THE UNIVERSITY of EDINBURGH

Edinburgh Research Explorer

Event composition and event individuation

Citation for published version:
Truswell, R 2019, Event composition and event individuation. in R Truswell (ed.), *The Oxford Handbook of Event Structure.* Oxford University Press, Oxford, pp. 90-122.
https://doi.org/10.1093/oxfordhb/9780199685318.013.5

OPEN ACCESS

Event Composition and Event Individuation

Robert Truswell

1 Introduction

This chapter explores a consequence of Davidson's (1967) foundational hypothesis that events are in some nontrivial way similar to individuals:[1] just as an individual can form part of a larger individual, an event can form part of a larger event. This implies that events may be composed of multiple smaller events. We call this phenomenon **event composition**.

A related issue is the **individuation** of events. The semantic structures we describe below imply a very large, richly structured, domain of events, including many events that are not likely to correspond to cognitively or linguistically relevant units. The question of the individuation of events is the question of which subset of the domain of events *is* cognitively or linguistically relevant. To approach this question, we supplement our logical semantics of event composition with a set of statements about cognitive and linguistic constraints on event individuation.

Below, we introduce composition relations for individuals and events (Section 2), and then turn in Section 3 to perceptual and cognitive constraints on event individuation. Finally, Section 4 discusses linguistic aspects of event composition and event individuation.

2 Foundations

In model-theoretic semantics, individuals are characterized set-theoretically: they are members of the domain of individuals, D_e, typically a denumerably infinite set partitioned into two classes, constants and variables. There is no direct relationship between this logical characterization and any given class of cognitive or perceptual objects, though. How do we know when we have encountered an individual? How do we recognize the members of that set? Such questions are everywhere when logical and cognitive approaches to semantics meet.

Logical individuals certainly do not match our intuitive notion of *individual*. For instance, London, justice, and the Boston Red Sox (the team) are arguably all logical individuals, but this seems intuitively absurd: London (see Chomsky 2000) is a city, a strange, amorphous region defined in partly political and partly geographical terms,

---

[1] I adopt this formulation as it is neutral between two possibilities: that events simply are individuals, or that the domain of events is disjoint from the domain of individuals, but has a similar structure. We will not distinguish between these options.

which also functions as a sort of club with gradient membership (some people are Londoners born and bred; many are definitely not Londoners; some are in between in different ways). Justice is intangible, an abstract concept that is 'done' or 'served' but, unlike many other things that are done (ballroom dancing, for instance), is somehow not event-like. We have quite clear intuitions about what constitutes justice, but do we really see an individual here? Finally, the Boston Red Sox—that's *nine* individuals (plus substitutes and coaches, etc.), not one.

We will not even try to bridge the gap between the logical definition of 'individual' and our intuitions about individuals. 'Individual', as a term in our logical vocabulary, is better characterized in terms of its relations to other parts of the logical vocabulary. Model-theoretic individuals are primitive elements from which other categories (such as predicates) are recursively constructed, and how that relates to any perceptually grounded intuitions about what counts as an individual is a separate question.

However, there are regular correspondences between syntactic constituents and their model-theoretic translations, and these correspondences can help us relate individuals as logical units and as cognitive units. If our compositional semantic theories include hypotheses about which natural language constituents denote logical individuals, and we have intuitions about perceptual correlates of those constituents, then we can infer rules of thumb, imprecise but still useful, about perceptual correlates of the logical notion of *individual*.

Here are two rules of thumb about natural language and logical individuals:

1. Noun phrases canonically denote individuals.

2. Individuals canonically function as arguments to first-order predicates.

The qualification 'canonically' is important: there is no way to determine *a priori* the denotation of natural language constituents. Indeed, there are several well-known exceptions to these rules of thumb (quantified noun phrases, for example, are usually assumed to denote objects of type $\langle\langle e,t\rangle,t\rangle$ rather than e), but these heuristics show the virtue of intuitively outlandish claims that London, or justice, or the Boston Red Sox, are individuals. First, *London, justice*, and *the Boston Red Sox* are noun phrases; secondly, their denotations can all function as arguments to first-order predicates. In these respects, they behave just like the prototypically individual-denoting proper name *Jeremy Clarkson*:

(1)   a.   (i)   London is annoying / I resent London.
           (ii)   Jeremy Clarkson is annoying / I resent Jeremy Clarkson.
      b.   (i)   Justice has been served / I want justice.
           (ii)   Jeremy Clarkson has been served / I want Jeremy Clarkson.
      c.   (i)   The Red Sox never make it easy for their supporters / Many people still support the Red Sox.
           (ii)   Jeremy Clarkson never makes it easy for his supporters / Many people still support Jeremy Clarkson.

Now, the crucial point: if London is an individual in this sense, then so is Camden, or the Tube, despite the fact that these are subparts of London. England and Europe are

individuals, despite the fact that London is part of these. The same goes for the Red Sox: if the Red Sox is an individual, then Dustin Pedroia and Major League Baseball are individuals too.

This tells us something about D_e: individuals can be part of other individuals. This is probably not true of the pre-theoretical, perceptually grounded notion of 'individual' (although I believe that Jeremy Clarkson is an individual, I do not believe that his eyebrows are also individuals), but there you go.

Following Link (1983), I assume a range of mereological, or part–whole, relations among individuals. Link distinguishes between **atomic individuals** and **plural individuals**, approximately mirroring the singular–plural distinction found in many natural languages. *John* and *Mary* denote atomic individuals (say j and m respectively), but the coordinate noun phrase *John and Mary* still denotes an individual, according to the above rules of thumb: aside from the fact that it triggers plural agreement, the distribution of *John and Mary* is very similar to the distribution of *John*. For example, both can function as arguments to predicates like *danced*. If we believe that *danced* denotes a predicate of type $\langle e,t \rangle$, then it would make sense for both *John* and *John and Mary* to be of type e.[2] Accordingly, we say that *John and Mary* denotes the plural individual $j \oplus m$, and that j and m are **individual parts** of $j \oplus m$.[3] An atomic individual is then an individual with no proper individual parts.

Even atomic individuals have parts, though. John has four limbs and 20 digits and 32 teeth and 206 bones and a nose, but these are not individuals independent of John, in the sense in which John remains an individual even when considered as part of $j \oplus m$. We do not look at John and see 264 individuals; we see only j. Nevertheless, there is a mereological relation between John's nose (call it n) and John: the stuff that constitutes n is a **material part** of the stuff that constitutes j, even though it is not an individual part of j (because j is an atomic individual, and atomic individuals do not have individual parts). All individual parts of an individual x are also material parts of x, but there may be material parts of x which are not individual parts of x.

These mereological relations among individuals are pervasive. Capturing those relations requires a domain of individuals with a surprisingly rich structure. For example, Link's analysis entails that multiple individuals can be spatiotemporally coextensive. Link argues that this is correct, as a new ring can be made from old gold. The gold and the ring are coextensive, but must be different individuals, if we assume that oldness and newness are mutually exclusive and that a single individual cannot have mutually exclusive properties.

If events are similar to individuals, we expect the domain of events to be similarly structured. Indeed, it is: a sphere can rotate quickly while heating up slowly (example modified from Davidson 1969). Assuming that quickness and slowness are mutually exclusive, the rotating event and the heating-up event must be distinct, despite being spatiotemporally coextensive.[4] This chapter examines mereological relations between

---

[2]We disregard the possibility that *John and Mary* denotes a quantifier, for space reasons.

[3]Following Link, I use the symbol $\oplus$ for this **individual sum** relation, and $+$ for a **material sum** relation to be introduced presently. For all x_1, x_2, x_1 and x_2 are material parts of $x_1 + x_2$; x_1 and x_2 are individual parts of $x_1 \oplus x_2$. I also use $x_1 \subseteq x_2$, $x_1 \subset x_2$ for 'x_1 is a part (or proper part, respectively) of x_2'.

[4]Davidson (1969) proposed that events are identical iff they have the same causes and effects. It is possible that the spinning causes the heating, further suggesting that the two events are distinct.

atomic events and their material parts; see Lohndal's chapter in this volume for discussion of plural events.

We begin by characterizing a relation of **event composition**, on analogy with individuals. Link's logic entails that for any atomic or plural individual x, there is some **stuff** (or portion of material) that constitutes x. Moreover, stuff can be subdivided arbitrarily. Finally, portions of stuff are individuals in their own right. These considerations jointly entail that any individual x can be subdivided into a set of individuals $\{x_1, \ldots, x_n\}$, none of which have any material parts in common, which jointly constitute x (the stuff constituting x is the same stuff constituting $x_1 + \ldots + x_n$). We will say that x is **composed** of $\{x_1, \ldots, x_n\}$.

Analogues of all of the above can be found in the domain of events (see Bach 1986: 5, where the relation 'events:processes :: things:stuff' was proposed). Specifically, the relationship between stuff and atomic individuals mirrors the relationship between stuff and atomic events.[5] Just as an atomic individual can be composed of a set of portions of stuff, so can an event. That is, a relationship of event composition can hold between a set of portions of stuff and an atomic event. We will also talk about **decomposition** of an event into a set of **subevents**. This is to be taken as the converse of event composition.

To illustrate these concepts, consider (2).

(2)   Michael built a snowman.

Following Davidson, (2) denotes the proposition that there exists an event temporally located prior to speech time, of snowman-building carried out by Michael. However, building a snowman has its own internal structure: you roll a giant snowball for the body by pushing a smaller snowball through a patch of snow, roll another for the head, and adorn the result with carrots and scarves. Each of those steps is an event in its own right; jointly, they compose the snowman-building event.

Events can be decomposed recursively. Pushing a giant snowball around is a process which stops when you have a sufficiently giant snowball. This process is composed of a series of iterable smaller events of taking a step and rolling a snowball in front of you. Taking a step involves coordinating a set of muscle movements: internally very complex, even if we, as adults, now often take the complexity for granted (if you don't believe me, ask my baby son). Muscle movements are probably really about things happening to electrons and ions, for all I know.

This suggests that the domain of events has a similar structure to the domain of individuals: there are discrete atomic events and continuous portions of stuff which can be summed and subdivided arbitrarily. One mereological relation tells us which portions of stuff are part of which events, a second relation, beyond the scope of this chapter, relates atomic events to plural events. Finally, a relation of event composition holds between an atomic event e and a set of nonoverlapping events $\{e_1, \ldots, e_n\}$, such that the same stuff constitutes e and $e_1 + \ldots + e_n$.

