

# Eventuality Types

## 2.1 Introduction

Eventuality types have played an important role in the organization of the grammar of natural languages since Dowty (1972, 1977, 1979)<sup>1</sup>. They represent certain conventional ways in which languages systematically divide states of affairs into categories, and which are crucial to the semantic representation of verbs, verb phrases and sentences. In developing his classification Dowty draws heavily on the work done in the philosophy of mind and action by Ryle (1949), Vendler (1957/1967) and Kenny (1963), who in turn built on Aristotle<sup>2</sup>. Although their analyses focus on action verbs and what they reveal about human agency, and thus differ from linguistic studies both in aim and scope, they describe distinctions that are highly relevant in the semantics of natural languages.

Following Bach, I use the term ‘eventuality (type)’, because it is both theoretically and ontologically the most neutral term used in the domain of ‘aspectual phenomena’ in a broad sense. It has the advantage over such terms as ‘aspect’ (Verkuyl, 1972, 1989 and elsewhere), ‘aspectual classes’ (Dowty, 1972, 1979), or ‘inherent lexical aspect’ (Comrie, 1976:41ff.; Van Valin, 1990) in so far as it minimizes the confusion with the grammatical category ‘aspect’, which covers the perfective-imperfective distinction that is expressed by inflectional suffixes on the verb (e.g., imparfait and passé simple suffixes in French, as in *je travaillais* and *je travaillai*). The term ‘eventuality type’ has an ontologically broader coverage than ‘event type’ or ‘Aktionsart’ (German term meaning ‘a type of action’), because it does not connote specifically dynamicity and exclusion of states. Moreover, ‘eventuality (type)’ does not suggest that agentivity plays an important role, as the German term ‘Aktionsart’ does.

I will first introduce Vendler’s influential distinction into states, activities, accomplishments and achievements. Recent approaches favor the tripartite distinction into states, processes and events, which is ontologically wider, because it is not restricted to verbs that denote actions instigated by human agents (see Mourelatos, 1978/1981; L. Carlson, 1981; Bach, 1981, 1986; Parsons, 1990). It subsumes Vendler’s accomplishments and achievements into one category

'events'. Many language phenomena clearly indicate that not only accomplishments and achievements form a natural class (events), but also states and processes, in some respects at least, exhibit significant semantic and syntactic similarities in their behavior. Therefore, on the most general level of classification, two main classes of verbal predicates and sentences are distinguished: events, which are telic or quantized, and states and processes, which are atelic or cumulative.

Following the work of Dowty, Vendlerian classification was further developed within tense logic and event semantics. Tense logical approaches base the classification primarily on temporal criteria, on abstract properties of time points and intervals (see Bennett and Partee, 1972/1978; Dowty, 1972, 1977, 1979; Bennett, 1977, 1981; Taylor, 1977; and others). Approaches within event semantics take events or eventualities as basic entities in the domain of discourse, along with individuals and times (see Bach, 1981, 1986a, 1986b; Parsons, 1985, 1990; Hinrichs, 1985; Krifka, 1986, 1989, 1992; Pustejovsky, 1988a, 1988b, Zucchi, 1993, and others). Bach (1981) proposes that at least some of the properties of event types can be understood in terms of parallels between verbal and nominal expressions that pertain to their 'part' structure, that is, to the ways in which an entity as a whole stands in relation to its parts. This approach to the classification of verbal predicates is inspired by the theories of mereology, or the logic of part-whole relations, and has gained a lot of prominence within event semantics. This is also the approach I adopt here.

Classifications of verbal predicates and sentences into classes that build on the work of Vendler and Dowty have been used for the analyses of a number of grammatical phenomena. Let me here briefly mention at least three. First, they are indispensable for the description of grammatical aspect in natural languages. Second, the fine-grained semantic distinctions that motivate the relevant classes play an important role in the syntax-semantics interface in the domain of argument structures (also Linking Theory, or argument selection). They enter into the formulation of language-specific and universal linking generalizations<sup>3</sup>, and in some approaches they contribute to the semantic characterization of thematic roles<sup>4</sup>. Third, eventuality types also play a role in our understanding of other grammatical phenomena, such as the choice of verb auxiliaries in Italian, German, and Dutch (Zaenen, 1987, 1988, 1993).

## 2.2 Vendler (1957/1967)

Vendler's goal is "to describe the most common time schemata implied by the use of English verbs" (p.98)<sup>5</sup>. Examples illustrating Vendler's categories, states, activities, accomplishments and achievements, are given in (1):

- |                         |  |
|-------------------------|--|
| (1) <b>States:</b>      | desire, want, love, believe, own, resemble, be in New York;  |
| <b>Activities:</b>      | run, walk, write letters, push a cart, breathe;  |
| <b>Accomplishments:</b> | run a mile, walk to the car, write a letter, recite a poem, grow up, recover from illness;   |
| <b>Achievements:</b>    | recognize, realize, spot, identify; lose, find, reach (the summit); win (the race); cross the border; start, stop, resume; be born, die. |

Vendler's classification is based on the following criteria: duration over time, change, set terminal point and homogeneity. As a point of departure, Vendler (1967:99) takes the progressive (his "continuous tense"), and argues that activities and accomplishments should be set apart from achievements and states, because only activities and accomplishments occur in the progressive:

- (2) a. John is running / pushing a cart.  
 b. John is running a mile / drawing a circle.  
 c. \*John is having a car. / \*Mary is being in New York.  
 d. \*John is realizing that he forgot to lock the door.

However, the compatibility with the progressive does not provide a suitable criterion for the classification of states and achievements into one class (and of activities and accomplishments into another). Dowty (1977, 1979), Mourelatos (1978/1981) and Vlach (1981), among others, point out that many achievement verbs in Vendler's list can appear in the progressive: *He is winning the race, He is dying, He is reaching the top, He is falling asleep, He is leaving, He is arriving*, for example. Bach (1981:77) observes that most stative predicates can be used with special interpretations in the progressive: cp. *I'm really loving the play, I'm understanding you but I'm not believing you*. Moreover, there are different reasons for the acceptability of achievements and states in the progressive. The acceptability of progressive sentences with state predicates seems to depend on whether the state predicate can be coerced into expressing a contingent property that changes over time (see

Comrie, 1976:38ff., Dowty, 1979:176ff., Carlson, 1981:43, Vlach, 1981). States may arise as a result of change, but they do not involve any changes. As Vendler observes, states last “for a period of time” (1967:103), but do not denote a process over time, they “cannot be qualified as actions at all” (1967:106).

The misconception that the progressives of achievements are generally ungrammatical could be attributed to Vendler’s claim that all achievements encode the inception or termination of an act and “occur at a single moment” (Vendler, 1967:103). Furthermore, it is explicable by Vendler’s focus on achievement verbs denoting psychological and perception events, such as *recognize*, *spot*, *notice*, which indeed are lexicalized as being instantaneous, and which do not usually occur in the progressive: \**He is noticing/recognizing / spotting his friend’s face in the crowd*. Achievements that are understood as occurring at a single moment, such as *flash*, *blink*, are odd with the progressive, unless we think of some unusual contexts, like a slow-motion movie, in which their beginning and end do not fall into a single moment, but instead are separated by an interval of time. Such punctual achievements are most likely to give rise to an iterative interpretation when they are used in the progressive. The possibility of an iterative interpretation depends on the resettability of the denoted punctual event (cp. *The light was flashing* vs. ?*He was finding his watch*, ?*She was noticing/spotting the squirrel*, ?*The bomb was exploding*).

Activities and accomplishments differ from states and achievements in so far as they “are processes going on in time, that is, roughly (...) they consist of successive phases following one another in time” (Vendler, 1967:99). It is an essential feature of accomplishments that they “proceed toward a terminus which is logically necessary to their being what they are” (Vendler, 1967:101). “[W]hile running or pushing a cart has no set terminal point, running a mile and drawing a cricle do have a ‘climax’, which has to be reached if the action is to be what it is claimed to be” (Vendler, 1967:100). This has the following consequence: activities are homogeneous, while accomplishments are not. Activities “go on in time in a homogeneous way; any part of the process is of the same nature as the whole” (1967:101). “If it is true that someone has been running for half an hour, then it must be true that he has been running for every period within that half hour” (1967:101). In contrast, accomplishments are not homogeneous: “... in case I wrote a letter in an hour, I did not write it, say, in the first quarter of that hour” (1967:101)<sup>6</sup>.

Apart from Vendler, other philosophers and linguists tried to make precise the intuitions that underlie the classification of verbal predicates

and sentences into classes inspired by Aristotle. The most complete list of tests can be found in Dowty (1979, Chapter 2 and 3), who gives eleven syntactic and semantic criteria based on Ryle (1949), Vendler (1957/1967), Kenny (1963), Lakoff (1965) and Ross (1972). In what follows I will give a brief summary of these tests:

### I. Non-stative Tests

#### Only non-statives occur in the progressive:

- (3) a. John is smiling.  
 b. John is drawing a circle.  
 c. \*John is knowing the answer.  
 d. \*She was finding her house for some time.

#### Only non-statives occur as complements of *force* and *persuade*:

- (4) a. John forced Barry to smile.  
 b. John forced Barry to draw a circle.  
 c. \*John persuaded Barry to know the answer.

#### Only non-statives occur as imperatives:

- (5) a. Smile!  
 b. Draw a circle!  
 c. \*Know the answer!

#### Only non-stative co-occur with agentive adverbs like *deliberately* and *carefully*:

- (6) a. John smiles deliberately.  
 b. John carefully draws a circle.  
 c. \*John deliberately knows the answer.

#### Only non-stative occur in pseudo-cleft constructions with the auxiliary *do*:

- (7) a. What John did was smile.  
 b. What John did was draw a circle.  
 c. \*What John did was know the answer.  
 d. What the rock did was roll down the path.

There are many predicates with inanimate subjects that do not pass the b.-d. tests. The reason is that these tests isolate a narrower property than non-stativity, namely agentivity. Agentivity entails non-stativity, but not vice versa. Many non-stative and non-agentive verbs can occur in the *do*-construction (see Ross, 1972).

**II. Non-statives have a habitual interpretation in the simple present**

- (8) a. John smiles.  
 b. John draws a circle.  
 c. John knows the answer.

**III. ‘ $\phi$  for an hour, spend an hour  $\phi$ -ing’**

This criterion distinguishes achievements and accomplishments from activities and states. Only the latter two can occur with durative temporal *for*-phrases and as complements of *spend  $\alpha$ -amount of time*:

- (9) a. Max ran for an hour.  
 b. John was sick for two years.  
 c. ?John built a cabin for three years.  
 d. \*John died for a year.

Dowty (1979:88) observes that there are verbs (he labels them *degree-achievements*) that appear to be achievements except for the fact that they can be combined with durative temporal *for*-phrases, or other durative adverbials:

- (10) a. The soup cooled for ten minutes.  
 b. The ship sank for an hour (before going under completely).  
 c. John aged forty years during that experience.

Such verbs have also been called *degree words* (Sapir, 1949; Bolinger, 1972) or *vague predicates* (Lewis, 1970; Kamp, 1975).

**IV. ‘ $\phi$  in an hour, take an hour to  $\phi$ ’**

This criterion is intended to distinguish activities and states from achievements and accomplishments. Only the latter two can occur with time span *in*-phrases and as complements of *take  $\alpha$ -amount of time to  $\phi$* :

- (11) a. (\*)John swam in an hour.  
 b. \*John was sick in two years.  
 c. John built a cabin in three years.  
 d. John noticed the painting in a few minutes.
- (12) a. (\*)It took John to swim in an hour.  
 b. (\*)It took John two years to be sick.  
 c. It took John three years to build a cabin.  
 d. It took John a few minutes to notice the painting.

**V. ‘ $\phi$  for an hour’ entails ‘ $\phi$  at all times in the hour’**

Just like the previous two criteria, this criterion is also mainly intended to set states and activities apart from accomplishments (see Dowty, 1979:60). This test is related to Vendler’s homogeneity property: If John ran for an hour, then, at any time during that hour it was true that John ran. If John wrote a letter for an hour, then it is not true that he wrote a letter at any time during that hour. (For the problems with this ‘entailment’, see Chapter 2.3.1.)

**VI. ‘x is  $\phi$ -ing’ entails ‘x has  $\phi$ -ed’**

This test goes back to Kenny (1963), who introduced it to differentiate activity verbs from accomplishment/achievement verbs (his ‘performances’). For activity verbs, the entailment from the progressive form “x is  $\phi$ -ing” to the simple form “x has  $\phi$ -ed” is valid, while for accomplishment/achievement verbs it is not. (13a) is said to entail (13b). On the other hand, sentences in (14a) do not entail those in (14b):

- (13) a. John is walking.  
b. John has walked.
- (14) a. John is writing a letter, John is falling asleep.  
b. John has written a letter, John has fallen asleep.

Strictly speaking, these are not semantically valid entailments, as Taylor (1977:205, 209) and Bach (1986:71) observe. To consider *John is writing a letter*  $\rightarrow$  *John has not written a letter*, for example, a valid entailment, we need to explicitly exclude all the occasions of John’s writing a letter that occurred prior to the current one. With this caveat, the intuition behind this test is nevertheless obvious and valid. The reason why the inference does not hold for accomplishments and achievements is that they entail *definite changes of state* that culminate at some final state: For example, in *John is writing a letter* it is the coming into existence of a complete letter. Once this point is reached, the writing of a letter must necessarily end. In *John is writing a letter*, the existence of a completed letter is only a possible outcome of the denoted event, while the corresponding perfect tense sentence *John has written a letter* entails that the complete letter came into existence. The problems related to the treatment of sentences like *John is writing a letter*, which are often summed up under Dowty’s (1972, 1977, 1979) label ‘imperfective paradox’, will be discussed in Chapter 4.

**VII. Complement of *stop***

Achievements cannot occur with *stop* (except in a habitual interpretation), but accomplishment, activities and states can:

- (15) a. ?John stopped being sick when he took the medication.  
 b. John stopped running.  
 c. John stopped building the house.  
 d. (\*)John stopped noticing the painting.

**VIII. Complement of *finish***

Accomplishments are distinguished in that they can be embedded under *finish* (without requiring any special interpretation):

- (16) a. \*John finished being sick when he took the medication.  
 b. (\*)John finished walking.  
 c. John finished building the house.  
 d. \*John finished noticing the painting.

**IX. Ambiguity with *almost***

As Morgan (1969) pointed out, *almost* is ambiguous with accomplishments, but not with activities. For example, (17a) entails that John did not walk. In contrast, accomplishment sentences like (17b) are ambiguous: (i) John did begin writing a letter, but he did not finish writing it; (ii) John perhaps had the intention of writing a letter, but changed his mind and did not even start writing it.

- (17) a. John almost walked.  
 b. John almost wrote a letter.

**X. 'x  $\phi$ -ed in an hour' entails ' $\phi$  was  $\phi$ -ing during that hour'**

This criterion is related to the fourth test. For many achievement expressions the time-span adverbial, such as *in a few minutes*, is understood as 'after  $\alpha$ -amount of time':

- (18) John noticed the painting in a few minutes.

(18) means *John noticed the painting after a few minutes*. The same holds for activities: *We shall run in two minutes* can be interpreted as *We shall run after two minutes*. In contrast, *John built a cabin in three years* and *John built a cabin after three years* do not have the same meaning (see also Vendler, 1967:10; Mourelatos, 1981:194): If *John built a cabin in three years* is true, then it is true that John was building



a cabin during those three years. In short, with achievements and activities the time indicated by the time-span adverbial is calculated from a contextually given reference point, while with accomplishments it is calculated from the beginning of the eventuality itself.

#### **XI. Co-occurrence with *studiously, attentively, carefully***

Ryle (1949:150) points out that adverbs like *studiously, attentively, carefully* are anomalous with “purely lucky achievements”:

(19) ??John carefully found a penny.

‘Purely lucky achievements’ are ‘prefaced by no task performances’ (or intentional ‘subservient task activity’), and hence clash with adverbs that presuppose a volitional, goal-oriented activity.

Further developments of Vendlerian classification can be divided into two main types: accounts within tense logical and event based semantics. In the next two sections I will first introduce tense logical accounts, taking a few select examples, and show why they are inadequate (in their pure tense logical form) for the characterization of eventuality types and semantics of individual verbs. Purely tense-logical accounts were subsequently abandoned in favor of event-based theories. The latter emphasize structural parallels between the denotational domains of nominal and verbal predicates. Such parallels, which concern the mereological ‘part’ relation, are often captured by the assuming that the denotational domains of nominal and verbal predicates have the mathematical structure of a complete join semi-lattice.

