X. Verb phrase semantics

48. Aspectual class and *Aktionsart*

Abstract

This contribution provides an overview of the main categories of aspectual class and Aktionsart, and a review of the development of typologies from Aristotle to the present day. Key theories of aspectual classes in linguistics and philosophy are discussed, and their contribution to our understanding of how verb meaning, compositional processes and pragmatic principles of interpretation determine the aspectual class of particular sentences. Meaning components that motivate the assignment of simple verbs and complex predicates to aspectual classes also play a role in other areas of semantic and pragmatic research, namely in the thematic role theory, for example, and intersect with the grammar of measurement and scalar semantics.

1. Overview: Main research traditions and terminology

The grammar of natural languages systematically distinguishes between two kinds of description of states of affairs: those that necessarily involve some end or limit (e.g., *leave, find, die*) and those that do not (e.g., *walk, see, know*). This essential distinction is taken to originate in Aristotle's dichotomy KINÊSIS ('motion', also 'change') vs. ENERGEIA (translated as 'actuality', 'actualization', also 'activity') (*Metaphysics*, Θ6, 1048b, 18–36). While KINÊSEIS are always for the sake of some external end, ENERGEIAI have ends that are 'actualized' as soon as they begin. In contemporary linguistics, this distinction is best known as the TELIC vs. ATELIC distinction, coined by Garey (1957), based on the Greek word *télos* 'goal' or 'purpose'. Telic predicates express "an action tending towards a goal" (Garey 1957: 106), while atelic predicates describe situations that "are realized as soon as they begin" (Garey 1957: 106). Despite the implication of agentivity inherent in the term 'telic', Garey illustrates his telic class with the non-agentive verb *se noyer* 'to drown', which means that his distinction meshes with subsequent agentivity-neutral Aristotelian classifications (e.g., Bennett & Partee 1972; Comrie 1976; Mourelatos 1978; Bach 1981).

The semantic (and ontological) nature of this basic distinction and its encoding in natural languages are at the core of the studies in ASPECTUAL CLASS and AKTION-SART (German, lit.: 'manner of action', also used in its plural form AKTIONSARTEN

'manners of action'). These two terms reflect the historical division of the field into two main strands. The English-language term ASPECTUAL CLASS is used co-extensively with the term 'Aristotelian class' (see Dowty 1979: 52). What 'Aristotelian' here means is shaped by the works of Oxford philosophers of language and mind, Ryle (1949) and Kenny (1963), with Ryle in turn inspiring Vendler (1957) whose impact on linguistics has been by far the most profound. The early theory formation in linguistics in the late 1960s and in the 1970s was carried by logicians and formal semanticists who laid the methodological foundations within tense logic (cf. article 57 (Ogihara) *Tense*), Montague Semantics and Generative Semantics (Bennett & Partee 1972; Dowty 1979; Montague 1968, 1973; Scott 1970; Taylor 1977). In the 1980s, the domain of aspectual classes was established as an important area of research and also received a new impetus with the advent of event semantics (Bach 1981, 1986) (cf. article 34 (Maienborn) *Event semantics*), which forged ties to the semantics of mass terms and plurals (Link 1983, 1987) (cf. article 46 (Lasersohn) *Mass nouns and plurals*). Much of the work in the Aristotelian tradition was originally motivated by the goal of formulating explanatory hypotheses for the existence of aspectual classes and understanding the nature of compositional processes needed in the derivation of aspectual classes at the level of VP*s* and sentences (Krifka 1986; Verkuyl 1971). This in turn stimulated new insights into the syntax-semantics interface (cf. article 82 (von Stechow) *Syntax and semantics*), lexical semantics of verbs as well as the theory of THEMATIC ROLES and ARGUMENT SELECTION (Dowty 1987, 1991) (cf. article 18 (Davis) *Thematic roles*). The most recent developments concern the crosslinguistic variation in the encoding of aspectual classes, implications for the status of aspectual classes as (possible) semantic universals (cf. article 96 (Bach & Chao) *Semantic universals and typology*) and their consequences for theories of language acquisition (cf. article 105 (Slabakova) *Meaning in second language acquisition*).

The German-language term AKTIONSART(EN) has its roots in the (Proto-)Indo-European (e.g., Sanskrit, Greek, (Old Church) Slavic, Romance, Germanic) and Semitic studies in the continental philology of the late 19th and early 20th century. The term AKTIONSART(EN) was coined by Agrell (1908) to cover the lexicalization of various 'manners of action' (e.g., terminative, resultative, delimitative, perdurative, iterative, semelfactive, attenuative, augmentative) by means of overt derivational word-formation devices, and set apart from grammatical ASPECT, as instantiated in Slavic languages by its two main formal categories, PERFECTIVE and IMPERFECTIVE (identified earlier by Miklosich 1868–1874). The theoretical elaboration of the Aktionsart vs. grammatical aspect distinction was the focus of much of the traditional European descriptive and structuralist research during the first half of the 20th century. The relevant discussions mainly regarded form-oriented issues: namely, the differentiation of morphemes dedicated to the encoding of Aktionsart as opposed to grammatical aspect in complex verb forms in Indo-European languages. Debates hinged on what exactly 'grammatical' is supposed to mean, and many settled on 'expressed by INFLECTIONAL morphology', i.e., morphology relevant to syntax (e.g., Anderson 1982) (cf. article 78 (Kiparsky & Tonhauser) *Semantics of inflection*). This led to the search for the requisite invariant meanings of the perfective and imperfective morphology (for overviews see Comrie 1976; Forsyth 1970) and the markedness theory (Isačenko 1962; Jakobson 1936 and reference therein) introduced theoretical constraints into the relevant discussions, which have since then shaped the aspectual theory. On one dominant view, mainly formulated in Slavic linguistics, the perfective is the marked category in the privative opposition to the

unmarked imperfective, and often characterized in terms of some boundary (*predel'nost'* in Russian) with respect to which the described situation is viewed as having reached its end, or can be viewed in its totality (*celostnost' dejstvija* 'totality of an event' in Russian). This idea became widespread in contemporary aspect studies largely due to Comrie's (1976) characterization: "perfectivity indicates the view of a situation as a single whole (…), while the imperfective pays essential attention to the internal structure of the situation" (Comrie 1976: 16); generally, the grammatical aspect distinguishes "different ways of viewing the internal temporal constituency of a situation" (Comrie 1976: 16). This characterization is aptly highlighted in Smith's (1991) term VIEWPOINT ASPECT for grammatical aspect, which is set apart from SITUATION ASPECT, meant to be coextensive with 'aspectual class' in Dowty's (1979) sense. One of the most influential formalizations of the 'viewpoint' semantic characterization of grammatical aspect is given by Klein (1994), who ties Reichenbach's (1947) theory of tense with work in formal semantics: the progressive/imperfective aspect is characterized as 'topic time (i.e., Reichenbach's 'reference time') within event time' (i.e., looking at event from within), and perfective aspect as 'event time within topic time' (i.e., looking at event as a completed whole). The widespread use and intuitive appeal of the 'viewpoint' based characterizations may also stem from the etymological origins of the term 'aspect'. This term is a loan translation of the Slavic term VID, etymologically cognate with 'view' and 'vision', and related to the Latin word *aspectus* translated as 'view', '(the act of) seeing, looking at'. As a linguistic term, *vid* was first used in the early 17th century work on Old Church Slavic by Smotritsky (1619) (see Binnick 1991: 135–214 for a terminological overview).

Starting in the early 1970s, there have been gradually increasing efforts to integrate insights from the two until then largely separate research traditions in which the terms ASPECTUAL CLASS and AKTIONSART originated. In the 1970s, in the European generative grammar frameworks (e.g., Platzack 1979; Verkuyl 1972), the association of the notion of 'Aktionsart(en)' with lexical semantics led to loosening of its dependence on overt derivational morphology and its merging with aspectual classes in the Aristotelian sense of Dowty (1979). In this sense, 'Aktionsart(en)' made entrance into American linguistics in the mid 1980s (Hinrichs 1985). In the late 1960s and the early 1970s, philosophers, logicians and formal semanticists who studied the progressive vs. non-progressive contrast in English (cf. article 49 (Portner) *Perfect and progressive*) in dependence on the Aristotelian classes became increasingly aware of the studies devoted to grammatical aspect in the continental philology of the 19th and early 20th century, and in later descriptive and structuralist traditions. The terms 'perfective' and 'imperfective' became standard in contemporary linguistics in the 1970s (Mourelatos 1978: 195, n. 10), mainly through the wide-spread reception of Comrie (1976) and Dowty (1977, 1979). These developments raised difficult questions about the relation between the perfective and imperfective GRAMMATICAL ASPECT, or 'aspectual form' (Dowty 1979: 52), and aspectual classes, which also came to be known as LEXICAL ASPECT, and often used not only with reference to expressions at the lexical V level, but also misleadingly at the levels of VPs and sentences. On one proposal, the function of the perfective/imperfective morphology is to encode aspectual classes (Mourelatos 1978: 194–195), which is taken to justify a single, possibly universal, semantic/conceptual dimension in terms of which phenomena belonging to both the grammatical aspect and aspectual/Aristotelian classes are analyzed. On another widespread view, aspectual classes are to be clearly distinguished from the grammatical aspect, formally and also semantically, as each is

taken to require distinct analytical tools (cf. Dahl 1985; Depraetere 1995; Dowty 1977, 1979; Filip 1993; Klein 1994; Smith 1991, among others). The field has reached an impasse regarding these two positions.

2. Origins of the Aristotelian tradition

2.1. Ryle, Kenny and Vendler

Ryle (1949) coined the term ACHIEVEMENTS for end-oriented actions (Ryle 1949: 149) and contrasted them with ACTIVITIES lacking any end, goal or result over and above that which consists in their performance (Ryle 1949: 150). The criterion of agentivity distinguishes ACHIEVEMENTS involving some result preceded by an intentional 'subservient task activity' (*score a goal, prove the theorem, win a race*) from 'purely lucky achievements' like *notice* that are not agentive: **My mother carefully noticed the spot* (Ryle 1949: 151). Kenny (1963) introduces a clear distinction between ACTIVITIES and STATES, and sets them apart from PERFORMANCES that are specified by their ends: "[a]ny performance is describable in the form: 'bringing it about that *p*'" (Kenny 1963: 178), whereby "every performance must be ultimately the bringing about of a state or of an activity" (Kenny 1963: 178) in order to prevent an infinite regress. Kenny motivated his three classes with diagnostic tests which now belong to the standard toolkit for detecting aspectually relevant meaning components (cf. Dowty 1979: 55ff; Parsons 1990: 34–39). For example, activity and performance predicates freely occur in the progressive, but not all state predicates can. In the simple present tense, activities (*John smokes*) and performances (*John wins a race*) have a habitual interpretation, while states do not (*John loves cigars*). Performance predicates prohibit the conclusion of "x has ϕ-ed" from "x is ϕ-ing", but activity predicates often allow it.

Vendler (1957) defines four classes that are intended to capture "the most common time schemata implied by the use of English verbs" (Vendler 1957: 144):

(1)   STATES: *desire, want, love, hate, dominate*;
      ACTIVITIES: *run, walk, swim, push (a cart)*;
      ACHIEVEMENTS: *recognize, reach, find, win (the race), start/stop/resume, be born/die*;
      ACCOMPLISHMENTS: *run a mile, paint a picture, grow up, recover from illness*.

Both accomplishments and activities involve *periods of time*, but only accomplishments also require that they be unique and definite (Vendler 1967: 149). Both states and achievements involve *time instants*, but only achievements "occur at a single moment" (Vendler 1967: 147), while states hold at *any* instant during the interval at which they are true (Vendler 1967: 149). The idea that *only* activities and accomplishments 'go on in time' is taken to motivate their compatibility with the 'continuous tense', i.e., the progressive, a property not shared by states and achievements. Hence, Vendler uses the progressive test to group activities and accomplishments into one basic class and states with achievements into another. Activities are distinguished from accomplishments due to their differential behavior with temporal adverbials. As (2) shows, only accomplishment predicates freely combine with *in NP* modifiers like *in an hour*. (The interpretation of *in NP* that is relevant for this test measures the extent of events described

by accomplishment predicates, the irrelevant interpretation concerns the measure of time until their onset from 'now' or some other reference point, see also Vendler 1957: 147.) In contrast, only activity predicates can be freely modified with *for NP* temporal adverbials.

(2)		in an hour	for an hour	
a.	John ran a mile in an hour	√	*	ACCOMPLISHMENT
b.	John reached the summit	*	*	ACHIEVEMENT
c.	John ran	*	√	ACTIVITY
d.	John knew the answer	*	?	STATE

Although the progressive and *in/for* tests are widely used, caution must be taken in their application. Vendler's achievements, just like his accomplishments, can appear in the progressive: *he is winning the race/dying/reaching the top/leaving* (Dowty 1977; Mourelatos 1978: 193). This effectively undermines Vendler's key diagnostic test for the separation between achievements and accomplishments, which is one of the most criticized weaknesses of his classification. In addition, most states can be used in the progressive, albeit often with special interpretations: *I'm really loving the play, I'm understanding you but I'm not believing you* (Bach 1981: 77), *I am understanding more about quantum mechanics as each day goes by* (Comrie 1976: 36; also Zucchi 1999, among others). There are states that pattern with activities, rather than with achievements, as they are compatible with *for NP* temporal adverbials: *Locals believed for years that a mysterious monster lurked in the lake*.