---

[5]As in the above quote, Bach's term for the event analogue of stuff was *processes*. Link (1997) expanded this use, defining processes as portions of space–time which may be reified as events or as individuals. I maintain Link's use of a single term for portions of material underpinning events or states, but avoid the term *processes*, which is used in other ways in the literature and below.

A major question for this chapter is how this mereological structure relates to events as perceptual and cognitive units, manipulated in our reasoning processes, and as described by 'simple' natural language predicates.[6] Natural language seems to be a good guide to events as cognitive units (see Zacks and Tversky 2001, Wolff 2003 for evidence of congruence between events as perceptual and linguistic units). Moreover, I assume that simple linguistic event descriptions pick out atomic events. The question then is, what kind of sets of events can simple event descriptions denote? Or turning the question on its head, what can we learn about linguistic event descriptions, and perhaps about events as cognitive units, by examining their denotations in a relatively highly structured domain like the domain of events described above?

We approach this question through the lens of some foundational aspectual distinctions. First, apart from microscopic modifications, if *Michael built a snowman* is a true description of some event e, it is not also a true description of any $e' \subset e$. In the terms of Krifka (1989), snowman-building events are **quantized**. Quantization contrasts with **cumulativity**: for a given snowball s, any event e_1 of pushing s, combined with a contiguous event e_2 of pushing s, gives a larger event $e_1 + e_2$, which is also an event of pushing s. Snowball-pushing is cumulative, and (with one exception, which we ignore) quantized events cannot be cumulative events, or *vice versa*.

Quantization and cumulativity can be used to characterize linguistically and perceptually relevant event types, or 'shapes', reflected in a fixed set of aspectual classes (see Mittwoch's chapter, and work such as Moens and Steedman 1988, Pustejovsky 1991, and Ramchand 2008 for various proposals as to the form and causal origin of those templates). For instance, **telic**, or **bounded** events (as described by accomplishment predicates, e.g. *build a snowman*, or achievement predicates) are quantized, while **atelic**, or **unbounded** events (as described by activity predicates, e.g. *push a snowball*, or stative predicates) are cumulative. The *telos*, or culmination, of a telic event is a distinguished point in the event, which Vendler (1957: 145) characterizes as 'a "climax," which has to be reached if the action is to be what it is claimed to be.' For each telic event, there is precisely one culmination, and this guarantees that telic events are quantized: summing two telic events produces an event with more than one culmination, which is therefore not a telic event. An atelic event lacks a characteristic culmination, which means that atelic events can be cumulative.

There is broad agreement that telic events constitute the major class of linguistically relevant quantized events. Quantization is a broader notion than telicity, though: there are other ways to be quantized. Telic events are quantized because they contain exactly one distinguished subpart (the culmination); any other class of events with exactly n distinguished subparts will also be quantized. For instance, *leave* may describe a quantized event with a distinguished initial subpart. To the best of my knowledge, there are no linguistically relevant classes of event with distinguished subparts in the middle (though see discussion of *fetch* below), with three distinguished subparts, etc.

Because of this, we adopt a common vocabulary here whereby an event consists maximally of two distinguished subevents, a temporally extended **process** and an instantaneous **culmination** at which a result state is reached.[7] By including or omitting

---

[6]By a 'simple' predicate, I mean a noun, adjective, or verb with its arguments, as opposed to a more complex predicate formed by coordinating VPs, negation of events, etc.

[7]The decision to focus on process and culmination may be construed as implying a hypothesis that these

these two components, we derive Vendler's four aspectual classes.

1. **Culminated processes** (process + culmination) ⤳ accomplishment predicates (e.g. *run a mile*)

2. **processes** ⤳ activity predicates (e.g. *run*)

3. **culminations** ⤳ achievement predicates (e.g. *hiccup*)

4. ∅ (neither process nor culmination) ⤳ stative predicates (e.g. *exist*)

Still following Vendler, we adopt diagnostic tests for the presence of a process or culmination. An event with a process is felicitous in the progressive, whereas an event without a process is only felicitous in the progressive if coerced into (for example) an iterated reading.

(3)   a.   John is running a mile.
           b.   John is running.
           c.   John is hiccupping [iterated reading only]
           d. #John is existing.

Meanwhile, an event with a culmination is infelicitous with *for*-PPs describing the temporal extent of the event, again disregarding possible coercion effects.

(4)   a.   #John ran a mile for five minutes.
           b.   John ran for five minutes.
           c.   John hiccupped for five minutes [iterated reading only]
           d.   John existed for five minutes.

The two subtypes of quantized events (culminations and culminated processes) can be distinguished on the basis of **durativity**. Culminated processes are durative in that they have proper subevents at the same level of granularity. In contrast, culminations (like dying or hiccupping) are construed as instantaneous. Of course, at a microscopic level, culminations do have subparts, but those subparts are not linguistically relevant. **Coarse-graining**, whereby the internal structure of a given individual or event is linguistically invisible, is pervasive in linguistic descriptions.

Meanwhile, processes and states are distinguished by a **dynamic** opposition of forces (see Copley's chapter): processes often involve change, or at least an equilibrium resulting from equal and opposing forces, while states describe properties construed as intrinsically static. In fact, we will disregard states in this chapter, as the vocabulary we develop below cannot straightforwardly be applied to them.

In Section 3, we discuss properties of events at different scales, from a hiccup to an ice age. The event shapes distinguished above give a unifying organizational principle across events on different scales: events, at any level of granularity, can be partitioned into the same four classes. In other words, the forms remain the same; the perceptual basis for individuating events according to those forms varies.

---

define *the* linguistically relevant event shapes, or as a case study illustrating the kinds of issues that arise in the study of event composition and individuation, according to the taste of the reader.

3 Constraints on Event Individuation

The mereological relations sketched in Section 2 are in principle unlimited in scope: any event, or any individual, can be decomposed into smaller parts. This means that we can generate arbitrary individuals and events: we can decompose any two events e and e' into arbitrary sets $\{e_1, \ldots, e_n\}, \{e'_1, \ldots, e'_n\}$ of subevents, then compose any $e_i + e'_j$ into a new event. Logically, this is as it should be. However, it is natural to complement this logic with a characterization of cognitively relevant events. To put it another way, Section 2 sketched general purpose tools for relating events to subevents; now we want to know when we actually use those tools. This is the question of event individuation.[8]

Our starting point is the relation between process and culmination in a culminated process. It is often assumed (e.g. McCawley 1968, Dowty 1979) that the process is related to the culmination by a causal relation such as 'directly causes' or 'leads to'. That is indeed often the case: if a falling rock smashes a vase, then the rock follows a particular trajectory, which directly causes the breaking of the vase. Likewise, if an author writes a novel, there is a writing process which directly causes the existence of the novel.[9] However, discussion in Davidson (1969) showed that the directness of direct causation is quite elusive: *A* may kill *B* by pouring poison into his bottle of scotch, but that action did not directly cause *B* to die in any obvious sense: adding poison to the scotch could be separated from *B*'s death by any amount of spatiotemporal distance, and requires assistance from *B* (who must consume some of the scotch if *A* is to successfully kill him). We may agree that *A* killed *B* in this scenario, but this does not mean that *A*'s actions (the process) directly caused *B*'s death (the culmination)— see also Fodor (1970). In fact, Copley and Harley (2015) discuss several linguistic structures suggesting that the relationship between process and culmination cannot be one of direct causation, at least not in the actual world. The occurrence of the process component of a culminated process does not entail the occurrence of the culmination, when on any commonsense definition of direct causation, it should.[10]

The best-known example of this is the so-called **imperfective paradox** (Dowty 1979, among many others).[11] The progressive form of an activity predicate is taken to entail the perfect variant, as in (5).

---

[8]Davidson (1969) coined the phrase *the individuation of events*. Davidson's concern in that paper is rather different from our concern here, though: he is concerned with identity relations among events, or when statements of the form $\iota e.P_1(e) = \iota e.P_2(e)$ are true.

[9]Even here, things are more strained, in that there is no instantaneous appearance of the book. As with many acts of creation, an author writing a book engages in a process which incrementally brings the book to completion, and the book is finished when the author decides. This is related to the distinction between culminated processes which are **measured out** by their objects, in that there is a homomorphic mapping between subparts of the event and of the object, and culminated processes where the subparts of the event bear no such direct relation to the subparts of the object. See chapters by Mittwoch and Verkuyl, and references therein.

[10]Causation is commonly treated as a counterfactual dependency (Lewis 1973, Dowty 1979; see Copley and Wolff 2014 for critical discussion): if C causes E, then in the most accessible worlds like w_0, if C hadn't happened then E wouldn't have happened. Such dependencies can be grouped into **causal chains**: e_1 causes e_2, which causes e_3; if e_1 hadn't happened then e_2 wouldn't have happened; if e_2 hadn't happened then e_3 wouldn't have happened. A relation of direct causation holds in a 2-member causal chain, with no intermediate events at the same level of granularity.

[11]As discussed in Mittwoch's chapter, it is now widely accepted that the imperfective paradox is not actually a paradox, but rather a data point that should shape our theories. The name, however, has stuck.

(5)   a.   John was running. →
            b.   John has run.

However, the progressive form of an accomplishment predicate usually entails the process, but not the culmination. That is, (6a) entails (6b) and (6c), but not (6d).

(6)   a.   John was painting a still life. →
            b.   John was painting. →
            c.   John has painted. [More idiomatic: John has done some painting.] ↛
            d.   John has painted/will have painted a still life.

The reason for this failure of entailment concerns the semantics of the different aspectual forms. (5a) describes an ongoing cumulative event of John running, with the reference time situated within the event time. Because running is cumulative, if some portion of the event time precedes the reference time, we can conclude that some part of the process of John running has already taken place: John has run. In contrast, painting a still life is quantized (a cumulative process). If the reference time is situated within the event time, that means that some portion of the process has taken place: John has done some painting. However, the cumulation (the completion of the still life) is still in the future, and consequently may not be reached. We therefore cannot conclude that John has painted a still life: (7a) is a contradiction, but (7b) is not.

(7)   a.   #John may have been running yesterday, but John has still never (successfully) run.
            b.   John may have been painting a still life yesterday, but John has still never (successfully) painted a still life.

