McNally, Louise. 2024. Two approaches to the semantic decomposition of change of state verbs, how they differ, and why it matters. *Glossa: a journal of general linguistics* 9(1). pp. 1–25. DOI: https://doi.org/10.16995/glossa.9948

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Two approaches to the semantic decomposition of change of state verbs, how they differ, and why it matters

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In this paper, I contrast two broad decompositional approaches to verb semantics. One, especially associated with David Dowty, involves translating verbs using a set of precisely interpreted primitive predicates such as CAUSE and BECOME, in order to facilitate semantic generalizations such as patterns of entailment between sentences. Another, with multiple origins in both temporal semantics and theories of the syntax/semantics interface (including, notably, work by Pustejovsky and Piñón), involves developing a theory of the internal part structure of the eventualities that verbs and other expressions describe; I refer to this approach, following Pianesi and Varzi, as *mereotopological*. These two approaches to decomposition are not, strictly speaking, incompatible, and they have sometimes been combined; however, perhaps surprisingly, comparison of them has been unsystematic. I address this gap by describing more systematically how the approaches differ from each other, illustrating with differences in the insights they offer into specific aspects of the semantics of simple change of state verbs and unselected object resultatives. I especially aim to promote interest in the development of more sophisticated, cross-linguistically applicable theories of so-called event structure through appeal to a wider range of notions from mereotopology.

1 Introduction

Verbs expressing change of state have been extensively studied in the linguistics literature for a variety of reasons showcased in this special issue.[1] In the case of semantic theory, they have figured prominently in proposals for decomposing the semantic contribution of verbs, with the goal of capturing different sorts of within-language and cross-linguistic generalizations. For example, the fact that (1a) entails (1b), and that (1b) entails (1c), motivated Dowty (1979) (building on earlier syntactic proposals by Lakoff 1965 and McCawley 1968) to decompose the contribution of verbs (and relevant accompanying phrases) by translating them into logical representations that included a combination of primitive predicates,[2] such as CAUSE and BECOME, with precise, invariant semantic interpretations, plus an idiosyncratic meaning component (e.g., **awake**).

(1) a. The noise awoke the baby.
 b. The baby awoke.
 c. The baby is awake.

Thus, adapting the rules in Dowty (1979: 307), (1a) could be translated as in (2), where ι is the logical representation of the definite article and entails uniqueness of the variable it binds, and P stands for a predicate – in prose, (2) says that something about the noise caused the baby to become awake.

(2) $[\exists P[P(\iota x.\mathbf{noise}(x))]\ \textsc{cause}\ [\textsc{become}(\mathbf{awake}(\iota y.\mathbf{baby}(y)))]]$

This kind of decomposition fulfilled at least three functions, in Dowty's view. First, it supported a semantic classification of verbs, according to the primitives into which they could be decomposed. Second, Dowty used the primitives to describe the semantic contribution of derivational morphology (such as adding *-en* to an adjective, as in *darken*). Finally, Dowty speculated that decomposition into semantic primitives might play a role in a theory of constraints on possible verb meanings.

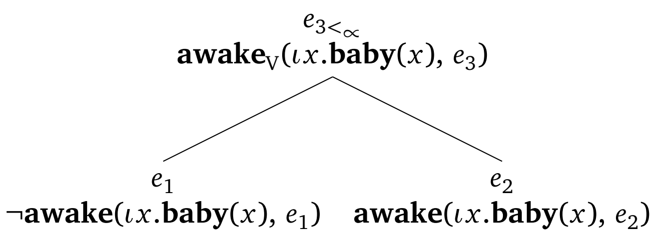
We can contrast the decomposition of a verb's entailments via primitive predicates with a different approach to semantic decomposition that aims to capture generalizations about verb

[1] Two terminological comments: First, though for simplicity I will talk about *verbs* expressing change of state, I take for granted that a verb's subject and complements as well as other accompanying phrases, such as resultatives, will as a rule also be relevant. Second, as I am mainly concerned with semantics, I will avoid to the extent possible any theory- or framework-specific assumptions about syntax, and use terms such as *subject* and *complement* for descriptive ease, without any specific theoretical commitments.

[2] Dowty also used the term *operator* to describe these predicates, echoing the fact that when they are precisely defined, they can be viewed as similar in relevant ways to operators which have been defined in logic in order to support inference rules, such as tense or modal operators. I will thus also occasionally follow Dowty in this use of the term *operator*.

meaning via a theory of the sorts of eventualities they describe and their internal part structure.[3] A prominent example appears in Pustejovsky (1991; 1995). On his theory, a verb like *to awake* describes a specific type of eventuality, namely a transition, consisting of a subeventuality (in this case, a state of some entity not being awake), followed immediately by another subeventuality (viz., a state of that entity being awake).[4] Thus, the semantics of (1b) could be represented as in (3), where e_3 is the transition, and $<_{\propto}$ indicates that e_3 consists entirely of state e_1 exhaustively ordered before state e_2 (i.e., all of e_1 precedes all of e_2). With the right additional assumptions, (3) captures the fact that (1b) entails (1c) insofar as the transition described by (1b) contains the state described by (1c) as a proper part. I have added logical representations on the nodes in (3) for clarity, but they are not part of the event decomposition system itself (here, the verb and adjective uses of *awake* are disambiguated by subscripting the translation of the former with "V").