In connection with the temporal adverbial *in/for* test, Vendler introduced one of the most important criterial properties into aspect studies: namely, the semantic property of homogeneity. Only activities like "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 1957: 146). If John ran *for an hour*, then, at any time during that hour it was true that John ran. In contrast, accomplishments are not homogeneous. If John wrote a letter *in an hour*, then it is not true that he wrote a letter at any time during that hour. This in turn follows from the characterizing property of accomplishments: namely, they "proceed toward a terminus which is logically necessary to their being what they are" (Vendler 1957: 146), and which implies that they consist of ordered parts, none of which includes this terminus, apart from the very last one.

2.2. Areas of research in linguistics

It is not entirely clear whether the Aristotelian categories that Ryle, Kenny and Vendler envisioned are of linguistic or ontological nature, which raises the following basic questions: Are these categories inherent in descriptions, in predicates of natural languages? Or, are they properties of states of affairs in the domain, inherent in 'nonlinguistic things in the world' (Parsons 1990: 20)? (cf. article 108 (Kelter & Kaup) *Conceptual knowledge, categorization and meaning.*) Some believe they are true ontological categories (Bach 1986; Parsons 1990: 34). Others question this possibility (Gill 1993) or even reject it (Filip 1993; Krifka 1986; Partee 2000). The plausibility of the latter view may be illustrated with the following example. Seeing Ben eat ice cream, we have a choice among a number of possibilities to describe this situation, including *Ben ate ice cream* (activity/atelic) and

Ben ate a bowl of ice cream (accomplishment/telic). There is nothing in the nature of the world itself that would force us to use one description and not the other. It is predicates that offer us different choices in the description of the world's phenomena and that impose categorization schemas on the world. Aristotelian classes then concern predicates of natural languages and it makes sense to speak of 'accomplishment predicates' or 'telic predicates', but not of 'accomplishment events' or 'telic events' (Krifka 1998: 207).

Although Vendler's (1957) classification has enjoyed the most widespread use, its four-fold division as well as the program of motivating it in terms of "the most common time schemata implied by the use of English verbs" (Vendler 1957: 144) have been subjected to much criticism and revisions. First, Vendler's own examples clearly indicate that his classes do not just concern the meaning of individual verb lexemes or surface verbs. Second, the grounding of Vendler's classes—or any Aristotelian classes for that matter— is not to be seen in purely temporal properties of moments and intervals of time, but is at least partly if not entirely based on properties that are not of temporal nature. Turning to the first point, all agree with Dowty (1979) that Vendler's (1957) attempt "to classify surface verbs once and for all" (Dowty 1979: 62) into Aristotelian classes is "somewhat misguided" (ibid.). The reason for this has to do with the observation that verbs manifest a considerable variability in their assignment to aspectual classes in dependence on their context of use, and hence the aspectual class of basic (underived) verbs does not always (fully) determine the aspectual class of their projections. Consequently, the domain of Vendler's classification in natural languages extends from basic verbs to at least VPs, and according to some, following Verkuyl (1972) and Dowty (1972, 1979), it also extends to sentences, since they take the (external) subject (argument) to be one among the determining factors of aspectual classes. Dowty (1979: 185) goes even further in extending the empirical scope of Aristotelian categorization by concluding that it "is not a categorization of verbs, it is not a categorization of sentences, but rather of the propositions conveyed by utterances, given particular background assumptions by speaker and/or hearer about the nature of the situations under discussion". This insight has only gradually been gaining prominence, and although it is now generally accepted across a wide spectrum of theoretical frameworks (Bennett & Partee 1972; Depraetere 2007; Filip 1993; Jackendoff 1996; Kratzer 2004; Krifka 1986, 1992; Langacker 1990; Levin & Rappaport Hovav 2005; Partee 1999, among others), the integration of the relevant pragmatic and cognitive principles of interpretation into full-fledged theoretical frameworks remains one of the outstanding problems.

At the same time, Dowty's conclusion, also independently later recognized by many others, raised doubts whether Aristotelian categories constitute generalizations over classes of predicates that ought to be a part of the grammar of natural languages. Two main arguments can be provided in defense of their grammatical status. First, they are grammatically significant due to the way in which they interact with the syntactic and morphological structure in natural languages (Dowty 1979: 185; Carlson 1981). Second, when a given verb, a verb phrase or a sentence changes its aspectual class in dependence on context, this change follows systematic patterns. For instance, epistemic verbs like *know* or *understand* predictably shift from their dominant state sense to an achievement 'insight' sense in the context of time-point adverbials like *suddenly* or *once: And then suddenly I knew!* (Vendler 1957: 153), *Once Lisa understood (grasped) what Henry's intentions were, she lost all interest in him* (Mourelatos 1978: 196). To take

another example, virtually any activity verb can have an accomplishment sense in an appropriate linguistic context, possibly in interaction with extra-linguistic knowledge. One triggering context is the temporal *in NP* adverbial, as in *Today John swam* [i.e., a certain distance] *in an hour* (Dowty 1979: 61), another is the embedding under a phasal verb, as in *Today John finished/stopped/started swimming early* (Dowty 1979: 61). Verbs derived from gradable adjectives ('degree achievements' in the sense of Dowty 1979) predictably alternate between the activity and accomplishment interpretation in dependence on temporal adverbials: *The soup cooled for/in 10 minutes*. It is precisely the task of a theory of aspectual classes to formulate correct and testable predictions about such patterns. The strategy is to derive aspectual classes in a systematic way from the meaning of verbs in interaction with the properties of temporal modifiers, phasal verbs, verbal affixes, adverbs of quantification (cf. article 54 (Maienborn & Schäfer) *Adverbs and adverbials*), tense operators (e.g., present tense), grammatical aspect operators (e.g., progressive) as well as quantificational and referential properties of nominal arguments (cf. article 43 (Keenan) *Quantifiers,* article 44 (Dayal) *Bare noun phrases*, article 46 (Lasersohn) *Mass nouns and plurals*). The main theoretical focus of recent and contemporary aspectual studies is on the compositional processes implicated in the observed patterns, and we have a number of competing proposals to analyze data that are of non-compositional nature, including underspecification (cf. article 24 (Egg) *Semantic underspecification*), ambiguity (cf. article 23 (Kennedy) *Ambiguity and vagueness*), general lexical rules, aspect shift and coercion (see e.g., de Swart 1998) (cf. article 25 (de Swart) *Mismatches and coercion*), null morphology, and constructional approaches (cf. article 86 (Kay & Michaelis) *Constructional meaning*).

As semanticists today agree, it is the meaning components lexicalized in verbs that constitute a large part of the explanation for the way in which aspectual properties of VPs and sentences are derived from their parts. They motivate Vendler's (1957) rudimentary time schemata associated with surface verbs, and later more explicit characterizations by means of temporal meaning postulates, as in Taylor (1977). This idea, which originated in the works of Verkuyl (1972) and Dowty (1972, 1977, 1979), raises two main questions that are still discussed today: (1) What exactly are the aspectually relevant meaning components, how are they related to each other and how do they uniquely determine the relevant Aristotelian classes and no other? (2) How are aspectually relevant meaning components lexicalized in verbs related to their other meaning components and how do they interact with the syntactic, morphological and semantic structure of sentences in natural languages? Answers to such questions expose the basic need for clarifying the empirical basis for a well-motivated theory of Aristotelian classes. What is still needed are *reliable* criteria that would allow us to provide systematic answers to the above questions. It is not always entirely clear what exactly the diagnostic criteria used by various researchers test for in linguistic expressions, and since the most common linguistic tests were developed based on English data (Dowty 1979: 55ff), not all the tests are transferable across natural languages, due to language-specific properties, and those that seem to be require some clarification whether they in fact access the same aspectually relevant properties in different languages (see Sasse 2002). Moreover, the diagnostic tests commonly used (Dowty 1979: 55ff) do not converge on coherent categories, such as Vendler's, but identify overlapping clusters which merely distinguish subsets of such categories (Dowty 1979: 60; Parsons 1989) or supersets.

The second main point regards the temporal grounding of Vendler's classes, and generally any aspectual classes of the Aristotelian type. In accordance with Vendler's (1957) explicit statements, they are commonly identified with 'temporal aspect' (L. Carlson 1981), the 'temporal constitution of verbal predicates' (Krifka 1992), or the 'temporal contours' introduced by verbs (Levin & Rappaport Hovav 2005), which would seem to suggest that their purely temporal grounding is taken for granted. Indeed, much of the research on aspectual classes was conducted within tense logic (introduced by Prior 1957, 1967) (cf. article 57 (Ogihara) *Tense*), and related modal logic (cf. article 58 (Hacquard) *Modality*), starting in the late 1960s until the early 1980s (Section 3). However, Vendler (1957: 149) himself, despite his emphasis on temporal criteria, cautions that the time element is insufficient observing that non-temporal factors like the presence or absence of an object argument, speaker's intention (Vendler 1957: 143) and agentivity (Vendler 1957: 149), for example, also play a role. Since Dowty's decompositional analysis (Section 4) and the advent of event semantics in the 1980s (Section 5) (cf. article 34 (Maienborn) *Event semantics*), non-temporal criteria have been gaining prominence among aspectually relevant meaning components lexicalized in verbs. In this connection, we see the rise of mereologically-based properties (Bach 1981, 1986), which are defined based on the part-whole structure of space-occupying objects, as originally proposed by Taylor (1977). Starting in the 1990's, aspectually relevant meaning components have been derived from the concepts used to structure space and from scalar semantics (Section 6). The inclusion of such non-temporally grounded properties into the inventory of aspectually relevant properties raises questions about the purely temporal grounding of Aristotelian categories in general, namely, to what extent they are emergent properties arising from the interaction of more basic properties that are not of purely temporal nature (see also Dowty 1979). This also led to refinements of the empirical test grounds for aspectual classes and to classifications of verb meanings that cannot be neatly aligned with Vendler's four-way schema.

Despite mounting evidence to the contrary, many scholars still take Vendler's classification as a linguistic fact, or at least a convenient point of reference, routinely crediting Dowty (1979) for introducing Vendler's classes into linguistics and providing arguments in their support. What is often failed to be recognized or fully appreciated is that Dowty (1979) does not just provide a decompositional analysis of Vendler's classes, but instead proposes an alternative classification (Dowty 1979, Chapter 3.8; see below Section 4), and others have followed suit since then. Dowty's revised classification comes close to Mourelatos' (1978) tripartite agentivity-neutral classification into STATES, PROCESSES (Dowty's 'indefinite change of state' predicates) and EVENTS (Dowty's 'definite change of state' predicates) (Section 5.1), which in turn is commonly used with some refinements in event semantics (starting with Bach 1981, 1986 and Parsons 1990) (Section 5.2). In sum, while Aristotelian aspectual classes are now established as generalizations over classes of predicates in the grammar of natural languages, their exact number and kind is not, and certainly Vendler's classification, despite its prominence, cannot be taken for granted. Hence, the two most basic questions still remain to be answered: What is the classification schema of aspectual classes and Aktionsart(en) that best fit the natural language data? What constitutes valid empirical evidence (like linguistic tests) for such a classification schema? (cf. article 12 (Krifka) *Varieties of semantic evidence.*)

3. Tense logic

Aristotelian categories proved to be indispensable for the analyses of the contrast between simple and progressive sentences (cf. article 49 (Portner) *Perfect and progressive*) and stimulated analyses of verb meanings within a formal (model-theoretic) semantics (cf. article 33 (Zimmermann) *Model-theoretic semantics*). The point of departure is Montague's characterization of the progressive in English (see Montague 1973): a progressive sentence is true at a given time *t* if and only if the corresponding non-progressive sentence is true at every moment throughout some open interval around *t* (see also Montague 1968; Scott 1970). This, however, fails to give us the right results for Kenny's (1963) entailment test (Section 2.1): namely, it wrongly predicts that *Jones is walking to Rome* entails *Jones has walked to Rome*, and from *Jones is walking* we can conclude *Jones has walked* just in case additional temporal and pragmatic assumptions about evaluation times are made. These problems stem from the Priorian tense logic presupposed by *PTQ*, in which sentences (under a given interpretation) are true at a moment of time. While this treatment is suitable for sentences with state predicates (*John has long arms, John is drunk*) or with punctual predicates (*The rock hit the window*), it fails for sentences like *John builds a house*, because it makes no sense to speak of their truth or falsity at a single moment of time.

   Such observations led Bennett & Partee (1972) to revise tense logic by taking the notion of a true sentence at an interval of time as basic, which marks the inception of INTERVAL SEMANTICS as a new branch of tense logic (cf. article 57 (Ogihara) *Tense*). In order to improve on *PTQ*'s analysis of the progressive, they propose an INTERVAL-WITHIN-A-SUPERINTERVAL characterization: A progressive sentence is true at an interval *I* if and only if *I* is a moment of time, and there exists an interval *I'* which contains *I*, and *I* is not an endpoint for *I'*, and the non-progressive form of the sentence is true at *I'*. The semantic difference between VPs like *walk to Rome* and *walk*, which gives rise to different entailments when they are used in the progressive, is characterized in terms of part-whole relations that structure intervals at which they are evaluated. (This idea foreshadows mereologically-based analyses of Aristotelian aspectual classes in event semantics in the 1980s.) *Walk to Rome* belongs to the class of NONSUBIN-TERVAL VPs: "If it took an hour to walk to Rome, one did not walk to Rome within the first thirty minutes of the hour" (Bennett & Partee 1972: 72). *Walk* falls under SUBIN-TERVAL VPs that "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''* (Bennett & Partee 1972: 72). Now, given that *walk to Rome* is nonsubinterval, and given that the progressive sentence does not require for its truth at *I* that there be any complete (past) interval at which the non-progressive sentence is true (in contrast to *PTQ*), it follows that *Jones is walking to Rome* does *not* entail *Jones has walked to Rome*. While this is the right result, the interval-within-a-superinterval analysis also requires that the conditions for the truth of *Jones is walking to Rome* state that Jones must reach Rome at some time in the future. This requirement is too strong, because *Jones is walking to Rome* is true and can be felicitously uttered, even if Jones only covers a part of the path leading to Rome and never reaches Rome. This problem became known as the 'imperfective paradox' (see Dowty 1977) or the 'partitive puzzle' (see Bach 1986), and its solution is still sought by linguists and philosophers alike (see Parsons 1990; Landman 1992; Portner 1998; Higginbotham 2004, among

others) (cf. article 49 (Portner) *Perfect and progressive*). When it comes to subinterval VPs in the progressive like *walk* in *Jones is walking*, the interval-within-a-superinterval analysis faces the following problem, observed by Taylor (1977: 218) and Bach (1981: 71): namely, it requires that the property of walking hold for the referent of *Jones* at all the single moments within some larger interval of walking, including its very first moment. This requirement is too strong, because what intuitively qualifies as walking takes up a subinterval larger than a single moment of time, i.e., a non-progressive sentence like *John has walked* is only true at certain sufficiently large proper subintervals of *Jones is walking*, and what they are requires appeal to pragmatics (see also Taylor 1977: 218). But this means that the inference of *John has walked* from *Jones is walking* has the status of a pragmatic inference, rather than of a semantically (logically) valid entailment.

