of properties should occur together in I-languages. Under Ritter and Rosen's approach, Malagasy should fall out as an I-language, and other properties of I-languages should also be found in Malagasy.

Both Ritter and Rosen and Travis attest languages where the distinction between volitional and non-volitional causers is grammaticalized. They also claim that the agentive/non-agentive causer distinction is going to be grammaticalized in I-languages. This underscores the conclusion that cause and agent are independent.

There are some issues to raise regarding the grammaticalizing of the initial temporal point of an event. Ritter and Rosen, and to a lesser extent Travis, portray the initial point as strictly temporal, on a par with the termination point, putting event initiation and termination on an equal semantic and grammatical footing. However, the upper VP and the outer aspect of Travis, or the AgrS projection of Ritter and Rosen, which are associated with the event initiation, encode agentivity, causer, or some combination of these. While the agent or causer may be responsible for initiating an event, what this involves is more than strictly temporal. In the sentence *Maiko ate a pear* the termination point is associated with the pear's disappearance; that is the extent of the pear's participation in the event. The pear is no more than passive temporal marker. The initial point is presumably associated with Maiko, who as a volitional agent chooses when to begin eating. However, the contribution of Maiko to the temporal semantics of this sentence is not on a par with that of the object. We must ask, should event structure be understood in strictly temporal terms? as Ritter and Rosen suggest. In this case it should be possible (and necessary for the sake of consistency) to understand causation (and agentivity) as a strictly temporal phenomena. Cause as a primitive would have to be abandoned, and the literature in general has shown no signs of taking this tack.

Van Hout's paper focuses on the role of event structure in the mapping between lexical semantics and syntax. Examining telic/atelic verb frame alternations in Dutch, she argues that this mapping must look directly at the verb's event type (as well as number of its arguments, etc.), and that verb frame alternations should be regarded as a reflex of a shift in

the event type represented by the verb, rather than as derived by specific operations on arguments or argument structure. In this she follows the literature mentioned above that argues that linking at the syntax/lexicon interface depends on aspect and event structure. The stand she takes on this issue is a strong one, claiming that the work of this mapping is done by event structure and syntactic configuration alone, and that thematic roles or argument structures are not needed as primitives in this linking.

Van Hout gives a minimalist account of the relevant syntax and phrase structure. She assumes there is a feature for telicity, which must be checked by the direct object through Specifier-Head agreement within the AgrO projection, in conjunction with checking for a feature of Strong Case.

Finally, of special interest in this paper, is Van Hout's account of some of the first experiments into the question of how children learn the event semantic properties of the lexicon/syntax interface. Van Hout found that her subjects know the telicity properties of overt markers of telicity such as telic particles, at the earliest tested age. However, they do not appear to master the less morphologically transparent aspects of the telicity system (and the effects of properties of the NP) until a later age.

Some literature has emerged relating to the acquisition of aspect, and it promises to be a fruitful area of research (See Antinucci and Miller 1976; Behrend 1990; Behrend, Harris and Cartwright 1995; Bloom, Lifter and Hafitz 1980; Cziko 1989; Li and Bowerman 1998; Olsen et al 1998, Shirai and Anderson 1995; Weist et al 1995). Van Hout's work on acquisition, taken together with event structural models of phrase structure, leads to further research questions: Does the acquisition of event structure morphosyntax correlate with the acquisition of the postulated functional projections in a predictable way? For example, do children generally learn inner aspect in the sense of Travis before outer aspect? Are the telicity markers that Van Hout finds children learning first, projections of Travis' inner aspect phrase? The articulation of event structure in syntax should lead to further insightful questions for research in language acquisition.

The three papers in this section share some common ground in their syntactic analyses. Both the Ritter and Rosen and the Van Hout papers have some version of the object NP or DP raising to the Specifier of AgrO position in delimited or telic contexts. Both have case interacting with this phenomenon. Ritter and Rosen propose that the delimiting object raises with accusative case but receives inherent/partitive case in situ. Van Hout (following De Hoop 1992) proposes a Strong/Weak Case distinction, where the Strong Case feature is associated with telicity.