### **2.3 Tense Logic**

The framework of classical tense logic<sup>7</sup> which is couched within model-theoretic semantics dominated much of the research on the classification of verbal predicates and sentences, aspect and tense during the 1970’s and early 1980’s. Lexical semantic properties of eventuality types were modelled in terms of purely temporal notions, that is, on the basis of abstract properties of moments and/or intervals of time. Among the issues around which many discussions revolved were the following: (i) evaluation at points (traditional tense logic, see Montague, 1968, 1974<sup>8</sup>, Scott, 1970, for example) or at intervals (Bennett and Partee, 1972/1978, Bennett, 1977, 1981, Taylor, 1977; Dowty, 1977, 1979; Hinrichs, 1985, for example), (ii) two-valued (Dowty, 1977, 1979) or many-valued logic (Hoepelman, 1976, 1978, 1981), (iii) extensional semantics (Taylor, 1977) or intensional

Montague semantics (Dowty, 1977, 1979), (iv) sentence semantics or discourse semantics (König, 1980; Smith, 1980, 1986, 1990).

Classical tense logic, within which these issues were discussed, was developed in order to solve certain philosophical problems. It was not intended as a means of describing specifically the semantics of verbal predicates in natural languages. This is at the root of the limitations and shortcomings of many description of verbal predicates within tense logic. There are many philosophical problems related to the notion of time that are, to a large extent, irrelevant to the explication of the notion of tense as it is encoded by linguistic expressions. For example, the tense logical approach is concerned with questions like the following: Is the set of times infinite or finite? Is there a first (last) moment of time? Is time discrete, dense, continuous? For what portion of an interval is a proposition expressed by a given sentence valid? Or, does a given sentence denote a situation that allows for gaps and for how many? It is not clear what difference, if any, the answers to these questions make for the formulation of linguistic theories. For example, with respect to the problem of whether time is discrete or dense, Dowty (1979:76) observes that there are no good linguistic reasons to assume either position<sup>9</sup>.

It was pointed out (see Vlach, 1981; Bach, 1981, 1986, among others) that we meet with formidable obstacles if we try to reconstruct the semantic criteria that underlie the classifications of Vendler (1957/1967) and Kenny (1963), for example, only with the apparatus provided by tense logic. Theory-internal assumptions of tense logic give rise to unexpected problems, such as those that have to do with the specification of the smallest and minimal parts of denoted eventualities and the ‘gappiness’ of the interval during which eventualities are asserted to hold. In order to account for such problems we are forced to postulate additional constraints and ad hoc theoretical constructs that do not play a systematic role in grammars of natural languages.

As a case in point I will discuss the reconstruction of the homogeneity property, introduced by Vendler (1957/1967), in tense-logical approaches. As has been observed above, Vendler (1957/1967:101) uses the homogeneity property to motivate his informal distinction between activity and accomplishment predicates. The problems related to Vendler’s homogeneity property are also reflected in the application of Kenny’s (1963) entailment from ‘x is V-ing’ to ‘x has V-ed’ to verb predicates.

### 2.3.1 Bennett and Partee (1972/1978), Taylor (1977)

In Bennett and Partee (1972/1978) Vendler's homogeneity property closely corresponds to the subinterval property:

“Subinterval verb phrases have the property that if they are the main verb phrase of a sentence which is true at some interval of time I, then the sentence is true at every subinterval of I including every moment of time in I. Examples of subinterval verb phrases are: *walk*, *breathe*, *walk in the park*, *push a cart*” (Bennett and Partee, 1972:17).

The subinterval property is intended to distinguish states and activities from accomplishments and achievements. The subinterval property is too strong for two reasons. First, the evaluation at individual moments of time is plausible only for certain states. Take, for instance, Taylor's example (1977:206) *Rod is hirsute*. It denotes a state that is true of Rod more or less permanently, true of his various manifestations without interruptions. (Such predicates correspond to Carlson's (1977) *individual-level* predicates.) From this it follows that such state predicates denote properties that can be true at particular single moments of time. Therefore, if the statement expressed by *Rod is hirsute* obtains at or throughout an interval of time P, then it is true of any moment *m* within P. Such “[s]tates are like snapshots of the world at a given instant” (Chierchia and McConnell-Ginet, 1990/1992:353), because, they do not entail any change. However, the evaluation at individual moments of time is insufficient for the statement of the truth conditions for non-state verbs, including activity verbs (see Taylor, 1977:207; Dowty, 1979:168; Bach, 1981:71). The reason is that a change of state can be characterized as a succession of at least two different states of affairs<sup>10</sup>, hence their truth conditions “require access to information about the physical state of the world at at least two moments in time” (Dowty, 1979:168).

Second, the subinterval property does not allow for any gaps. However, activities like *walk*, *breathe*, *walk in the park*, *push a cart* readily allow for gaps (see Dowty, 1977:50, among others). Take the following example: if Mary ran for a week one may truthfully assert *Mary ran* during that week even though Mary was not engaged in running at every subinterval and instant of that week. We must allow for a certain number of subintervals during which Mary does not run.

Taylor (1977) avoids the first criticism directed at Bennett and Partee's subinterval property by postulating that activities are valid at

intervals larger than a moment. Taylor's temporal postulates that characterize Vendler's four classes are as follows<sup>11</sup>:

- (20)
- a. If  $\alpha$  is a *stative* predicate, then  $\alpha(x)$  is true at an interval  $I$  just in case  $\alpha(x)$  is true at all moments within  $I$ .
  - b. If  $\alpha$  is an *activity* verb (...) or an *accomplishment / achievement* verb (...), then  $\alpha(x)$  is only true at an interval larger than a moment.
  - c. If  $\alpha$  is an *accomplishment/achievement* verb, then if  $\alpha(x)$  is true at  $I$ , then  $\alpha(x)$  is false at all subintervals of  $I$ .
  - d. If  $\alpha$  is an *activity* verb, then if  $\alpha(x)$  is true at  $I$ , then  $\alpha(x)$  is true for all subintervals of  $I$  which are larger than a moment.

If Taylor's temporal postulate for activity verbs is given an unconstrained interpretation, it cannot account for the 'gappiness', the second problem associated with Bennett and Partee's subinterval property. In fact, apart from "atemporal" states, such as those expressed by *be hirsute*, *be a believer in God*, which do not allow for any gaps, and achievements that denote punctual events, all the other classes of predicates readily allow for gaps. Let us take an example with a predicate expressing a temporary state, or Carlson's (1977) *stage-level state*: *Fido is being obnoxious today*. This sentence can be felicitously uttered even if there are moments during the day during which Fido is well-behaved. In other words, the stative sentence can be true for the interval but not true at each and every moment within that interval.

The 'gappiness' property gained a surprising prominence in the temporal accounts of eventuality types and was considered by some logicians important enough to serve as a basis for their classification (Rescher and Urquhart, 1971:160, for example). 'Gappiness' is problematic as a semantic criterion, because it presupposes a clear-cut distinction between trivial and non-trivial gaps. Even if we could draw a line between trivial and non-trivial gaps, we might still wonder what non-trivial gaps would tell us about the semantics of verba; predicates, what role they would play in the semantics of natural languages. It is best to conclude that 'gappiness' is not a semantic property of verbal predicates. If it were, an explicit account of 'gappiness' would presuppose that we can determine once and for all the permitted number and size of non-trivial gaps that are characteristic for each eventuality type. However, this is impossible, because in general the permitted number and size of such gaps and the required number of subintervals at which the situation must hold will depend on contextually determined pragmatic factors. For example, an hour full of running may be

without gaps, like a bathtub full of water, a year full of running is naturally assumed to have gaps (iterative interpretation), like a street full of policemen (see Vlach, 1981:282, fn. 17).

Related to the problem of ‘gappiness’ is the definition of the truth conditions for durative *for*-phrases. Their domain of application is restricted to certain state and activity predicates. Similarly as the subinterval property of Bennett and Partee (1972/1978), it is too strong if understood in its unconstrained interpretation. Such an interpretation is given by Dowty (1979:60): ‘ $\phi$  for an hour’ entails ‘ $\phi$  at all times in the hour’. Here the problem stems from the fact that Dowty (1979:79) represents durative adverbials, such as *for six weeks*, as universal quantifiers over time intervals: namely, in terms of a quantified time expression and a two-place AT operator:  $(\forall t: t \in \text{six weeks}) AT(t,p)$ . This formula is understood as “for all times  $t$  such that  $t$  is a member of the period six weeks, it was true at  $t$  that  $p$ ” (see Dowty, 1979:79). Dowty himself observes that if “we are to use the universal quantifier to represent durational adverbs like *for six weeks* in a natural logic at all, then the moments it quantifies over must be something like ‘relevant psychological moments’ which are both vaguely specified and also contextually determined” (Dowty, 1979:81).

It seems to be incorrect to say that durative adverbials themselves have the property of quantifying over all (universal quantification) or just some relevant, vaguely specified and contextually determined, moments and/or subintervals of time. Rather, we need to interpret this variability as the feature of the eventualities denoted by the predicates in the domain of application of durative adverbials and the context in which a given durative adverbial is used. Durative adverbials have two inherent properties: they indicate a certain temporal measure and their domain of application is restricted to certain stative and activity predicates and sentences. How the denoted period, temporal measure, is divided in terms of its (proper) parts is not a matter of the semantics of durative adverbials, but rather is to be determined by the semantics of the predicates in the scope of durative adverbials and by various pragmatic considerations. An adequate account of durative adverbials cannot rely on universal quantification and it must be flexible enough to fit the variability of contexts in which durative adverbials are used.

Taylor (1977) draws attention to another problem with his temporal postulate for activities. He observes that the postulate does not apply to all the activity verbs, but rather only to homogeneous activity verbs, such as *blush* or *fall*. For example, for *fall* it holds that

“even a microsecond within a period of falling is plausibly reckoned as itself genuinely a period of falling, even though it can be told as such by means of normal empirical criteria only indirectly, via the knowledge that it does indeed come within some wider period long enough for those criteria to be applied” (Taylor, 1977:212).

Taylor distinguishes homogeneous activity verbs from heterogeneous ones, such as *chuckle*. It denotes an eventuality that has proper parts that are too small to count as chuckling. Therefore, it is divisible only up to certain minimal proper parts. Other examples of heterogeneous activity verbs are *talk*, *giggle* and verbs of motion like *run*, *swim*, *walk*, *crawl*, *dance*, *waltz*, for example. As Dowty (1979:168) observes, such verbs of motion involve patterns of change of position, or particular sequences of more simple changes of position, that are “required to characterize a certain complex activity, though no particular member of the sequence need occur first” (Dowty, 1979:171). For example, since the waltz involves sequences of three steps, any interval at which Mary takes less than three steps is not an interval at which *waltz(Mary)* is true. *Mary is waltzing* can be true at a time *t* even though *waltz(Mary)* is false, because *t* might fall within the very first “minimal” subinterval of the interval within which *Mary is waltzing* is true, and at any time within that “minimal” subinterval it will be true that *Mary is waltzing*, but false that *Mary has waltzed*. In other words, within this first “minimal” subinterval, there would be no past interval for which *waltz(Mary)* would be true (see Taylor, 1977:207, Dowty, 1979:171). The above observations lead Taylor to the following conclusion: “it must be denied that there is a genuine entailment from ‘*x is V-ing*’ to ‘*x has V-ed*’ for heterogeneous E-verbs [activities]” (Taylor, 1977:214). This also means that Kenny’s (1963) entailment from ‘*x is V-ing*’ to ‘*x has V-ed*’ cannot be applied to all the activity verbs, but rather only to homogeneous ones. But now we are faced with a new problem: How do we identify the minimal subinterval or minimal part of heterogeneous activities? Taylor (1977) assures us that

“there is no cause for undue concern, provided the natural assumption be made that the minimal periods of chuckling within a piece of normal-rate chuckling are the least times of chuckling so discernable by normal empirical criteria. For them it will at least remain true that no speaker will be in a position warrantably to assert that *x is chuckling* until, some minimal period of chuckling having passed and been recognized, it is true that *x has chuckled*; ...” (Taylor, 1977:214). “(...) within any period of chuckling there will be minimal periods [italics

mine] of chuckling, and it is natural to identify the minimal periods of a chuckling carried out at the normal rate with those which everyday empirical criteria can identify as such" (Taylor, 1977:212).

From Taylor's observations it is clear that the problem of minimal periods or parts is not a problem that should be treated and resolved within semantic theories.

To take another example showing that purely temporal characterizations of the relevant semantic properties of eventuality types is insufficient, let us take Kenny's (1963) entailment from 'x is V-ing' to 'x has not V-ed' which is supposed to characterize accomplishment/achievement verbs. As has been pointed out above, strictly speaking, this is not a semantically valid entailment. Take, for example, *If John is building a house, John has not built a house*. Suppose that John is in the process of building a series of houses. When he is building the second house, it would be false to say that he has not yet built a different house from the one he is now building. One way to amend this problem would be, following Taylor (1977:209), to characterize the notion of an individuated time period within which an event denoted by a given accomplishment verbal predicate holds by some additional meaning postulate. It would guarantee that *John is building a house* will entail *John has not yet built a house during this period of his building of a house*. This would, however, be ad hoc. Moreover, what is really behind sentences like *John is building a house* is the intuition that the assertion concerns participants in a particular individuated event. Or, as Dowty (1979:57) proposes, it may be suggested that "we must give a 'wide scope' reading to any quantifier occurring within the  $\phi$  [i.e., 'x is  $\phi$ -ing' to 'x has not  $\phi$ -ed', HF] to apply the test appropriately" (Dowty, 1979:57). This is to ensure the identification of the appropriate object (a/the house) subjected to the denoted event (building of that house). However, such a scope solution must also be rejected on independent grounds (see Zucchi and White, 1996:334-5). In short, problems with the application of Kenny's 'entailment' test, and the various proposals to solve them, provide in Bach's (1986) view "a strong argument against all attempts to reconstruct events and the like on the basis of times" (Bach, 1986:71).

The above observations make it sufficiently clear that tense logical approaches can model only some semantic properties of verbal predicates, which are crucial to their classification into eventuality types. It is impossible to provide an adequate characterization of the relevant semantic properties of verbal categories only with the apparatus

provided by tense logic, that is in terms of abstract properties of intervals and moments of time. Theory-internal assumptions of tense logic force us to consider problems, such as the minimal parts and ‘gappiness’, that do not help us deepen our understanding of the semantic properties of verbal predicates. Moreover, the solution of such problems unnecessarily complicates the proposed temporal accounts. For example, Taylor’s (1977) temporal postulates are coherent if additional semantic constraints are formulated and/or pragmatic conditions on the application of the relevant temporal postulates and tests are stated. He also evokes notions, such as ‘everyday’ or ‘normal empirical criteria’, and language users’ common general knowledge about the denoted eventualities. Modifications of this kind weaken the force of his temporal postulates. This led to the gradual emergence of new approaches within tense logic and truth-conditional semantics that combined temporal and non-temporal properties in their characterizations of the lexical semantics of verbal predicates. As an example the highly influential work of Dowty (1972 and 1979) will be discussed in the next section.

### **2.3.2 Dowty (1972, 1979)**

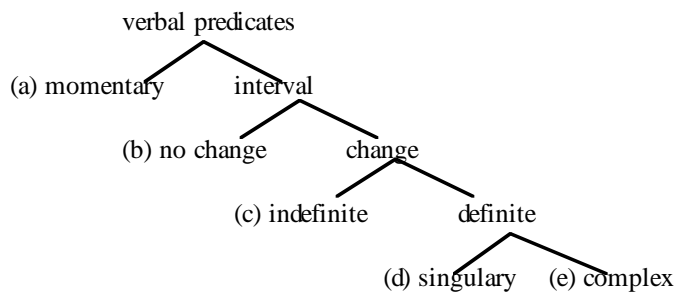
Dowty emphasizes that an adequate description of verbal predicates and sentences, including their aspect and tense, requires semantic, pragmatic and discourse semantic motivations. Dowty (1979) explicitly rejects such approaches as Taylor’s (1977), which try to reduce the differences between different verb classes to purely temporal properties, because they do not capture important lexical semantics of verbs, and hence provide no adequate motivation for the different behavior of the verbal classes. “[A] description such as Taylor’s leaves it an apparent accident that the class of verbs that have definite change-of-state entailments and the class of verbs that seem to obey (56) [i.e. Taylor’s postulate for accomplishment/achievement verbs here given in (20), HF] is exactly the same” (Dowty, 1979:167). Dowty develops a fine-grained lexical semantic analysis of eventuality types that combines the philosophical insights of Aristotle, Kenny, Ryle and Vendler, lexical decomposition analysis of generative semantics (see Lakoff, 1965; McCawley, 1968; Postal, 1970; Ross, 1972) with the formal theory of truth-conditional and model-theoretic semantics.