All of this seems at odds with any representation in which the process directly causes the culmination: (7b) shows that the former can occur without the latter, while causation-based theories of aspectual class yoke the two together. In his influential analysis, Dowty included a modal component in his analysis of the progressive, reconciling the imperfective paradox with his analysis of accomplishment predicates as lexicalized instances of direct causation. For Dowty, if John is painting a still life, then the still life may not be completed in w_0, the actual world, but it is completed in all **inertia worlds**, in which there are no unforeseen interruptions to the normal course of events.

A second case comes from the now widely documented phenomenon of **non-culminating accomplishments** (see Travis 2000, Bar-El *et al.* 2005, and Mittwoch and Travis' chapters in this volume). In a range of typologically unrelated languages, the culmination component of an accomplishment predicate is an implicature rather than an entailment, and can be explicitly contradicted. Examples from Malagasy (8a) and St'át'imcets (8b) (both from Copley and Harley 2015) are below; Mittwoch's chapter contains further examples from Hindi, Mandarin, and Japanese.

(8)   a.   Namory   ny ankizy ny mpampianatra, nefa tsy   nanana
                PAST.AV.meet the children the teachers   but NEG PAST.have
                fotoana izy
                time   they
                'The teachers gathered the children, but they didn't have time' (Travis

2000:173)
b. k'ul'-ún'-lhkan   ti   ts'lá7-a,   t'u7 aoy t'u7 kw tsukw-s
make-TR-1SG.SU DET basket-DET but NEG just DET finish-3POSS
'I made the basket, but it didn't get finished' (Bar-El *et al.* 2005:90)

Phenomena like the progressive and non-culminating accomplishments raise doubts about analyses which implicate direct causation in the subevent structure of culminated processes; one advantage of the mereological approach sketched in Section 2 is that it places less emphasis on causation as the 'glue' relating subevents. In fact, I will claim that the nature of the relationship between process and culmination depends on the perceptual nature of the event itself.

Returning to our discussion of snowman-building from Section 2, note that events at different scales have quite different characters (see also Zacks and Tversky 2001). The smallest events we observe are characterized in purely physical terms: a snowflake falls, or muscles contract as people move. At a slightly larger scale, we are aware of the alternating pattern of more-or-less bounded movements of the limbs: although it is difficult to decide precisely where one step stops and the next starts, we readily accept that we have seen a string of steps. At coarser grains still, such as the rolling of a giant snowball, events are identified by the perceived intentions and goals of agents. For example, Dowty (1979) discusses pauses in events: we recognize an event of Michael rolling a snowball even if he took a breather in the middle, or left the scene to recruit friends to help. I take this (unlike Dowty) to be related to a perceived continuity of intention in such cases, even if there is no corresponding continuity of action (see also Tovena 2011). Larger still, a war starts and ends according to a diplomatic process (declaration of war, ceasefire) quite remote from events on the ground. Likewise, most of the activity in an Apollo mission happens on the ground—the spacecraft moving through space is just the tip of the iceberg. However, there is no perfect correlation between the size of an event, construed as its spatiotemporal extent, and its perceived physical, intentional, or other nature. An actor's raised eyebrow might be an exquisitely planned intentional event, but it is still small in scale compared to some physical events like natural disasters.

I will introduce a set of labels for these different event types. I refer to physical changes and interactions among physical objects as **physical events**. Events individuated on the basis of inferred intentions and their quasi-causal effects (Michotte 1954, Woodward 1998) are **intentional events**. **Strategic events** are initiated by directors (whether playwrights or presidents) who effectively control the actions of possibly quite remote individuals or groups in a 'strategic' way (a deliberately vague characterization under which I hope to group everything from a shepherd's control of a herd of sheep through the intermediary of a dog in a sheepdog trial, to the role of the composer and the librettist in an opera, or that of an arch-manipulator using the power of suggestion to get his own way). Finally, an analyst may postulate an **analytical event**, by uncovering order in a set of happenings that was not apparent to any individual present at the time (emergent phenomena like stock market crashes or the migration out of Africa are likely examples; see also Link 1997 on the French revolution). There are surely other types of perceptually and linguistically relevant events, but we will restrict ourselves to these.
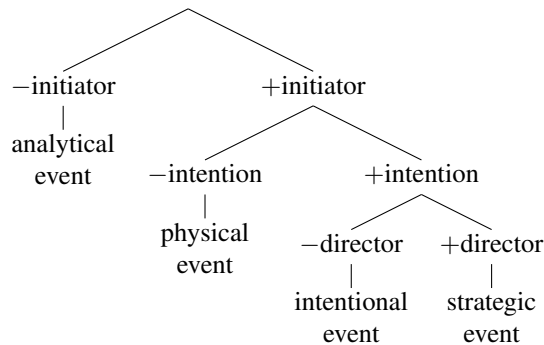
Figure 1: Relations among event types

Each of these event types comes with its own set of well-formedness constraints. We are more likely to perceive a set of happenings as an atomic event to the extent that they match these constraints. Moreover, I will suggest that these different event types form a hierarchy. As diagrammed in Fig. 1, analytical events are distinguished from other types by not requiring that a distinguished participant (canonically a figure, or **agonist**, in Talmy's 1988 terms) be identified; among the rest, physical events alone do not attribute intentionality to that distinguished participant, and intentional and strategic events are distinguished by whether the intentional initiator is a direct participant in the event, or a **director**, in the sense of Copley (2008).

In the next four subsections, we define these terms and show how they are implicated in the individuation of events of different classes. We begin with physical events (Section 3.1), and proceed to intentional and strategic events (Sections 3.2 and 3.3, respectively), before returning to analytical events (Section 3.4). As we pursue this classification of events, we will keep returning to the set of aspectual classes discussed in Section 2: each of these four types of events shows the same range of temporal profiles.

Although we rely on linguistic event descriptions throughout this section, our focus here is on the events themselves. We discuss further grammatical reflexes of the different event types in Section 4.

3.1 Physical events

The happenings we perceive as physical events are characterized by a set of common-sense beliefs about the way the world works sometimes grouped together under the heading naïve physics (see Smith and Casati 1994 and references therein). The hallmark of naïve physical frameworks is that they privilege faithfulness to cognitive representations of notions such as causation over detailed and accurate explanation of real-world physical phenomena. The canonical examples of physical events are inanimate objects in motion, and the *effet Lancement* ('launching effect') of Michotte (1954), whereby an object in motion makes contact with a second object, which then begins to move, as well as related configurations discussed in Talmy (1988).

Three subtypes of physical events matching the three eventive aspectual classes are motion and other unbounded physical processes (9); culminations, instantaneous changes of state (10); and culminated processes (11). The examples below use the diagnostics from Section 2 to confirm the class of each event description.

(9) a. The river flowed (for five minutes) / the river is flowing.
     b. The flag fluttered.
     c. The lava cooled.

(10) a. The balloon burst (#for five minutes) / #the balloon is bursting.
     b. The vase bounced.

(11) a. The wind blew the ball into the lake (#for five minutes) / The wind is blowing the ball into the lake.
     b. The falling tree crushed the car.

The events described above are dynamic and spatiotemporally continuous: a direct interaction between a set of one or more objects associated with tendencies to motion or to rest, as described in Talmy (1988 *et seq.*). An individual may move in a variety of ways: a river flowing is fairly stable, while a fluttering flag is less predictable in terms of both orientation and speed of motion. Instantaneous changes of state like those in (10) can be construed as spontaneous, without a clearly discernible cause. Finally, causal relations like those in (11) then often emerge from local interactions between objects associated with different such tendencies to motion or to rest: the tree has a tendency to fall, the car has a tendency to stasis, and the tree overcomes the resistance from the car.

However, physical causation need not be local. A classic example of action at a distance, or nonlocal physical causation, is turning on a light (intentionally or accidentally) by flicking a switch: the switch can be any distance from the light (it is not inconceivable that someone at Ground Control can flick a switch and turn on a light on a space station). The relationship between the switch and the light is otherwise the same as that between the tree and the car, though. This suggests that physical events are not always spatially continuous. Causal relations among spatially contiguous events may well be the canonical case of physical causation, though, as action at a distance tends to involve a special trigger like a switch, while any moving object can bump into any other.[12]

Likewise, pressing a button on a vending machine causes snacks to fall into the tray, only after five nerve-wracking seconds of indeterminate whirring. This is perceived as temporal, as opposed to spatial, action at a distance: the button press sets in motion a chain of obscure events that eventually makes the snacks fall into the tray, but we have no idea what, if anything, happens during the delay. Although these examples seem more marginal than spatial action at a distance (a switch could turn a light on thousands of miles away, but would we really perceive any relatedness in a button

---

[12]Of course, microscopically, action at a distance is still spatially contiguous: flicking a switch transmits a signal through some medium like a wire, and this causes the effect through a chain of local physical causal relations. The point is that our naïve physics doesn't see the microscopic intermediate steps, and associates the more tangible initial cause and final effect directly, an instance of the fairly shallow causal theory that our naïve physics apparently relies on (see Rozenblit and Keil 2002 on the 'illusion of explanatory depth').

that made chocolate appear in hundreds of years' time?), physical events can clearly sometimes be temporally as well as spatially discontinuous.

These examples of causal relations at a spatiotemporal distance are arguably distinct from cases of caused motion, as event descriptions for the two classes show different patterns of coarse-graining. If a gust of wind blew a ball halfway down the hill, the ball came to rest, and then a second gust of wind blew the ball to the bottom of the hill, we can report the path from top to bottom with a single event description: *The ball rolled down the hill* or *The wind blew the ball down the hill*. This shows that the temporal discontinuity is construed as an insignificant interruption in the event, and as the discontinuity grows, the impression that the above sentences do not accurately describe the event grows commensurately. With action at a distance such as flicking a light switch or using a vending machine, the spatiotemporal remoteness of cause and effect is part of our understanding of how the system works. It is arguable that the cases of action at a distance have more in common in this respect with the intentional events discussed below, with agents and objects such as vending machines sharing the property of 'teleological capability' (Folli and Harley 2008). I persist, however, in grouping causation at a distance with physical events here because both types of event require a causal relation between process and culmination. Little hinges on this if this turns out to be inaccurate.