Both the Travis and the Ritter and Rosen papers propose two levels of functional projections encoding event structure properties: a functional projection between the upper and lower VPs which deals with telicity (inner Aspect for Travis and AgrO for Ritter and Rosen), and a functional

projection above the higher VP (outer aspect for Travis and AgrS for Ritter and Rosen), which encodes the temporal initiation of the event. Van Hout focuses on lower aspect and she too assumes that an AgrO projection between the VPs is where telicity is checked. This common ground is encouraging, promising more movement towards a coherent, consistent picture of the intersection of event structure and phrase structure.

Part 111. Event Structure and the Syntax and Semantics of Adverbs

Section three is comprised of three papers on adverbs and event structure. The reader may be surprised to find an entire section devoted to adverbs, which are often regarded as somewhat peripheral to the core issues of theoretical syntax and semantics. However, because they interact so clearly with both syntactic and semantic structure, and because many assumed or proposed typologies of this disparate group seem to reflect event structural distinctions, adverbs are an obvious place to look for insight into the role of event structure at the syntax/semantics interface. In fact, a majority of the papers in this volume refer in one way or another to adverbial data in their argumentation. The three papers in this section focus on particular classes of adverbs that interact with aspectual, temporal, agentive, or causative elements in revealing ways. The three papers are ordered from the adverb types 'closest' to the verb, to those adverb types 'farthest out' from the verb, in a layered or hierarchical event composition within the VP.

Tenny examines three types of adverbs: the measure or partitive adverbs, the restitutive adverbs, and the adverbs exemplified by *almost.* She demonstrates that these classes may be differentiated by how (or whether) they interact with two event structural elements of lexical semantics, which she calls the core event and the measure or path, and which are expressed syntactically by the verb in conjunction with its innermost arguments. Tenny also argues that the well-known supposed ambiguity associated with adverbs like *almost* (as in *John almost filled the glass)* is in fact a vagueness and not an ambiguity. Finally, Tenny situates these three adverb classes syntactically in an extended series of functional projections constituting an extended event structure for the clause. She proposes a general linking strategy between hierarchical or layered semantic zones, and syntactic functional projections. A semantic zone for Tenny is a segment of a layered event structure where the corresponding semantic composition has some identifiable, unifying theme. Under Tenny's approach these are the semantic units that map to syntactic functional projections.

Ernst takes a more semantic approach, examining the phenomenon of predicational adverbs which can have both a clausal and a manner reading. It is an interesting problem why the same adverbs should commonly have these two particular readings, which seem to focus on two different facets of

the event. He argues that manner adverbs (which modify the agentive portion of the event) do not constitute a distinct and coherent class of adverbs, but are derived from clausal readings by semantic rule. The predicational adverbs take Fact/Event objects as arguments; these include speech acts, facts, propositions, events, and specified events, where a specified event is the event construed in a narrower way. Under Ernst's view it is manner that differentiates between specified events. Ernst takes a conservative stand about proposing syntactic and semantic primitives. This distinction between an event and a specified event is not a semantically primitive distinction for Ernst, but is simply available whenever the adverb's lexical semantic content permits the manner reading to be derived. Ernst's paper gives us a semantic picture of the way in which events may be built up in hierarchical layers that adverbs key into.

Literature on the distribution and interpretation of adverbs ranges from the purely syntactic to the entirely semantic in approach. Cinque 1997 represents the syntactic end of these approaches; Ernst's paper represents the semantic end; and Tenny's paper falls in the middle ground between syntactic and semantic analyses.

Tenny's and Ernst's papers examine the behavior and interaction of certain types of adverbs within the clause. Wickbolt's paper requires us to also consider the interaction of event structure elements across clause boundaries; and in addition it demonstrates interactions of event structure with focus-presuppositional structure. Wickbolt begins with an interesting observation about manner adverbials in adjunct clauses. Specifically, manner adverbials within English *since* clauses 'suspend the telicity' of the telic event modified within the clause, resulting in the causal and not the temporal reading of the since clause. In the general case, telicity seems to block subsequent discourse from referring to the internal properties of the described telic event, but this constraint is lifted by the manner adverb attributing properties internal to the event. Furthermore, the presence of a manner adverbial in the *since* clause has a focusing effect on the construction. Wickbolt argues that temporal *since* clauses introduce presupposed information, while causal ones contain asserted information; therefore manner adverbials in *since* clauses are compatible with the causal but not the temporal readings.