Dowty observes that “the syntactic tests for distinguishing the four categories [Vendler’s states, activities, accomplishments and achievements, HF] do not give us totally consistent results for all examples below. In fact, consideration of some of them will force us to



make some revisions in the Vendler-Kenny classification” (Dowty, 1979:65-66). Dowty introduces his revised classification in Chapter 3.8: *Another Look at the Vendler Classification in an Interval-Based Semantics* (p.163ff.). It is based on the set of five partially cross-classifying semantic distinctions, four temporal and one non-temporal (agency): (i) momentary vs. interval, (ii) change vs. no change, (iii) definite change vs. indefinite change, (iv) singulary change vs. complex change, (v) agentive vs. non-agentive. They split verbal predicates into states, activities, complex change of states (accomplishments) and single change of states (achievements). As is obvious from Table 1, the most fundamental criterion that Dowty uses to distinguish between the different types of predicates is based on the notion of *change*. The fifth semantic distinction, the notion of ‘agentivity’, is orthogonal to the other four, so that each of these four classes is further split into agentive and non-agentive predicates. However, ‘agentivity’ is less important for the classification of verbal predicates than its prominence in Dowty’s system seems to suggest.

Table 1: Dowty’s classification of verbal predicates (1979: 163ff., 184)



- (a): be asleep, be in the garden (stage-level states); love, know (object-level states); (habitual uses of verbs in all classes);  
 (b): sit, stand lie (interval states); be polite, be a hero;  
 (c): make noise, roll, rain; walk, laugh, dance;  
 (d): notice, realize, ignite; kill, point out (something to someone);  
 (e): flow from x to y, dissolve; build (a house), walk from x to y, walk a mile.

A change of state can be characterized as a succession of at least two different states of affairs. Hence, as in Taylor (1977), the notion of ‘change’ motivates the assumption that only states can be true at

moments of time, while all the non-stative classes, activities, accomplishments and achievements can only be true at intervals of time<sup>12</sup>.

On the basis of the co-occurrence with the progressive aspect, Dowty distinguishes between *momentary* and *interval* predicates. Momentary predicates are states, such as *be asleep*, *be in the garden*, *love*, *know* (and habitual uses of verbs in all classes) and interval predicates comprise all the other classes of predicates. Dowty's two classes of *momentary* predicates correspond to Carlson's (1977) distinction in *object-level* (*know*, *love*) and *stage-level* (*be asleep*, *be in the garden*) predicates, while all interval predicates correspond to Carlson's *stage-level* predicates.

Sentences denoting activities entail an *indefinite change* of state in their semantic description, while accomplishments and achievements are characterized by a *definite change* of state over time. Dowty illustrates this point with motion predicates. An activity sentence like *The ball moved* entails an indefinite change of state, it can be felicitously uttered in any situation in which some change of location of the ball took place. Such an activity sentence "is true of any interval in which the ball changes its location to any degree at all, and thus may be simultaneously true of an interval and various subintervals of that interval" (Dowty, 1979:168)<sup>13</sup>. In contrast, accomplishment sentences like *The ball moved six feet* or *The ball moved to the bottom of the slope* entail a definite change of state: the ball moves a specific distance (six feet), or to a specific location (to the bottom of the slope). Such accomplishment sentences "are true when a change of location of a particular specified location has taken place, and thus are true of a single interval, but not of any subintervals or superinterval of that interval" (Dowty, 1979:168).

Accomplishments entail a 'complex change' and achievements 'singulary change'. The main difference is in the presence of a subsidiary causal event that brings about the change entailed by accomplishments (see Dowty, 1979:183). Examples of predicates entailing a complex change are: *build a house*, *shoot someone dead*, *the collision mashed the fender flat*. Examples of predicates entailing a singulary change are: *reach the age of 21*, *awaken*, *reach the finish line*, *arrive in Boston*, *realize*, *forget*, *find*, *discover*, *arrive at*, *reach*, *depart from*, *leave* and 'aspectual' complement verbs like *stop*, *start*, *begin*, *continue*, etc.

Although Dowty observes that "[t]his presence or absence of a causal event seemed to be the most salient distinction between the accomplishment and achievement class for Vendler (and is for me), ..."

(1979:183), it should be emphasized that Dowty's use of 'achievement' and 'accomplishment' does not correspond to Vendler's use of these terms. The reason is that Dowty's 'subsidiary causal event' criterion overrides any considerations having to do with agency (see Dowty, 1979:183). Vendler's examples of achievements are mostly non-agentive events that cannot be deliberately brought about (*die, lose, notice*), while his accomplishments are typically agentive. Dowty's integration of achievements and accomplishments is clearly superior to Vendler's distinction between achievements and accomplishments that is based, among other things, on the criterion of agency. However, the criterion of 'agency' muddies the classification in both Vendler's and Dowty's classification and should be avoided altogether.

Dowty proposes that the relevant properties of eventuality types can be captured by means of a simple 'aspect calculus' (see also Dowty, 1979:71)<sup>14</sup>. It consists of basic stative predicates, three sentential operators DO, BECOME and CAUSE, and the combinatorial apparatus of intensional logic. Each verb can be represented as a propositional function containing (at least) one predicate which is assigned one or more arguments. Each stative verb corresponds to a stative predicate in the aspect calculus language. Non-stative verbs are constructed from stative predicates with the three operators DO, BECOME and CAUSE.

In Dowty's lexical decomposition analysis, activity predicates have a semantic structure that contains states and the DO relation. Dowty's analysis of the progressive and of the temporal properties of the DO relation predict that predicates with DO in their logical representation can occur in the progressive.

Achievement and accomplishment predicates have a logical structure consisting of a one-place atomic predicate BECOME and an embedded proposition  $\phi$ , BECOME  $\phi$ , where  $\phi$  may contain a state, an activity, accomplishment or achievement predicate<sup>15</sup>.

Only accomplishment, but not achievement, predicates are defined with the operator CAUSE. The class of accomplishments corresponds to a large extent to the class of causative verbs in generative semantics. The notion of causation, as it is encoded by CAUSE, is explained in terms of the semantics for conditionals developed by Lewis (1973) and Stalnaker (1968) (it involves the counterfactual "if not  $\phi$ , then not  $\psi$ " and resemblance relation between possible worlds). All accomplishments have the logical structure [ $\phi$  CAUSE  $\psi$ ], where  $\phi$  and  $\psi$  are propositions, that is, CAUSE is a two-place sentence connective<sup>16</sup>.  $\phi$  is often a BECOME sentence or contains an activity predicate,  $\psi$  is a BECOME sentence (see Dowty, 1979:91). To illustrate how Dowty's lexical decomposition works, consider the

relation between the following state, achievement and accomplishment predications:

- (21) a. The door was open.  
 b. The door opened.  
 c. John opened the door.

We can translate *is open* with a one-place stative predicate  $\text{open}'_a$  (“a” stands for ‘adjective’). The intransitive verb *open* in (21b) can be translated as in (21b’), and the transitive verb *open* in (21c) as in (21c’):

- (21) b.’  $\text{open}'_i = \lambda x [\text{BECOME} (\text{open}'_a(x))]$   
 c.’  $\text{open}'_t = \lambda x \lambda y [\text{CAUSE}(x, \text{BECOME} (\text{open}'_a(y)))]$

The  $\lambda$ -expression in (21c’) denotes a relation that holds between  $x$  and  $y$  iff some property that  $x$  has (or some action that  $x$  engages in) causes  $y$  to become open. This can be put in more simple terms as:  $[[\text{John does something}] \text{CAUSE} [\text{BECOME} [\text{the door is open}]]]$ . One of the reasons why Dowty proposes the decompositional account is to motivate the entailment relations that hold among lexical items. To see this, consider again the main predicates in (21) and their respective translations in intensional logic. However, there are many problems related to this analysis. I will briefly mention two. The first has to do with the well-known observation that causative verbs and their paraphrases with the causative verb *cause* are not always synonymous. Yet, the formula in (21c’) is intended to specify a necessary condition for the truth of the sentence *John opened the door*. This sentence entails the logical formula as well as the sentence *John caused the door to become open*. However, the formula is not a sufficient condition for the truth of the sentence *John opened the door*, because it does not incorporate the notion of ‘direct causation’.

The second problem has to do with using the scopal behavior of adverbs in support of the lexical decomposition of accomplishment and achievement predicates (see Dowty, 1979:250ff.). Certain adverbs can be construed as taking scope over the whole BECOME sentence or only over the stative clause embedded under BECOME. This can be illustrated with the following ambiguous sentence: *The sheriff of Nottingham jailed Robin Hood for four years*. Under the ‘external reading’, the whole sentence is in the scope of the durative adverbial *for four years*: (for four years) (CAUSE (the sheriff of N) (BECOME (in jail RH)))<sup>17</sup>. Under the ‘internal reading’, the durative adverbial *for four years* modifies only the result state, e.g., the embedded stative sentence

*Robin hood is in jail.* This reading can be paraphrased as ‘The sheriff of Nottingham brought it about that for four years Robin Hood was in jail’ and represented in the following way: (CAUSE (the sheriff of N) (BECOME (for four years (in jail RH)))). Dowty also points out that ambiguities illustrated by the lexical decomposition of such verbs as *to jail* do not arise with all the accomplishment verbs, but rather only with verbs that denote a resettable event.

Chierchia and McConnell-Ginet (1990, 1992:359) conclude that data from adverbial modification do not directly support (or provide evidence against) Dowty’s decompositional analysis. For example, they notice that for sentences with verbs like *clean* “intuitive judgments definitively reject internal modifier interpretations” (p.359). Consider the following two sentences:

- (22) a. John cleaned the jacket again.  
b. John caused the jacket to be clean again.

Suppose that John bought the jacket which was new and in a clean state, and no one ever cleaned the jacket before John bought it. If it then got dirty and John cleaned it, then it would be appropriate to say (22b), but not (22a). However, on Dowty’s analysis both (22a) and (22b) should be true in this situation.

## 2.4 Event-Based Semantics

In the early eighties new approaches to the classification of verbal predicates became prominent that were based on event semantics. They can be traced to Davidson (1967) who adds events to the ontology of individuals and represents event-sentences with explicit (first-order) existential quantification over events. Since the work of Davidson philosophers and linguists have argued for the addition of eventualities (Bach’s term, 1981) as basic entities into the domain of discourse (see Kamp, 1979; Bartsch, 1981; Barwise and Perry, 1983; Higginbotham, 1983; Parsons, 1985, 1990; Bach, 1986). They propose that at least some sentences should be interpreted as indefinite eventuality-descriptions rather than as propositions in the classical truth-conditional sense. It is now widely recognized that event-based semantics allows us to formulate many significant linguistics generalizations that otherwise would be difficult to formulate or missed altogether (see Parsons, 1990, for example).

The idea of viewing events as basic entities of a model goes back to Frege (1918), Whitehead (1920), Reichenbach (1947) and above all to

Davidson (1967). Davidson (1967) is the first one to use the notion of explicit event quantification in the logical representation of a sentence. He proposes to represent sentences denoting actions with an additional argument position for an event variable. According to Davidson, an ontology of events (understood as single particulars) are necessary for the discussion of central philosophical issues, such as causation, and theses, such as metaphysical determinism. Causation, for example, can be understood as a relation between events: causes and effects. Determinism is the thesis that every event is causally determined by antecedent events. Moreover, Davidson argues that reference to events is part of natural language semantics, which allows us to capture the logical structure of certain sentence types, namely of action sentences. Davidson proposes that ordinary  $n$ -place action predicates of tensed sentences are represented by  $(n+1)$ -place predicates in the first-order predicate language<sup>18</sup>. For example, *Mary sings* is represented as:

(23)  $(\exists e)(\text{sing}'(\text{Mary}', e))$

Action-denoting verbs like *sing* contain an additional argument place for an event and sentences like *Mary sings* are then treated as existential quantifications over events. Davidson's analysis is extended to a full theory of eventuality types by Parsons (1980, 1985, 1990).

## 2.4.2 Parsons (1980, 1985, 1990)

Parsons (1990) investigates the hypothesis that simple sentences in English contain subatomic quantification over events. In this connection, he gives four arguments in support of the existence of underlying events, and hence also in support of the event-based approach to the classification of verbal predicates and sentences.

### I. Entailment relations between sentences with adverbial modifiers.

(24a) is entailed by each of (24b)-(24d). And (24b) and (24c) are both entailed by (24d). Davidson suggests that we capture these logical relationships by quantifying over events. If the adverb 'out of tune' is treated as an "adjective of events" the logical form of (24b) can be given as (24b')<sup>19</sup>:

- (24) a. Mary sang.  
 b. Mary sang out of tune.  
 c. Mary sang in the shower.  
 d. Mary sang out of tune in the shower.

(24) b.'  $(\exists e)(\text{sang}'(\text{Mary}', e) \ \& \ \text{out-of-tune}'(e))$ .

**II. Complements of perceptual verbs.** Sentences like *Mary saw Brutus stab Ceasar* are analyzed as follows: The subject Mary perceives a certain event, an event described by the embedded clause *Brutus stab Ceasar*. This can be paraphrased in Davidsonian way as 'There is a seeing whose subject is Mary and whose object is a stabbing of Caesar by Brutus.'

**III. Implicit and explicit reference to events.** Implicit and explicit reference to events concerns the formal relationships between verbs and the nominal gerunds derived from them, and between adjectives and the corresponding *-ly* adverbs, as in the following sentences:

- (25) a. After the Marseillaise was sung they saluted the flag.  
 b. After the singing of the Marseillaise they saluted the flag.
- (26) a. The quiet singing of the Marseillaise (soothed their ears).  
 b. They sang the Marseillaise quietly.

According to Parsons, it is not a coincidence that such relationships exist. Within the event-based semantics we can provide a straightforward account for them by assuming that verbs and nominal gerunds, on the one hand, adjectives and *-ly* adverbs, on the other hand, contribute exactly the same predicate to the logical form.

**IV. Explicit quantification over events.** Sentence (27c) follows from (27a) and (27b). It is clear that the explicit quantification over burnings in (27a) is related to (27b) and (27c). Hence, implicit quantification over events can be assumed if we find inferences that link it with explicit quantification over events.

- (27) a. In every burning, oxygen is consumed.  
 b. Agatha burned the wood.  
 c. Oxygen was consumed.

Apart from these four pieces of evidence, Parsons also incorporates issues connected to the treatment of modifiers (e.g, their scopal properties, conjunctions of modifiers and the interpretation of group noun phrases), thematic roles, causatives, inchoatives and the progressive aspect in English. In these respects, Parsons work builds directly on Dowty (1979). Parsons' (1990) work is directly related to

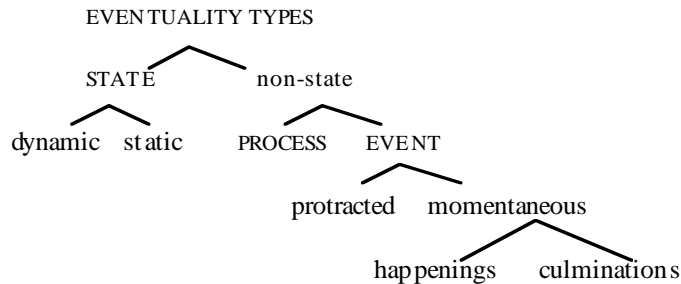
Bach's (1981, 1986), both contributing some of the most important building blocks in the general program to develop a full-fledged theory of eventuality types. From Bach (1986) Parsons (1990) also adopts the term 'eventualities' for the tripartite distinction into events, processes and states.

### 2.4.3. Bach (1981, 1986)

Bach establishes a unified way of analyzing eventuality types in terms of the mereological 'part' relation and by pointing out direct structural analogies between nominal and verbal predicates: a process predicate (or sentence) is to an event predicate (or a sentence) as a mass noun is to a count noun. The 'part' relation is the most basic and intuitive mereological concept. Mathematical structures that model the intuitive notion of 'part' were first used in linguistics and philosophy to represent the semantics of plural and mass nouns. The most influential and pioneering work was done by Link (1983, 1987) and Landman (1989a,b)<sup>20</sup> who model the mereological 'part' structure in terms of complete join semilattices. Bach's (1986) important contribution was to extend Link's (1983) analysis to the semantics of verbal predicates. Let me now present Bach's work in more detail.

Following Vendler (1957/1967), Kenny (1963), Mourelatos (1978/1981) and L. Carlson (1981), Bach (1981,1986) proposes the following division of 'eventualities' into states, processes and events.

Table 2: Classification of verbal predicates in Bach (1986)



- static states:** be in New York, own (a house), love (one's cat), resemble (one's uncle); tall, intelligent, sane;
- dynamic states:** sit, stand, lie +LOC; drunk, present, sick;
- processes:** walk, push a cart, rain, sleep;



<b>protracted events:</b>	build (a cabin), eat a sandwich, polish a shoe,; walk to Boston; grow into an adult, melt;
<b>culminations:</b>	take off; arrive, leave, depart;
<b>happenings:</b>	blink, flash, knock, kick, hit, pat, wink, clap, tap, snap; recognize, notice, spot, realize; be struck by a lightning; find (a penny), lose (one's watch); burst, explode <sup>21</sup> .

Bach distinguishes between two kinds of state predicates according to their ability to occur with the progressive: *dynamic* state and *static* state. Only the dynamic state predicates can freely occur with the progressive, as is illustrated in (28):

- (28) a. ?Mary is being in New York.  
b. ?I am knowing the answer.  
c. ?John is believing that the earth is flat.  
d. I am living in California.