3.2   Intentional events

We construe a subset of individuals (primarily animate individuals) as behaving intentionally:[13] these individuals have goals, and act rationally to reach those goals. I will say that a set of events, construed as an agent's actions aiming at a goal, jointly compose an **intentional event**.

Of course, an agent acting intentionally can also be considered as a purely physical object (animacy entails physicality but not *vice versa*). This lies behind the ambiguity of (12)—see also Jackendoff (1972).

(12)   John hit the wall.

On one reading, John is just a lump of flesh, flung against a wall. On the other reading, John acts intentionally, propelling his fist into the wall. The former reading describes a purely physical event; the latter is intentional.[14] Jackendoff (1990) analyses this distinction by relating intentions to an independent 'action tier' in his semantic representation. This allows him to claim that in the purely physical reading of (12), John is just a theme, while in the intentional reading, John is both a theme and an agent, maintaining a largely localist approach to thematic roles, in terms of notions like movement of a theme along a path from source to goal, independent of an agent–patient articulation closer to the concerns of this section.

---

[13]Of course, we may use intentional language nonliterally when discussing purely physical events, for instance *The sun is trying to shine*. However, we cannot describe a weather forecast by saying that *The sun is planning to shine at 3pm*; nor can we use futurates like *The sun is shining soon* when the sun is dispersing cloud cover.

[14]Bridget Copley (p.c.) notes that the purely physical reading is dispreferred for animate individuals, suggesting that we prefer to construe animate individuals as acting intentionally.

Many people claim that the relationship between the intentional event and the physical event in (12) is causal. For example, in the terminology of Ramchand (2008), we might say that in the purely physical reading of (12), *John* is the subject of a process which causes John to come into contact with the wall. In the intentional reading, *John* is also the subject of an initiating event which causes that process. Similar ideas are discussed at length in Pietroski (2000). However, Kamp (1999−2007) and others (Copley 2010, Truswell 2011) have argued that such approaches are ultimately unsatisfactory: the relationship between the intentional and the physical event is not merely one of the intentional event causing a physical event which is independently asserted to exist. Rather, the intention defines the event, providing the basis for the event's individuation, and the action realizes the intention.

One piece of evidence that Kamp adduces for this claim concerns the verb *fetch*. Fetching *x* consists of going to *x*, taking *x*, and returning to the original location, specifically with the intention to bring *x* to that location. In other words, fetching is the concatenation of three physical events, linked by a common intention. The heterogeneity of the physical processes in the service of a common intention suggests that the intention alone individuates the event.

Related evidence comes from the progressive test described in Section 2. Following Reichenbach (1947), the progressive locates the reference time within the runtime of the event itself, and so is used to describe ongoing processes or events *en route* to completion. This means that we can use the descriptive content of VP to tell us what kind of event is ongoing.

A purely physical event description like (13) can felicitously be uttered from the moment the ball starts moving down the hill, until it reaches the bottom; even (because of coarse-graining) during a sufficiently brief hiatus in the middle.

(13)   The ball is rolling down the hill.

(13) cannot be uttered before the ball starts moving, even if it is clear that the ball is about to roll down the hill (because the wind is picking up, for example); and (13) cannot be uttered when the ball reaches the bottom, even if it carries on moving. The progression from top to bottom delimits the event.

Intentional events can be bigger than this. More specifically, they can start earlier. If we see a round man limbering up at the top of a hill, and we infer that he is preparing to roll down it, we can use a **futurate** progressive like (14) (see Copley 2008).[15]

(14)   Hey, look! The round man is rolling down the hill!

When we say this, the round man is not necessarily moving down the hill at all, but we infer his intention, and also infer that his current actions might rationally be expected

---

[15]In fact, futurate variants of (13), such as *The ball is rolling down the hill at 3pm next Tuesday*, are also possible, but report on strategic events, in the terms used here: as discussed below, futurate progressives report on plans, and plans reside in minds. As none of the participants in (13) have a mind, we interpret such futurates as describing the plans of a director rather than an agent. Although the verb bears present tense inflection in futurates like this, the time adverbial is a clue that the runtime of the event described does not overlap with speech time. *Hey, look!* in (14) instructs the listener to pay attention to plans inferrable on the basis of current actions. These may be larger than physical events, while still being smaller than the types of plans described by futurates.

to lead to fulfilment of that intention. That is enough for the round man's limbering up to count as part of a rolling-down-the-hill event: the physical rolling down the hill is a proper subpart of the intentional rolling down the hill, and we can use (14) to describe the ongoing intentional event.

Similar effects are reported, from a different perspective, in Wolff (2003). In a series of experiments, Wolff showed that purely physical events were often characterized by direct causation, but that intentional events could be more inclusive.[16] One example of this distinction involved a pair of animations. In the first, three marbles were shown. The first marble rolled into the second, which in turn rolled into the third. In the other animation, the first marble was replaced by a hand, which pushed the second marble into the third. Although the physical relations are essentially identical in the two cases, participants reported seeing two distinct events in the first animation, but only a single event in the second animation. As a linguistic correlate of this, participants typically described the chain of causal relations in the first experiment using periphrastic causatives like (15b), but could describe the second animation using lexical causatives like (16a).

(15)   a.   #The red marble moved the blue marble.
          b.   The red marble made the blue marble move.

(16)   a.   The man moved the blue marble.
          b.   The man made the blue marble move.

Wolff interprets this as showing that perceived intention increases the likelihood of a single-event construal: participants infer that when the hand pushes one marble, the agent intended to move the other marble, and that moving the first marble **enables** him to move the second. That licenses perception of a single event.

This suggests that intentional events are bipartite: they are **actions** (processes) related to a **goal** (a culmination). As with physical events, intentional processes and intentional culminations can be found in isolation, or combined in a culminated process. These three possibilities are illustrated in (17)–(19).

(17)   a.   John is working out.
          b.   John worked out for hours.

(18)   a.   John is spitting. [Iterated reading only]
          b.   John spat for hours. [Iterated reading only]

(19)   a.   John is building a snowman.
          b.   John built a snowman #for five minutes.

In at least the case of the culmination (18), the physical event of spitting is coextensive with the intentional event of spitting; in the other cases, as with Kamp's example of *fetch*, it is certainly not guaranteed that there is a single recognizable physical event that corresponds to the range of activities involved in working out or in building a snowman (see again Kamp 1999−2007, Tovena 2011). Similarly, working out subsumes a range of physically quite distinct activities. There is no clear physical continuity between

---

[16]I have modified Wolff's terminology for consistency with the rest of this chapter.

doing sit-ups and using a rowing machine, for example. It is only the continuity of intention that justifies the grouping of such disparate activities together as a single event.

Plan and goal differ from cause and effect in that a cause produces an effect, whereas a plan may not lead to its goal.[17] Related differences are linguistically encoded in several languages. Perhaps the best-known is the Tagalog distinction between 'neutral' and 'ability and involuntary action (AIA)' verb forms (Dell 1983; see also Travis' chapter). The neutral forms encode intention but not causation, while the AIA forms entail causation. Accordingly, one can simultaneously assert the neutral form while denying the AIA form.

(20) **Pumunta** sa Maynila si Pedro, pero naligaw siya, kaya hindi
      Neut.-PF-go DAT Manila NOM Pedro but get.lost NOM-he hence not

      siya **nakapunta**
      NOM-he AIA-PF-go
      'Pedro went to Manila but got lost and didn't get there.' (Dell 1983: 180)

A related phenomenon concerns the interpretation of verbs like *offer* (Oehrle 1976, Martin and Schäfer 2012). *Offer* can take an animate or inanimate subject, with a difference in interpretation. If an agent offers *x* to *y* (21a), she intends that *y* has a chance to take *x*, but *y* may refuse. However, if a nonagentive subject offers *x* to *y*, the entailment is that *y* has *x* (21b).

(21) a. L'organisateur de la course lui a offert la première place. Mais
          the-organizer of the race her has offered the first place but

          elle a refusé ce marché.
          she has refused this deal.
          'The organizer of the race offered her first place, but she refused this deal.
      b. Son excellent résultat lui a offert la première place. #Mais elle
          her excellent result her has offered the first place but she

          ne l'a pas prise.
          NEG it-has not taken
          'Her excellent result offered her first place, but she didn't take it.' (Martin and Schäfer 2012: 248)

Intentional events necessarily involve action: an intention does not determine an intentional event unless the agent is actually doing something about it.[18] I intend to die happy and fulfilled, but that is not sufficient to license utterances like (22) in my current state (quite healthy, thank you very much).

(22) #Rob is dying happy and fulfilled.

There are further constraints on how perceived actions relate to inferred intentions. In particular, the speaker, with limited knowledge of the agent's intentions, must be able

---

[17]It is of course possible to construe intentional events as encoding a modal form of causation, following Dowty (1979). In that case, the question at issue is the nature of the modal base and ordering source.

[18]In contrast, the futurates discussed in Copley (2008) typically presuppose that the agent is able to bring about the intended event, but may not be doing anything at speech time.

to infer the intention on the basis of the observed action. This constrains the size of the intentional events described: only actions stereotypically related to a specific goal are likely to form part of an intentional event description. For example, we cannot utter (14) if we see the round man at home, eating breakfast before heading to the hillside: even if the round man knows that he is eating a hearty breakfast to prepare himself for the ordeal that lies ahead, we typically would not look at the breakfast and infer a link to a plan to roll down a hill. Likewise, we cannot use (14) if the round man is limbering up, at the top of the hill, intending to BASE jump off the summit, but *we* know that the wind is picking up, and will send him rolling down the hill before he gets a chance to jump. In the first of these cases, the action of eating breakfast does not make the round man's intentions manifest to a typical observer; in the second, we know that the action will lead to a culmination other than the intended one; but we cannot describe that combination of an intention and an unintended culmination with a single verb. This tells us that action and goal form a bipartite structure, analogous to cause and effect in physical events.

The relationship between action and goal in an intentional event should satisfy at least the following constraints.

1. The agent must believe that there is a relationship of causation or enablement between action and goal.

2. The agent's action must be part of a plan, evident to the speaker, to reach the goal.

3. The plan in question must be minimal, in a sense to which we return below.

The first condition excludes cases where an observer can see consequences of an agent's action that an agent cannot. For example, let us assume that a common outcome of rolling down hills is broken ribs. A common trait among round men who roll down hills is blissful ignorance of the dangers they face. When the round man is limbering up, we might know that he is preparing to do something that will land him in hospital, but that is not part of the round man's plan. We can still felicitously say (14), but we cannot say (23).