(3)



Pustejovsky refers to representations such as (3) as *event structures*, but as this term is used by a number of researchers in slightly different ways (see, e.g., Truswell 2019), I will instead refer to the approach to semantic decomposition illustrated in (3) as *mereotopological*, following, e.g., Pianesi & Varzi (1996) and Piñón (1997). Mereotopology, as used here, combines mereology – the theory of parts and wholes – "together with a topological component, thereby allowing the formulation of ontological laws pertaining to the boundaries and interiors of wholes, to relations of contact and connectedness, to the concepts of surface, point, neighbourhood, and so on" (Smith 1996: 287; see this work for additional, more general references). The analysis in (3) is mereotopological insofar as it characterizes *to awake* as describing a type of eventuality with a particular internal structure: one state in which an individual is not awake, connected to an immediately posterior state in which that individual is awake. The term is perhaps complex, but the specific mereological and topological notions we will use are fairly simple, as will become evident in Section 2.2.

[3] I use *eventuality* as in Bach (1986) as a cover term for both states and non-states, and *event* specifically for non-states.

[4] Pustejovsky (1995) cites Kamp (1980), van Bentham (1983), Moens & Steedman (1988), and Grimshaw (1990) as related antecedents of and inspirations for his theory.

The differences between semantic decomposition via primitive predicates vs. via mereotopology may seem subtle or even pedantic.[5] The principal contrast that we might observe in these first examples is that there are no event variables in (2), and no primitive predicates like BECOME in (3). But this, as we will see below, does not reflect deep facts about the two approaches, and in fact they are not incompatible; indeed, sometimes they have been combined – Pustejovsky (1991) and Rothstein (2004) offer examples. Perhaps this is why there is almost no specific comparison of them in the literature, to my knowledge.[6] However, such a comparison is important not only for semantic theory but also because we might expect its results to inform syntactic analyses that make use of decomposition or abstract heads in the representation of basic clause structure (see Folli & Harley 2004; Ramchand 2008; Alexiadou et al. 2015; Beavers & Koontz-Garboden 2020 for varied examples, and see the latter work for additional discussion and references). It can also inform debates within decompositional approaches about which alternatives among specific choices of primitives are best chosen (see e.g. Lombard 1985; Parsons 1990; Pietroski 2005; Wunderlich 2012 *inter alia* for examples and discussion).

The goal of this paper is therefore to fill this gap. After offering additional details in Section 2 on approaches to semantic decomposition as applicable to change of state verbs, in Section 3 I present examples illustrating how the approaches afford different sorts of insights and why, in particular, greater attention should be given to the mereotopological approach.

2 Approaches to semantic decomposition for change of state verbs

I begin with a preliminary note. Formal semantic analysis in the tradition of Montague (1970a; 1970b) typically involves two steps: a translation of the language being analyzed into a disambiguated logical representation, followed by an interpretation of that logical representation in a model. Although Montague has been associated with the position that this translation step is in principle omissible (see e.g. Dowty 1979: 29ff., Barker & Jacobson 2007 for discussion), in practice translation into logical representation is widely used in formal semantics, and indeed it

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[5] There are other ways to semantically analyze verbs. One long-standing approach is to posit features to classify verbs according to one or more semantic properties that they manifest. Examples, from different proposals, include features such as [+/–telic], [+/–ADD TO] (Verkuyl 1972), or [+/–CUM] (for “cumulative reference,” Krifka 1989). However, since these features, when given formal definitions, have been treated as properties of the verbal predicates themselves, not as proposals for decomposing the verb’s logical translation or the sort of eventuality it describes, I will not discuss them further here, despite their prominence in the literature on verb semantics and lexical aspect more specifically.

[6] While Pustejovsky (1991) presents some criticisms of decomposing verb semantics into primitive predicates, his emphasis is on different aspects of his theory of event structure than those I will emphasize below. Similarly, while Piñón (1997) offers arguments for the use of mereotoplogical notions in analyzing verb semantics, he does so primarily in order to defend a particular characterization of Vendler’s (1957) class of achievement predicates. Truswell (2019: Chapter 1) is perhaps the closest in spirit to the sort of discussion I aim to provide.

has been argued by some to be essential (see e.g. Kamp 2017 and references cited there), or at least useful as an analytic heuristic (Dowty 1979: 31ff.).