Throughout the 1970s and the 1980s, analyses within interval semantics led to significant advances in the study of aspectual classes and their interaction with tense, grammatical aspect and adverbial phrases (van Benthem 1983; Dowty 1979, 1982; Heny 1982; Moens & Steedman 1988; Richards 1982; Rohrer 1980). This work sharpened our understanding of the explanatory depth of the analyses of verb meanings based on properties of intervals and moments of time, and what is more, it also uncovered the limits of such analyses. The problems related to a purely tense-logical characterization of Aristotelian classes led Taylor (1977) to proposing a new research program for their study grounded in space-time analogies. Taylor (1977) presupposes an interval-based semantics, just like Bennett & Partee (1972), but cites Dowty (1977) as the relevant previous work. His main goal is to provide an analysis of Aristotelian classes, namely, *state, energeia* and *kinêsis*, which he characterizes in terms of temporal meaning postulates (see Dowty 1979: 166ff for a summary), and their differential interactions with the progressive. Its main function, according to Taylor (1977: 206), is to distinguish a particular time, typically a moment, within a larger interval in which the corresponding non-progressive sentence would be true. This distinction is irrelevant for sentences that contain state predicates like *be hirsute* or *know French*, because they hold for their arguments at *any single* moment within larger intervals at which they are true. Consequently, combined with the progressive they are odd or ungrammatical, because the progressive contributes a meaning component that is not informative. Making it possible for a sentence to hold true at single moments of time is the key temporal property of state predicates setting them apart from all non-states. The latter entail a change of state and hence must be evaluated at intervals *larger than a single moment of time*. Intuitively, a change is a transition from one state of affairs to another, and therefore, in order to judge whether a change of state predicate is true of an individual, we need information about the physical state of the world at two distinct moments at least, i.e., at an interval (see e.g., Dowty 1979: 168; Kamp 1980). Since non-state predicates must be evaluated at intervals larger than a moment of time, the progressive contributes a meaning component that is informative and hence their combination is well-formed. Non-state predicates are divided into *energeia* like *walk* (Bennett & Partee's subinterval VPs) and *kinêsis* like *walk to Rome* (Bennett & Partee's nonsubinterval VPs). A purely temporally based delimitation of these two main classes is complicated by their behavior with respect to the subinterval property. While all *kinêsis* verbs are false at all the subintervals of main intervals at which they are true, *energeia* verbs fail to exhibit a uniform behavior with respect to the subinterval property. Some like *fall* or *blush* are true at all the subintervals larger than a moment, but others like *walk* are

true at subintervals that are not only larger than a moment but sufficiently large (see also above). In order to clarify this temporal distinction, Taylor (1977) draws analogies to the spatial properties of objects in the denotation of nouns. *Energeia* verbs like *fall* or *blush* have denotations that pattern with HOMOGENEOUS mass nouns like *gold* in so far as their proper parts are alike. In contrast, the denotations of *energeia* verbs like *walk* pattern with HETEROGENEOUS mass nouns like *fruitcake* in so far as what they describe is divisible only down to certain MINIMAL PROPER PARTS whose size depends on pragmatic factors. To complete the space-time analogy, sentences with *kinêsis* (nonsubinterval) predicates like *walk to Rome* have denotations that are indivisible just like those of sortal nouns like *cat*. In sum then, substances (described by sortal nouns like *cat*) are to stuffs (described by mass nouns like *gold*) like the temporal properties of *kinêsis* (nonsubinterval) predicates (*walk to Rome*) are to (subinterval and homogeneous) *energeia* predicates (*blush*).

Taylor's (1977) space-time analogy has wide-reaching theoretical consequences, since it implies that principles of individuation that apply to the denotations of nouns can be used as the basis for a theory of events, and aspectually relevant properties of verbs can be understood in terms of structural analogies to the meanings of count and mass nouns (cf. article 97 (Doetjes) *Count/mass distinction*). Taylor's (1977) programmatic proposal was also instrumental in a shift from purely temporally-based theories of aspectual classes to mereologically-based ones developed in event semantics starting in the early 1980s (Section 5.1–5.3). At the same time, Taylor's (1977) work is instructive in so far as it brings to the fore the pervasive and subtle difficulties that we encounter when we try to characterize aspectual classes by means of properties that are based in our intuitions how entities are related to their proper parts. For instance, Taylor (1977) uses *stab* as a paradigm example for his *kinêsis* (nonsubinterval) predicates and *table* for sortal count nouns, but both have divisible denotations that may have proper parts describable by *stab* and *table*. (Mourelatos 1978 uses *clock* instead of Taylor's 1977 *table*, which is no less problematic, since there are clocks consisting of smaller clocks.) Such examples are also problematic for subsequent mereologically-based characterizations of count (sortal) nouns and telic predicates based on their intuitive indivisibility: namely, the property of ANTI-SUBDIVISIBILITY proposed by Bach (1981) (Section 5.2) and QUANTIZATION by Krifka (1986) (Section 5.3 and Section 6).

4. Dowty's aspect calculus

Dowty (1979) defines a new framework for a decompositional analysis (cf. article 7 (Engelberg) *Lexical decomposition*, article 17 (Engelberg) *Frameworks of decomposition*) of aspectual classes and a new program for the integration of lexical semantics with a model-theoretic semantics (cf. article 33 (Zimmermann) *Model-theoretic semantics*). Dowty's main thesis is that the temporal properties associated with aspectual classes, as captured in Taylor's (1977) temporal meaning postulates, are grounded in the change of state entailments and their absence in the different classes (Dowty 1979: 167) and in our expectations about the way changes happen over time (Dowty 1979: 185). The implementation of this thesis requires the background of an interval-based semantics and motivates three main aspectual classes, given in Tab. 48.1. namely, states, activities and definite (single/complex) changes of state.

Tab. 48.1: Aspectual classes: Dowty (1979, Chapter 3.8.3 A Revised Verb Classification)

momentary	interval			
no change	no change	change		
		indefinite change	definite change	
Non-Agentive: *be empty; know*	Non-Agentive: *sit, stand, lie*	Non-Agentive: *make noise, roll, rain*	Non-Agentive: *notice, realize, ignite*	Non-Agentive: *flow from x to y, dissolve*
Agentive: (possibly) *be a hero*	Agentive: *sit, stand, lie*	Agentive: *move, laugh, dance*	Agentive: *reach, kill, point out (something to someone)*	Agentive: *build (a house), walk from x to y, walk a mile*
habituals in all classes				
STATES		**ACTIVITIES**	**SINGLE CHANGE OF STATE**	**COMPLEX CHANGE OF STATE**

The aspectual classes are defined by means of formulas of aspect calculus, which provides tools for a decompositional analysis of predicates in general and allows us to represent systematic relations among classes of verbs as well as their shared selectional restrictions and entailments. In formulas of aspect calculus, state predicates are basic elements from which non-state predicates are formed by means of the vocabulary of standard first-order logic and three main abstract predicates: namely, DO (agentivity), BECOME (definite change of state) and CAUSE (causation) (Dowty 1979: 71, 122). Although state predicates are taken to be 'aspectually simple and unproblematic' (Dowty 1979: 71), Dowty's difficulties with fitting them into appropriate aspectual classes reveal that their semantic and ontological status is significantly more puzzling than that of most non-state predicates, and their relation to temporal notions is often unclear (see also Bach 1981; Carlson 1977; Chierchia 1995; Comrie 1976; Fernald 2000, for example). Following suggestions in Taylor (1977) and Carlson (1977), Dowty (1979: 184) settles on the main distinction between *momentary states* vs. *interval states*, using the compatibility with the progressive construction as the main diagnostic test. *Momentary state* predicates are incompatible with the progressive, because they are true at single moments of time (see Taylor 1977 in Section 3). *Interval state* predicates, which correspond to Carlson's (1977) STAGE-LEVEL state predicates (cf. article 47 (Carlson) *Genericity*), freely occur in the progressive, because they have truth conditions involving intervals (Dowty 1979: 176, also Section 3 above), which in turn follows from the fact that they describe temporary (i.e., changeable) properties of individuals (Dowty 1979: 177ff).

Non-state predicates fall into two main classes, depending on the type of change they entail. One class comprises predicates that entail an INDEFINITE CHANGE of state (see Dowty 1979: 169ff) like *move*, for instance, since *any* change of location it describes qualifies as a situation of moving. Among other examples are *push a cart, raise the thermostat, dim the lights* (Dowty 1991: 568). The other class comprises predicates that entail a DEFINITE CHANGE of state. A paradigm example is *reach*, since only a change with respect to a definite location, specified by its object, will qualify as a situation described by *reach*. The entailment of a 'definite change of state' is represented by

means of a one-place predicate BECOMEϕ which is true at a (minimal) time interval *t* at whose initial bound $\neg\phi$ holds and at whose final bound ϕ holds (Dowty 1979: 140ff), where ϕ is a state (outcome, result) or an activity sentence (Dowty 1979: 124–125). The semantics of BECOME is inspired by von Wright's (1963, 1968) notion of a 'change of state' (Dowty 1979: 74ff) and Kenny's (1963) performances (Dowty 1979: 77–78), which entail the bringing about of a state or an activity (Section 2.1). Definite change of state predicates are divided into SINGLE DEFINITE CHANGES OF STATE (inchoatives, Dowty's achievements) and COMPLEX DEFINITE CHANGES OF STATE (causatives, Dowty's accomplishments) (Dowty 1979: 184). These two subclasses are derivationally related building on the analysis of the inchoative/causative alternation in Generative Semantics (Lakoff 1965; Gruber 1967): namely, single definite change of state predicates (3b) are derived from basic state predicates (3a) by means of BECOME, and they in turn serve as arguments of the CAUSE predicate (3c) in the derivation of complex definite change of state predicates.

(3) a. The room was empty.   **empty'**(room)
     b. The room emptied by 11pm.   BECOME **empty'**(room)
     c. John emptied the room.   [John does something] CAUSE [BECOME
                                          empty'(room)]

CAUSE is treated as a bisentential operator, [ϕ CAUSE Ψ], following Vendler (1967), Geis (1970), McCawley (1971), among others (Dowty 1972, 1979: 71, 91, 122). DO (Ross 1972) is intended to represent agentivity, but many agentive ACTIVITY verbs correspond to primitive non-logical predicate constants, which has the drawback that they are representationally indistinguishable from basic states in Dowty's aspect calculus. This inconsistency in the application of DO is somewhat attenuated by the fact that each aspectual class is split into an agentive and a non-agentive subclass, as Tab. 48.1 shows, with the net effect that agentivity is dissociated from aspectual classes. In the 1970's the idea that agentivity has a different status from the properties that cross-classify aspectual classes became established also in other aspect classifications (see e.g., Comrie 1976; Mourelatos 1978; also Section 5.1 below) and today it is accepted across a wide range of theoretical frameworks.

Given that agentivity, represented by DO, is orthogonal to aspectual classes, BECOME and CAUSE are the key components in Dowty's aspect calculus. They stimulated some of the most fruitful debates regarding Dowty's decompositional analysis with respect to aspectual classes and also other parts of the grammar of natural languages (cf. article 17 (Engelberg) *Frameworks of decomposition*). They tend to revolve around three main issues. First, what is controversial is the logical status of BECOME and CAUSE as sentential operators and the kinds of arguments they take. Dowty (1979) defines CAUSE as a bisentential operator, but the majority of subsequent proposals (Chierchia 2004; Levin & Rappaport Hovav 1998; Parsons 1990; von Stechow 1995, to name just a few) assume a bievent structure of causatives (already proposed by Davidson 1967; Miller & Johnson-Laird 1976; Schank 1973). As Parsons (1990: 108–109) observes, it is counterintuitive to analyze what is caused as a proposition instead of an event; moreover, there is little evidence for CAUSE to function as an operator taking scope over sentences, because it does not interact with other scope bearing operators, such as quantifiers, nor does it create opacity. Similar objections can be raised against Dowty's treatment of BECOME.