(23)   #Look! The round man is breaking his ribs!

The second condition is intended as a guarantee of perceived rationality on the part of the agent. Although there is no guarantee that the agent is actually acting rationally, rational plans stand in more predictable relations to observable events. Intentional events are therefore easier to perceive and describe to the extent that the plans underpinning them are rational. It is not enough for the agent to see a link between his actions and goals; the speaker must see the link and expect his audience to see the link.

The third condition imposes a minimality requirement on the plans underpinning intentional events. We can think of a plan as roughly analogous to a chain.[19] The

---

[19]Only roughly analogous, because plans can contain multiple independent subplans. Subplans can also act simultaneously as steps towards multiple independent goals. Formally, although plans can be modelled to an extent as a partially ordered set of steps, they certainly do not have to be total orders, as suggested by the metaphor of a chain (see also Jackendoff 2007). We disregard these complexities here, assuming that the discussion here can be extended to more complex structures.

intention behind the minimality condition is that elements of that chain must all be related in certain ways, so that there can be no superfluous links in the chain. A rough formulation of the minimality condition is in (24).

(24) **Minimality condition on plans**
A minimal plan consists of a series of steps, $s_1, \ldots, s_n$, such that:
  a. for each s_i, s_{i+1} ($1 \leq i < n$), s_i either causes or enables s_{i+1}, and
  b. no well-formed plan can arise from omission of any step s_i ($1 \leq i < n$).

The point of the minimality condition is that intentional events can be more temporally discontinuous than physical events. We saw that only small pauses could be included within physical events, but plans can be put on hold almost indefinitely before they are resumed. The process of building a house involves a lot of building activity, and two types of non-building activity. On the one hand, there are the preparatory activities, the builder's equivalent of the round man limbering up; on the other hand, there are pauses in the activity of varying lengths where the builder is not engaged in anything directly related to the building of the house. The builder goes home every afternoon, and may disappear for a few days to work on something else altogether. In Canada, a lot of construction work grinds to a halt for weeks or months in the depths of winter. All of these pauses are normal, or even inevitable, but they are of a different status to the preparatory activities. Without the preparatory activities, the house wouldn't get built; without the pauses, the house would still be built. The preparatory activities are part of a minimal plan as characterized above; the pauses are not, and can only be included as part of an intentional house-building event if coarse-graining allows us to ignore them.

Such coarse-graining is vague, and partially contextually determined: because Canadian winters are more severe than British winters, Canadians expect long pauses in construction activity over winter, whereas British people do not. In Canada, it is normal to say that someone is building a house next door, even if cold weather has prevented any progress for months. In Britain, if nothing happened for months, people would probably assume that the project had hit the rocks.

In other words, intentional events, like physical events, tolerate discontinuities. The discontinuities can be individually longer than discontinuities in typical physical events, and can occupy a greater proportion of the event's runtime. Such discontinuities require us to admit a process of coarse-graining whereby possibly quite large breaks in an activity are subsumed within an ongoing perceived continuity of intention. But not every discontinuity can be coarse-grained away like this. The minimality condition on plans guarantees that actions unrelated to the goal of building a house do not count as part of a house-building event.

To summarize, there are several formal similarities between causes and effects in physical events, and actions and goals in intentional events. The differences that do exist between causal and intentional relations can largely be ascribed to differences between our perception of the two types of relation. We perceive physical causes as having almost inevitable, typically proximal effects, but we can see an action as part of a plan to reach a remote goal. As a result, intentional events often have more remote culminations than physical events, the process leading to the culmination can be more internally differentiated in intentional events (because different preparatory steps can

be unified by a common intention), and it is more likely that the culmination is never reached.

3.3   Strategic events

Strategic events are similar to intentional events in that the coherence of the stuff constituting such an event is linked to an individual's intention. However, the agent in an intentional event is a participant in the event, whereas in a strategic event, the intention may lie with someone who is not an event participant, or may not even be present when the event takes place. In other words, strategic events are related to established plans which may not be related to perceived actions, while intentional events are related to plans inferred from perceived actions. This means that every intentional event is a strategic event, but not *vice versa*.

Strategic events are the objects described by Copley's (2008) analysis of futurate progressives (25), and I will adopt her term of **director** to describe the individual whose plan characterizes a strategic event. Strategic events are different from physical and intentional events in that although the event is characterized by the director's intention, the director need not directly participate in the event.

(25)   The Red Sox are playing the Yankees tomorrow. (Copley 2008: 261)

The following conditions hold of strategic events:

1. The director is believed to be able to realize the plan.

2. There is a relationship of causation or enablement between the actions of agentive event participants and the plan of a director.

3. The plan is minimal, as above.

Although the definitions are not quite parallel, I intend intentional events as a special case of strategic events where the agent is identified with the director and the plan is inferred from observed actions. We could also define a complement set of 'strictly strategic events' which are not intentional events (at least one agent is disjoint from the director).

Strategic events show increased flexibility in the relationship between an agent's actions and the plan: an agent acts intentionally with respect to some goal, but that goal may or may not be shared with a director.

Just as Kamp's (1999−2007) discussion of fetching showed that intentional events are distinct from physical events, we can argue that strategic events are distinct from intentional events by demonstrating that heterogeneous agentive actions can correspond to the stable intention of a director, and that the director's stable intention is the basis for individuation of the event. For example, consider a homeowner who wants to sell his house. The homeowner may take the single step of employing an estate agent who will sell his house on his behalf. This is sufficient for the estate agent to assume the intention to sell the house and to act towards that goal (placing adverts, organizing viewings, etc.). In the meantime, the homeowner goes about his daily business and never thinks about selling the house: there is no way of observing the homeowner

during these weeks and inferring an intention to sell the house. At virtually no point during this period can someone point at the homeowner's actions and say (26).

(26)   Hey, look! The homeowner is selling his house.

Months pass, nothing happens, and the homeowner comes to believe that the estate agent is not working hard enough. He fires the estate agent and employs a different one instead. At this point, the first estate agent stops acting with a goal of selling the house, and the second estate agent starts doing so. The homeowner goes back to not thinking about the house. Weeks pass, and the house is sold. The homeowner says:

(27)   I finally sold the house.[20]

What is the homeowner's involvement in this process? Mainly, he delegates: he tells other people to align their intentions with his. The estate agents' actions fulfil the homeowner's intention, a phenomenon known as **secondary agentivity**. The homeowner may well have had no involvement in the actual sale, but it is the homeowner's intention that characterizes the event: neither estate agent is involved with the house for the duration of the efforts to sell the house, and other agents, answerable to an estate agent and responsible for smaller tasks such as the preparation of adverts, are involved for even shorter time periods.

Non-agent directors are also detectable in a certain class of rationale clauses. A typical rationale clause, as in (28), is attached to a VP describing an intentional event, and describes the goal of that event.

(28)   I [[came here] [to talk about crime]].

Because intentional events involve action, stative predicates generally resist rationale clauses.

(29)   #I [[have a mouth] [to talk about crime]].

However, a rationale clause can also describe a non-agent director's intentions. In those cases, the restriction on stative main clauses is lifted. In cases like (30a), the statue does not intend to scare the children away, but the creator of the statue does. (30b), describing a **physical disposition** in the terms of Copley and Wolff (2014), is from Williams (1985: 310–11), who writes that 'we must ... suppose that there is some purposeful agent (evolution, God) under whose control is the circumstance "grass is green". This is quite different from saying that God or evolution is an *Agent* in the theta-theoretic sense.' Although such rationale clauses are still quite mysterious, their semantics seems to require reference to a non-agent director.

---

[20]Interestingly, the director can be portrayed as the subject of *sell* much more easily than certain, apparently similar cases. When the homeowner hires someone to fix the washing machine, it sounds disingenuous to say *I fixed my washing machine*, and if you order (freshly prepared) takeout, it sounds simply false to claim *I cooked dinner*. I suspect that this is a kind of blocking effect: a speaker is typically quite capable of cooking dinner, so we imagine the speaker is acting as agent. However, few people want to dive into the intricacies of selling one's own house, so the involvement of a specialist can be more or less taken for granted.

(30)   a.   The statue has red eyes to scare the children away.

            b.   Grass is green to promote photosynthesis.

The characterization of strategic events given above suggests several subcases, depending on how the agent's actions are related to the director's plan. In one case, both director and agent are aware of the goal, and the agent is acting cooperatively, in accord with the director's plan. This occurs, for example, when a homeowner hires a technician to fix the washing machine: the technician (the agent) intends to fix the washing machine because the homeowner (the director) wants him to, and will take whatever steps he believes will enable him to fix the washing machine. A second case occurs when the director specifies instructions which can be followed multiple times (for example, writing a concerto). The orchestra (the agent) may intend to follow the composer's instructions to the slightest detail, but the composer may have no idea that the performance is even taking place. Finally, in more Machiavellian examples, the director influences the behaviour of others in accordance with his own goals, without the agent being aware of those goals. The agent has some local goal (to borrow the director's car, say), but in acting towards that goal, inadvertently fulfils the director's plan (removing the evidence from the scene of the crime). I collapse these subcases here, because they all share the common characteristic of individuation on the basis of a director's plan, and can all be described with reference to that plan.

(31)   a.   The homeowner got his washing machine fixed.

            b.   The composer had her symphony performed.

            c.   The criminal got rid of the evidence.

However, strategic event descriptions need not dissociate director and agent. When director and agent are identified, the line between intentional and strategic events can be somewhat blurred. For instance, *She's leaving* describes an intentional even when it describes a possibly heterogeneous set of physical events from which an agent's stable intention is inferred, and describes a strategic event when it describes an established plan which may not correspond to an observable set of actions. When the distinctions between plan, action, and physical happenings are not clear, the same stuff may correspond to physical, intentional, and strategic events.

    This approach multiplies quite brazenly the number of events corresponding to a particular portion of stuff. An actor who writes, directs, and performs a solo show simultaneously carries out strategic, intentional, and physical events. This is a necessary feature of a model of event individuation, though: the actor might write quite brilliantly, but perform quite poorly, for example. As with Link's new ring from old gold and Davidson's sphere rotating quickly and heating slowly in Section 2, the writing must be distinguished from the performance, even if both are related to the same observable portion of stuff.