Semantic decomposition into primitive predicates is a part of translation into logic, and therefore presupposes that there is such a translation step, even if it is only for the purpose of making the semantics explicit. In contrast, the (mereotopological) approach of decomposing eventualities into parts is a matter of defining what a model for natural language interpretation should include, in particular what belongs in *natural language ontology* (the set of entities we "talk as if there is", Bach 1986: 573) and how they are structured and grouped. Crucially, the decomposition of eventualities does *not* presuppose any specific assumptions about translation into logic: It is therefore compatible with semantic decomposition into primitive predicates, but does not require any such step. Thus, a first observation is that the two types of decomposition involve distinct aspects of semantic modeling.

2.1 Translation using primitive predicates

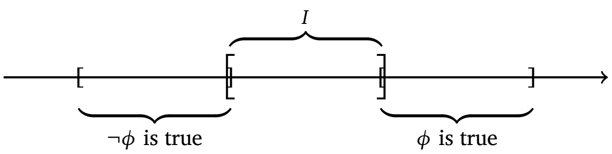
Dowty's program was "to show that the kind of decomposition analysis produced in G[enerative] S[emantics] can form a useful basis for expanding the class of entailments among English sentences that are formally provable in the theory" (viz., Montague Semantics, Dowty 1979: 31). This program was very general: There are multiple ways to account for intuitions about when sentences are true, as well as for the logical (or more generally, inferential) relations between them. Importantly, Dowty's semantics, unlike most current work on verb semantics, did not include eventualities as basic entities, and therefore his truth conditions for CAUSE and BECOME do not refer to them. In the case of BECOME, Dowty offers two different analyses. In Chapter 2, the semantics for the operator makes crucial reference to truth at times understood as *instants* t, as in (4):

(4) Where ϕ is any formula, and t is any time, BECOME(ϕ) is true at t iff ϕ is true at t and false at $t - 1$. (Dowty 1979: 76)

In Chapter 3, where he adopts a semantics in which truth is defined at temporal *intervals* I, he proposes the semantics in (5). This semantics associates simple changes of state with the minimal interval consisting first of $\neg\phi$ holding and then ϕ holding, as illustrated in (6).

(5) BECOME(ϕ) is true at I iff (1) there is an interval J containing the initial bound of I such that $\neg\phi$ is true at J, (2) there is an interval K containing the final bound of I such that ϕ is true at K, and (3) there is no non-empty interval I' such that $I' \subset I$ and conditions (1) and (2) hold for I' as well as I. (*op. cit.*: 141)

(6)



(*op. cit.*: 140)

Dowty eventually advocates the interval-based semantics in (5) for BECOME after identifying a series of problems with the analysis in (4). However, it is worth highlighting his comment that "[i]n fact, the analysis I will propose below turns out not to require the assumption that the meanings of accomplishments and achievements[7] are exactly 'decomposable' in terms of operators like CAUSE and BECOME at all, but merely that these two classes of verbs logically entail BECOME-sentences (or other formulas with equivalent semantic properties)." (*op. cit.*: 137)

In contrast, Dowty's analysis of CAUSE does not make reference to times. He limits himself (*op. cit.*: 109) to characterizing the operator as a relation between propositions; his truth conditions are inspired in Lewis' (1973) analysis of causation.[8]

(7) [ϕ CAUSE ψ] is true if and only if (i) ϕ is a causal factor for ψ, and (ii) for all other ϕ' such that ϕ' is also a causal factor for ψ, some $\neg\phi$-world is as similar or more similar to the actual world than any $\neg\phi'$-world is.

Although Dowty remains noncommittal about the temporal interval at which the CAUSE relation holds, he leans towards the idea that sentences of the form in (7) will be true "at the smallest interval containing the intervals at which ϕ and ψ are true" (*op. cit.*: 191, fn. 17).

With these definitions in hand, the translations of caused changes of state predicates can be represented by embedding a BECOME proposition as the second argument to CAUSE, as in (2) (repeated below in (8)) for (1a). We can now see why the first argument of CAUSE is not simply the translation of *the noise* (i.e., $\iota x.\mathbf{noise}(x)$): CAUSE needs a full proposition, not just an entity, as its first argument.

(8) $[\exists P[P(\iota x.\mathbf{noise}(x))]$ CAUSE $[\text{BECOME}(\mathbf{awake}(\iota y.\mathbf{baby}(y)))]]$

Dowty's primitive predicate-based approach has remained influential, though one important detail has changed with time: Most semantic analyses that incorporate such primitives now assume eventualities as basic sorts of entities in natural language ontology (see Rothstein 2004; Beck 2005; Gehrke 2008; Beavers & Koontz-Garboden 2020 *inter alia* for proposals inspired in his work), and use them in the semantics for CAUSE and/or BECOME in place of propositions. To illustrate with just one recent concrete example, Beavers & Koontz-Garboden (2020) define

[7] These are two of Vendler's (1957) well-known aspectual classes of predicates. Dowty associated achievement predicates with decomposition involving BECOME, and accomplishments with the additional presence of CAUSE.