Second, what is not well understood and agreed upon is the relation of BECOME and CAUSE to each other and how they combine with other meaning components in the logical representation of predicates to yield aspectual classes and also finer-grained semantically coherent lexical classes of verbs. In current aspect studies, the notion of a 'definite change of state' represented by BECOME is identified with the core of telicity, namely with its inchoativity or transition component (see e.g., Pustejovsky 1991; Tenny & Pustejovsky 2000). Hence, the mutual independence of BECOME and CAUSE in the aspect calculus can be taken as implying a strong claim about the separation of telicity from causation in the organization of lexical semantic information, and at the level of sentential semantics. However, Dowty (1979) does not take this implication to its logical conclusion, because he uniformly analyzes accomplishments as causatives (Dowty 1979: 124–125, Chapter 3.8.3, and elsewhere), which is unjustified (see below). Third, there is no unanimity concerning the empirical domain of application of BECOME, which is shared by accomplishments and achievements, and no agreement on what constitutes empirical evidence for treating a predicate as causative, cross-linguistically and in a particular language (Alexiadou, Anagnostopoulou & Everaert 2004). It is, therefore, unsurprising that the nature of accomplishments and achievements as well as that of their superordinate category of telicity have been subjected to different interpretations and revisions since Dowty's (1979) original proposal, with the result that the boundary of a set of telic predicates and the line between accomplishments and achievements have been in a constant flux. It is worth mentioning that Dowty (1991) appears to extend the causative analysis to certain achievement verbs, which are not causative in his 1979 work, when he characterizes verbs like *emerge, submerge, deflate, bloom, vaporize* and *decompose* as "achievement verbs which entail a complex rather than simple change of state" (Dowty 1991: 571, n.15). They constitute a subclass of unaccusatives (Rosen 1984), which as a whole class are taken to be causative, according to Chierchia (2004) and Pustejovsky (1995), among others. Reanalyses of classes of verbs as causatives, as we see in Dowty's (1979, 1991) work, are not uncommon, and the adequacy of existing proposals is best judged in connection with the insights gained in the research on causation in closely related fields of cognitive science, most importantly in philosophy and psycholinguistics.

Within the three main areas outlined above, two particular issues bear closer examination: namely, Dowty's uniform treatment of accomplishments as causatives and the notion of a 'definite change of state' represented by BECOMEϕ. In treating accomplishments as causatives, Dowty (1979: 183) follows Vendler (1957), but in departure from Vendler Dowty (1979) takes causation to be the single most important meaning component separating accomplishments from achievements, while agentivity and temporal extent are irrelevant (Dowty 1979: 183). Vendler's accomplishments are restricted to agent initiated actions that are temporally extended, and achievements largely correspond to non-agentive punctual occurrences. Dowty's accomplishments are temporally extended (*build a house*) or punctual (*shoot someone dead, break the window*), agentive or non-agentive (e.g, *the collision mashed the fender flat*). Dowty's achievements cut across the agentivity/non-agentivity line (e.g., *notice, kill*, see Dowty 1979: 184), and can be either punctual or nonpunctual (e.g, *melt, freeze,* see van Valin 1990: 223, n.2). Also contrary to Vendler, Dowty (1979: 183) observes that the lack of temporal extent is not necessarily correlated with the lack of agentivity. His examples are *reach the finish line, arrive in Boston*. Notice that both *reach* and *arrive* can freely occur with intentional subject-oriented modifiers: *Susan intentionally arrived in Seoul a few days in advance of*

the conference, *We deliberately reached his doorstep an hour later than the time printed on the gilded invitation.* A uniform treatment of accomplishments as causatives has attained a considerable prominence in contemporary aspect studies (Croft 1991; Erteschik-Shir & Rapoport 2004; Foley & van Valin 1984; Jackendoff 1990: 75, 128, and references therein). We also commonly find decompositional analyses with events as primitive elements, in which directed motion predicates are decomposed into a causing motion event and a caused resultant state of reaching some goal (Croft 1991; Jackendoff 1990: 75, 128; see already Talmy 1972).

However, a uniform causative analysis of accomplishments is fraught with numerous problems, and in what follows, two will be briefly summarized. First, causation is neither a necessary nor a sufficient property of accomplishments. It is not a sufficient property, because there are causatives that are not accomplishments: *The clowns walked the elephants around in a circle for five minutes/#in five minutes.* Neither is causation a necessary property of accomplishments, because there are accomplishments that are not causatives. A case in point is given by directed motion predicates like *John drove a car from Boston to Detroit*, which are analyzed as causatives in Dowty (1972, 1979: 207–213, 216), but which lack the properties of causatives, according to van Valin & LaPolla (1997), Levin & Rappaport Hovav (1999), among others. Second, a uniform causative treatment of accomplishments has undesirable consequences for the analysis of complex predicates like those resulting from aspectual composition (Section 5.3), for instance: *John ate two apples* (accomplishment) vs. *John ate popcorn* (activity). Here, the accomplishment or activity interpretation depends on the quantificational properties of the Incremental Theme argument. From Dowty's (1979) analysis it would seem to follow that only accomplishment, but not activity, complex predicates of this type and possibly also their head verbs should be analyzed as causatives. But this means that it is the quantificational properties of the Incremental Theme argument (which determine the accomplishment interpretation of a whole sentence) that drives the decision whether a given complex predicate and possibly also its head verb are to be analyzed as causative. This is clearly unsatisfying, as Levin (2000) observes, also in the light of the fact that lexical causative verbs like *kill* or *break* are causative in all of their occurrences, and regardless of the quantificational properties of their objects. A causative analysis of verbs of consumption like *eat* is rejected by Higginbotham (2000), Levin (2000), van Valin & LaPolla (1997), to name just a few. These two problems suffice to illustrate that a uniform treatment of accomplishments as causatives is unjustified, and hence causation cannot be viewed as a meaning component that distinguishes between accomplishments and achievements. The idea that causation is dissociated from aspectual classes finds support in early approaches to aspect (see e.g., Bennett & Partee 1972; Garey 1957; Verkuyl 1972; McCawley 1976: 117) that cross-classify aspectual classes without any recourse to causation, and the same holds true of mereologically-based theories (see Sections 5.2–5.3), which emphasize space-time analogies (Section 3 and 5.1) as the basis for a theory of aspectual classes.

Having seen that agentivity (represented by DO) is orthogonal to aspectual classes, as Dowty (1979) proposes, but causation (represented by CAUSE), as well, contrary to Dowty (1979), we are left with BECOME as the only aspectually relevant predicate in Dowty's aspect calculus. As has been observed, the notion of a 'definite change of state' represented by BECOME is now commonly taken to correspond to the inchoativity or transition core of telicity (see e.g., Pustejovsky 1991; Tenny & Pustejovsky 2000). The question then arises whether it is adequate for the representation of all the relevant telicity

phenomena in natural languages. It turns out that it is too narrow, since in BECOMEϕ, ϕ stands for an outcome of a result state or an activity, which excludes a number of telic predicates that cannot be plausibly claimed to entail any such outcome. Among the salient examples are paradigmatic telic predicates consisting of durational adverbials and activity verbs (Bach 1981: 74) like *smile for an hour*. The telicity of such predicates is straighfor-wardly accounted for in approaches to aspect that base their understanding of telic predi-cates on space-time analogies, assimilating them to sortal predicates, as in Taylor (1977) (Section 3), and emphasize the criterial properties of indivisibility (following Taylor 1977, Section 3) or countability (following Mourelatos 1978, Section 5.1). These properties are formalized in mereological approaches to aspect by Bach (1981, 1986) and Krifka (1986, 1992) (Section 5.2–5.3), but they can also be found under a different elaboration in cog-nitive theories like those of Jackendoff (1983, 1990, 1991, 1996) and Talmy (1985), for example. The disparity between the view of telicity based on space-time analogies and the view of telic predicates based on the notion of a definite change of state represented by Dowty's (1979) BECOME can be highlighted by their differential treatment of semelfac-tives (from Latin *semel* 'once', 'a single time' and *factive* related to *factum* 'event', 'occur-rence'). Mourelatos (1978) uses the semelfactive verb *hit* as a paradigm example of a telic (his EVENT) predicate (Section 5.1). It belongs to the class of 'full-cycle resettable' verbs along with *knock, kick, slap, tap, blink, flash*, all of which describe situations that end with the return to the initial state (Talmy 1985). Hence, although it arguably entails a kind of definite change of state, it cannot be analyzed by means of BECOMEϕ, since it entails no resultant state or activity. It may also be mentioned that there is another proposal advo-cated by Smith (1991: 28) who argues that semelfactives neither fit Dowty's four aspectual classes nor are they telic, but instead ought to be treated as an atelic aspectual class *sui generis*. In sum, although the notion of telicity grounded in Dowty's (1979) BECOME is widespread, it represents just one among other valid intuitions about the nature of telicity. It is one of major current challenges in aspect studies to reconcile such disparate proposals in a comprehensive account of telicity.

The independence of BECOME in the aspect calculus also raises the question whether there is an independent level of logical (or lexical conceptual) representation based on the notion of a 'change of state' captured by BECOME, i.e., whether it is clearly distinct from other kinds of representation, and if so, what its properties are and how exactly they interact with properties of other types of representation of natural languages. (cf. article 19 (Levin & Rappaport Hovav) *Lexical Conceptual Structure*, article 30 (Jackendoff) *Conceptual Semantics*). Crucial empirical evidence for distinguishing among different proposals for logical-conceptual decompositions (cf. article 17 (Engelberg) *Frameworks of decomposition*) bearing on this issue and for evaluating their empirical predictions is to be sought in the cross-linguistic comparison of lexicalization patterns (cf. article 19 (Levin & Rappaport Hovav) *Lexical Conceptual Structure*, article 27 (Talmy) *Cognitive Semantics*).

5. Event semantics

5.1. Events in linguistics and philosophy

Event semantics rose to prominence in the late 1970s and the early 1980s when Davidson's (1967) analysis of action sentences led to adding of events, used as discourse referents,

into the analysis of temporal structure at the discourse level within the Discourse Representation Theory (Kamp 1979; Kamp & Rohrer 1983) (cf. article 37 (Kamp & Reyle) *Discourse Representation Theory*). This stimulated a revived interest in Reichenbach's (1947) theory of tense and temporal anaphora (Partee 1984), with new connections to aspectual classes (Hinrichs 1986) as well as to dynamic semantic theories starting in the early 1990's (Kamp & Reyle 1993; ter Meulen 1995) (cf. article 38 (Dekker) *Dynamic semantics*).

On Davidson's account, action sentences involve implicit reference to and quantification over events (see also Ramsey 1927: 37). Any *n*-place action verb (e.g., *butter* in (4a)) is represented by (*n*+1)-place predicates (4b), where the extra argument *e* is a singular term for an *event*, treated as a first-order variable of existential quantification. This implies that action sentences are indefinite descriptions of events. Davidsonian events constitute a basic ontological category along with ordinary objects, and are understood as particulars (particular datable occurrences that occur at a specific place and time), rather than universals (entities that can recur at different places and times), as in Montague (1974).

(4) a. *Jones buttered the toast with a knife.*
     b. $\exists e[\text{BUTTER}(\text{Jones}, \text{toast}, e) \wedge \text{WITH}(\text{knife}, e)]$
     c. $\exists e[\text{BUTTER}(e) \wedge \text{AGENT}(\text{Jones}, e) \wedge \text{THEME}(\text{toast}, e) \wedge \text{WITH}(\text{knife}, e)]$

In event-based analyses of linguistic phenomena (cf. article 34 (Maienborn) *Event semantics*), Davidson's (1967) original proposal underwent substantial modifications and extensions. (See Partee 2000 for differences in the understanding of events in linguistics and philosophy.) Within the Neo-Davidsonian theory (a term coined by Dowty 1989; see Dowty 1991: 553, n.7), and following Castañeda (1967), Parsons (1980) and Higginbotham (1983) propose to treat arguments in the same way as Davidson's (1967) adjuncts, i.e., as separate two-place predicates added conjunctively to the verb (4c). On this view, verbs are one-place predicates of events and their arguments two-place relations between participants and events, which are characterized as thematic relations in Parsons (1980).

A widening of ontological commitments beyond Davidson's view of events as changes in objects induced by agents raised questions whether an event argument is to be associated with every verbal predicate, including state predicates. Kratzer (1988/1995) argues that only stage-level predicates (in the sense of Carlson 1977) have an event argument (her situation argument). On another prominent view due to Higginbotham (1985, 2000), every predicate head of *V, N, A*, and *P* category in the *X*-bar system has an event argument, and introduces an explicit reference to the event argument as part of the word meaning. Davidson's analysis of action sentences is extended to all sentences in Bach (1981, 1986), and Parsons (1990) follows suit. Similarly as Mourelatos (1978), Bach uses the classification into STATES, PROCESSES and EVENTS (originally used in Comrie 1976: 13, 48–51; see Mourelatos 1978, n. 23) for which Bach (1981: 69) coins the cover term 'eventualities', since the term EVENT predications is reserved for telic predications only.