Bach's distinction between dynamic and static states mainly draws on Carlson's (1977) between object-level and stage-level predicates. Object-level predicates hold permanently of their arguments or can be predicated of them 'atemporally'. Stage-level predicates are episodic, they are analyzed in Carlson as applying to 'spatiotemporal slices' of individuals. Following Carlson (1977), Bach suggests that "a progressive verb phrase denotes the property of being an individual such that there is a manifestation (or realization) of that individual of which the basic predicate holds. In mereological terms we can identify the manifestation of an individual with some temporally limited proper part of the individual" (Bach, 1981:78). This allows us to capture the commonality between progressive sentences like (28d) with the state predicate *live* and those in (29).

Non-states are subdivided into processes (*walk, push a cart*) and events. Events are protracted (*build x, walk to Boston*) or momentaneous. Momentaneous events are culminations (*die, reach the top*) or happenings (*recognize, notice, flash once*). With a few exceptions in the class of happening predicates, non-state predicates are acceptable with the progressive:

- (29) a. John was running.  
b. Mary was building a cabin.  
c. Mary was finding a unicorn.

There are four main features that characterize Bach's classification and that make it particularly compelling. First, Bach proposes an agentivity-neutral classification. Such a classification is preferable to classifications that appeal to the notion of 'agency' (e.g. Dowty's, Vendler's or Kenny's). As Mourelatos (1978/1981) points out, classifications like Vendler's and Kenny's, which focus on verbs that denote actions and events related to human agency, are too narrow from the linguistic point of view.

Second, Bach's categorization captures the basic distinction between states and non-states, a distinction that is deemphasized in Vendler's and in Dowty's classification. The 'state' vs. 'non-state' distinction plays an important role in the organization of the grammar of natural languages. It is pervasive in traditional descriptive accounts of verb classes. It is based on the lexicalization of the notion of 'change', which in turn represents an important category of experience<sup>22</sup>.

Third, following Mourelatos (1978/1981), Bach posits one eventuality type 'events' (with further subdivisions) that subsumes a two-way distinction made in the accounts of Vendler (accomplishments vs. achievements) and Dowty (singulary change vs. complex change), for example. Mourelatos argues that the behavior in the progressive is not a sufficient reason for separating accomplishments from achievements, contrary to Vendler (1957/1967). The decisive semantic property that is shared by all the event predicates has to do with the fact that they "involve a product, upshot, or outcome" (Mourelatos, 1978:417, 1981:193). This sets them clearly apart from state and activity predicates<sup>23</sup>.

Fourth, Bach proposes that eventualities are basic entities in the domain of discourse, rather than being analyzed in terms of time structures. Here Bach also adopts Whitehead's view that time is a derivative notion (see Bach, 1981:69-70, 75), which is reconstructable in terms of relations among eventualities. Moreover, Bach proposes that at least some of the properties of the eventuality types can be understood in terms of their 'part' structure, or to put it in other words, to the ways in which an eventuality as a whole stands in relation to its parts. This method of analysis is grounded in the theories of mereology, or the logic of part-whole relations. For instance, for events like a finding of a unicorn and building of a cabin, it holds that

"no proper part of one event can be an event of the same kind. Call this property ANTISUBDIVISIBILITY. This property is clearly not shared by processes. Note that it is not correct to say that a process can always be subdivided into parts that are also processes of the same

kind. The point is that sometimes processes can be so subdivided but events never can. Further if you have two distinct events of the same kind, their sum is never an event of the same kind; but if you have two or more processes of the same kind add up to one process of the same kind, you will or may have a process of the same kind: call the latter ADDITIVITY. Thus we can say that events are antidisubdivisible and nonadditive; processes lack these properties” (Bach, 1981:70).

Bach’s ideas were taken up in the work of Hinrichs (1985), Link (1987), Krifka (1986, 1990, 1992), Lasnik (1988/1990) and Zucchi (1993), for example. One of their common concerns is to show parallels and interactions between the semantics of nominal and verbal predicates and to model them within lattice theory. In the next section, I will therefore focus on these parallels and the apparatus of extensional mereology and lattice theory that provides us with the tools to represent them in an insightful way.

## 2.5 Parallels between Verbal and Nominal Predicates

### 2.5.1 Divisibility and Cumulativity

We can divide nominal and verbal expressions into two main classes depending on the way in which their denotations (individuals and eventualities, respectively) as a whole stand in relation to any of their parts. Mass and plural noun phrases have the property of distributive (or divisive) reference: Any part of something which is *P* is also *P*. For example, parts of the interpretation of *water* and *apples* are describable by the same noun *water* and *apples*, respectively. In contrast, count noun phrases like *an/the/one apple*, *five apples*, and measure phrases, like *a glass of wine*, are not divisible. If an individual falls in the denotation of *an apple*, for example, then it cannot have a proper part that also falls under *an apple*. Greenberg (1972) relates the indivisibility property of count noun phrases to the ‘internal organization into an integrated and organic whole’ of the entities they denote:

“If I cut a piece of meat in two, I have two pieces of meat, but if I cut a dog in two, I still have only one dog, a dead one. The property that distinguishes dogs and automobiles in these cases is evidently internal organization into an integrated and organic

whole, (...). We might call this feature +/-structured" (Greenberg, 1972:22-23).

As Quine (1960:91ff.) observed, mass nouns, like *water*, and determinerless plural nouns like, *apples*, are cumulative<sup>24</sup>: any sum of parts which are water is water, and any two sums of entities in the denotation of *apples* add up to a sum also in the denotation of *apples*. In general, any sum of parts which are *P* is also *P*, where *P* is a mass or plural term<sup>25</sup>. This does not hold for count noun phrases. If we add two sets of entities denoted by *five apples*, their sum will be a set of entities denoted by *ten apples*.

Verbal predicates can also be characterized in terms of divisibility and cumulativity. The analogy to the domain of the denotata of nominal predicates is easy to see. To put it in the simplest terms, when we analyze individuals, we consider their spatial parts, when we analyze eventualities, we consider their temporal parts: "[E]vents are antidisubdivisible and nonadditive; processes lack these properties" (Bach, 1981:70). Hence, this yields the following proportion: a process predicate (or sentence) is to an event predicate (or a sentence) as a mass noun is to a count noun (see Bach, 1986). Let us have a look at this in more detail.

Event predicates like *closed the door* in *John closed the door* are 'antisubdivisible', according to Bach (1981:70): no proper part of the event denoted by it can be an event of the same kind. If it took John five minutes to close the door, he did not close it in the first two minutes<sup>26</sup>. *Closed the door* is not cumulative, or 'additive' (see Bach, 1981:70), since two distinct events of closing of the door amount to a sum event of closing of the door twice. Clearly, *John closed the door* and *John closed the door twice* denote different events.

Process and state predicates are cumulative and divisible (up to a certain point). Take a process-denoting predicate like *swam*, as in *John swam*, for example. If John swam for five minutes without interruptions, then he also swam during the first two minutes. Hence, *swam* is divisible<sup>27</sup>. Now, suppose that John swam continuously for an hour. Then, adding the chunk of swimming during the first half hour and his swimming during the second half hour amounts to swimming. Hence, *swam* is cumulative, or 'additive' (in Bach's terminology). In general, two or more processes of the same kind add up to one process of the same kind.

It is often pointed out that the analysis of verbal and nominal predicates in terms of the property of 'divisibility' is complicated by two problems: the problem of the smallest parts and the problem of

minimal parts. The problem of the smallest parts was first noticed by Quine (1960) who points out that the divisibility (or distributivity) property in its unconstrained form is too strong, because it allows for the division of any stuff to arbitrary small parts. Although mass nouns like *water* can refer (in a given context) to some quantity of water that can be divided into smaller portions which will also qualify as *water*, the denotation of *water* resists a unique division into minimal or atomic portions. In general, for most substances it is false to claim that *every* part of a given substance is also that same substance. Even for unspecific parts of an apparently homogeneous substance like water, all the inferences to arbitrary small proper parts may not be valid, because water is not infinitely divisible. There are parts of water that are too small to count as water. For example, a collection of several molecules of water does not count as water, and each molecule of water is divisible into two hydrogen atoms and one oxygen atom that on their own do not count as water.

The second problem has to do with the identification of the relevant minimal parts of heterogeneous substances, such as fruit-cake, that consist of a number of different ingredients. “Division of a lump of fruit-cake will produce a lump of fruit-cake only until a sample of some minimal size is reached; a mere sultana does not in itself constitute a lump of fruit-cake, ...” (Taylor, 1977:211)<sup>28</sup>. In short, for a mass noun *P* denoting a heterogeneous substance, there should be a specific *minimal size* that parts of its referent have in order to count as *P*.

Taylor (1977) shows that the ‘homogeneous-heterogeneous’ distinction and the problem of minimal parts has its counterpart in the domain of verbal expressions. Contrary to Vendler’s (1957/1967:101) claim that all the activity predicates “go on in time in a homogeneous way”, Taylor (1977) suggests that we need to distinguish homogeneous activity verbs, like *fall*, *move*, *blush*, from heterogeneous activity verbs, like *chuckle*, *giggle*, *talk*, *walk*. Heterogeneous activities like chuckling, for example, are divisible only up to certain minimal parts, anything smaller does not count as chuckling, according to Taylor (1977).

The smallest and minimal part problems do not invalidate the insights that we may gain from the semantic analysis of nominal and verbal predicates that uses the notion of ‘divisibility’. Few substances, if any, are homogeneous through and through. Yet from the point of view of the semantic theories of natural language it seems perfectly reasonable to assume that substances like gold and water are homogeneous, even though, strictly speaking, they do consist of heterogeneous parts. In order to understand what nouns like *gold* and

*water* mean, we do not need to know what the smallest parts of gold and water are. As far as natural language is concerned, any part of something which is gold is also gold. Questions regarding the smallest parts are relevant and coherent within the theories of physical matter. However, even if such theories could identify the smallest parts of matter, such 'expert knowledge' would hardly have any relevance to the semantic theories of natural language (see Nagel, 1987, ch. 5). In short, identification of the smallest parts is not a problem that belongs to linguistic semantics. As far as the semantic theories of natural language are concerned, it is justified to assume that the property of 'divisibility' or 'distributivity' is not to be taken in the strict sense as entailing that every part of a given substance is also that same substance.

The same arguments can be made about the identification of the minimal parts. Not only is the exact determination of minimal parts for heterogeneous entities difficult, but also it is not a problem for semanticists to solve, because there are no crucial grammatical facts that hinge on it. It has also been observed that such questions as 'What is a minimal part of warm water?' or 'What is a minimal part of dirty water?' do not even make any sense. There is no such thing as an atom or a molecule of warm water; a single atom or molecule of water cannot be in itself warm, because warmth is an emergent property that is caused by molecular movement (see ter Meulen, 1981). In short, we may also reject the relevance of the 'minimal parts' problem to the semantics of mass nouns (see Bunt, 1979:255, 1985:45) and also to the semantics of activity predicates. Natural language semantics involves a much coarser part structure than physical theories are concerned with, a part structure that involves the notions of 'minimal' and 'smallest (proper) part' that is linguistically relevant and/or contextually determined.

Related to the problems of the smallest and minimal parts, is the problem of individuation and identification of individuals and eventualities. To individuate means to mark off one referent of a count expression from another. Bach (1986:15) observes that we have no ready answers to such questions as 'How many things are there in the room?' and 'How many events took place in the last hour?' Building a cabin, for example, consists of a variety of eventualities, drawing up the plans, hammering and pounding in nails, sawing wood, and the like. There is often vagueness about the exact number of such eventualities that is due to the difficulties in their individuation. Even if we were able to individuate all the eventualities that constitute the building of a cabin and determine their number, it would not contribute to our

understanding of the global and grammatically relevant properties of the event denoted by *build a cabin*. In short, linguists need not answer the questions above, for “[i]t is not part of linguistics to decide whether all matter is atomic or all happenings are reducible to little granules of process” (Bach, 1981:15). Bach concludes that our linguistic inquiry into ontological presuppositions concerns only those that can be found in our understanding of the world as it is reflected in linguistic categories, “our guide in ontological matters has to be language itself” (Link, 1983:303ff.).

With these observations in mind, we can safely set the problems of the smallest and minimal parts aside and return to our main points regarding the properties of ‘divisibility’ and ‘cumulativity’. They allow us to divide nominal and verbal predicates into two large groups: quantized and cumulative. Process and state predicates are cumulative, or atelic, and events quantized, or telic. The terms ‘quantized’ and ‘telic’ are here used interchangeably in the domain of verbal predicates. This implies that the term ‘telic’ is used here in its wide, and well-established, sense (see Hopper and Thompson, 1980; Rappaport and Levin, 1988; Dowty, 1991; Zaenen, 1993, among many others). It covers all verbal predicates that entail some ‘delimitation’ in their semantic description, including any type of a final state, regardless of its nature and regardless whether they have animate and inanimate, human and non-human subjects. It also includes predicates denoting events that are delimited at their initial boundary, as in *take off*. In addition, I also use the terms ‘quantized’ and ‘telic’ to cover complex predicates with a durative *for*-PP as in *John was in New York only for two days* and *John swam for an hour*, for example (see Bach, 1981: 74)<sup>29</sup>. This is a departure from Garey (1957), who coined the term ‘telic’ by deriving it from the Greek word *télos* that means ‘goal’ or ‘purpose’. Garey’s examples of telic verbs are verbs denoting goal-oriented actions with human agents, which he characterizes as “... a category of verbs expressing an action tending towards a goal envisaged as realized in a perfective tense, but as contingent in an imperfective tense” (Garey, 1957:6). Atelic verbs, on the other hand, do not involve any such goal or boundary in their semantic structure. They are characterized as verbs denoting actions that “are realized as soon as they begin” (Garey, 1957:6).

Here, the category ‘telic’ covers accomplishment and achievement predicates in Vendler, event predicates in Mourelatos, Bach and Parsons, for example, and definite change predicates in Dowty. The category ‘atelic’ comprises Vendler’s (1957/1967) state and activity predicates, state and process predicates in Mourelatos (1978/1981), Bach (1981,

1986), Parsons (1990), for example, and predicates that entail either no change or an indefinite change in Dowty (1979). Table 3 summarizes the terminology introduced so far.

Table 3:

MASS AND PLURAL NPs

wine, apples

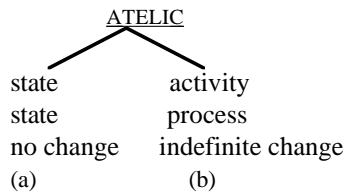
SINGULAR COUNT NPs

an/the/one apple

QUANTIFIED / MEASURE NPs

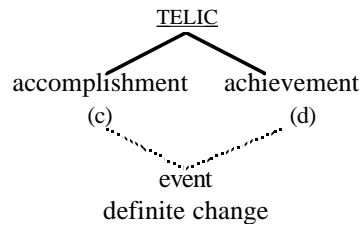
five / all (the) apples

a glass of wine



(a) Mary drank wine.

(b) Mary was in New York.



(c) Mary drank a glass of wine.

(d) Mary arrived.

## 2.5.2 Elementary Extensional Mereology

The term ‘mereology’ derives from the Greek word *meros* meaning ‘a part’. Mereology was developed by the Polish logician Stanislaw Lesniewski in several papers in 1916 and in 1927-31, who uses mereology to provide an interpretation for the language of set theory<sup>30</sup>. The mereological predicate logic and calculus of individuals was further developed in Leonard and Goodman (1940), Goodman and Quine (1947) and Grätzer (1971). In what follows I will outline an elementary extensional mereology, following proposals in Krifka (1986, 1990, 1997, 1998), Link (1983, 1987), Landman (1996) and Lewis (1991). The mereology, I assume here, can be characterized as in (30).