    The strategic examples discussed so far are all culminated processes, but strategic events from other classes can be found. A nonculminating process is described in (32): dogs behave intentionally, but their intentions here are subsumed under those of the speaker, who allows, or causes, the dogs to exercise. As in previous sections, Vendler's diagnostic tests show that walking the dogs is a temporally extended process without an inherent culmination.

(32) a. I'm walking the dogs.
     b. I walked the dogs for/#in an hour.

As for a strategic culmination, imagine a society in which a suitably powerful person can honour a visiting dignitary by arranging for several soldiers to fire their rifles simultaneously. As described in (33), this is necessarily strategic, as the queen has the role of a director rather than a direct event participant. A sufficiently powerful queen can initiate this ritual at a moment's notice. Vendler's tests diagnose a culmination with no associated process.

(33) a. #The queen is honouring the visiting dignitary.
     b. The queen (spontaneously) honoured the visiting dignitary at 1pm/#in five minutes/#for five minutes.

3.4 Analytical events

We have now seen three variants on a common set of aspectual classes formed from processes and culminations. A final possibility is that an event may not fit any of the above templates, but may nonetheless be identified by the same formal criteria discussed repeatedly above: individuation as diagnosed by anaphora, coupled with the aspectual classes described in Section 2. Any participants in such an event may or may not be aware that they form part of the event (in comparison, at least the agents and directors in intentional and strategic events are aware of what type of event they form part of).

In fact, the event may be construed as not having participants: the last ice age was an event according to the above criteria (it can be referred to anaphorically, and has the shape of a process of lowering of average temperature causing expansion of the ice caps, culminating when the ice caps receded beyond a certain threshold), but with no grammatically relevant participants (in particular, the ice age is not the same as the spread of the ice caps or the drop in temperature). Accordingly, analytical events are often described using **simple event nominals** (Grimshaw 1990, Roy and Soare 2013—see also Gärdenfors 2014 on different conceptual structures of verbs and event nominals), event descriptions distinguished by their lack of argument structure. This property, in turn, makes analytical events, as described by single event nominals, useful for investigating the relationships and discrepancies between event structure and argument structure.

Events like ice ages are only apparent to analysts, typically divorced from the events themselves. Even if an individual is aware that she is in the middle of an ice age, this knowledge is inevitably the product of analytical inquiry, rather than directly related to that one individual's experience.[21] From this perspective, ice ages have something in common with phenomena like population movements or the behaviour of stock markets: large-scale accumulations of events with emergent properties. Surely no one individual intends to contribute to rural exodus, for example. Rather, multiple individuals

---

[21]The line here is again somewhat blurred. Link (1997) discusses events like the French revolution or the scientific revolution, which have the properties of analytical events on the present typology. However, participants in either event no doubt were aware that something revolutionary was going on, even if they could not have been aware of the nature and extent of the revolution.

or small groups move independently, in parallel, pursuing smaller-scale goals (jobs, excitement, whatever draws people to cities). The process of rural exodus in France is only apparent to someone who can see the aggregate of those individual histories, just as patterns of change in glaciation are only apparent to someone who sees aggregate data from across the centuries.

Analytical events are less rigidly characterized than physical, intentional, or strategic events: any portion of stuff which fits into one of the spatiotemporal profiles described in Section 2 can be construed as an analytical event. Analytical events are therefore quite unrestricted; it is up to individuals to make judgements about the set of *actual* analytical events. Indeed, apparently quite unruly portions of stuff can insightfully be seen as single events by the right analyst, as with the phenomena supporting the postulation of the Earth's revolving around the sun, or global warming, as analytical events.[22] As with strategic events, we can also define a set of 'strictly analytical events', which do not fall into any other category of events.

Of the examples considered so far, rural exodus and ice ages are processes: people migrate from the country to the city for years, the earth cools for centuries. The migration out of Africa is a culminated process, or at least a set of culminated processes distinguished by their geographical endpoint (for example, people migrated from Africa to Europe in a given amount of time). A clearer example of an analytical culminated process is a typical extinction: although strictly speaking, the extinction of a species is as instantaneous as the death of the last member of that species, the progressive test indicates that we typically (but see below) construe extinction as a culminated process: *the giant panda, and Skolt Sami, are dying out*, we say. Perhaps the closest approximations to analytical culminations are catastrophic global events like mass extinction of dinosaurs: populist presentations often give the impression that dinosaurs were almost instantaneously wiped out globally.[23] The mass extinction of dinosaurs, if ascribed these properties, has the form of an analytical culmination: it resists the progressive (*#After the meteor hit the earth, the dinosaurs were dying out*), rejects *for*-PPs (*The dinosaurs died out in/#for decades*), and is too complex to be treated as a purely physical event (*die out* and *become extinct* are collective predicates, which are sortally restricted to species or similar groupings. Although extinction of a species clearly entails deaths of the members of that species, a claim of extinction is really a universal claim to be made by an analyst: members of that species used to exist, and now there are no members of that species).[24]

Analytical events, then, can have any of the same shapes as other classes of event. They are distinguished by the diminished role of any individual participants, and by the fact that they often occur at timescales which are only apparent *post facto* to an analyst who may not have observed the actual event.

---

[22]The Earth is a sphere spinning quickly and heating up slowly. Davidson would surely approve.

[23]Real-world culminations are never actually instantaneous, of course: they are simply very quick relative to some contextual standard (compare culmination *hop* to process *climb*, for instance). Even a mass extinction that takes decades or centuries may be construed as a culmination from this perspective. This is another case where temporal coarse-graining is required for a satisfactory empirical account.

[24]It is interesting that *die out* describes a culminated process in the case of the pandas, but a culmination in the case of the dinosaurs, apparently because of world knowledge alone. This could be taken as evidence, as in Mittwoch's chapter, that the distinction between accomplishments and achievements is not as basic as the distinctions between events, processes, and states.

3.5   Interim summary

Section 2 discussed three temporal profiles shared by many event descriptions: processes, culminated processes, and culminations. In this section, we have discussed some orthogonal distinctions in the relations between event predicates and arguments.

1. **Physical events** concern dynamic physical configurations of event participants, as well as beliefs about action at a distance as effected by devices like switches.

2. **Intentional events** are grounded in the perceived intentions underlying the actions of an agent: the event is perceived as an action performed by the agent as a step towards an inferred goal, which may (but need not) be quite remote from the observed process, and therefore more likely not to be reached.

3. **Strategic events** are like intentional events, except that the intention which defines the event shape is that of a director who may not participate in the event itself.

4. **Analytical events** often cannot be directly perceived, and are instead identified analytically. The basis for individuation of an analytical event need not involve a distinguished individual such as an agonist, agent, or director.

Each of these event types includes processes, culminations, and culminated processes, but determines the roles of participants differently, as represented in the hierarchy of increasingly constrained event types in Fig. 1.

The basis for individuation of physical and intentional events is perceived properties of grammatically realized event participants alone, while strategic and analytical events are individuated otherwise (strategic events rely on the intentions of a non-participant director, and analytical events rely on large-scale inferred patterns which frequently abstract away from individual participants). Even if the migration out of Africa must have been composed of individual physical and intentional events, it has only an indirect relationship to the individuals that actually migrated out of Africa. If any one individual, or even any fifty individuals, had not taken part in the migration, the basic analytical fact of the migration would not change. Similarly, unlike smaller-scale events, no one 'snapshot' would suffice to show that the migration was taking place. The identity of an analytical event is related to the systematicity revealed by generalization and abstraction. The relation of the individual to such large-scale analytical events is similar to the relationship between individuals and populations: we see groups of participants as instances of the pattern identified by the analyst, rather than constitutive of the pattern.

There are two general schemata for the individuation of non-analytical events, according to dynamic configurations of individuals (physical events), or according to the intentions of an agent (intentional and strategic events). In the latter case, the intentions of a single individual grounds the individuation of the event, whereas this is not the case with physical or analytical events.[25] With *the ball rolled down the hill* or *early*

---

[25]One consequence of this latter distinction is that there need not be any participants identified in physical event descriptions like *It rained*, any more than analytical event descriptions like *the last ice age*. We will come back to the significance of this in the following section.

humans migrated out of Africa, the event is delimited not just by the moving theme, but also by the properties of the path-denoting PP. In contrast, with an intentional event description like *Susan carried Jeff into the sea*, we do not care whether Jeff intended to end up in the sea. He may or may not have been a willing participant; we just don't know. Even verbs which entail things about the intentions of participants other than the agent, like *persuade*, make no commitment as to those intentions prior to the event of persuading. It is an implicature, rather than an entailment, that if *X persuaded Y to Z*, Y comes to intend to Z as a result of X's actions. There is no contradiction in an utterance like (34).

(34)   Jeff persuaded Susan to carry him into the sea, but she didn't really need persuading: she was intending to do it anyway.

This section has sketched the degrees of freedom in the relationship between an event's temporal properties and argument structure. At one extreme (physical events), the temporal properties entirely determined by the force-dynamic tendencies of event participants; at the other extreme (analytical events), an event need not even be construed as having participants. We now discuss a linguistic reflex of this taxonomy of events.

4   Linguistic constraints on event composition

So far, we have presented a taxonomy of event types, consisting of a set of aspectual classes cross-classified with a set of statements about how we tend to individuate events. The discussion has been largely based on event descriptions. The rationale for this is that if something happens, and we have a way of describing it, then that something is an event. Sometimes, the descriptions will be short on descriptive content (*chaos*, *that*, etc.); sometimes, as with most examples in this chapter, not.

Our linguistic event descriptions have changed shape as we progressed from physical events to analytical events. We typically described physical events using clauses like (35a), but used simple event nominals like (35b) for analytical events.

(35)   a.   The ball rolled down the hill.
        b.   The last ice age.

This is not a coincidence. There are ways of using noun phrases to refer to the event described in (35a), for example in (36a), but there are no obvious verbal equivalents of (35b), at least in English (see (36b)). Although sentences like (36c) are possible, they are hardly verbal event descriptions; rather, they use a verb like *happen* as a means of asserting the existence and temporal location of the event; the event description is still nominal: (36c) can be paraphrased as 'there is an event e, e is located prior to speech time, and e is the last ice age'.