(5) STATES: *The air smells of jasmine.*   (Mourelatos 1978: 201)
     PROCESSES: *It's snowing.*
     EVENTS: (i)   Developments: *The sun went down.*
                        (ii) Punctual Occurrences: *The pebble hit the water.*

In an explicit departure from Vendler (1957) and Kenny (1963) (Section 2.1), Mourelatos (1978) separates aspectual classes from agentivity, and implicitly from causation, in contrast to Dowty (1979) (Section 4). Following Taylor's (1977) proposal (Section 3), among others, Mourelatos (1978) motivates the properties of aspectual classes mainly with recourse to the analogy 'mass : count = process/state : event'. Telic predicates (his EVENT predicates) describe situations that "fall under SORTS that provide a PRINCIPLE of count" (Mourelatos 1978: 209) and "can be directly or intrinsically counted" (Mourelatos 1978: 209). This semantic and ontological claim is supported by linguistic tests. (Mourelatos' strategy of supporting ontological categories by means of linguistic categories and tests is criticized by Gill 1993, who defends an autonomous metaphysical theory.) Only telic predicates are straightforwardly compatible with cardinal count adverbials, as in *fall asleep three times*. They are also realized in count-quantified existential constructions: *Vesuvius erupted three times* → *There were three eruptions of Vesuvius*. Atelic predicates cannot be combined with cardinal count adverbials, unless they first shift to telic interpretations, as in *run (*)three times*, and they are realized in mass-quantified existential constructions: *Onlookers shoved and screamed* → *There was shoving and screaming*. Apart from its interaction with quantification in natural language (cf. article 43 (Keenan) *Quantifiers*), the direct structural analogy between individuals and event(ualitie)s is manifested in other linguistic phenomena, for instance in the domain of syntax and semantics of anaphora and reference, which can be taken to support Davidson's idea that events, similarly as individuals do, may often serve as referents of linguistic expressions in a semantic model (but see ter Meulen 2000 for differences between events and individuals in this regard).

5.2. Mereology and event semantics with lattice structures

In event semantics, the analogy 'mass : count = process : event', whose origins are in Taylor (1977) (Section 3) and Mourelatos (1978) (Section 5.1), is formalized by means of the algebraic device of a complete join semilattice that serves as the cornerstone for much of the research that takes events as basic entities in the domain of discourse. Bach (1981) lays the mereological foundation for this program, and Bach (1986) extends Link's (1983) lattice-theoretic semantics of plurals and mass terms to the domain of eventualities (cf. article 46 (Lasersohn) *Mass nouns and plurals*). The mereological approach assumes the basic binary relation *part-of* '≤' defined from the *sum* '⊕' operation for forming 'sum individuals' or 'plural individuals' (Link 1983; Sharvy 1980). In Link (1983), the denotation of count nouns, their singular (*boy*) and plural forms (*boys*), contains subdomains structured by join semilattices. In a domain with three boys, John, Bill and Tom, the singular form *boy* has as its denotation the set consisting of these three atomic individuals. The denotation of the plural form *boys* are the four non-atomic elements (on a 'strict plural' interpretation), including, for instance, the plural/sum individual *John⊕Bill*, i.e., John and Bill taken together. (There are also uses of plural nouns that have the entire semilattice as denotation, including its atomic elements.) The denotation of mass nouns (*coffee*) has the form of a non-atomic join semilattice. In the domain of eventualities, as Bach (1986) proposes, the denotation of EVENT (telic) verbs like *arrive* has the structure of an atomic join semilattice, while the denotation of PROCESS (atelic) verbs like *swim* has the form of a non-atomic join semilattice. Mass nouns and process predicates also share the property of ADDITIVITY. For instance, if *x* is some quantity of water, and

y also, then their mereological sum $x \oplus y$ is describable by *water*; if *e* falls under *run* and *e'* also, then $e \oplus e'$ is their sum describable by *run*. Count (sortal) nouns like *cat* and EVENT predicates like *build a cabin* have the property of ANTISUBDIVISIBILITY, because what they describe has no proper parts that are describable by *cat* and *build a cabin*.

Bach's event semantics with lattice structures straightforwardly motivates the cross-categorial constraints on the occurrence of quantifiers, observed by Mourelatos (1978) (Section 5.1): namely, some (e.g., *much*) have interpretations that restrict their application to the non-atomic domain of mass/process predicates: *much wine*, *he did not sleep much*. Others (e.g., *many, three*) operate over the domain of count/event predicates that is necessarily atomic: *many/three books; he arrived many/three times*. In subsequent research, such parallels in cross-categorial quantificational constraints are discussed in connection with the hypothesis that natural languages have two main types of quantificational ontology (Bach et al. 1995): quantification over individuals paradigmatically expressed by determiners like *three* (D-quantification) and quantification over events often expressed by adverbials like *three times* (A-quantification).

Second, event semantics with lattice structures allows us to motivate a parallel between the 'imperfective paradox' (Dowty 1977, 1979) and the 'partitive puzzle' posed by the nominal *part of* construction (Bach 1986). For example, *This is part of Mozart's Requiem* can be true and felicitously uttered, even if the requiem never existed or will exist in its entirety. Similarly, *Mozart was composing the Requiem when he died* is true, even if its non-progressive counterpart *Mozart composed the Requiem* is false. The unifying requirement is that there be a (whole) *P* to which some *x* or *e* stands in a *part-of* relation (Bach 1986: 12), which Krifka (1992: 47) formalizes as follows: PART = $\lambda P \lambda x' \exists x [P(x) \wedge x' \leq x]$ and PROG = $\lambda P \lambda e' \exists e [P(e) \wedge e' \leq e]$.

Third, cross-categorial parallels in shifting operations are generalized in terms of a many-to-one function (homomorphism) from count to non-count and also EVENT to PROCESS meanings. This amounts to an intriguing asymmetry in shifting operations, which has remained understudied. Count to non-count shifts and the parallel EVENT (telic) to PROCESS (atelic) shifts, as in *Much missionary was eaten at the festival* (by "Universal Grinder", see Pelletier 1975, following Lewis' suggestion) and *John ate the sandwich bit by bit for an hour, but still didn't finish it*, are predictable, nearly unrestricted, since they can be understood as removing the criterion of individuation inherent in count/EVENT (telic) predicates, and hence they do not require much effort on the part of the interpreter. In contrast, the opposite shifts, non-count to count and PROCESS to EVENT, are much less systematic and require a considerable effort on an interpreter's part. Such shifts are common with nouns denoting foodstuffs bundled via "Universal Packager" (Bach 1986) into (conventional) PORTIONS, as in *After two beers he began to feel better,* or into KINDS, as in *He prefers Tuscan wines*. Almost any PROCESS (atelic) predicate can shift into an EVENT (telic) interpretation, as in *John ran* [e.g., a certain distance] *in an hour*, but this shift presupposes what is often a rather complex process identification of the requisite criterion of individuation for EVENT-hood in dependence on the linguistic and extra-linguistic context (cf. article 25 (de Swart) *Mismatches and coercion*).

5.3. The mereological approach to aspectual composition

There are two main observations that any adequate theory of aspectual composition must explain. First, the count/mass distinction (cf. article 97 (Doetjes) *Count/mass*

distinction) and quantificational properties (cf. article 43 (Keenan) *Quantifiers*) of nominal arguments systematically influence the (a)telicity of complex predicates. For example, as Garey (1957) observes, *he played a Beethoven sonata* is telic, i.e., it "designates something that has a structure with a temporal ending to it" (Garey 1957: 107), because its direct object is a count term. In contrast, *he played a little Beethoven* with a mass object is atelic. Second, such systematic effects of nominal arguments on the (a)telicity of complex predicates depend on how the participants associated with them function in described eventualities, and hence on our knowledge that is lexical and pragmatic in nature. Implicitly, this idea is already present in Jacobsohn's (1933: 297) proposal that verbs like 'build' with *accusativus effectivus* (6a), i.e, 'accusative of creation', occur in telic (his 'perfective') predicates, while verbs like 'beat' with *accusative affectivus* (6b) in atelic (his 'imperfective') predicates. Although both (6a) and (6b) contain a singular count direct object in the accusative case, only (6a) is telic, but (6b) is atelic. Intuitively, this difference stems from the observation that an extent of an object of creation delimits the (temporal) extent of an event during which it comes into existence. In contrast, the extent of an object whose surface is affected by contact with another object, but does not necessarily change as a result of it, does not delimit an event of surface contact.

(6)   a.   Die Maurer bauten das Haus.   b.   Der Mann schlug den Hund.   German

the bricklayers built the. ACC house. ACC

the man beat the. ACC dog. ACC

'The bricklayers built the house.'

'The man beat the dog.'

The second observation clearly points to the meaning of verbs as the key m[...] factor of aspectual composition, and it drives Krifka's (1986, 1992, 1998), a[...] quently also Dowty's (1987, 1989, 1991), mereologically-based theories of [...] composition. They propose that it depends on a particular thematic property, namely, an Incremental Theme (cf. article 18 (Davis) *Thematic roles*), which is an entailment of certain episodic verbs and defined in terms of a homomorphism between the lattice structure (part structure) associated with the Incremental Theme argument and the lattice structure associated with the event argument. (The term 'Incremental Theme' was coined by Dowty (1987) and replaced Krifka's (1986, 1992) 'gradual Patient' or 'successive Patient'.) The most robust aspectual composition effects are triggered by verbs that are *strictly incremental* (Krifka 1998). The paradigm examples are verbs of creation (*build, write*), consumption (*eat, drink*) and destruction (*destroy, burn*). Intuitively, their Theme argument refers to an object that undergoes a permanent change of state in its physical extent/volume, as it gradually comes into existence or disappears during the course of an event.

Traditionally, the phenomena falling under the aspectual composition are understood as manifestations of a 'semantic concord' (Leech 1969: 137) with respect to the [±countable] feature of nominal and verbal predicates (Mourelatos 1978: 204; Verkuyl 1972; Platzack 1979) (cf. article 16 (Bierwisch) *Semantic features and primes*). In order to capture this insight, Krifka (1986 and elsewhere) defines two cross-categorial mereological properties over the atomic and non-atomic lattice structures for objects and eventualities

(see Link 1983, 1987; Bach 1986, Section 5.2). One is cumulativity, defined in (7a), which formalizes Quine's (1960: 91) cumulative reference and Bach's (1981) additivity (Section 5.2). The other is quantization, which corresponds to Bach's (1981) antisubdivisibility (Section 5.2) and is defined in (7b): A predicate *P* is quantized if and only if no entity that is *P* can be a subpart of another entity that is *P*.

(7) a. $CM(P) \leftrightarrow \forall x,y[P(x) \land P(y) \rightarrow P(x \oplus y)] \land \exists x,y[P(x) \land P(y) \land \neg x = y]$

soup, apples

   b. $QUA(P) \leftrightarrow \forall x,y[P(x) \land P(y) \rightarrow \neg y < x]$

an apple, two apples, a bowl of soup/apples

Quantized predicates are atomic like *apple* or apply to entities that consist of atoms like *three apples* (Krifka 1998). Quantized predicates also apply to measured quantities expressed by measure phrases like *a bowl of soup/apples, a liter of wine*. They are derived from cumulative predicates (e.g., *soup, wine, apples*) by means of extensive measure functions expressed by words for standard measures like *liter* or words for non-standard measures derived from containers like *bowl*. All quantized verbal predicates are telic, but not vice versa (Krifka 1998).

With this apparatus in place, the homomorphism entailment straightforwardly motivates the aspectual composition: namely, an incremental verb composed with a quantized Incremental Theme argument yields a quantized verbal predicate, and with a cumulative Incremental Theme argument a cumulative predicate, provided the resultant combination is understood as referring to a singular eventuality. The homomorphism entailment motivates not only which verb-argument combinations must obey aspectual composition, but also which are exempt from it like *beat the dog* (6b) or *push a cart*, for instance. Since *beat* and *push* do not lexically specify an incremental relation, their Theme argument *on its own* has no effect on the (a)telicity of its predication. For instance, even if it is count like *the dog* or *a cart*, it does not enforce the telicity of its predication.

The distinct advantage of Krifka's (1986 and elsewhere) proposal is that the aspectual composition directly follows from the standard semantic composition of a sentence. Moreover, the homomorphism entailment also motivates the cross-linguistic variation in the encoding of telicity. In Krifka's theory, its counterpart in the grammar of natural languages guarantees the 'transfer' of the quantization and cumulativity properties between the semilattices of objects and eventualities, and since a homomorphism generally preserves the inverse map, the 'transfer' works in both directions between the semilattices. Hypothesizing that the two semantic properties of quantization and cumulativity are universally available, Krifka proposes that the encoding of telicity is a function of their overt expression either by a nominal predicate operator on the Incremental Theme argument (e.g., Germanic languages) whose denotational domain are objects, or by a verbal predicate operator applied to the incremental verb (e.g., Slavic languages, Hindi, Chinese) whose domain are eventualities. Incremental Theme operators are determiner quantifiers, measure expressions, case inflection, prepositions or morphological exponents of the grammatical category of number, which interact with the lexical count vs. mass distinction. Common verbal predicate operators are affixes and particles. Natural languages can be divided into two main classes depending on which of the two main strategies they employ as their dominant encoding strategy.

6. Current trends

Semantic and pragmatic theories of aspectual classes and Aktionsart share two main theoretical assumptions. First, the meaning of verbs is the key motivating factor for a variety of (a)telicity phenomena. Second, events in the denotation of telic (accomplishment) predicates are delimited with respect to (measured) objects related to them, which presupposes that there is a systematic relation between events and the relevant (measured) objects. (See also Davidson's 1969 independent idea that events are often described and identified in terms of the objects to which they are 'in one way or another' related.) Consequently, telicity is generally viewed as yet another phenomenon in the grammar of natural languages that exploits systematic parallels between the ontological structure of event(ualitie)s and objects.

Three main types of object dimensions are distinguished with respect to which events can be delimited (see e.g., Tenny 1987, 1994; Ramchand 1997; Rappaport Hovav 2008, and references therein): (i) the extent/volume of an object (e.g., *John ate an apple*), (ii) the length of a path in physical space (e.g., *John drove from Boston to Chicago*), (iii) some other property of an object that can be measured on a scale (e.g., temperature, as in *The soup cooled*).