These three papers make it quite clear that the distribution and interpretation of adverbs is to be understood at least partly in terms of a layered event structure, and that some kind of event structure governs which elements are accessible or modifiable across these different layers. But it is unclear how much of this is syntactic and how much is semantic. Tenny argues for functional projections linked to semantic zones. Ernst argues for semantic layering of distinctions such as Event and Specified Event. Wickbolt talks in terms of shifting perspective to make an event internally

modifiable across clause boundaries.

Both Wickbolt and Ernst argue that manner adverbs play a focusing role in certain situations. Wickbolt's paper in particular reminds us that we must examine the relation between event structure and focus/presuppositional structure.

Part IV: On Event and State Arguments

The papers in this section are organized around the issue of examining certain primitives assumed in grammatical representations of events; in particular the event variables assumed in the Davidsonian program and employed in Parson's subsequent work. Ter Meulen discusses the problem that quantification over events is not referentially on a par with quantification over individuals, and she also looks at a phenomenon in Dutch illustrating the coreference of event variables. Pylkkanen argues that the state variable employed by Parsons can be internally complex. Katz argues that the semantics of stative sentences should not contain predications over underlying states.

Ter Meulen addresses the question of how the event variable in a Davidsonian representation is identified and individuated. She points out that different occurrences of the same predicate with an event variable do not necessarily name the same event. The events that are quantified over in a Davidsonian representation are not referential in the same way as the individuals that are quantified over. Furthermore, syntactically distinct occurrences of the same verbal predicates do not necessarily name distinct events; the intervening context must help to determine that. Ter Meulen refers to her earlier work addressing how event arguments can corefer in the sense of having the same temporal reference (Ter Meulen 1995).

The specific problem Ter Meulen addresses in her paper is the interaction of light verbs with the se reflexives in Dutch. In the light verb ('let + infinitive') construction, the event arguments of the light verb predicate and the infinitival predicate are equated in a meaning postulate under Ter Meulen's approach. An interesting feature of this construction is that it does not accept an agent as subject of the embedded infinitival, a fact which is also captured (indirectly) in the meaning postulate. The se reflexive construction is compatible with the light verb because, in this reflexive construction, the se seems to be associated with an internal argument, as it cannot be associated with an agent thematic role.

The light verb construction brings out interesting differences between the Dutch unaccusatives and the se reflexives, with respect to agency and causation. Ter Meulen shows that agents are underlyingly or implicitly present in unaccusatives, but not in the se reflexives. Perhaps some constraint involving the difference between internal and external causation is at work here, which is brought out when the se reflexives are associated with a causing event. In any case the phenomenon has something to teach

us about the representation of agency and causation in Dutch.

Pylkkanen's and Katz's papers both address issues regarding stativity. In most of thg traditional literature in lexical semantics, states are regarded as primitives, without internal structure relevant to the grammar. In the Davidsonian/Parsonian representations they are treated as simplex. However, Pylkkanen argues that statives can be grammatically complex. Looking at psychological causatives in Finnish, Pylkkanen argues that Finnish experiencer-object psych verbs are in fact causative statives, being at the same time morphologically causative and aspectually stative. She represents them as two causally related states, where the first (causing) state is the perception event. Finnish provides the opportunity to contrast complex and simple states, because the morphologically causative and morphologically simple psych verbs illustrate very different types of stativity. Pylkkanen invokes a distinction between external and internal causation introduced by Levin and Rappaport 1995, arguing that the causative suffix for psych verbs is one of internal causation, which has particular argument structure properties of its own. Pylkkanen's method of linking the causativized statives to syntax employs this distinction, together with a thematic role hierarchy. Pylkkanen's and Ter Meulen's papers both address issues having to do with case and agentivity, and remind us that there are open questions about the relation between case and agentivity and event structure.