(30)  $P = \langle U, \oplus, \leq, <, \otimes \rangle$  is an extensional mereology, iff

a. ‘U’ is a set of entities, individuals, eventualities and times:

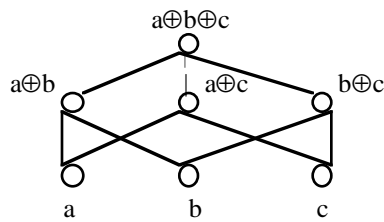
$$I \cup E \cup T \subset U$$



- b. ‘ $\oplus$ ’ is a binary **sum operation**, it is a function from  $U \times U$  to  $U$ .  
 It is idempotent:  $\forall x [x \oplus x = x]$   
 commutative:  $\forall x, y [x \oplus y = y \oplus x]$   
 associative:  $\forall x, y, z [x \oplus (y \oplus z) = (x \oplus y) \oplus z]$
- c. ‘ $\leq$ ’ is the **part relation**:  
 $\forall x, y \in U [x \leq y \leftrightarrow x \oplus y = y]$
- d. ‘ $<$ ’ is the **proper part relation**:  
 $\forall x, y \in U [x < y \leftrightarrow x \leq y \wedge x \neq y]$
- e. ‘ $\otimes$ ’ is the **overlap relation**:  
 $\forall x, y, z \in U [x \otimes y \leftrightarrow \exists z \in U [z \leq x \wedge z \leq y]]$
- f. **remainder principle**:  $\forall x, y, z \in U [x < y \rightarrow \exists! z [\neg [z \otimes x] \wedge z \oplus x = y]]$

$P$  is a part structure that consists of a set  $U$ , the universe of discourse (of a model for the semantic interpretation of natural languages), a binary sum operation ‘ $\oplus$ ’, a part relation ‘ $\leq$ ’, a proper part relation ‘ $<$ ’, and an overlap relation ‘ $\otimes$ ’. In addition, we need the remainder principle that exludes models in which an object can have a single proper part. An example of a part structure defined by (30) is a complete join semi-lattice depicted in the Hasse Diagram (31):

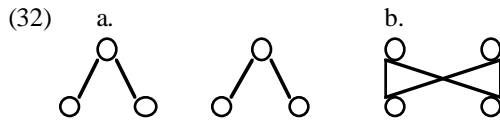
(31) **Hasse Diagram: Mereological Structure**



Suppose that the lowest circles stand for individuals, that is, people like John, Mary and Bill, and objects like individual apples. The individuals at the bottom of the lattice constitute the reference of singular definite noun phrases like *Mary* or *this apple*. The lines connecting lower circles to upper ones indicate that the former are parts of the upper. We see that for the two entities  $a$  and  $b$ , there is a sum entity  $a \oplus b$ . That is, with the binary sum operation we can define sums of individuals. For

any two entities  $a, b$  in the domain,  $a \oplus b$  is the smallest entity comprising them. For example, the sum operation ' $\oplus$ ' allows us to form the plural individual *John and Mary* as the sum of John and Mary,  $\text{John} \oplus \text{Mary}$ . Link (1983) proposes that *John and Mary* denote a plural individual  $\text{John} \oplus \text{Mary}$ , rather than the set consisting of  $\llbracket \text{John} \rrbracket$  and  $\llbracket \text{Mary} \rrbracket$ . A plural individual like  $\text{John} \oplus \text{Mary}$  is of the same ontological type as John on his own or Mary on her own. According to Link, the domain of individuals consists of singular (atomic) individuals and plural individuals, where plural individuals are sums of singular individuals under the operation of sum formation ' $\oplus$ '. Now, suppose that John, Mary and Bill are students. Then the plural noun *students* is true of pluralities of students, that is, it is true of John and Mary, Mary and Bill and all the other possible plural individuals of which these three individuals can be part.

In general, whenever there are any individuals in the universe, there exists a sum of those individuals (see *unrestricted composition* in Lewis, 1991:74). We can join any number of individuals (even an infinite number), and in this sense, the sum operator ' $\oplus$ ' is complete. The corresponding lattices representing such sums of individuals are called 'complete'. This excludes a structure like (32a).



This also means that the domain of universe  $U$  is closed under the sum formation ' $\oplus$ '. In the diagram (31) it is the sum of  $a$  and  $b$  and  $c$ :  $a \oplus b \oplus c$ . If John, Mary and Bill are all the individuals who are students in the universe  $U$ , their sum will be the **maximal** plural individual that falls under the denotation of *students*, here, it will be the plural individual that comprises all the three students. The unique sum of all the students in the domain is the supremum, it constitutes the denotation of plural definite noun phrases *the students*. Given a predicate  $P$ , the supremum is the unique sum of all entities that are  $P$ 's. The same individuals cannot have two different unique sums (see *uniqueness of composition* in Lewis, 1991:74), which excludes (32b), because not every two entities have a unique sum.

The elements which join to form a sum are called the **parts** of the sum. For example, in the diagram (31) the individual  $a$  (and  $b$ ) is called a part of the individual  $a \oplus b$ . We also say that the domain of individuals, such as that represented in (31), is ordered by the proper part

relation ' $<$ ' and part ' $\leq$ ' relation. The proper part relation is a strict partial ordering. It has the following formal properties:

- (33) Properties of the proper part relation ' $<$ ':
- a. irreflexive:  $\forall x \in U[\neg(x < x)]$   
Nothing is a proper part of itself.
  - b. asymmetric:  $\forall x, y \in U[x < y \rightarrow \neg(y < x)]$   
If one thing is a proper part of another, then the second is not a proper part of the first.
  - c. transitive:  $\forall x, y, z \in U[(x < y \wedge y < z) \rightarrow x < z]$   
If one thing is a proper part of another, and the second is a proper part of a third, then the first is a proper part of the third.

In some cases we may need to use the corresponding non-strict relation 'part-of-or-equal', or part relation ' $\leq$ '. (Every entity is a part of itself.) The part relation ' $\leq$ ' is a weak ordering relation. It has the following formal properties:

- (34) Properties of the part relation ' $\leq$ ':
- a. reflexive:  $\forall x \in U[x \leq x]$
  - b. transitive:  $\forall x, y, z \in U[(x \leq y \wedge y \leq z) \rightarrow x \leq z]$
  - c. antisymmetric:  $\forall x, y \in U[(x \leq y \wedge y \leq x) \rightarrow x = y]$

An individual that has no parts except itself, and no proper parts, is an atomic individual. In general, an atom can be defined as in (35):

- (35) atom:  $At(x) \leftrightarrow \neg\exists y[y < x]$

For example, in the Hasse Diagram (31), the lowest circles represent atomic elements of a lattice.

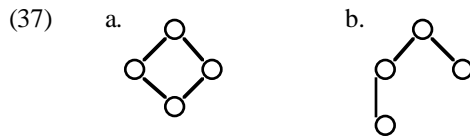
The two sum individuals,  $a \oplus b$ , and  $b \oplus c$ , overlap, because they have  $b$  in common<sup>31</sup>. Two individuals **overlap** mereologically if and only if they have at least one part in common. This includes the case where one is part of the other, and also the case of identity. Overlap is reflexive and symmetric, but it is not transitive. In those cases in which individuals overlap, but neither is part of the other, we may speak of **proper overlapping**. For example, two intersecting roads overlap at their junction, but neither is part of the other. Individuals are

disjoint if and only if they do not overlap, that is, if they have no part in common. Disjointness is symmetric.

While in the set theory even two disjoint sets have an intersection, namely the null set, most mereological theories do not assume the existence of a null individual which is part of all individuals<sup>32</sup>.

(36)  $\neg\exists x\forall y[x \leq y]$  (no  $\perp$  (=null) individual)

(36) says that there is also no null individual that is part of everything else and in which all the individuals overlap; that is, structures with a bottom element like (37a) are excluded, and also structures like (37b):



The extensional mereology in its unconstrained “classical” sense presented above, has two main problems. First, it asserts the existence of certain individuals, mereological *sums*, for whose existence we have no empirical evidence. As in the case of products, the binary sum or join operator can be used to define sums of arbitrary finite numbers of individuals. Since individuals may be disjoint, spatio-temporally widely separated, and of different kinds, the claim that any two individuals possess a sum (or join), in its unconstrained form, is implausible. Second, the theory is not applicable to most objects around us, and is of little use as a formal reconstruction of the concepts of part and whole which we actually employ (see Simons, 1987:1)<sup>33</sup>.

Nevertheless, the theories of mereology have proven useful for the description of plurals and mass nouns. Link's (1983, 1987) lattice-theoretic approach models the denotation domains of plural and mass terms as being similar in so far as both form complete join semilattices. The main difference between their denotational domains is in the type of the semi-lattice that structures them: in the case of plural nouns it is atomic, while in the case of mass nouns it is non-atomic. The non-atomic semi-lattice from which mass nouns take their denotation is homomorphic to the atomic one that structures the domain of plural nouns.

For example, this allows us to capture the assumption that *water* is the name of an individual concept of a special kind (see Carlson, 1977). The extension of *water* is the union of all things which are water at each  $(i, j)$ , whereby “*i*” is a world and “*j*” a moment of time. It is a

“scattered individual”. The theory of mereology allows us to form such ‘superindividuals’ and to speak about their parts. For bare plurals, a similar assumption is also made. For example, the denotation of *apples* is the individual concept that has as its extension at each point  $(i, j)$  the set of all individuals to which at  $(i, j)$  the predicate *apple* can truly be applied.

The systematic correspondence, a homomorphism, between elements of the denotation domains of plural and mass nouns is treated in terms of mapping of atomic individuals and plural individuals (or groups) onto their material substance, or simply the stuff that makes them up. Every count predicate  $P$  denoting a set of atomic individuals has a mass term correspondent  ${}^mP$  which denotes a set of quantities of matter:  $\llbracket {}^mP \rrbracket = \{x \in D \mid x \leq \text{sup}[h[\llbracket P \rrbracket]]\}$  (Link, 1983:309). The supremum function ‘sup’ applies to the materialized counterpart of  $P$ , that is, the result of applying the materialization function  $h$  to the denotation of  $P$ , to yield the sum of the quantities of matter which make up the individuals in the interpretation of  $P$ . For example, the denotation of *apple* in *There is apple in the salad* (used as a predicative mass noun) is the set of quantities of matter that are  $m$ -parts of the value of  $h$  applied to the set of apples in the world.

One of the appealing features of the lattice-theoretic approach is that it allows us to model the denotation domains of verbal and nominal expressions as being similar and to capture the well-known intuitions about the structural analogies between them. Link’s lattice-theoretic account of the semantics of plurals and mass nouns was extended to the semantics of verbal predicates by Bach (1986). He proposes that verbal predicates also have denotations that have the algebraic structure of a complete join semi-lattice. Each event predicate has an atomic structure, just like the denotation of a singular count noun. The atoms are the particular events denoted by verbal predicates. The denotation of a state or process predicate, on the other hand, has the form of a non-atomic join semilattice, just as is the case for mass nouns. Direct structural parallels between the denotational domains of nominal and verbal predicates, described in section 2.5.2, are viewed as one important piece of evidence, among others, for adding eventualities as basic entities into the domain of discourse (see Bach, 1981, 1986; Hinrichs, 1985; Link, 1987; Krifka, 1986, 1990, 1992; Laserson, 1988/90; Zucchi, 1993)<sup>34</sup>.

Building on the work of Quine, Link and Bach, Krifka (1986) defines two properties, cumulativity and quantization, that allow us to divide the denotations of nominal and verbal predicates into two large classes:

- (38) A predicate P is **cumulative** iff  
 $\forall x,y[[P(x) \wedge P(y) \rightarrow P(x \oplus y)] \wedge \text{card}(P) \geq 2]$   
 [whenever P applies to x and y, it also applies to the sum of x and y, provided that it applies to at least two distinct entities.]

Examples of cumulative predicates are mass predicates like *water* and plurals like *apples*. Process and state predicates are also cumulative. (See section 2.5.2.)

- (39) A predicate P is **quantized** iff  
 $\forall x,y[P(x) \wedge P(y) \rightarrow \neg y < x]$   
 [whenever P applies to x and y, y cannot be a proper part of x.]

Examples of quantized predicates are single count noun phrases like *an apple*, quantified noun phrases like *all the apples*, *three apples* and measure noun phrases like *three glasses of wine*.

To sum up, the main parallels between nominal and verbal predicates are summarized in (40):

- (40) a. If  $\alpha$  is a plural, mass, state or process predicate, then  $\llbracket \alpha \rrbracket$  is cumulative.  
 b. If  $\alpha$  is a plural predicate, then entities in  $\llbracket \alpha \rrbracket$  can be divided in a unique way into atoms all of which belong to the extension of  $\alpha$ .  
 c. If  $\alpha$  is a singular count noun or an event predicate, then all the entities in  $\llbracket \alpha \rrbracket$  are atoms, and hence quantized.

The telic-atelic distinction has proven indispensable for the description of many grammatical phenomena in English as well as in other languages. Krifka's mereologically-based definitions of quantized and cumulative predicates capture in a precise way the intuitions behind the telic-atelic distinction, as coined by Garey (1957), but also behind other numerous informal proposals to characterize this basic distinction in the domain of verbal predicates. Some of them are listed in Table 4. (See also S.-G. Andersson, 1972 and Dahl, 1981:80 for more information on these distinctions):

Table 4: Terminology in the domain of telicity

telic	atelic	Garey, 1957; Dowty, 1991
accomplishment	activity	Vendler, 1957/1967
terminative	aterminative	Maslov, 1959
performance	activity	Kenny, 1963
event	process	Mourelatos, 1978;1981
bounded	unbounded	Allen, 1966; Talmy, 1986
developments	processes	Mourelatos, 1978
change of state	activity	Dowty, 1979
quantized	cumulative	Krifka, 1986, 1989
delimited	non-delimited	Tenny, 1987

However, the application of the definition of ‘quantization’ and ‘cumulativity’ to nominal and verbal predicates is not straightforward in all the cases. Take, for example, definite noun phrases like *the water*, *the people*, possessive noun phrases like *my friends*, noun phrases containing vague quantifiers like *most of it*, *a little water* and count noun phrases with common noun heads like *a ribbon* or *a chain*. *A ribbon* or *a chain* are singular count, and hence ought to be quantized just like *an apple*. However, they fail the definition of quantization given in (39), because there are members of their extension that have parts which are also members of the extension of *a ribbon* or *a chain* (see Dahl, 1991:815). Moltmann (1991:647) observes that noun phrases with vague quantifiers like *a lot of*, *many*, *much* are cumulative, but they are not divisible (in a strict sense). For example, if *a* is a group of many roses and *b* is a group of many roses, then the sum of *a* and *b* is a group of many roses. If *a* is a group of many roses, then a subgroup *b* of *a* need not be a group of many roses. *Many roses* fails to be quantized, because *a* may have a subgroup *b* that still counts as *many roses*. Noun phrases with vague quantifiers like *(a)few*, *little* are divisible up to a point, but they are not cumulative. If *a* is a group of few roses and *b* is a group of few roses, then the sum of *a* and *b* is not necessarily a group of few roses. Given that *a* has a subgroup *b* that falls under the denotation of *(a)few roses*, then *(a)few roses* is not quantized.

Definite noun phrases like *the water*, *the people*, possessive noun phrases like *my friends*, noun phrases containing vague quantifiers and certain count noun phrases with common noun heads like *a ribbon* or *a chain* fail the definition of quantization, and yet they behave like quantized noun phrases (e.g., *a letter*) with respect to aspectual composition and temporal adverbials (see L. Carlson, 1981:54;

Mittwoch, 1988:fn.24; Dahl, 1991:815; Moltmann, 1991; White, 1994; Zucchi and White, 1996; Partee, p.c. to Krifka, for example). Examples from Zucchi and White (1996) illustrate this point:

- (41) a. John wrote a letter ??for an hour / in an hour.  
 b. John wrote a sequence (of numbers) ??for ten minutes / in ten minutes.
- (42) John wrote some letters ??for an hour / in an hour.

In (41) and (42) the verb phrases are odd with a durative *for*-PP, but acceptable with a time-span *in*-PP. The domain of application of durative adverbials, such as *for*-PPs, is restricted to process predicates. The domain of application of time-span adverbials, such as *in*-PPs, is restricted to event predicates. This means that just like *a letter*, *a sequence (of numbers)* and *some fleas* occur in verb phrases that are quantized, hence just like *a letter*, they behave like quantized noun phrases with respect to aspectual composition, as well. (I will return to this point in section 2.5.3 and in chapter 3.)

Jackendoff (1990:101) observes that definite noun phrases like *the water* and *the people* behave like quantized or cumulative predicates depending on the context in which they are used. For example, the following sentences suggest that there was an unbounded stream of water or of people:

- (43) a. The water was rushing out of the faucet.  
 b. The people were streaming into the room.

The sense of ‘unboundedness’ is heightened by the use of progressive aspect, “which in a sense takes a snapshot of an event in progress whose temporal boundaries are not in view. The definite article “performs only a deictic function; in these cases it designates a previously known *medium* instead of a previously known *object*. In other words, under this interpretation, the definite/indefinite distinction is orthogonal to the closed form/medium distinction and does not affect the analysis” (Jackendoff, 1990:101). If the progressive is replaced by simple past, as in (44), “the event may be viewed as temporally bounded. As a result, the amount of water and the number of people is also bounded, ...” (Jackendoff, 1990:101):

- (44) a. The water rushed out of the faucet.  
 b. The people streamed into the room.



### 2.5.3 Shared Semantic Domains

In this section I will provide a number of diverse data that show the connections between the denotational domains of nominal and verbal predicates. Extensional mereology in combination with lattice-theory allows us to provide a unified perspective on a number of such apparently diverse phenomena and also on the striking similarities in the syntactic and semantic behavior of verbal and nominal predicates.