We may distinguish recent aspect theories according to which of these three object dimensions they emphasize in their theory formation. In (Neo-)Davidsonian event semantics (Section 5.1), it is largely driven by the phenomenon of aspectual composition, which ontologically presupposes that events are delimited with respect to the extent/volume of objects (Section 5.3). The path is the basic concept unifying a variety of telicity phenomena in the theories that are, to various degrees and often only implicitly, aligned with the tradition of Localism (Gruber 1965; Jackendoff 1972, 1983, 1990, 1996, and references therein). A paradigmatic example is the Conceptual Semantics approach to telicity by Jackendoff (1996) (cf. article 30 (Jackendoff) *Conceptual Semantics*). Assuming that our intuitions about the delimitation of events are the clearest for sentences with motion verbs (Jackendoff 1996: 315), their telic interpretations are derived when the path has an explicit endpoint (e.g., *Bill floated into the cave *for hours*) and atelic interpretations when it lacks such an endpoint (e.g., *Bill floated down the river for hours*). The elements of conceptual structure that represent changes of Themes in their physical location and coming to be in/at a location on a path serve to model all other changes of state of Themes/Patients, including those that are measured by degrees on a property scale. For instance, in telic property resultatives, as in *Willy watered/made/ got the plants flat*, the Theme/Patient argument (here *the plants*) comes to be in the final state expressed by the resultative phrase (here *flat*). 'Path-based' approaches to telicity predominate in conceptual and cognitive frameworks (cf. article 27 (Talmy) *Cognitive Semantics*, article 30 (Jackendoff) *Conceptual Semantics*) and they generally assume some metaphoric or analogical extension mechanism(s) from the spatial domain to other domains (cf. article 26 (Tyler & Takahashi) *Metaphors and metonymies*), which have received empirical support from psycholinguistic studies on analogical reasoning strategies (cf. article 109 (Landau) *Space in semantics and cognition*). The notion of a generalized path for modeling changes in a variety of event dimensions is also used in formal and model-theoretic approaches to aspect, as in Krifka (1998), Gawron (2005), Zwarts (2008), among others. The notion of a scale as the main explanatory mechanism for (a)telicity phenomena has been gaining prominence since Hay, Kennedy &

Levin (1999) (see e.g., Beavers 2008; Filip 2008; Kearns 2007; Kennedy & Levin 2008; Rappaport Hovav 2008, and references therein). Scalar approaches to telicity are best developed for 'degree achievements' (in the sense of Dowty 1979). They are derived from gradable adjectives like *cool* or *darken* that lexicalize a scale measuring a property predicated of the referent of their Theme argument. All sentences with degree achievements (DAs) allow atelic interpretations. Telic interpretations are enforced by overt expressions of the difference value (Kennedy & Levin 2008) in the relevant property change, as in *The soup cooled (by) 17 degrees in 30 minutes/*for 30 minutes*, where it is expressed by the measure phrase *17 degrees*. If the difference value is not expressed, the main challenge is to specify the semantic conditions and pragmatic factors (especially related to scalar implicatures) (cf. article 87 (Chierchia, Fox & Spector) *Grammatical view of scalar implicatures*) leading to telic (accomplishment) interpretations, given that they are favored by DAs lexicalizing closed scales like *darken*, as in *The sky darkened (in/for an hour)*, but resisted by certain DAs that lexicalize open scales like *widen*, as in *The gap widened (in/for ten minutes)*, which may only have an achievement interpretation with *in NP* temporal adverbials (Section 2.1) and are odd with endpoint-oriented modifications like *completely*, as in #*The gap widened completely in 90 seconds* (Kearns 2007).

While different theoretical approaches to aspect vary with respect to what constitutes the relevant 'measuring rod' for events (borrowing Kratzer's 2004 term), they all agree that it must be systematically related to events it delimits. There have been a variety of such object-event mapping relations proposed, including a homomorphism (Krifka 1986, 1992), also referred to as 'incremental relations' or 'incrementality' (Krifka 1998), the 'ADD TO' relation (Verkuyl 1972, 1989, 1993), the 'measuring out' relation captured by the telic MEASURE aspectual role (Tenny 1987, 1994), and 'structure-preserving binding relations' (Jackendoff 1996), to name just the most cited ones. Disagreements concern two main issues: (i) the relation of such mapping relations to telicity, and (ii) their source, namely, in particular the extent to which they are determined by the lexical properties of verbs, their context of use or by pragmatic factors, and if they are a lexical property of verbs, what effects, if any, they have on argument selection (cf. article 83 (Pesetsky) *Argument structure*).

As far as the first issue is concerned, in most semantic and pragmatic theories, telicity and the relevant mapping relations are fully independent of each other, as is suggested in the original proposal in mereologically-based theories (Section 5.3, Dowty 1991; Filip 1989, 1993, inter alia). Incrementality is not necessary for telicity, because there are telic verbs that are not incremental like *hit* (Section 5.1), neither is it sufficient for telicity, because there are incremental predicates that are atelic like *eat apples/soup*. Consequently, incremental verbs like *eat*, which can head either telic (accomplishment) or atelic (activity) predications, are unspecified for telicity. In contrast, in syntactically-based theories of aspect, incrementality and telicity are conflated in a single representational device, as in the telic MEASURE aspectual role in Tenny (1987, 1994) or the denotation of the inflectional head feature *[telic]* in Kratzer (2004).

Regarding the second main issue, the idea that verbs are lexically specified for object-event mapping relations was defended early on in the syntactic theories like Verkuyl's (1972 and also his later work). Subsequently, this idea enters the formulation of the *Aspectual Interface Hypothesis* by Tenny (1987, 1994), on which certain episodic verbs are specified for the telic MEASURE aspectual role, which generalizes over Themes of

changes of state and Themes of changes of location in the lexical conceptual structure. The telic MEASURE aspectual role is uniformly linked to the (internal) direct object in the deep structure, which amounts to the claim that argument selection is both lexically and aspectually driven. The systematic telicity-direct object link is also the cornerstone of current syntactic theories of aspect. It motivates not only the licensing of telicity by a dedicated functional projection above the VP, but also the independence of telicity from verb meaning (e.g., see Borer 2005; Kratzer 2004; Travis 1991; Verkuyl, de Swart & van Hout 2005, and references therein), in departure from Tenny's Hypothesis. Aspectual phenomena are motivated by the syntactic telicity-direct object link, which in turn is exploited to determine argument selection. Hence, both aspect/telicity and argument selection are severed from the lexical semantics of verbs.

Current semantic and pragmatic theories of aspect are unified by the agreement that neither incrementality nor telicity are systematically linked to the direct object or due to a specific syntactic projection (see e.g., Ackerman & Moore 2001; Filip 1993, Jackendoff 1996; Rappaport Hovav & Levin 2005, and references therein). The main disagreements amongst them concern the claim that incremental relations are a lexical property of verbs, proposed by Krifka (1986, 1992) and integrated into Dowty's (1987, 1991) theory of thematic proto-roles and argument selection. On Dowty's view, they define the Incremental Theme property, one among other verbal entailments in the cluster concept of Proto-Patient, which may be lexicalized as the direct object or the subject of transitives, as in *At the turtle race, the winning turtle crossed the finish line in 42 seconds* (Dowty 1991; see also Filip 1990 and related examples in Declerck 1979). Both Krifka and Dowty also observe that incremental relations have a variety of verb-external sources, both semantic and pragmatic. For instance, *Mary saw seven zebras (for three minutes/in three minutes)* (Krifka 1986) may have a telic (accomplishment) interpretation involving successive events of seeing of zebras, despite the fact that *see* on its own is non-incremental, which is facilitated by the quantificational properties of the direct object *seven zebras* and our general knowledge about visual perception. Incremental relations may also hold between an event argument and a semantic argument that is not syntactically realized, as in *John drove from Pittsburgh to Washington*, where it is a covert path implied by the source and goal PPs, or in *John was becoming an architect but was interrupted before he could finish his degree* (see Dowty 1991: 569), where the 'path' consists of the implied training stages.

Virtually any non-incremental episodic verb can be used as a basic building bloc of a telic sentence, provided we can establish incremental relations between its event argument and some suitable path or scale that has an explicit upper bound and with respect to which events described by that telic sentence can be delimited. What constitutes the 'suitable' path or scale is determined by the verb's meaning, other lexical material in a sentence and their interaction with pragmatic factors and cognitive principles of interpretation. This clearly indicates that incremental relations and the derivation of telic interpretations cannot be just confined to semantics. However, neither can they be entirely delegated to pragmatics. If the latter were true, then the telicity of a given predicate ought to be generally cancelable in a suitable linguistic or extra-linguistic context, but this prediction is not borne out for all the relevant cases. For instance, there are telic predicates resisting a shift into an atelic interpretation by means of the durative *for NP* adverbial, as in *John proved the theorem *for an hour* (Zucchi 1999: 351), and also disallowing continuations that negate the final stage of events in their denotation, as in *John*

*proved the theorem, *but died before he could finish proving it*. This behavior strongly suggests that telicity is an *entailment* of such predicates, and since it is systematically linked to predicates headed by strictly incremental verbs, at least this class of verbs may be taken to be lexically specified for an Incremental Theme.

Based on such observations, Filip (1993) proposes that incremental relations generalize over a variety of telicity sources, and at least some verbs are lexically specified for Incremental Theme with all the relevant argument selection consequences, as in Krifka's and Dowty's theories, but incremental relations can also be a property of certain grammatical constructions, with the requisite homomorphism generalized to a structure-preserving mapping between parts of eventualities and parts of *scales* that measure incremental changes in a variety of dimensions. Rappaport Hovav & Levin (2002, 2005: 284–285) conclude that incremental relations are a lexical property of verbs motivating a range of telicity phenomena, but play no role in lexically constrained argument selection. Jackendoff (1996: 315) argues that Incremental Theme is not a lexical property of verbs and pragmatic factors inducing incrementality in interaction with the lexical structure of the verb have no effect on argument structure.

Starting in the early 1990s path-based and scalar approaches to aspect have stimulated a broadening of the empirical focus from data covered by aspectual composition (Section 5.3) to telicity data that are of non-compositional nature, and whose analyses require pragmatic and cognitive principles of interpretation. In this larger empirical domain, the phenomenon of aspectual composition, which dominated the formation of early contemporary theories of aspect, now constitutes a special, rather than a central, case. The widening of the empirical domain also raised new questions about a unified analysis for the whole range of the relevant (a)telicity data, and about how much of the explanation should rest on pragmatics (see e.g., Depraetere 2007; Jackendoff 1996; Rappaport Hovav 2008). One of the main challenges for future research is to provide a representational system that integrates insights from semantic theories of event structure and pragmatic theories. The notion of a scale and scalar (quantity) implicature (cf. article 87 (Chierchia, Fox & Spector) *Grammatical view of scalar implicatures*) have recently been added to the key elements in articulating this integration (see e.g., Beavers 2008; Filip 2008; Filip & Rothstein 2005; Hay, Kennedy & Levin 1999; Kearns 2007; Kennedy & Levin 2008; Kratzer 2004; Krifka 1998; Rappaport Hovav 2008; Rothstein 2004, 2008a; Wechsler 2005, and references therein). The notion of a scale, conceived of as an ordered set of units of measurements, establishes a link to Krifka's (1986, 1990 and elsewhere) mereological event semantics (Section 5.3), where the notion of measure function, imported from the measurement research that focuses on the relation between measures and mereological part-whole relations, serves to derive quantized predicates. While the notion of quantization is not unproblematic (see e.g., Filip 2000, 2005; Zucchi & White 2001, and references therein), when it comes to the characterization of telicity, the notion of measure function and other tools from the grammar of measurement like a scale have proven to be important meaning components in the analysis of aspectual classes (Filip 2000, 2005; Kennedy & Levin 2008, and references therein). The grammar of measurement in natural languages may also provide some answers to the perennially thorny issues in the domain of aspectual classes like the motivation for the prohibition against more than one delimitation being expressed within a single predication (see e.g., Bach 1981; Goldberg 1992; Tenny 1987, 1994), as illustrated by *run a mile for two hours*, *wash the clothes clean white*.

7. References

Ackerman, Farrell & John Moore 2001. *Proto-properties and Argument Encoding: A Correspondence Theory of Argument Selection.* Stanford, CA: CSLI Publications.

Agrell, Sigurd 1908. Aspektänderung und Aktionsartbildung beim polnischen Zeitworte: Ein Beitrag zum Studium der indogermanischen Präverbia und ihrer Bedeutungsfunktionen. *Lunds Universitets Arsskrift* (New series) I, iv.2.

Alexiadou, Artemis, Elena Anagnostopoulou & Martin Everaert (eds.) 2004. *The Unaccusativity Puzzle. Explorations at the Syntax-Lexicon Interface.* Oxford: Oxford University Press.

Anderson, Stephen R. 1982. Where's morphology? *Linguistic Inquiry* 13, 571–612.

Bach, Emmon 1981. On time, tense, and aspect: An essay in English metaphysics. In: P. Cole (ed.). *Radical Pragmatics.* New York: Academic Press, 63–81.

Bach, Emmon 1986. The algebra of events. *Linguistics & Philosophy* 9, 5–16.

Bach, Emmon et al. (eds.) 1995. *Quantification in Natural Language*s (Studies in Linguistics and Philosophy 54). Dordrecht: Kluwer.

Beavers, John 2008. Scalar complexity and the structure of events. In: J. Dölling, T. Heyde-Zybatow & M. Schäfer (eds.). *Event Structures in Linguistic Form and Interpretation.* Berlin: de Gruyter, 245–267.

Bennett, Michael & Barbara H. Partee 1972. *Toward the logic of tense and aspect in English.* Santa Monica, CA: System Development Corporation. Reprinted with an Afterword: Bloomington, IN: Indiana University Linguistics Club, 1978. Reprinted in: B. H. Partee. *Compositionality in Formal Semantics: Selected Papers by Barbara H. Partee.* Oxford: Blackwell, 2004, 59–109.