There are two things of particular interest to point out in this paper. One is the idea that a perception event might need to be represented as a primitive element of event structure, which Pylkkanen proposes. If this is so then not only do we have an expansion of our list of primitives, but perception enters the ranks with causation and agentivity, two other nontemporal elements proposed as part of, or related to, event structure. Issues about the relationship of agentivity and cause and event structure also apply to the relationship between perception and event structure. This is an idea worth investigating. The second is the nature of the relation between event structure and the stage/individual-level predicate distinction, which needs working out. These Finnish data speak to the question, as Pylkkanen shows that the Finnish causative psych verbs are stage-level predicates, while the noncausative psych verbs are individual-level predicates. Pylkkanen argues for an analysis in which the stage-level property of the causative is a consequence of its complex, bistative, event structure and the individual-level property of the noncausative is a consequence of its extremely simple event structure.

Where Pylkkanen argues that states must be represented with more complexity, Katz argues that they should not figure at all in Davidsonian representations. Katz argues that stative sentences should be represented as predicated of individuals, rather than as predicated of underlying states.

Where event sentences have an underlying syntactic event argument, state sentences do not. Stative sentences do not make references to underlying states on a par with eventive sentences, he argues, and there should be no variables ranging over states in a Davidsonian logical form. Katz focuses his arguments on English nominalization, perception verb complements, adverbial modification, and anaphora.

Katz also addresses the stage-level/individual-level predicate distinction, claiming that his analysis argues against that of Kratzer **1995,** who takes stage-level stative predicates to have an extra event argument. Katz maintains that the stage-level/individual contrast is a semantic/pragmatic contrast, rather than a structural one. We await further research sorting out the relation between the stage/individual level distinction, and the grammatical representation of events and event structure.

Special properties of perception and perception verb complements emerge in both Katz and Pylkkanen's papers. There is more work to be done on the relation of perception events to the grammatical representation of events in general. Finally, we point out that Katz' and Pylkkanen's positions are not necessarily mutually exclusive. It could be the case that the complexity of states and the predication over state variables are orthogonal matters. We await and encourage further research into the nature of stativity and its place in event structure.

In the next contribution, Pustejovsky motivates some modifications and enhancements to his model of event structure, based on data that prove difficult to handle under current event-based theories. These data mostly involve "contradictions of change", which are descriptions that, by virtue of the events they participate in, no longer hold without contradiction. To solve these cases, Pustejovsky outlines an algorithm for computing the maximally coherent event description associated with a sentence. This results in a semantic representation he calls the *event persistence structure,* computed as an extension of the event structure. He argues that this is a natural manifestation of the linguistically motivated entailments regarding change and persistence in a sentence, and can be derived compositionally from sentential interpretation. One of the consequences of this analysis is that the chain of states associated with an object in discourse is initially projected from the lexical and compositional semantic properties of expressions in the sentence and represented structurally in the event persistence structure. Pustejovsky views this level of representation as the starting point from which discourse inference is computed.

The final paper in the volume, by Barbara Partee, is a reflective and historical essay on the way the term 'event' has been interpreted in the fields of linguistics and philosophy. In Partee's paper, the importance and relevance of the event role in semantics is discussed. Partee points out the distinction between the philosopher's treatment of events and the way

it has come to be used in linguistics. Philosophers have typically taken a more conservative approach to the ontological commitments underlying linguistic expressions, and have been often been content with the standard repertoire, such as properties, individuals, and moments of time. For example, Montague had no interest in introducing events into the ontology, since the interesting semantic properties attributed to eventhood could arguably be captured with other logical tools in the semantics.

Partee points out that one of the strongest early motivations for events came from Kamp and Rohrer's work on tense and aspect in discourse interpretation; this work eventually led to the reified event argument in discourse representation theory. Related to this is Kratzer's work on defining the proper role of event argument in situation theory semantics.

Regarding linguistic models of decomposition and lexical semantics, Partee views the recent developments in event semantics as linguistically informative and a potentially fruitful direction. But, she does caution that, just because an expression may be discovered as having a "complex interpretation", it does not necessarily require a complex representation in the language of interpretation. Reification of arguments] be they individuals or events, comes from strong empirical support and grammatical evidence in the language.

As stated at the beginning of the introduction, we hope that this brief and incomplete history of events and their role in linguistic theory can serve as a workable guide to the papers in this volume. The reader who is interested in learning more about past research in event-based semantics is strongly encouraged to explore the works in the bibliography below.

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