#### 2.5.3.1 Countability

The operation of counting only applies to the domain of individuated entities. Stuffs like water cannot be counted, because we simply do not know what to count, but they can be measured. The reason is, as L. Carlson (1981:50) points out, that the parts already counted are further divisible into a number of smaller parts. Since it is difficult to individuate the relevant parts to be counted, the exact number of such parts is necessarily vague, even if there were a finite upper bound to the number of the parts of a substance that we count<sup>35</sup>.

Both nominal and verbal predicates entail the feature of ‘countability’ (see also Leech, 1969:134). The countability feature of nouns and verbs is syntactically manifested in their co-occurrence with articles, quantifiers, numerals and various other expressions of quantity and measure. Count nouns occur in a determination construction with the indefinite article *a(n)*, cardinal count numerals (*three*) and with quantifiers like *each, every, either, both, many, several, (a) few* and *some* (stressed). Mass nouns, on the other hand, can occur in a determination construction with *much, all, most, a lot of, an amount of, (a) little* and the unstressed indefinite article *some* (*any* in non-assertive contexts), for example. Mass and plural nouns also sanction expressions of comparison like *more* and *less* and of measurement, measure expressions like *a cup, a heap, a herd*.

Mourelatos observes that telic predicates denote “those situations that can be directly or intrinsically counted” (Mourelatos, 1981:209). Hence, in this respect telic predicates behave like count nouns, they can be easily modified with various count quantifiers and cardinal numerals. This does not hold for atelic predicates that behave like mass nouns in this respect. To illustrate this point, consider the following examples, which are taken from Bach (1986:5):

- (45) a. Much mud was in evidence.  
b. (\*) Much dog was in evidence.

- (46) a. John slept a lot last night.  
 b. (\*) John found a unicorn a lot last night.
- (47) a. Many dogs were in the yard.  
 b. (\*) Many muds were on the floor.
- (48) a. John fell asleep three times during the night.  
 b. (\*) John slept three times last night.

Mourelatos also proposes that a telic sentence like *He crossed himself* entails the cardinal adverbial (*at least*) *once*. This motivates the fact that it can be modified with another iterative adverbial like *three times*, for example<sup>36</sup>.

As a corollary, Mourelatos (1978/1981) shows that the same restrictions on the occurrence with count quantifiers and cardinal numerals are valid when telic and atelic predicates are paraphrased with nominalization constructions. The nominals (a gerund or a deverbative noun with suffixes like *-ion*, *-ment*, *-al*, *-ure*) preserve the countability feature of the telic predications from which they are derived. Mourelatos (1981:204) illustrates this with the following examples:

- (49) a. Vesuvius erupted. →  
 There was (at least) one eruption of Vesuvius.  
 b. Vesuvius erupted three times. →  
 There were three eruptions of Vesuvius.  
 c. Max ran yesterday. →  
 There was (some) running by Max yesterday.

Quantification by means of iterative adverbials and by means of cardinal numerals does not always yield truth-conditionally equivalent sentences. Fillmore and Kay (1992) notice a meaning difference between the following sentences:

- (50) a. She promised three times.  
 b. She made three promises.

(50a) means that there were three occasions on each of which 'she' made the same promise. The felicitous utterance of (50a) requires that the speaker and the hearer share the knowledge of what 'she' promised. (50b), on the other hand, is most naturally interpreted as implying that there were three different promises.

Independently of Mourelatos (1978/1981), Talmy (1986:11) also comments on the preservation of the countability feature across the nominal and verbal domains. In his framework, nominalization of telic predicates is referred to as ‘reification as an object’ (51), while nominalization of atelic predicates as ‘reification as mass’ (52). He also notices the inverse relation of ‘actionalizing’ (Talmy, 1986:11), as in (53), where a telic predicate is derived from a count noun:

- (51) a. John called me. → John gave me a call.  
 b. I was called by John. → I got a call from John.
- (52) a. John helped me. → John gave me some help.  
 b. I was helped by John. → I got some help from John.
- (53) I removed the pit from the cherry. → I pitted the cherry.

### 2.5.3.2 Partitivity

Bach (1986) draws attention to the parallels between the semantics of the progressive and the parallel partitive operation in the nominal domain. Consider the following examples:

- (54) a. The Romans were building this aquaduct.  
 b. This is part of a Roman aquaduct.

The progressive operator relates episodic eventualities, including temporary states, to their (proper) parts (see Bennett and Partee, 1972/1978; Bach, 1986; Krifka, 1992). Consequently, the utterance of a progressive sentence does not commit its speaker to any particular outcome of the denoted event. Assuming that the progressive operator is applied to a base predicate that is non-progressive, this poses the following question: How can we characterize the meaning of a sentence like (54a) *The Romans were building this aquaduct* on the basis of the meaning of the corresponding simple sentence *The Romans built this aquaduct*, when *The Romans were building this aquaduct* can be true and felicitously uttered without *The Romans built this aquaduct* ever being true? Moreover, verbs of creation like *build* pose the problem of incomplete objects: If the Romans were building an aquaduct, then only a part of the event took place and only a part of the aquaduct came into existence. Therefore, the statement of truth conditions for (54a) may not entail any existential quantification over *an aquaduct*. The same problem of incomplete objects is also posed by (54b). We can utter

(54b) and point to a certain object, even if there never was or will be a complete aqueduct. The semantic parallels between (54a) and (54b) come clearly to focus if we represent them in terms of the mereological part relation ‘ $\leq$ ’, as in Krifka (1992):

- (55) a.  $\text{PART} = \lambda P \lambda x' \exists x [P(x) \wedge x' \leq x]$   
 b.  $\text{PROG} = \lambda P \lambda e' \exists e [P(e) \wedge e' \leq e]$

The problems posed by sentences like (54a) and (54b) are known as the ‘imperfective paradox’ (Dowty, 1977, 1979) or ‘partitive puzzle’ (Bach, 1986). I will return to them in more detail in Chapter 4.

### 2.5.3.3. Measure

Durative adverbials, as in *For three days, John was in New York*, *Max slept for an hour*, *Ralph taught English for a year*, can be thought of as ‘some sort of MEASURE of time’ (L. Carlson, 1981:46), “they stand to verbal expressions as amount expressions stand to nominal expressions” (Bach, 1981:74). Just as a bathtub can be full of water, so an hour can be thought of as being filled with Max’s sleeping. We can ‘package’ or collect and thus individuate stuffs into portions determined by standard measure functions (e.g., *liter*, *pound*), conventional containers like bathtubs, or bounded groups like herds or clusters: *a bathtub / puddle / drop of water*, *a cube of sugar*, *a stand of timber*, *a herd of elephants*, *a cluster of trees*. Similarly, we can ‘package’ or individuate cumulative eventualities (states and processes) into portions and stretches of time (see Mourelatos, 1978:430; Bach, 1986:11).

### 2.5.3.4 Portion-Excerpting and Unit-Excerpting

By the operation of ‘unit-excerpting’ “a single instance of the specified equivalent units is taken and set in the foreground of attention” (Talmy, 1986:12). This operation applies to an entity with ‘discrete’ or ‘particulate’ internal organization, and which is “conceptualized as having breaks, or interruptions, through its composition” (Talmy, 1986:15)<sup>37</sup>. For example, we can ‘excerpt’ an individual, a discrete entity, from the group of entities referred to by mass and collective nouns, such as *rice*, *timber*, *furniture*, *committee*, by using a ‘classifier-like’ expression: cp. *a grain of rice*, *a piece of furniture/timber*, *a member of the/a committee*. Similarly, we can excerpt a portion out of the ‘continuous’ stuff denoted by mass nouns, as in *a spoonful of icecream* or *a bucket of water*. Which ‘classifier’-like expression

exactly will be used in each portion-excerpting and unit-excerpting case is not fully predictable.

There is a parallel situation in the domain of atelic verbal predicates. According to Talmy, ‘discrete’ *furniture* is to ‘continuous’ *water* as *breathe* is to *sleep*. In the case of *breathe*, unit-excerpting can be accomplished by means of ‘light verbs’ and verbal particles: cp. the atelic predicate *breathe* and the telic predicate *take a breath* or *breathe in/out*. Independently, Dowty (1979:173) also observes that non-homogeneous activity predicates “are always defined in terms of more primitive accomplishments/achievements” (Dowty, 1979:173). For example, what the activity verb *walk* denotes may be seen as involving two or more instances of an accomplishment denoted by the telic verb *take a step*. However, such ‘unit-excerpting’ lexicalization patterns are not fully productive in the domain of English verbs. For many activity predicates, such as *chuckle*, *giggle*, for example, there is no corresponding accomplishment predicate describing the minimal event in terms of which the activity predicate could be defined.

### 2.5.3.5 Pluralities

There are also parallels that concern pluralities of individuals and eventualities. In the case of nominal predicates, the plural morpheme *-s* maps a singular noun denoting a single individual (*horse*) into a noun denoting a number of such individuals (*horses*). It has been observed that the rule of iterative interpretation applies to almost any type of sentence to ‘pluralize’ it (L. Carlson, 1981:43, Talmy 1986, Jackendoff, 1990:29, among others). For both plural noun phrases and iterative sentences it holds that they “fix the ‘grain size’ in terms of the singular individuals making up the cumulative medium [i.e., process/substance and plural objects/plural eventualities], so that decomposition of the medium into parts is not as arbitrary as it is with substances and processes” (Jackendoff, 1990:29).

A particular eventuality can be mapped into a plurality of eventualities by a variety of means: for example, the construction with a phasal verb like *keep* or *continue* (*The beacon kept flashing*), the progressive together with a punctual event verb (*The beacon was flashing*), an iterative adverb like *five times* (*The beacon flashed five times in a row*) and the reduplication by means of a coordinated construction with the conjunction *and* (*The beacon flashed and flashed*). Based on such observations, Talmy (1986, 1988:17-77) introduces the cross-categorial distinction “uniplexity” vs. “multiplexity” for the singular and plural in nouns and in verbs. According to Talmy

(1986:12), the operation of ‘multiplexing’ copies an original solo referent onto various points of space or time. A similar operation is also characterized in Jackendoff (1987, 1990, 1991)<sup>38</sup>.

Pluralities in the domain of verbal predicates also include distributivity, as in *The students left the room one after another*. Allen (1966:198, 22) and Leech (1969:135-36, 137, 140-42, 143) observe that (present and past) habitual sentences like *He makes toys*, *Jane writes books*, *They came every afternoon*, *They played bridge every afternoon*, *He sighs (a lot)* are analogous to plural count nouns. Such habitual statements express ‘principled’ generalizations over *particular* single situations, such as *They were playing bridge yesterday afternoon* (see Krifka et al, 1995:44).

#### 2.5.4 Interactions and Mutual Constraints: From Nouns to Verbs

The influence of certain nominal arguments on the eventuality type (telic/event and atelic/process) of complex verbal predicates, which is one of the main topics of this study, can be seen as one of the ways in which the structural parallels between the denotational domains of nominal and verbal predicates become apparent in the syntactic and semantic structure of sentences. For example, when verbs like *eat* are combined with a single count argument like *an/the apple*, they yield event-denoting (or telic) verbal predicates, provided the predicate has a single interpretation:

- (56) a. John ate an/the apple (?)for ten minutes/in ten minutes.  
b. John ate soup/apples for ten minutes/\*in ten minutes.

The same verb *eat* combined with a mass or plural argument yields a process-denoting (or atelic) predicate. A similar shift can be also found with achievement predicates like *find*, as Dowty (1979) observes<sup>39</sup>:

- (57) a. John discovered the buried treasure in his yard \*for six weeks  
b. John discovered crabgrass in his yard / fleas on his dog for six weeks.

In short, we see that quantized nominal arguments yield quantized (event) predicates, and cumulative ones cumulative (process) predicates. Such shifts in interpretation between event and process are reflected in the distribution properties of temporal adverbials. In general, the domain of application of time-span adverbials, such as *in*-PPs, is

restricted to event predicates, while that of durative adverbials, such as *for*-PPs, is restricted to process predicates.

The influence of the quantificational properties of certain nominal arguments on the telicity of complex verbal predicates has been observed by many, for example, Gary (1957), Gruber (1965), Allen (1966:192-204), Leech (1969:125-126, 134-137), Gabbay and Moravcsik (1973:523), Bolinger (1975:147, see Table 6-2, and 152-153), Mourelatos (1978), Hoepelman and Rohrer (1980). There have also been several approaches that attempt to motivate it in a systematic way: Verkuyl (1972:54-97, 1989, 1993), Platzack (1979), Dowty (1972, 1979), Hinrichs (1985), Krifka (1986, 1989, 1992), Tenny (1987, 1994), Jackendoff (1987, 1996). The interactions and mutual constraints between nominal arguments and verbal predicates will be discussed in detail in Chapter 3.

### 2.5.5 Shifts

**Universal Grinder.** Almost every concrete count noun can have a mass reading via the “Universal Grinder” (suggested by David Lewis, see Pelletier, 1975/1979)<sup>40</sup>. In English, a mass interpretation of (what is inherently) a count noun is enforced in constructions with the indefinite article *some*, the quantifier *much* and in constructions in which a singular count noun occurs without a determiner as the only element of a maximal noun phrase<sup>41</sup>. This is illustrated by the following sentences:

- (58) a. Much missionary was eaten at the festival. (Bach, 1981:10)  
 b. Give me some more pillow. (Weinreich’s example,  
 see Fillmore, 1989:48)  
 c. There was cat all over the driveway. (Langacker’s example,  
 see Fillmore, 1989:48)

However, in some cases the expected shift does not occur. Certain nouns always entail that their referents are countable and this property cannot be overridden by a construction that requires the mass sense: \**Would you care for some more pea?* (see Fillmore 1989:49). Such examples are admittedly few, nonetheless, we cannot simply claim that “every noun must have (perhaps hidden) both a count and a mass sense” (Pelletier, 1975/1979:5ff.). Some shifts from count-to-mass appear to be restricted to particular positions in certain grammatical constructions. For example, the use of the noun *cat* as a mass noun is possible in (58c), but not in \**I saw cat all over the driveway*, as Fillmore (1989:48)

observes. This was also noticed by Allan (1980): “It is true that there may be constraints on the location of such noun phrases within sentence structure, and restrictions on the inclusion of other noun phrase constituents” (p.547).

**Universal Packager.** Nouns which would normally be classified as mass can be given a count sense via “Universal Packager” (see Pelletier, 1975/1979): a kind or a conventional portion. For example, when we use an undetermined plural noun phrase like *beers*, we understand that what is conveyed is something like *kinds of beer* or *bottles of beer*. In the following examples, given by Fillmore (1989:48), the mass noun accepts both pluralization (with the plural suffix -s) and a quantifier (*several, two*):

- (59) a. There are several German beers available. [= kinds of beer]  
 b. After two beers he's incoherent. [= portions of beer]

Given an appropriate setting (such as a customer in a restaurant to his waitress), a question like ‘How many beers are on tap in this pub?’ can have an answer *There are several German beers available*, where *beers* is understood as *kinds of beer*, etc. In other contexts, such as *After two beers he's incoherent*, we understand that the reference is to a number of portions, to two glasses of beer, for example.

We have seen that the “Universal Grinder” is not truly universal, because not all the expected count-to-mass shifts can occur. Similarly, the “Universal Packager” does not seem to be ‘universal’, but rather it appears to be largely restricted to foodstuffs, as Fillmore and Kay (1994: ch.3, p. 29) observe. For example, you cannot say *\*I'll have a dirt here* to mean *I'll have a shovelful of dirt here*, even if the extralinguistic context would support this reading. (Suppose that the speaker and the addressee are in the garden planting some flowers.) Nevertheless, both the “Universal Grinder” and the “Universal Packager” have their counterparts in the domain of verbal predicates.

**Telic-to-atelic and atelic-to-telic shifts.** Almost any atelic verb, verb phrase and sentence can have a telic interpretation, provided it occurs in an appropriate context. Dowty, for example, observes, “I have not been able to find a single activity verb which cannot have an accomplishment sense in at least some special context” (Dowty, 1979:61). Also, telic verbs, verb phrases and sentences can be coerced into an atelic interpretation. In this connection Bach (1986:11) observes that verbal and nominal predicates exhibit the same general asymmetry when they



shift interpretation: namely, the cumulative-to-quantized shifts in general require more work on the part of the interpreter than the shifts in the opposite direction. When “we put a process expression into a count context, we must come up with some kind of corresponding event, but just what it is is relatively free, perhaps the beginning of the process in question, or some bounded portion of it” (Bach, 1986:11). If we derive a count meaning from a non-count meaning of a given noun, the meaning changes often do not seem to be systematic. For example, a *beer* may be a serving of beer or a kind of beer. On the other hand, if we derive a non-count meaning from a count meaning, the meaning change is regular and predictable. In *There is apple in the salad*, the mass term *apple* refers to the stuff apples consist of (cp. also (*smell of onion, (taste of) apple, much lamb*)).