Benthem, Johan van 1983. *Modal Logic and Classical Logic.* Napoli: Bibliopolis.

Binnick, Robert I. 1991. *Time and the Verb: A Guide to Tense and Aspect.* Oxford: Oxford University Press.

Borer, Hagit 2005. *In Name Only. Structuring Sense, vol. I. The Normal Course of Events. Structuring Sense, vol. II.* Oxford: Oxford University Press.

Castañeda, Hector-Neri 1967. Comments on Donald Davidson's 'The logical form of action sentences'. In: N. Rescher (ed.). *The Logic of Decision and Action.* Pittsburgh PA: University of Pittsburgh Press, 104–112.

Carlson, Gregory N. 1977. A unified analysis of the English bare plural. *Linguistics & Philosophy* 1, 413–458.

Carlson, Lauri 1981. Aspect and quantification. In: P. Tedeschi & A. Zaenen (eds.). *Syntax and Semantics 14: Tense and Aspect.* New York: Academic Press, 31–64.

Chierchia, Gennaro 1995. Individual-level predicates as inherent generics. In: G. N. Carlson & F. J. Pelletier (eds.). *The Generic Book.* Chicago, IL: The University of Chicago Press, 176–223.

Chierchia, Gennaro 2004. A semantics for unaccusatives and its syntactic consequences. In: A. Alexiadou, E. Anagnostopoulou & M. Everaert (eds.). *The Unaccusativity Puzzle. Explorations at the Syntax-Lexicon Interface.* Oxford: Oxford University Press, 22–59.

Cole, Peter (ed.) 1981. *Radical Pragmatics.* New York: Academic Press.

Comrie, Bernard 1976. *Aspect. An Introduction to the Study of Verbal Aspect and Related Problems.* Cambridge: Cambridge University Press.

Croft, William 1991. *Syntactic Categories and Grammatical Relations: The Cognitive Organization of Information.* Chicago, IL: The University of Chicago Press.

Dahl, Östen 1985. *Tense and Aspect Systems.* London: Blackwell.

Davidson, Donald 1967. The logical form of action sentences. In: N. Rescher (ed.). *The Logic of Decision and Action.* Pittsburgh, PA: University of Pittsburgh Press, 81-95. Reprinted in: D. Davidson. *Essays on Actions and Events.* Oxford: Clarendon Press, 1980, 105–122.

Davidson, Donald 1969. The individuation of events. In: N. Rescher (ed.). *Essays in Honor of C. G. Hempel.* Dordrecht: Reidel, 216–234.

Declerck, Renaat 1979. Aspect and the bounded/unbounded (telic/atelic) distinction. *Linguistics* 17, 761–794.

Depraetere, Ilse 1995. On the necessity of distinguishing between (un)boundedness and (a)telicity. *Linguistics & Philosophy* 18, 1–19.

Depraetere, Ilse 2007. (A)telicity and intentionality. *Linguistics* 45, 243–269.

Dowty, David R. 1972. *Studies in the Logic of Verb Aspect and Time Reference in English*. Ph.D. dissertation. University of Texas, Austin, TX.

Dowty, David R. 1977. Toward a semantic analysis of verb aspect and the English 'imperfective' progressive. *Linguistics & Philosophy* 1, 45–79.

Dowty, David R. 1979. *Word Meaning and Montague Grammar. The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ*. Dordrecht: Reidel.

Dowty, David R. 1982. Tense, time adverbs and compositional semantic theory. *Linguistics & Philosophy* 5, 23–59.

Dowty, David R. 1987. Aktionsarten, NP semantics, and the structure of events. Paper presented at *The Joint Association for Symbolic Logic/Linguistic Society of America Conference on Logic and Natural Language*. Stanford University, Stanford, CA, July 9-10.

Dowty, David R. 1989. On the semantic content of the notion 'thematic role'. In: B. H. Partee, G. Chierchia & R. Turner (eds.). *Properties, Types, and Meanings*, *vol. II*. Dordrecht: Kluwer, 69–130.

Dowty, David R. 1991. Thematic proto-roles and argument selection. *Language* 67, 547–619.

Erteschik-Shir, Nomi & Tova Rapoport 2004. Aspectual focus: Bare aspect. In: J. Guéron & J. Lecarme (eds.). *The Syntax of Time.* Cambridge, MA: The MIT Press, 217–234.

Fernald, Theodore B. 2000. *Predicates and Temporal Arguments*. Oxford: Oxford University Press.

Filip, Hana 1989. Aspectual properties of the AN-construction in German. In: W. Abraham & T. Janssen (eds.). *Tempus-Aspekt-Modus. Die lexikalischen und grammatischen Formen in den germanischen Sprachen.* Tübingen: Niemeyer, 259–292.

Filip, Hana 1993. *Aspect, Situation Types and Noun Phrase Semantics*. Ph.D. dissertation. University of California, Berkeley, CA. Published as *Aspect, Eventuality Types, and Noun Phrase Semantics.* New York: Routledge, 1999.

Filip, Hana 2000. The quantization puzzle. In: J. Pustejovsky & C. Tenny (eds.). *Events as Grammatical Objects, from the Combined Perspectives of Lexical Semantics, Logical Semantics and Syntax*. Stanford, CA: CSLI Publications, 3–60.

Filip, Hana 2005. Measures and indefinites. In: G. N. Carlson & F. J. Pelletier (eds.). *Reference and Quantification: The Partee Effect*. *Festschrift for Barbara H. Partee*. Stanford, CA: CSLI Publications, 229–288.

Filip, Hana 2008. Events and maximalization. In: S. Rothstein (ed.). *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect.* Amsterdam: Benjamins, 217–256.

Filip, Hana & Susan Rothstein 2005. Telicity as a semantic parameter. In: J. Lavine et al. (eds.). *Formal Approaches to Slavic Linguistics (=FASL) XIV: The Princeton Meeting*. Ann Arbor, MI: University of Michigan Slavic Publications, 139–156.

Foley, William A. & Robert D. van Valin, Jr. 1984. *Functional Syntax and Universal Grammar*. Cambridge: Cambridge University Press.

Forsyth, J. 1970. *A Grammar of Aspect. Usage and Meaning in the Russian Verb*. Cambridge: Cambridge University Press.

Garey, Howard B. 1957. Verbal aspects in French. *Language* 33, 91–110.

Gawron, Jean Mark 2005. Generalized paths. In: E. Georgala & J. Howell (eds.) *Proceedings of Semantics and Linguistic Theory (=SALT) XV*. Ithaca, NY: Cornell University.

Geis, Jonnie 1970. *Some Aspects of Verb Phrase Adverbials in English*. Ph.D. dissertation. University of Illinois, Urbana, IL.

Gill, Kathleen 1993. On the metaphysical distinction between processes and events. *Canadian Journal of Philosophy* 23, 365–384.

Goldberg, Adele E. 1992. *Argument Structure Constructions*. Ph.D. dissertation. University of California, Berkeley, CA. Reprinted: Chicago, IL: The University of Chicago Press, 1995.

Groenendijk, Jeroen, Dick de Jongh & Martin Stokhof (eds.) 1987. *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers* (Groningen-Amsterdam Studies in Semantics 8). Dordrecht: Foris.

Gruber, Jeffrey S. 1965. *Studies in Lexical Relations*. Ph.D. dissertation. MIT, Cambridge, MA.

Gruber, Jeffrey S. 1967. Look and see. *Language* 43, 937–947.

Hay, Jennifer, Christopher Kennedy & Beth Levin 1999. Scale Structure underlies telicity in 'degree achievements'. In: T. Matthews & D. Strolovitch (eds.). *Proceedings of Semantics and Linguistic Theory (=SALT) IX*. Ithaca, NY: Cornell University, 127–144.

Heny, Frank 1982. Tense, aspect and time adverbials, Part II. *Linguistics & Philosophy* 5, 109–154.

Higginbotham, James 1983. The logic of perceptual reports: An extensional alternative to situation semantics. *Journal of Philosophy* 80, 100–127.

Higginbotham, James 1985. On semantics. *Linguistic Inquiry* 16, 547–593.

Higginbotham, James 2000. On events in linguistic semantics. In: J. Higginbotham, F. Pianesi & A. C. Varzi (eds.). *Speaking of Events*. Oxford: Oxford University Press, 49–79.

Higginbotham, James 2004. The English progressive. In: J. Guéron & J. Lecarme (eds.). *The Syntax of Time.* Cambridge, MA: The MIT Press, 329–358.

Hinrichs, Erhard 1985. *A Compositional Semantics for Aktionsarten and NP Reference in English*. Ph.D. dissertation. Ohio State University, Columbus, OH.

Hinrichs, Erhard 1986. Temporal anaphora in discourses of English. *Linguistics & Philosophy* 9, 63–82.

Isačenko, Aleksandr V. 1962. *Die russische Sprache der Gegenwart, Bd. I: Formenlehre*. Halle/Saale: Niemeyer.

Jackendoff, Ray S. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, MA: The MIT Press.

Jackendoff, Ray S. 1983. *Semantics and Cognition*. Cambridge, MA: The MIT Press.

Jackendoff, Ray S. 1990. *Semantic Structures*. Cambridge, MA: The MIT Press.

Jackendoff, Ray S. 1991. Parts and boundaries. *Cognition* 41, 9–45.

Jackendoff, Ray S. 1996. The proper treatment of measuring out, telicity, and perhaps even quantification in English. *Natural Language and Linguistic Theory* 14, 305–354.

Jacobsohn, Hermann 1933. Aspektfragen. *Indogermanische Forschungen* 51, 292–318.

Jakobson, Roman 1936. Beitrag zur allgemeinen Kasuslehre: Gesamtbedeutung der russischen Kasus. *Travaux du Cercle Linguistique de Prague* 6, 240–288. Reprinted in: R. Jakobson. *Selected Writings, vol. II: Word and Language*. The Hague: Mouton, 1971, 23–71.

Kamp, Hans 1980. Some remarks on the logic of change. In: Ch. Rohrer (ed.). *Time, Tense, and Quantifiers*. Tübingen: Niemeyer, 103–114.

Kamp, Hans 1979. Events, instants and temporal reference. In: R. Bäuerle, U. Egli & A. von Stechow (eds.). *Semantics from Different Points of View*. Berlin: Springer, 376–417.

Kamp, Hans & Christian Rohrer 1983. Tense in texts. In: R. Bäuerle, Ch. Schwarze & A. von Stechow (eds.). *Meaning, Use and Interpretation of Language*. Berlin: de Gruyter, 250–269.

Kamp, Hans & Uwe Reyle 1993. *From Discourse to Logic.* Dordrecht: Kluwer.

Kearns, Kate 2007. Telic senses of deadjectival verbs. *Lingua* 117, 26–66.

Kennedy, Christopher & Beth Levin 2008. Measure of change: The adjectival core of degree achievements. In: L. McNally & C. Kennedy (eds.). *Adjectives and Adverbs: Syntax, Semantics and Discourse*. Oxford: Oxford University Press, 156–182.

Kenny, Anthony 1963. *Action, Emotion and Will*. London: Routledge and Kegan Paul.

Klein, Wolfgang 1994. *Time in Language*. London: Routledge.

Kratzer, Angelika 1988. Stage-level and individual-level predicates. In: M. Krifka (ed.). *Genericity in Natural Language*. *Proceedings of the 1988 Tübingen Conference* (SNS-Bericht 88-42), 247–284. Reprinted in: G. N. Carlson & F. J. Pelletier (eds.). *The Generic Book*. Chicago, IL: The University of Chicago Press, 1995, 125–175.

Kratzer, Angelika 2004. Telicity and the meaning of objective case. In: J. Guéron & J. Lecarme (eds.). *The Syntax of Time.* Cambridge, MA: The MIT Press, 389–424.

Krifka, Manfred 1986. *Nominalreferenz und Zeitkonstitution. Zur Semantik von Massentermen, Individualtermen, Aspektklassen*. Doctoral dissertation. Ludwig-Maximilians-Universität München. Reprinted: München: Fink, 1989.

Krifka, Manfred 1992. Thematic relations as links between nominal reference and temporal consti-
    tution. In: I. Sag & A. Szabolsci (eds.). *Lexical Matters*. Stanford, CA: CSLI Publications, 29–53.

Krifka, Manfred 1998. The origins of telicity. In: S. Rothstein (ed.). *Events and Grammar*.
    Dordrecht: Kluwer, 197–235.

Lakoff, George 1965. *On the Nature of Syntactic Irregularity*. Ph.D. dissertation. Indiana University,
    Bloomington, IN. Published as *Irregularity in Syntax*. New York: Holt, Rinehart & Winston, 1970.

Landman, Fred 1992. The progressive. *Natural Language Semantics* 1, 1–32.

Langacker, Ronald W. 1990. *Concept, Image, and Symbol: The Cognitive Basis of Grammar*. Berlin,
    New York: de Gruyter.

Levin, Beth 2000. Aspect, lexical semantic representation, and argument expression. In: A. Yu et
    al. (eds.). *Proceedings of the Annual Meeting of the Berkeley Linguistics Society (=BLS) 26*.
    Berkeley, CA: Berkeley Linguistics Society, 413–429.

Levin, Beth & Malka Rappaport Hovav 1998. Building verb meanings. In: M. Butt & W. Geuder
    (eds.). *The Projection of Arguments: Lexical and Compositional Factors*. Stanford, CA: CSLI
    Publications, 97–134.

Levin, Beth & Malka Rappaport Hovav 1999. Two structures for compositionally derived events.
    In: T. Matthews & D. Strolovich (eds.). *Proceedings of Semantics and Linguistic Theory (=SALT)
    IX*. Ithaca, NY: Cornell University, 199–223.