(36)   a.   (i)   The ball's movement/progress/trajectory (down the hill)
              (ii)   The event we just witnessed
              (iii)   That
        b.   (i)   *It/there ice-aged (most recently).
              (ii)   *Ice aged.

(iii) *The age was iced.
c.   The last ice age happened/occurred/took place

We can find a definite noun phrase for any event we perceive (even if, in some cases, the NP in question is just *it* or *that*). However, there are several events which cannot be described by a verb, and those events tend to be analytical in nature.

We saw earlier that there are argument-structural correlates of the distinctions between different types of events. That suggests, in the spirit of Grimshaw 1990, that verbal event descriptions are more restricted than simple event nominals because verbal event descriptions must obey constraints on argument realization.[26]

Grimshaw shows that, on the one hand, simple event nominals clearly describe events, as shown by their co-occurrence with predicates which are semantically restricted to event-denoting arguments in (37).

(37)   a.   The war happened.
        b.   The race took two hours.

On the other hand, simple event nominals do not make the internal structure of those events linguistically accessible in the same way in which complex event nominals or verbs do: simple event nominals do not take *in/for*-PPs (38), and do not take any obligatory arguments (39).

(38)   #The race in/for two hours was exciting.

(39)   a.   John/*There raced ??(against Sam) yesterday.
        b.   John's/the race (against Sam) took place yesterday.

This means that we can use relatively unconstrained simple event nominals as a comparison class to identify specifically linguistic constraints on other classes of event description: certain events relate participants in a way which does not map well onto a verb's argument structure, given the constraints on the realization of verbal arguments. In such cases, we may nevertheless be able to describe the event using a simple event nominal. If so, we have found an event which is not well-described by a verb precisely because of its internal structure.

We focus on near-universally accepted statements concerning argument structure like the following:

1. The event participant hierarchy: syntactically realized event participants obey the ordering INITIATOR > UNDERGOER > RESULTEE, where > represents asymmetric c-command.[27]

---

[26]Most of what I say about verbal argument structure is also true of Grimshaw's **complex event nominals**, nominal event descriptions with argument structure. Because distinguishing different types of nominal event description can be quite delicate, I only compare simple event nominals and verbs here. The interested reader can consult Grimshaw (1990), or Moltmann's chapter, for further details.

[27]Although similar in organization, the event participant hierarchy is conceptually distinct from the thematic hierarchies elaborated since Fillmore (1968), and strictly separated from the thematic hierarchy by Grimshaw (1990) in an analysis of the thematically similar *fear* and *frighten* classes of psych-predicates (see Jackendoff 1990 for related ideas). The specific terms used here are borrowed from Ramchand (2008) for concreteness, although there is still some variation among researchers in how many roles are recognized. Ramchand's idea is that participants in causally prior subevents are more prominent than participants in

2. A single event participant cannot be described by multiple arguments.

These are intended as building blocks in a theory of event structure and argument realization. For further ingredients in a fuller theory, see chapters by Baglini & Kennedy, Lohndal, Levin & Rappaport Hovav, Ramchand, Siloni, and Travis, as well as an extensive primary literature going back through Hale and Keyser (1993) to work in Generative Semantics such as McCawley (1968). Staggering amounts of research was done in this area in the 1990s and 2000s (see Rosen 1999 for a summary of early results, and work such as Borer 2005 and Ramchand 2008 for more recent proposals). We cannot adequately summarize those results here, and will instead aim to show how constraints on argument realization affect the linguistic description of the different event types outlined above.

The restriction which emerges from these two constraints on verbal argument structure is that verbal event descriptions are usually asymmetric: verbs typically have arguments, and a single argument, the initiator, is more prominent than all the others. Putting alternations such as the passive aside, it is this argument which is realized as the subject (the syntactic argument which asymmetrically c-commands all others in the standard case).

Because of this, for example, there is no verb *schlime* such that (40a) and (40b) are synonymous. This reflects the difficulty of finding a construal in which the mountain initiates the climbing event.[28]

(40) a. John climbed the mountain.
      b. The mountain schlimed John.

The same is true of strategic events: (41a) is an appropriate description of a strategic event, but there is no verb *schefeat* to form (41b).

(41) a. William the Conqueror defeated the English.
      b. The English schefeated William the Conqueror.

The asymmetric nature of intentional and strategic events feeds the asymmetry in verbal descriptions of such events, as in (40)–(41). In other words, the agent in an intentional event, and the director in a strategic event, are always construed as the initiators of those events, so there is limited scope for variation in mapping of event participants to syntactic positions. Much the same is true of agonists in physical events: to the extent that the event has a single agonist, or 'force-exerting entity ... singled out for focal attention' (Talmy 1988: 53), that single agonist will reliably be identified as

caused subevents. For example, an initiator participates in a causing event, which brings about some result involving the resultee, so initiators are more prominent than resultees. Ramchand treats intentions as a type of cause, so this approach is also intended to cover intentional and strategic events, in the above terms.

[28]Pairs of verbs with apparent mirror-image argument structures do exist, with the best known being experiencer alternations such as *John likes pears* and *Pears please John*. In many cases, at least one member of such pairs is stative, in which case notions such as 'initiator' are inappropriate. In other cases, such as the *spray/load* alternation (*John loaded the truck with hay* vs. *John loaded the hay onto the truck*), the symmetry reflects two salient ways of construing the event, as bounded by the theme or the goal.

initiator.[29],[30]

In contrast, our characterization of analytical events does not require such asymmetry among participants. If an analytical event is to be described using a verb, an asymmetry among participants must be imposed on the event.

There are a few ways to do this: many analytical events can be construed as having an initiator—if not an agent or a director, a cause, as in (42a) or theme in (42b).

(42)   a.   Gavrilo Princip [the man who shot Fanz Ferdinand] started World War I.
       b.   Several small groups of humans migrated out of Africa.[31]

Finally, restrictions arising from the mapping of event participants to verbal arguments can sometimes be overcome by choosing a verb with a simple argument structure: a 1- or 0-place predicate. The single argument of a 1-place predicate can refer to a group or mass, without differentiating the roles of subparts of that group or mass, as in (43).

(43)   a.   The volunteers spread out across the field.
       b.   Gondwanaland broke up.

As for 0-place predicates, the best-known are **weather verbs**. There is nothing which forces the events described by weather verbs to be described by 0-place predicates: (44a) and (44b) are equally valid descriptions of the same situation.

(44)   a.   It rained.
       b.   Rain fell from the sky.

In (44b), the rain is construed as a theme, or figure, moving away from the sky, a source. In (44a), there is no such asymmetry, as there are no arguments.

If no such simple argument structure is available, but the complexity of the relations among event participants does not allow for straightforward identification of an initiator, it will often not be possible to describe an event using a VP.

---

[29]Bridget Copley (p.c.) observes that there is a tendency for syntacticians to focus more on the process–culmination model of event composition, and for semanticists to focus more on the mereological approach we used to ground the process–culmination model in Section 2. As she notes, the relevance of the process–culmination model to verbal argument structure (see e.g. Ramchand's chapter) may ground syntacticians' preference for that model. This suggests further explorations into the semantics of simple event nominals: if particular argument-structural configurations necessarily describe quantized or cumulative events, with process and culmination acting as an intermediary between argument structure and algebraic semantics, we may expect temporal profiles other than those defined by process and culmination to be available to simple event nominals. I have no idea if this is actually the case.

[30]There is some variation in description of strategic events, mainly concerning the phenomenon of secondary agentivity discussed above. The secondary agent can be omitted entirely, as in (41) (William the Conqueror didn't defeat the English single-handedly; rather, he instructed his army to act in a way which led to the defeat of the English). It can also be included with verbs such as *make* or *have* (*William the Conqueror had his men attack the English*, but not *William the Conqueror had his men defeat the English*). A range of subtle consequences follow (for instance, compare *I finally sold the house* with *I finally had the estate agent sell the house*—the former suggests a period of waiting for a buyer; the latter a period of indecision).

[31]A single person, or a single family, cannot migrate. Only largish populations can. But a migration can be made up of multiple small-scale movements of individuals or families, with internal organization invisible to anyone other than an analyst. I have no idea if the migration out of Africa actually had such properties; all that matters is that we *could* describe an event with such properties, and it would have to be an analytical event with *several small groups of humans* as its theme.

The following is an example. A simple car crash, with two cars, can be described as follows, either verbally with one car identified as the theme/initiator and the other as the goal, as in (45a); verbally with no indication of asymmetry between the roles of the two cars (45b); or nominally (45c).

(45)   a.   The red car crashed into the blue car.
            b.   Two cars collided.
            c.   The car crash

A more complex car crash, involving 27 cars in various ugly configurations, is more likely to be described using a nominal: (46ai) is false; (46aii) is better, but still implies a weak reciprocal reading, where 27 cars collided with each other. (46aiii) is more accurate, but hopelessly circumlocutious. (46b) is looser: if, say, two cars crashed, another went into the back of them, a fourth swerved to avoid them and hit a tree, the distraction caused a fifth to lose control on the far side of the road, and so on, (46b) would be an adequate description, but (46aii) would not, because the 27 cars did not collide with each other.

(46)   a.   (i)   #The red car crashed into 26 other cars.
                  (ii)   27 cars collided.
                  (iii)   Several groups of cars collided; 27 cars were involved overall.
            b.   A 27-car pile-up.

A second example of the same phenomenon is in (47). Imagine a war involving five countries, A, B, C, D and E, where the following propositions are all true.[32]

(47)   a.   A and B are fighting as allies against C.
            b.   A is fighting alone against D.
            c.   B is fighting alone against E.

We can describe this situation accurately using a conjunction of the three propositions above, but how else can we describe it? (48ai) is almost accurate, but oversimplistic, reducing a complex set of interactions to an antagonistic relationship between two 'teams'. (48aii) seems unwarranted, implying that A–E all fought each other. The nominal (48b), because it avoids any argument-structural commitments, seems less inaccurate.

(48)   a.   (i)   A and B fought C, D, and E.
                  (ii)   A, B, C, D, and E fought.
            b.   The war

In both of these cases, as relations between a large set of participants become more complex, it becomes increasingly hard to shoehorn the event description into a verbal argument structure. As a consequence, it becomes increasingly natural to use an argument-free, nominal event description.

---

[32]Wikipedia currently lists 114 countries which were implicated in World War II in a variety of ways. Although I imagine that it is possible to see World War II as a two-sided fight between allies and axis, it is clearly also possible to construe it in a way whose complexity far outstrips (47).