The meaning shifts between event and process are subject to a variety of contextual factors. Some of the most frequently discussed sentence-internal eventuality type ‘shifters’ are given in the following list:

- (60) a. optional adverbials (temporal, locative, directional);  
 b. phasal verbs;  
 c. mood (imperative);  
 d. aspect (progressive);  
 e. tense.

The shifts between process/state and event interpretations also depend on the inferences that can be drawn from discourse-level linguistic context and the context of the utterance. In what follows I will provide some examples that illustrate the workings of the eventuality type ‘shifters’ listed in (60).

**Iterative and frequency adverbials.** Iterative and frequency adverbials behave like quantifiers over telic predicates (see Bach, 1981:74). Atelic predicates are acceptable in the scope of such adverbial quantifiers, if they can be assigned a telic interpretation. For example, Mourelatos (1981:207) observes that the combination of the atelic sentence *He pushed the cart* and the cardinal count adverbial *three times* is well-formed if the atelic sentence can be interpreted as one of (i) - (iii) in (61):

- (61) He pushed the cart three times. (Mourelatos, 1981:207)  
 (i) He pushed the cart out of his way three times.

- (61) (ii) He pushed the cart over the hill three times.  
 (iii) He started pushing the cart three times.

Similarly, *Sometimes Bill ran* is acceptable if it entails that there were several occasions on which Bill started to run, ran, and stopped, as Bach (1981) observes. Also state predicates can occur with iterative and frequency adverbials, provided they refer to some ‘bounded portion’ of the denoted state:

- (62) a. John hated liars three times in his life.  
 b. John was in New York twice.

**Point adverbials.** Certain state verbs like *know* and *understand* can be interpreted as telic in the context of punctual adverbials like *once*, *at that moment*. They have an inchoative meaning, that is, they focus on the beginning of the denoted state:

- (63) a. At that moment I knew the answer. (Mittwoch, 1988:81)  
 b. Once Lisa understood (grasped) what Henry’s intentions were, she lost all interest in him. (Mourelatos, 1981:196)

**Time-span and durative adverbials.** As has already been pointed out, the domain of application of time-span adverbials, such as *in*-PPs, is restricted to event predicates and the domain of durative adverbials, such as *for*-PPs, is restricted to process predicates. If a given predicate can be interpreted as event (telic) or process (atelic), it is the temporal adverbial that enforces either one or the other interpretation. This is illustrated by the following examples:

- (64) a. The insect crawled through the tube for hours/in two hours’ time. (Declerck, 1979:768ff.)  
 b. She combed her hair for/in five minutes. (Fillmore, 1971, in Dowty, 1979:61)

Take *She combed her hair* in (64b), for example. It can be given a process (atelic) interpretation in the scope of the durative phrase *for five minutes*, in which case *for five minutes* measures the time during which ‘she’ combed her hair. In the scope of the time-span phrase *in five minutes*, *She combed her hair* is interpreted as an event (telic) predicate, for example, if ‘she’ follows a certain hair-combing procedure. In the scope of this time-span phrase, *She combed her hair* can also have an inchoative interpretation, where five minutes measures the time from

some contextually determined time point to the time when ‘she’ started to comb her hair.

It is unclear how we could empirically justify whether the process (atelic) or event (telic) interpretation is more basic in the case of such predicates like *crawl through the tube*, *read a book*, *comb one’s hair*. Therefore, such predicates are best treated as underspecified with respect to the eventuality type. The behavior of verbal predicates of this type is comparable to such nouns as *cake*, *stone*, *cork*. They can be equally well used as count or mass nouns, and hence can be regarded as underspecified with respect to the count-mass distinction.

Temporal adverbials coerce shifts in the inherent eventuality type of a verbal predicate when there is a clash between their argument requirements and the inherent eventuality type of the predicate to which they are applied. For example, *Mary played the same waltz* on its own will have most likely an event interpretation. In (65) in the scope of *for an hour*, it is coerced into a process interpretation: there was some playing of the waltz by Mary and it lasted for an hour. Or, it may have an iterative interpretation, namely, Mary played the same waltz over and over for an hour.

(65) Mary played the same waltz for an hour.

The iterative interpretation concerns a mapping from a single event into an unspecified number of events of the same kind. Such a plurality of events can be thought of as constituting a complex process.

Many shifts require us to draw on our general world knowledge. In (66) such knowledge contributes to our selecting the iterative interpretation as the most likely interpretation for event (telic) predicates in the scope of a durative *for*-phrase (see Dowty, 1979:173, Vlach, 1981:281-2):

- (66) a. Max won for a year.  
b. John rode the bus to work for three years.

In (66b), for example, it is the series of bus rides to work which continued for a three year period, not a single bus ride.

Another case of coercion or shift in eventuality types can be found with process (atelic) predicates in the scope of time-span *in*-phrases. Here, we have a process-to-event shift. Consider the following examples:

- (67) a. John swam today.  
b. Today John swam in an hour.

(67a) denotes a process, while (67b) denotes an event. We understand (67b) to mean that John swam a certain set distance. Although such a reading is rather marginal, it is sanctioned, provided that the set distance is clearly recoverable from the context. Dowty (1979:61), for example, suggests that the sentence *Today John swam in an hour* is felicitous in the following situation: “Thus if I know (and the addressee knows) that John is in the habit of swimming a specific distance every day (...), then I can assert that today John swam in an hour, or that he finished swimming early, or that on Tuesday he stopped, but did not finish swimming” (Dowty, 1979:61)<sup>42</sup>.

In the cases of shifts between process (atelic) and event (telic) reading the meaning of a sentence is not a simple function of its component parts. What is interesting about examples like (65) and (66) (interpreted iteratively), for example, is the observation that *Mary played the same waltz* or *John rode the bus to work* on their own do not entail any iteration. Nor is the iterative interpretation entailed by the durative *for*-phrase. In short, there is no constituent in (65) or (66) that by itself contributes the meaning of iteration to the meaning of the whole sentence. Such data seem to pose problems to compositional semantic analyses. What principles of interpretation license the iterative interpretation? How do we describe them? I will return to this point in more detail in Chapter 3.

In this connection some puzzling cases may be mentioned that concern the interpretation of undetermined plural noun phrases in the scope of time-span adverbials, as in (68):

- (68) a. Pat built houses (\*) in six months.  
b. Lynn made cookies in forty minutes.

With verbs like *build* and *make* the undetermined plural direct object typically yields an atelic (process) interpretation, and hence the whole complex predicate should occur in the scope of a durative *for*-phrase. (See also section 2.5.3.6.) However, (68a) is acceptable if it has a generic (habitual) interpretation, that is, when it expresses a generalization over particular building events, whereby each is associated with a different house whose construction took six months (see Fillmore and Kay, 1993): (in six months (Pat build a house)). In (68b) the undetermined plural noun phrase *cookies* seems to denote some conventional amount of cookies (a batch of cookies, for example)

that are baked during one baking event. So in the scope of the time-span adverbial *in forty minutes* the interpretation of *cookies* appears to have a quantized interpretation and determines the telic (event) reading of the complex verbal predicate *made cookies*. How exactly the interpretation of undetermined plural noun phrases in sentences like (68) is to be handled is an open question.

**Directional and locative adverbials.** The eventuality type of (69a) is determined by the eventuality type of its main verb *walk*, both the sentence and the verb *walk* heading it are atelic (process-denoting). In (69b) this is not the case, because the addition of the locative extent and directional (source and goal) adverbial phrases makes the sentence event-denoting:

- (69) a. John walked.  
b. John walked a mile / out of the room / to the park.

The contribution of adverbial phrases in sentences like (69b) is two-fold: First, they contribute to the expression of the goal-directed motion in these sentences. Notice that each of the simple intransitive verbs in (69b) is a manner of motion verb. Second, the locative and directional adverbials imply a Path that covers a definite quantity of space, which yields the telic (event) reading of a complex verbal predicate.

Not all the directional adverbials imply a delimited Path. These are, for example, *toward the house*, *down the road*, and extent adverbials like *over water*, *for miles and miles*. Hence, with manner of motion verbs they do not induce a telic (event) reading of a sentence. This is shown in (70), where both the main verb and the whole sentence are process-denoting (atelic).

- (70) a. John walked toward the house / down the road /  
for miles and miles.  
b. John flew over water.

A different, though related, case are examples in which the lexical semantic properties of the main verb appear to shift, in addition to the eventuality type shift:

- (71) The elevator wheezed upward to the fourteenth floor.  
(B. Levin, 1989; Levin and Rappaport Hovav, 1995)

The verb *wheeze* is a verb of sound emission, and it is atelic (process). On its own it does not entail any motion, yet (71) is understood as expressing a goal-oriented motion event. Hence, it is telic.

All the above examples have in common that the telic reading of a sentence is induced by optional adverbials rather than by subcategorized nominal arguments. This is also the case with the resultative phrases.

**Resultatives.** In (72b) the adjectives *flat*, *smooth* and *shiny* denote the state of the entity expressed by the direct object argument after the denoted event ended.

- (72) a. John hammered the metal. (Dowty, 1979:219)  
 b. John hammered the metal flat / smooth / shiny.

The resultant states ‘flat’, ‘smooth’, ‘shiny’ can be thought of as the final state at which the denoted event culminates. Hence predicates like *hammer flat / smooth / shiny* are event-denoting.

**Phasal verbs.** Atelic predicates are understood as telic if they occur as complements of phasal verbs like *finish* or *stop*. Take *look at* and *look for* in (73) where they are used as telic (event) predicates (examples are taken from Dowty, 1979:61):

- (73) a. The librarian finished looking for ‘Moby Dick’, but he did not find it.

For example, (73) is felicitous in the situation where a library has an established search procedure for books involving a definite number of prescribed steps.

**Imperative mood.** State predicates are acceptable in imperative constructions if they can be coerced into an episodic (process or event) interpretation. For example, *understand* has an event (telic) interpretation in the imperative sentence (74):

- (74) Please understand (get the point) that I am only trying to help you! (Mourelatos, 1981:196)

**Progressive.** The progressive operator relates episodic eventualities, including temporary states, to their proper parts. That is, the progressive operator contributes the notion of ‘partitivity’ (see Bennett and Partee, 1972/1978; Bach, 1986; Krifka, 1992) and the notion of

‘temporariness’ or ‘contingency’ (see Comrie, 1976:38). The progressive operator can be applied to a state predicate, if the predicate has an episodic sense (Bach’s, 1981, “temporary” or “dynamic states”): if it denotes or can be construed as denoting a temporary changeable property (of temporary manifestations) of individuals over some limited period of time. The following examples illustrate this point:

- (75) a. John is knowing all the answers to test questions more and more often. (Binnick, 1991:173)  
 b. I am understanding more about quantum mechanics as each day goes by. (Comrie, 1976:36)

In (75b), “the reference is not to an unchanging state of comprehension, the degree of comprehension being the same from one time-point to another, but rather of a change in the degree of understanding: on any given day, I understood more about quantum mechanics than on any previous day. Thus the verb *understand* here refers not to a state, but to a developing process, whose individual phases are essentially different from one another” (Comrie, 1976:36-7).

With state predicates that do not allow for an episodic interpretation (see Bach’s, 1981, “static states”) the progressive is anomalous. However, most state predicates can be used with special interpretations within the scope of the progressive operator (see Bach, 1981:77). The only exceptions seem to be certain syntagmas with the verb *be*: \**Mary is being drunk*, \**Mary is being asleep*, and *be* when it combines with a locative prepositional phrase, as in \**Mary is being in New York*.

**Present tense.** It has been already mentioned above that in English, simple (non-progressive) present tense of episodic predicates, both telic and atelic, selects for generic and habitual readings: cp. *John writes poems*, *John smokes*. Since these involve unspecified pluralities of eventualities, they may be viewed as falling under atelic interpretations.

### 2.5.6 Apparent Problems for Eventuality Types

The classification of verbal predicates into eventuality types appears to be vulnerable to two main objections. First, it may be suggested that the classification has more to do with our common sense beliefs and expectations about various states of affairs, with our real world knowledge, than with linguistic categories. The criteria on which it is based, such as ‘single change of state’, ‘complex change of state’, ‘homogeneity’, for example, are subject to differing expectations and

beliefs of speakers about how states of affairs evolve over time. As a result, the classification is “fuzzy”. Second, the membership of a given verbal predicate in a given eventuality class is often not stable, a number of verbal predicates easily shifts from their basic eventuality type to another depending on the context in which they are used. Various examples were given in the previous section.

The classification of verbal predicates into eventuality types is not invalidated by such objections. The first objection can be discarded on the following grounds. It is widely accepted that it is at the lexical level at which the knowledge of a language and knowledge of the world tie up (see Putnam, 1978, Dowty, 1979; Partee, 1980). This position in semantics has been fruitfully explored by semanticists who do not draw a strict line between these two types of knowledge. The most prominent example is the Frame Semantics approach of Fillmore to the interpretation of words and sentences. Within Frame Semantics, words represent categorizations of experience, and their meanings are relativized to conceptual scenes or frames (see Fillmore, 1977a:59).

The first objection is related to the common confusion as to what entities the classification of verbal predicates into eventuality types concerns: Does it concern particular eventualities or their linguistic representations? The assumption that eventuality types have to do with our common sense beliefs, rather than with linguistic categories, might lead us to proposing that what we classify into eventuality types are particular eventuality occurrences in the world. However, such a proposal is problematic in many respects and must be rejected. For example, it allows for the misconception that there is a certain unique way in which the world is structured which our language categories conveniently pick out. On this view, the world has exactly the structural properties that we attribute to it when we use our linguistic representations. Hence distinguishing between different kinds of verbal predicates on the basis of the different kinds of eventualities they denote is dictated by the way the world is structured.

However, this cannot be the case, because there is more than one way the world *is* independently of our linguistic (or any other) representations of it. The world has all the structure that we attribute to it when we use our particular conceptual scheme (e.g., natural language, for example) and it has more structure than we are able to pick out with our linguistic categories. This structure exists quite independently of the fact whether we attribute certain structural properties to the world. There may be other conceptual schemes, apart from natural language, we could use that would allow us to pick out a different sort of structure in the world.



Natural languages provide us with a wealth of categories, or particular shared “knowledge structures”, which enable us to convey information about the world. For example, we may point to a piece of gold and felicitously assert (76a) using a mass noun phrase or (76b) with a count noun phrase (see Dahl, 1981:83).

- (76) a. This is gold.  
b. This is a nugget.

Similarly, seeing John drinking coffee from a cup, we can represent what we see either by means of an atelic eventuality description or a telic one:

- (77) a. John drank coffee.                      atelic, process  
b. John drank a cup of coffee.              telic, event

The relevant distinctions, count vs. mass and telic vs. atelic, should be viewed as distinctions between predicates, nominal and verbal, respectively. Verbal and nominal predicates provide us with certain choices in the description of aspects of reality. The relevant classificatory criteria that underlie these distinctions are not inherent in the domain of individuals and eventualities but in nominal and verbal predicates. The fact that we distinguish between different kinds of eventualities is an artifact of our linguistic categories. In short, eventuality descriptions, denoted by verbal predicates and sentences, represent certain conventional ways in which languages tend to lexicalize the structure of various states of affairs in the real world.

This also means that we need to separate such linguistically encoded distinctions from inferences drawn on the basis of general world knowledge and pragmatic principles of interpretation. For example, telic or quantized predicates are often characterized in terms of notions like ‘result state’, ‘goal’, ‘limit’, ‘set terminal point’, ‘definite endpoint’, ‘product’, ‘upshot’, ‘outcome’, ‘culmination’. Such lexically determined notions must be clearly distinguished from the notion of a ‘causally related consequence’ or a mere ‘incidental consequence’. Take, for example, the telic sentence *Kim knitted a sweater*. The event denoted by it necessarily comes to an end when the result state, namely the state in which the whole sweater exists, is reached. In Dowty’s decompositional analysis, we can give it the following representation: [[Kim knits] CAUSE [BECOME [a sweater exists]]]. The inception of the result state coincides with the necessary end of the denoted event. Such result states are lexically determined, that is, they are built into

the meaning of verbs. By contrast, a ‘causally related consequence’ is any state of affairs that can be causally related to a given event. To illustrate this point, consider the following example: *The balloon, which was filled with water, burst. Max was soaking wet.* The event denoted by *The balloon burst* has one specific lexically determined result state, namely ‘the balloon was burst’. Both the state ‘the balloon was burst’ and ‘Max was soaking wet’ are caused by the event of the bursting of the balloon. However, from this inferred causal connection between Max’s being soaking wet and the bursting of the balloon, it does not follow that the proposition expressed by *Max was soaking wet* counts as the result state entailed by the sentence *The balloon burst*. Another reason why such an approach is untenable has to do with the fact that virtually any given eventuality can be causally related to a large number (perhaps infinitely many) other events; however, there is only one result state entailed by a given telic predicate.