Levin, Beth & Malka Rappaport Hovav 2005. *Argument Realization*. Cambridge: Cambridge
    University Press.

Lepore, Ernest & Brian McLaughlin (eds.) 1985. *Actions and Events: Perspectives on the Philos-
    ophy of Donald Davidson*. Oxford: Blackwell.

Link, Godehard 1983. The logical analysis of plurals and mass terms. In: R. Bäuerle, Ch. Schwarze
    & A. von Stechow (eds.). *Meaning, Use, and Interpretation of Language*. Berlin: de Gruyter,
    302–323.

Link, Godehard 1987. Algebraic semantics of event structures. In: J. Groenendijk, M. Stokhof
    & F. Veltman (eds.). *Proceedings of the Sixth Amsterdam Colloquium*. Amsterdam: ILLC,
    243–272.

ter Meulen, Alice G. B. 1995. *Representing Time in Natural Language. The Dynamic Interpretation
    of Tense and Aspect*. Cambridge, MA: The MIT Press.

ter Meulen, Alice G. B. 2000. How to tell events apart. In: C. Tenny & J. Pustejovsky (eds.). *Events as
    Grammatical Objects, from the Combined Perspectives of Lexical Semantics, Logical Semantics
    and Syntax*. Stanford, CA: CSLI Publications, 377–392.

McCawley, James D. 1971. Tense and time reference in English. In: C. J. Fillmore & T. Langendoen
    (eds.). *Studies in Linguistic Semantics*. New York: Holt, Rinehart & Winston, 97–113.

McCawley, James D. 1976. Remarks on what can cause what. In: M. Shibatani (ed.). *Syntax and
    Semantics 6: The Grammar of Causative Constructions*. New York: Academic Press, 117–129.

von Miklosich, Franz 1868-1874. *Vergleichende Grammatik der slavischen Sprachen*. Wien: Wilhelm
    Braumüller.

Miller, George A. & Phillip N. Johnson-Laird 1976. *Language and Perception*. Cambridge, MA:
    Harvard University Press.

Moens, Marc & Mark Steedman 1988. Temporal ontology and temporal reference. *Computational
    Linguistics* 14, 15–28.

Montague, Richard 1968. Pragmatics. In: R. Klibanski (ed.). *Contemporary Philosophy*. Firenze: La
    Nuova Italia Editrice, 102–121. Reprinted in: R. Thomason (ed.). *Formal Philosophy. Selected
    Papers of Richard Montague*. New Haven, CT: Yale University Press, 1974, 95–11.

Montague, Richard 1973. The proper treatment of quantification in ordinary English. In: J.
    Hintikka, J. M. Moravcsik & P. Suppes (eds.). *Approaches to Natural Language*. Dordrecht:
    Reidel, 221–242. Reprinted in: R. Thomason (ed.). *Formal Philosophy. Selected Papers of
    Richard Montague*. New Haven, CT: Yale University Press, 1974, 247–270.

Montague, Richard 1974. *Formal Philosophy. Selected Papers of Richard Montague*. Edited and
    with an introduction by Richmond H. Thomason. New Haven, CT: Yale University Press.

Mourelatos, Alexander P. D. 1978. Events, processes and states. *Linguistics & Philosophy* 2, 415–434. Reprinted in: P. Tedeschi & A. Zaenen (eds.). *Syntax and Semantics 14: Tense and Aspect*. New York: Academic Press, 1981, 191–212.

Parsons, Terence 1980. Modifiers and quantifiers in natural language. *Canadian Journal of Philosophy* (Supplement) 6, 29–60.

Parsons, Terence 1989. The progressive in English: Events, states and processes. *Linguistics & Philosophy* 12, 213–241.

Parsons, Terence 1990. *Events in the Semantics of English: A Study in Subatomic Semantics* (Current Studies in Linguistics Series 19). Cambridge, MA: The MIT Press.

Partee, Barbara H. 1984. Nominal and temporal anaphora. *Linguistics & Philosophy* 7, 243–286.

Partee, Barbara H. 1999. Nominal and temporal semantic structure: Aspect and quantification. In: E. Hajičová et al. (eds.). *Prague Linguistic Circle Papers* 3, 91–108.

Partee, Barbara H. 2000. Some remarks on linguistic uses of the notion of 'event'. In: C. Tenny & J. Pustejovsky (eds.). *Events as Grammatical Objects, from the Combined Perspectives of Lexical Semantics, Logical Semantics and Syntax*. Stanford, CA: CSLI Publications, 483–495.

Partee, Barbara H. 2004. *Compositionality in Formal Semantics: Selected Papers by Barbara H. Partee*. Oxford: Blackwell.

Pelletier, Francis J. 1975. Non-singular reference. *Philosophia* 5. Reprinted in: F. J. Pelletier (ed.). *Mass Terms: Some Philosophical Problems*. Dordrecht: Reidel, 1979, 1–14.

Platzack, Christer 1979. *The Semantic Interpretation of Aspect and Aktionsarten: A Study of Internal Time Reference in Swedish*. Dordrecht: Foris.

Portner, Paul 1998. The progressive in modal semantics. *Language* 74, 760–787.

Prior, Arthur N. 1957. *Time and Modality*. Oxford: Oxford University Press.

Prior, Arthur N. 1967. *Past, Present and Future*. Oxford: Oxford University Press.

Pustejovsky, James 1991. The syntax of event structure. *Cognition* 41, 47–81.

Pustejovsky, James 1995. *The Generative Lexicon*. Cambridge, MA: The MIT Press.

Quine, Willard van Orman 1960. *Word and Object*. Cambridge, MA: The MIT Press.

Ramchand, Gillian 1997. *Aspect and Predication. The Semantics of Argument Structure*. Oxford: Clarendon Press.

Ramsey, Frank 1927. Facts and propositions. *Aristotelian Society Supplementary Volume 7*, 153–170.

Rappaport Hovav, Malka 2008. Lexicalized meaning and the internal temporal structure of events. In: S. Rothstein (ed.). *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*. Amsterdam: Benjamins, 13–42.

Rappaport Hovav, Malka & Beth Levin 2002. Change of state verbs: Implications for theories of argument projection. In: J. Larson & M. Paster (eds.). *Proceedings of the Annual Meeting of the Berkeley Linguistics Society (=BLS) 28*. Berkeley, CA: Berkeley Linguistics Society, 269–280. Revised version in: N. Erteschik-Shir & T. Rapoport (eds.). *The Syntax of Aspect*. Oxford: Oxford University Press, 2005, 274–286.

Reichenbach, Hans 1947. *Elements of Symbolic Logic.* New York: Macmillan.

Richards, Barry 1982. Tense, Aspect, and Time Adverbials. Part I. *Linguistics & Philosophy* 5, 59–107.

Rohrer, Christian (ed.) 1980. *Time, Tense, and Quantifiers*. Tübingen: Niemeyer.

Rosen, Carol 1984. The interface between semantic roles and initial grammatical relations. In: D. Perlmutter & C. Rosen (eds.). *Studies in Relational Grammar 2*. Chicago, IL: The University of Chicago Press, 38–80.

Ross, John R. 1972. Act. In: D. Davidson & G. Harman (eds.). *Semantics of Natural Language*. Dordrecht: Reidel, 70–126.

Rothstein, Susan (ed.) 1998. *Events and Grammar*. Dordrecht, Boston, London: Kluwer.

Rothstein, Susan 2004. *Structuring Events*. Oxford: Blackwell.

Rothstein, Susan 2008. Telicity, atomicity and the Vendler classification of verbs. In: S. Rothstein (ed.). *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect.* Amsterdam: Benjamins, 43–77.

Ryle, Gilbert 1949. *The Concept of Mind*. London: Barnes and Noble.

Sasse, Hans-Jürgen 2002. Recent activity in the theory of aspect: Accomplishments, achievements, or just non-progressive state? *Linguistic Typology* 6, 199–271.

Schank, Roger 1973. Identification of conceptualizations underlying natural language. In: R. Schank & K. Colby (eds.). *Computer Models of Thought and Language*. San Francisco, CA: W. H. Freeman Co, 187–247.

Scott, Dana 1970. Advice in modal logic. In: K. Lambert (ed.). *Philosophical Problems in Logic*. Dordrecht: Reidel, 143–173.

Sharvy, Richard 1980. A more general theory of definite descriptions. *Philosophical Review* 89, 607–624.

Smith, Carlota S. 1991. *The Parameter of Aspect*. Dordrecht: Kluwer.

Smotritsky, Meletiy 1619. *Grammar of Church Slavonic*. Kiev.

von Stechow, Arnim 1995. Lexical decomposition in syntax. In: U. Egli et al. (eds.). *Lexical Knowledge in the Organization of Language*. Amsterdam: Benjamins, 81–117.

de Swart, Henriette 1998. Aspect shift and coercion. *Natural Language and Linguistic Theory* 16, 347–385.

Talmy, Leonard 1972. *Semantic Structures in English and Atsugewi*. Ph.D. dissertation. University of California, Berkeley, CA.

Talmy, Leonard 1985. Lexicalization patterns: Semantic structure in lexical forms. In: T. Shopen (ed.). *Language Typology and Syntactic Description, vol. III: Grammatical Categories and the Lexicon*. Cambridge: Cambridge University Press, 130–176.

Taylor, Barry 1977. Tense and continuity. *Linguistics & Philosophy* 1, 199–220.

Tenny, Carol L. 1987. *Grammaticalizing Aspect and Affectedness*. Ph.D. dissertation. MIT, Cambridge, MA.

Tenny, Carol L. 1994. *Aspectual Roles and the Syntax-Semantics Interface.* Dordrecht: Kluwer.

Tenny Carol L. & James Pustejovsky 2000. A History of Events in Linguistic Theory. In: C. L. Tenny & J. Pustejovsky (eds.). *Events as Grammatical Objects, from the Combined Perspectives of Lexical Semantics, Logical Semantics and Syntax.* Stanford, CA: CSLI Publications, 3–37.

Travis, Lisa 1991. Inner aspect and the structure of VP. *Cahiers de Linguistique de l'UQAM* 1, 132–146.

van Valin, Robert D., Jr. 1990. Semantic parameters of split intransitivity. *Language* 22, 221–260.

van Valin, Robert D., Jr. & Randy J. LaPolla 1997. *Structure, Meaning and Function*. Cambridge: Cambridge University Press.

Vendler, Zeno 1957. Verbs and times. *Philosophical Review* 56, 143-160. Reprinted in: Z. Vendler. *Linguistics in Philosophy*. Ithaca, NY: Cornell University, 1967, 97–121.

Verkuyl, Henk J. 1971. *On the Compositional Nature of the Aspects*. Doctoral Dissertation. Utrecht University. Reprinted: Dordrecht: Reidel, 1972.

Verkuyl, Henk J. 1989. Aspectual classes and aspectual composition. *Linguistics & Philosophy* 12, 39–94.

Verkuyl, Henk J. 1993. *A Theory of Aspectuality: The Interaction between Temporal and Atemporal Structure*. Cambridge: Cambridge University Press.

Verkuyl, Henk, Henriette de Swart & Angeliek van Hout (eds.) 2005. *Perspectives on Aspect* (Studies in Theoretical Psycholinguistics 32). Dordrecht: Springer.

Wechsler, Stephen 2005. Resultatives under the event-argument homomorphism model of telicity. In: N. Erteschik-Shir & T. Rapoport (eds.). *The Syntax of Aspect*. Oxford: Oxford University Press, 255–273.

von Wright, Georg H. 1963. *Norm and Action. A logical enquiry*. London: Routledge and Kegan Paul.

von Wright, Georg H. 1968. An essay on deontic logic and the general theory of action. *Acta Philosophica Fennica* 21, 1–110.

Zucchi, Sandro 1999. Incomplete events, intensionality and imperfective aspect. *Natural Language Semantics* 7, 179–215.

Zucchi, Sandro & Michael White 2001. Twigs, sequences and the temporal constitution of predi-
cates. *Linguistics & Philosophy* 24, 223–270.
Zwarts, Joost 2008. Aspects of a typology of direction. In: S. Rothstein (ed.). *Theoretical and Cross-
linguistic Approaches to the Semantics of Aspect.* Amsterdam: Benjamins, 79–106.

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49. Perfect and progressive

1. Introduction
2. The perfect
3. The progressive
4. References

Abstract

*This article surveys the major approaches to the semantics of the perfect and progres-
sive. While it may not seem difficult to describe the meaning of these constructions infor-
mally, both present empirical puzzles, within and across languages, which show that initial
descriptions do not do justice to their meanings. As a result, a range of analyses of the per-
fect and progressive have been developed. These analyses are important not only in their
roles as attempts to formalize the meaning of the construction in question, but also because
they have developed tools which have proven fruitful in other areas of linguistic theory.*

1. Introduction

This article discusses two aspectual constructions which are prominent in English and
many other languages, and which have received a great deal of attention within semantic
theory. They are worth studying because they are of linguistic interest in their own right
(as are the prominent constructions of any language) and more importantly because
of the in-depth research they have triggered. We have learned a great deal about the
temporal semantics, event semantics, modal semantics, and various other issues, from the
progressive and the perfect.

2. The perfect

The perfect is a grammatical construction which is built from a participial verb phrase
and an auxiliary, and which indicates temporal anteriority (roughly, past-ness) as part of
its meaning.

(1)   Ben has fallen asleep.

The most basic goal of theories of the perfect is an analysis of the type of anteriority it
indicates. It is not simply the kind of past meaning expressed by the past tense, as we can
see in English from the contrast in (2):