The moral of the story, following Rosen (1999: 8), is that 'verbs at least in part mean what the syntax allows them to mean.' These linguistic constraints on event descriptions are partly language-particular. Languages other than English have broader classes of 0-place verbal predicates than the weather verbs described above, whether derived or basic. Perhaps the best known of these are **impersonal passives** in German and other languages, such as (49).

(49) Es wurde getanzt
      It was   danced
      'There was dancing.'

A second example, from Serbo-Croatian, uses a reflexive morpheme instead.[33]

(50) Ratovalo se   godinama.
      war.PTCP REFL years.INST
      'There was a war for years.'

The Serbo-Croatian example (though not necessarily the German impersonal passive) implies the same kind of complexity, or abundance of activity, which could most felicitously be described by the nominal examples above. Notably, idiomatic English translations of (49) and (50) resort to a nominal event description, reflecting the absence of productive ways of forming verbal 0-place predicates in English. Verbs, to an extent, mean what the syntax allows them to mean, but the syntax does not restrict the meaning of simple event nominals. Asymmetries among participants in events with initiators (whether agonists, agents, or directors) tend to be well-described by verbs; other events, without such an articulation, are often better described by such nominals.

5   Summary

The Davidsonian parallel between individuals and events leads us to expect that events can be individuated at a variety of levels of granularity, just as individuals can. This appears to be true. However, just as with individuals, there are a range of perceptual constraints on event individuation. We identified four different types of events (physical, intentional, strategic, and analytical), corresponding roughly to four different granularities, and saw that, despite the distinct individual properties of these different event types, each shares a basic Vendlerian compositional template, consisting maximally of a process leading to a culmination, or nonmaximally of either a process or a culmination in isolation.

A major distinction was drawn between physical, intentional, and strategic events, in which there is a single privileged initiator argument, and analytical events, where there need not be any such individual. However, we saw that effects relating to verbal argument realization may impose such an asymmetry on arguments even when there is no such asymmetry inherent to the event: in languages like English, in the vast majority of verbal event descriptions there must be a syntactically most prominent argument

---

[33]Thanks to Berit Gehrke, Dejan Milacic, Ana Werkmann, and Vesela Simeonova for discussion of this and related constructions.

corresponding to a semantically most prominent argument. In turn, this entails that many very complex analytical events are most naturally described in English using nominal, rather than verbal, event descriptions: simple event nominals do not need arguments like verbal event descriptions typically do. This means that there are systematic linguistic constraints on a class of event descriptions in English, over and above any perceptual restrictions on the shape of events.

In contrast, other languages have means of circumventing those linguistic constraints, by more productive use of 0-place verbal predicates. We saw two such examples above: the impersonal passive in German and other languages, and a particular reflexive construction found in Serbo-Croatian and elsewhere. In such languages, verbs can be used to describe events which do not readily lend themselves to verbal event descriptions in languages like English.

In sum, we have seen a basic logical relation, of event composition, constrained by perceptual factors relating to the individuation of events, and further constrained by linguistic factors, both universal factors relating to argument structure such as the mapping between event participant roles and syntactic postions, and language-particular factors such as the particular configurations of verbal arguments available in a given language.

References

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

Bar-El, Leora, Davis, Henry, and Matthewson, Lisa (2005). On non-culminating accomplishments. In *Proceedings of the Thirty-fifth Annual Meeting of the North East Linguistic Society, Vol.I* (ed. L. Bateman and C. Ussery), pp. 87–102. GLSA, Amherst, MA.

Borer, Hagit (2005). *Structuring Sense. Volume 2: The Normal Course of Events*. Oxford University Press, Oxford.

Chomsky, Noam (2000). *New Horizons in the Study of Language and Mind*. Cambridge University Press, Cambridge.

Copley, Bridget (2008). The plan's the thing: Deconstructing futurate meanings. *Linguistic Inquiry*, **39**, 261–274.

Copley, Bridget (2010). Towards a teleological model for modals. Paper presented at Paris working sessions on modality, goals, and events.

Copley, Bridget and Harley, Heidi (2015). A force-theoretic framework for event structure. *Linguistics and Philosophy*, **38**, 103–158.

Copley, Bridget and Wolff, Phillip (2014). Theories of causation should inform linguistic theory and vice versa. In *Causation in Grammatical Structures* (ed. B. Copley and F. Martin). Oxford University Press, Oxford.

Davidson, Donald (1967). The logical form of action sentences. In *The Logic of Decision and Action* (ed. N. Rescher), pp. 81–95. University of Pittsburgh Press, Pittsburgh, PA.

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

Dell, François (1983). An aspectual distinction in Tagalog. *Oceanic Linguistics*, **22/23**, 175–206.

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

Fillmore, Charles (1968). The case for case. In *Universals in Linguistic Theory* (ed. E. Bach and R. Harms), pp. 1–90. Holt, Rinehart and Winston, London.

Fodor, Jerry A (1970). Three reasons for not deriving "kill" from "cause to die". *Linguistic Inquiry*, **1**, 429–438.

Folli, Raffaella and Harley, Heidi (2008). Teleology and animacy in external arguments. *Lingua*, **118**, 190–202.

Gärdenfors, Peter (2014). *The Geometry of Meaning: Semantics based on Conceptual Spaces*. MIT Press, Cambridge, MA.

Grimshaw, Jane (1990). *Argument Structure*. MIT Press, Cambridge, MA.

Hale, Kenneth and Keyser, Samuel Jay (1993). On argument structure and the lexical expression of syntactic relations. In *The View from Building 20: Essays in Honor of Sylvain Bromberger* (ed. K. Hale and S. J. Keyser), pp. 53–109. MIT Press, Cambridge, MA.

Jackendoff, Ray (1972). *Semantic Interpretation in Generative Grammar*. MIT Press, Cambridge, MA.

Jackendoff, Ray (1990). *Semantic Structures*. MIT Press, Cambridge, MA.

Jackendoff, Ray (2007). *Language, Consciousness, Culture: Essays on Mental Structure*. MIT Press, Cambridge, MA.

Kamp, Hans (1999−2007). Intentions, plans and their execution: Turning objects of thought into entities of the external world. Unpublished ms., Universität Stuttgart.

Krifka, Manfred (1989). Nominal reference, temporal constitution, and quantification in event semantics. In *Semantics and Contextual Expression* (ed. R. Bartsch, J. van Bentham, and P. van Emde Boas), pp. 75–115. Foris, Dordrecht.

Lewis, David (1973). Causation. *Journal of Philosophy*, **70**, 556–567.

Link, Godehard (1983). The logical analysis of plural and mass terms: A lattice-theoretical approach. In *Meaning, Use and the Interpretation of Language* (ed. R. Bäuerle, C. Schwarze, and A. von Stechow), pp. 303–323. Walter de Gruyter, Berlin.

Link, Godehard (1997). *Algebraic Semantics in Language and Philosophy*. CSLI, Stanford, CA.

Martin, Fabienne and Schäfer, Florian (2012). The modality of *offer* and other defeasible causative verbs. In *Proceedings of WCCFL 30* (ed. N. Arnett and R. Bennett), Somerville, MA, pp. 248–258. Cascadilla Press.

McCawley, James (1968). Lexical insertion in a transformational grammar without deep structure. In *Papers from the Fourth Regional Meeting, Chicago Linguistic Society, April 19-20, 1968* (ed. B. Darden, C.-J. Bailey, and A. Davison), pp. 71–80. Department of Linguistics, University of Chicago. Reprinted as ch.8 of McCawley (1973).

McCawley, James (1973). *Grammar and Meaning: Papers on Syntactic and Semantic Topics*. Academic Press, New York.

Michotte, Albert (1954). *La perception de la causalité* (2nd edn). Publications universitaires de Louvain, Louvain.

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

Oehrle, Richard (1976). *The Grammatical Status of the English Dative Alternation*. Ph.D. thesis, Massachusetts Institute of Technology.

Pietroski, Paul (2000). *Causing Actions*. Oxford University Press, Oxford.

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

Ramchand, Gillian (2008). *Verb Meaning and the Lexicon: A First Phase Syntax*. Cambridge University Press, Cambridge.

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

Rosen, Sara Thomas (1999). The syntactic representation of linguistic events. *Glot International*, **4**, 3–11.

Roy, Isabelle and Soare, Elena (2013). Event-related nominals. In *Categorization and Category Change* (ed. G. Iordăchioaia, I. Roy, and K. Takamine), pp. 123–152. Cambirdge Scholars Publishing, Newcastle upon Tyne.

Rozenblit, Leonid and Keil, Frank (2002). The misunderstood limits of folk science: An illusion of explanatory depth. *Cognitive Science*, **26**, 521–562.

Smith, Barry and Casati, Roberto (1994). Naive physics. *Philosophical Psychology*, **7**, 227–247.

Talmy, Leonard (1988). Force dynamics in language and cognition. *Cognitive Science*, **12**, 49–100.

Talmy, Leonard (2000). *Toward a Cognitive Semantics*. MIT Press, Cambridge, MA.

Tovena, Lucia (2011). Accomplishments: Their telos and their structure. In *Proceedings of Sinn und Bedeutung 15* (ed. I. Reich, E. Horch, and D. Pauly), Saarbrücken, pp. 613–628. Universitätsverlag des Saarlandes.

Travis, Lisa (2000). Event structure in syntax. In *Events as Grammatical Objects: The Converging Perspectives of Syntax and Lexical Semantics* (ed. C. Tenny and J. Pustejovsky), pp. 145–185. CSLI, Stanford, CA.

Truswell, Robert (2011). *Events, Phrases, and Questions*. Oxford University Press, Oxford.

Vendler, Zeno (1957). Verbs and times. *Philosophical Review*, **66**, 143–160.

Williams, Edwin (1985). PRO and subject of NP. *Natural Language & Linguistic Theory*, **3**, 297–315.

Wolff, Phillip (2003). Direct causation in the linguistic coding and individuation of causal events. *Cognition*, **88**, 1–48.

Woodward, Amanda (1998). Infants selectively encode the goal object of an actor's reach. *Cognition*, **69**, 1–34.

Zacks, Jeffrey and Tversky, Barbara (2001). Event structure in perception and conception. *Psychological Bulletin*, **127**, 3–21.