The second main possible objection against the classification of verb predicates in terms of eventuality types concerns the observation that the inherent lexical semantic properties of a given verb and its basic eventuality type may shift when the verb is integrated into a verb phrase or a sentence. Although Vendler’s (1957/1967) intention seems to be to classify primarily individual verbs into states, processes, accomplishments and achievements, such shifts, among other things, have led researchers to assume that the distinctions on which his categories are based concern not only individual verbs, but also verb phrases and sentences. Should we view such shifts as merely exceptional uses of certain verbs in special contexts? Certainly not, since virtually all verbs can be used with a sense different from their inherent eventuality type under the right circumstances and the appropriate shift-inducing context. Does it then mean that virtually no verbs can be assigned to a particular eventuality type in the lexicon once and for all? Do shifts force us to abandon the assumption that individual verbs are classified into eventuality types on the basis of their inherent lexical semantic properties? Certainly, not.

For a comparison let us look at analogous shifts between count and mass nouns. Here, such shifts do not force us to abandon the lexical distinction between mass and count. Rather, nouns are viewed as having the potential to be used either as count or mass nouns, and they differ with respect to the ease with which they can shift between count and mass interpretations. Nouns manifest different degrees of countability or individuation and can be ordered on an individuation scale (see Ross, 1973).

If we abandoned the classification of verbs into eventuality types, we would miss the observation that such shifts are to a large extent systematic and predictable on the basis of the inherent lexical meaning of verbs, on the one hand, and the meaning of contextual factors that induce the shift, on the other hand. The assumption that individual verbs are classified into different eventuality types on the basis of their inherent lexical semantic properties is supported by the observation that in many cases the expected shift does not occur, and the combination of a verb with a certain eventuality type shifter results in ungrammaticality or anomaly. Certain verbal predicates are always associated with a given eventuality type and cannot be integrated into the meaning of a construction that requires a verbal predicate of a different eventuality type. For example, the verb *croak* cannot be ‘fitted’ into a directed-motion construction, because it is not of the appropriate semantic type sanctioned by this construction. Hence, *Frogs croaked to the pond* is ungrammatical.

## Notes

1. See Bennett and Partee (1972/78), Taylor (1977), Mourelatos (1978/81), Bach (1981, 1986), Parsons (1980, 1985, 1990), Hale and Keyser (1987), Tenny (1987, 1989, 1992, 1993a), Tenny and Henny (1993), Moens and Steedman (1988), Van Voorst (1988), Pustejovsky (1989, 1991), Grimshaw (1990), Jackendoff (1987), Dowty (1989, 1991), Krifka (1986, 1989, 1992), Levin and Rappaport (1992), Zucchi (1993), among others.

2. *De Anima, Nicomachean Ethics* and *Metaphysics*. Aristotle is in general credited with observing the distinctions discussed in this chapter. However, it is not clear to what extent Aristotle himself distinguished the various classes that the philosophers Ryle (1949), Vendler (1957/1967) and Kenny (1963) propose (see Dowty, 1979:53). A thorough analysis of the relevant work of Aristotle and further references can be found in Kenny (1963:173-183).

3. See Foley and Van Valin (1984), Van Valin (1987, 1990). Tenny (1987, 1992, 1993), Zaenen (1987, 1988, 1993), Dowty (1988, 1991), Wechsler (1991), Legendre (1991), among others.

4. Foley and Van Valin (1984), Van Valin (1990), Pustejovsky (1988a, 1988b), Dowty (1988, 1991). Pustejovsky (1988a and 1988b) proposes a semantics based on events in which “it is the topology of the event itself which defines the aspectual classification of a verb or sentence. As a result of a finer-grained, subeventual structure, thematic relations are a derivative

notion and play no primary role in determining the meaning of a verb (but may, in fact, play a role in language learnability)”.

5. Vendler’s article “Verbs and Times” was revised and published in 1967 as Chapter 4 in *Linguistics in Philosophy* (pp. 97-121). My references are to the 1967 version.

6. In Vendler’s words, “the man who stops running did run”, but “if someone stops running a mile he did not run a mile” (Vendler, 1967:100).

7. Tense logic is concerned with the study of valid inferences of tensed sentences, the structure of time, and the analysis of temporal relations. Tense logic can be viewed as a branch of modal logic and historically the focus of attention was on modal notions when inferences with tensed sentences were studied (see Clifford, 1975:18ff.). The origins of modern tense logic can be traced back to the publication of A. N. Prior’s *Time and Modality* (1957). Prior summarized the work in tense logic in the first decade in *Past, Present and Future* (1967). He also seems to be the first one to propose that tenses not be viewed as operators on predicates or subjects, but on whole sentences.

8. See Montague (1974), Paper 5, “On the Nature of Certain Philosophical Entities”.

9. However, later in his book, Dowty (1979:139) assumes, along with Bennett and Partee (1972/1978), that time is dense. This is motivated by his definition of the abstract predicate BECOME that encodes a definite and gradual change-of-state entailment that characterizes the class of accomplishment and achievement predicates. See also Kamp (1980), on the logic of change and the density of time.

10. See Kamp (1980:135-179), for a detailed discussion of the problems involved in the definition of the notion of ‘change’.

11. Taylor’s (1977) postulates are here given in Dowty’s (1979:166) formulation. Taylor uses the terms ‘energeia’ verbs for activity verbal expressions, ‘kinesis’ verbs for accomplishment and achievements verbal expressions. Taylor’s temporal postulates are supposed to motivate the different behavior of Vendler’s classes with respect to the progressive aspect.

12. Dowty illustrates this point with the paradigm example of non-stative verbs, namely those that denote a change in the physical properties: “consider a segment of a motion picture film showing a ball rolling down an inclined plane. A single frame of this film does not in itself offer us the evidence to say that the ball is really in motion, assuming that the film does not show any blurs, but any two frames (adjacent or not) showing the ball in slightly different locations do provide evidence of movement” (Dowty, 1979:168). Dowty credits Wittgenstein (1958), *Philosophical Investigations*, with making a similar point.

13. The truth conditions that Dowty (1979:169) gives for *moved(x)* can be paraphrased as follows: ‘x moved’ is true at an interval *I* just in case *x* was located at one place at the beginning of *I* and at another place at the end of *I*. “[I]t is the narrow scope existential quantification over places in this definition that is responsible for the indefiniteness” (Dowty, 1979:169). Dowty also (1979:170) addresses some interesting problems connected to the characterization of motion verbs. For example, he gives M. J. Cresswell’s example of a perfect sphere rotating in space but not coming to occupy any new previously unoccupied space. In such a case it would be necessary to make reference to positions occupied by parts of an object. Dowty also points out that the case of an object that moves in a circular path presents a problem, as the object may occupy exactly the same position at the beginning and end of an interval of movement. Motional activities characteristic of animate beings, like *running*, *swimming*, *walking*, *crawling*, *dancing*, etc., involve patterns of change of position, or particular sequences of more simple changes of position. Such changes are not just related to the location of the whole body, but related to the positions of its parts (see Dowty, 1979:170-1).

14. The idea that state as well as non-state predicates can be analyzed in terms of the same kind of stative properties may seem counterintuitive. However, the translations in intensional logic are not intended to constitute a linguistic level of representation. Moreover, it is not crucial that a given sentence corresponds to a unique translation in intensional logic. As Dowty observes: “... it is not necessarily the form of a particular complex translation or meaning postulate that is literally significant, but the more subtle claim that word meanings of certain kinds are always constructable out of a certain fixed set of primitive semantic operations (here represented by the interpretations of operators such as CAUSE and BECOME) and stative properties” (Dowty, 1979:199).

15. The intuition behind this characterization is related to Kenny’s (1963) view: “performances [accomplishments/achievements] are specified by their ends” (Kenny, 1963:178). The proposition variable  $\phi$  in BECOME  $\phi$  corresponds to the result or end state of achievements and accomplishments: “Performances are brought to an end by states. Any performance is describable in the form: ‘bringing it about that *p*’. Washing the dishes is bringing it about that the dishes are clean; learning French is bringing it about that I know French, walking to Rome is bringing it about that I am in Rome. In all these cases, what is brought about is, by our criteria, a state: ‘is clean’, ‘knows’, ‘is in Rome’ are all static verbs” (Kenny, 1963:177). Or, the proposition  $\phi$  may also be an activity, as the beginnings and endings of activities can also be achievements. And it may even be another achievement or accomplishment. However, in order to

prevent an infinite regress, it is crucial that “every performance must be ultimately the bringing about of a state or of an activity” (Kenny, 1963:178).

16. Dowty adopts a “bisentential analysis” of CAUSE that was earlier suggested by Vendler (1967), Geis (1970), Fillmore (1971), McCawley (1971), among others. The bisentential analysis differs from McCawley’s original proposal that treated CAUSE as a relation between individuals and propositions.

17. Notice that this is in turn ambiguous: (i) ‘The sheriff of Nottingham repeatedly jailed Robin Hood during the period of four years’ (iterative reading) or (ii) ‘The sheriff of Nottingham spent four years bringing it about that Robin Hood was in jail’.

18. Davidson (1967, 1980:118) expresses this as follows: “For example, we would normally suppose that ‘Shem kicked Shaun’ consisted in two names and a two-place predicate. I suggest, though, that we think of ‘kicked’ as a three-place predicate, and that the sentence to be given in this form: (17)  $(\exists x)(\text{Kicked}(\text{Shem}, \text{Shaun}, x))$ ”.

19. As Parsons (1990:5) observes, Davidson’s theory fails to provide a general account. It works well for adverbials like ‘in the bedroom’, ‘happily’, but it fails for intensional and modal adverbials like ‘in a dream’, ‘necessarily’.

20. Other proposals can be found in Burge (1972), Massey (1976), Sharvy (1980), Simons (1983, 1987), Roeper (1983), Bunt (1985), Lønning (1987), Ojeda (1991, 1993), Moltmann (1997).

21. Many examples in this list are taken directly from Bach (1981, 1986), some are added from other sources.

22. This can be supported by the fact that “sensory systems demonstrate an acute sensitivity to change, as if change carried information of great biological significance. Sensitivity to change, and a conservative tendency to attribute changes to intelligent sources, is characteristic of the perceptual system at every level of its functioning” (Miller & Johnson-Laird, 1976:79).

23. This is also recognized by Kenny (1963) who views Vendler’s accomplishments and achievements as belonging to one category ‘performances’ (Kenny, 1963:175). However, his category ‘performances’ is too narrow, it is restricted to events involving human agency.

24. “So-called mass terms like ‘water’, ‘footwear’, and ‘red’ have the semantical property of referring cumulatively: any sum of parts which are water is water” (Quine, 1960:91).

25. Link (1983) summarizes this as follows: “a. If a is water and b is water, then the sum of a and b is water. b. If the animals in this camp are

horses, and the animals in that camp are horses, then the animals in both camps are horses” (Link, 1983:303).

26. See also Vendler’s characterization of accomplishments: “... in case I wrote a letter in an hour, I did not write it, say, in the first quarter of that hour” (Vendler, 1967:101).

27. Dowty (1979) also observes that “for (...) a particular activity verb, it seems that the same kind of property must be acquired for each interval of which that verb is true of an individual” (Dowty, 1979:168-9). This property was already observed by Vendler (1957/1967): “running and its kind go on in time in a homogeneous way; any part of the process is of the same nature as the whole” (Vendler, 1967:101).

28. However, a sultana may constitute a part of a fruitcake. So a question like ‘Did she eat the whole slice of fruitcake?’ can be felicitously answered with ‘No, there was a bit left on her place, a sultana.’ Depending on its history, a given sultana may or may not be part of a fruitcake, just as, depending on its history, a glass pane, may or may not be a part of a house.

29. Bach (1981:74), for example, points out that “[t]he combination of a specific durational adverbial with a process predicate (or sentence) acts in every way like an event predicate (or sentence): (30) *It took John an hour to run for an hour (naturally).* (31) *?John ran for an hour for an hour.*”

30. Lewis (1991:vii) puts it succinctly as follows: “The notion of ‘singleton’, or unit set, can serve as the distinctive primitive of set theory. The rest is mereology”.

31. The overlap is the mereological counterpart of the intersection of two sets. In terms of the part-structure, any such common part is a lower bound for the two individuals. Overlapping individuals have a greatest lower bound or *infimum*. Infimum is *product* in set theory.

32. A join semi-lattice without a bottom element provides a better model for the common language usage. If we assumed a complete lattice with a bottom element, we would be committed to the undesirable view that for every two objects in a lattice there is a part, namely the null part, that they share in common. But of course, in our ordinary language use we are not committed to this view.

33. See Simons (1987) for the discussions of these problems and the strategies to cope with them.

34. In this respect, they are directly related to the work of Davidson (1967), and also to the work of Kamp (1979), Bartsch (1981) and Parsons (1986) who propose that at least certain episodic sentences should be interpreted as indefinite eventuality-descriptions.

35. “For a given number of minimal objects that satisfy a noncountable noun, there is an exponentially related number of other overlapping objects that also satisfy the same noun, in virtue of additivity. (...) The paradox of

counting the noncountable can be put in the form of a dilemma. If all objects that satisfy a noncountable noun can be counted at all, their number is worthless. Two conditions are needed for a practicable numerical estimate: (a) the objects counted should be more or less equal in relevant respects; and (b) they should exhaust the totality without overlap. In other respects, the choice of unit is immaterial. But this, in turn, is nothing other than a rough description of MEASURING a substance!” (Carlson, L., 1981:50).

36. Mourelatos (1978/1981) suggests that all and only telic predicates “include, or can admit, or imply cardinal count adverbials that refer to the situation itself, as distinct from associated occasions” (Mourelatos, 1978:429; 1981:209). Leech (1969:125) illustrates the ‘situation-occasion’ distinction with the following ambiguous example: *He knocked on the door three times*. It has two interpretations: (i) there was one knock on the door on three different occasions (in the case of multiple-occasions interpretation, there is an implied ‘once’ assigned to the situation); (ii) there were three knocks on the door on one single occasion. Both the situation and occasion are quantified, hence we can assign one cardinal count adverbial to the occasion and another cardinal count adverbial to the situation. This can be best shown when the quantification is explicit: *He knocked on the door three times on two occasions*. “Either the occurrences are explicitly counted, or if they are not, the occurrences are nevertheless implicitly under the governance of terms that presuppose that the occurrences are countable (‘a’ or ‘at least one’)” (Mourelatos, 1978:425; 1981:204). Mourelatos (1981:204, fn. 31) points out that his paraphrases resemble Davidson’s (1967:81-95; 1969:216-234) logical representation of action sentences that involve explicit event quantification.

37. Jackendoff (1991:8) uses a feature system that contains the semantic feature “internal structure” for the same notion. He uses this feature to distinguish between individuals, such as those denoted by *a pig*, and groups, such as *a committee*. Only the latter are assigned the “internal structure” feature.

38. Jackendoff (1987, 1990:29, 1991:3) describes the parallel between plural count nouns and iteration in the following way: iteration is “an operator which maps a conceptual constituent that encodes a single Event into a conceptual constituent that encodes a repeated sequence of individual Events of the same type. Brief consideration suggests that in fact this operator has exactly the same semantic value as the plural marker, which maps a conceptual constituent that encodes an individual Thing into a conceptual constituent that encodes a collection of Things of the same type. That is, this operator is not formulated specifically in terms of Events, but



rather should be applicable in X-bar fashion to any conceptual entity that admits of individuation” (Jackendoff, 1991:29).

39. “If a sentence with an achievement verb contains a mass noun phrase or a bare plural noun phrase (or if a sentence with an accomplishment verb contains such a noun phrase as object), then it behaves like a sentence with an activity verb” (Dowty, 1979:63).

40. This paper was first published as “Non-singular Reference: Some Preliminaries”, *Philosophia*, 5 (1975). It was reprinted in Pelletier, F. J. (ed.), 1979, 1-14. Taking up a suggestion by David Lewis, Pelletier (1975/1979) proposes a “Universal Grinder” into which any object denoted by a count noun can be fed. Universal Grinder machinery “allows it to chop up any object not matter how large, no matter how small, no matter how soft, no matter how hard” (Pelletier, 1975/1979:6) into a homogeneous mass, which is then appropriately denoted by the same noun used as a mass noun. For nouns which do not have physical objects in their extension, and which are “ungrindable, because there is nothing to grind”, it is only necessary that a normal sentence use the word in a mass sense (see Pelletier, 1975/1979:6).

41. Even proper names can behave like mass nouns: *More Mexico for less, Never has so much Mexico been offered for so little.*

42. Another example of this kind can be found in Comrie (1976:45-6): “a singing class where each of the pupils is required to sing a certain passage; then the verb *sing* on its own, in this context, may be taken to mean ‘sing the set passage’; so that from *John is singing* it will not follow that *John has sung*” Comrie (1976:46). In this context, the following conjoined sentences have a telic reading: *John has already sung, now Harry will sing.* Hence, not only the sentence-internal linguistic context, but also the discourse-level linguistic context and the context of the utterance can enforce a telic interpretation of a sentence that would otherwise have a process interpretation.”