[8] Dowty (*op. cit.*: 108) defines "causal factor" as in (i), where ϕ *depends causally* on ψ if and only if ϕ and ψ are true and $\neg\phi$ is the antecedent, and $\neg\psi$, the consequent, in a Lewisian counterfactual conditional relation.

(i) ϕ is a *causal factor* for ψ if and only if there is a series of sentences $\phi, \phi_1, \ldots, \phi_n, \psi$ (for $n \geq 0$) such that each member of the series depends causally on the previous member.

CAUSE as a relation between two eventualities (events or states),[9] and BECOME as in (9) (minor notational adaptations here and below).[10]

(9) For all *s*, *e*, BECOME(*s, e*) is true iff at the beginning of *e* the state *s* does not hold and at the end of *e* the state *s* does hold. (Beavers & Koontz-Garboden 2020: 36)

Note that this definition closely parallels Dowty's second definition of BECOME, in (5): *e* would appear to have to have a duration corresponding to a minimal interval, since it must include a time at which *s* does not hold followed by another at which *s* does hold. It also closely resembles Pustejovsky's transition in (2).

In line with (8), Beavers and Koontz-Garboden combine CAUSE and BECOME as in (10b) (their (24c), p. 15, illustrated for (10a)), where *v* ranges over events or states and EFFECTOR is a thematic role type equivalent to "causer".

(10) a. Mary flattened the rug.
b. $\exists v \exists e[\text{EFFECTOR}(\mathbf{m}, v) \wedge \text{CAUSE}(v, e) \wedge \exists s[\text{BECOME}(s, e) \wedge \mathbf{flat}(\iota x.\mathbf{rug}(x), s)]]$

Note, however, that nothing in (10b) explicitly indicates whether there are any part relations between *v*, *e* or *s*. Beavers and Koontz-Garboden do comment (*op. cit.*: 50) that "if there are two (or more) event structural subevents in the overall event described by the verb, causation is the relation that relates the subevents together, regardless of how exactly that relation is modeled, unless there is a specific reason to assume some other relation, whatever it may be," and add (*op. cit.*: 54) that "in principle, the simplest analysis is that all of the change-of-state and manner events entailed to be part of the causal chain by a single change-of-state predicate are somehow mereologically joined at the top vP, which is thus a predicate over the joined events (e.g. that there is some whole event $h = e \oplus v$ in [(10b)] that the top vP predicates of)".[11] But the representation in (10b) contains no variable corresponding to a larger event that might contain *v* and *e* as parts; we can at most infer that such a larger event exists. There is also no mention of the temporal interval at which sentences like (10a) are evaluated. The fact that Beavers and Koontz-Garboden did not explicitly mention a larger event in their representations arguably indicates that explicit part structures for events are not especially crucial to their analysis.

9 Unike Dowty, Beavers and Koontz-Garboden (2020: Section 1.6.2) do not propose an explicit semantics for CAUSE, citing the limitations of existing proposals, including the Lewis/Dowty semantics, and the complexities involved in developing a viable alternative.

10 Beavers and Koontz-Garboden later revise their semantics to incorporate a degree semantics for gradual change, but as this will not be relevant in what follows, I will avoid this more complicated formulation here.

11 The mereological structure of entities in semantic theory is typically described using notions from lattice theory. The join of two entities is that entity which is their least upper bound. $\oplus$ is used here to represent the join (of *e* and *v*), and is analogous to the sum operation described in (11c) below. See e.g. Partee et al. (1993), Casati & Varzi (1999), Cotnoir & Varzi (2021) for introductions to lattice theory and mereology.

To summarize, one approach to semantic decomposition involves translating natural language into logical representations involving primitive predicates with more or less precise truth conditions. This kind of analysis can be considered successful if it can predict the conditions under which sentences are true (e.g. that the truth of (1b) requires the baby to have been not awake immediately before, while (1c) does not), entailment relations between sentences (e.g. that (1a) entails (1b)), or the systematic semantic effects of morphological processes (e.g. the similarity between *dark/darken* and *weak/weaken*). This approach does not require any specific commitments about natural language ontology: We have seen that it can be developed with or without positing a primitive notion of eventuality, for example, and therefore it does not carry any specific commitments about the part structures of eventualities.

2.2 Mereotopologies and event(uality) structures for verb semantics

In contrast, the question of the possible part structures of the entities we describe using natural language is precisely the focus of mereotopological analyses of linguistic phenomena. Such analyses have been prominently used to undergird accounts of spatial expressions and spatial reasoning (Casati & Varzi 1999) as well as theories of which aspects of the internal structure of ordinary entities are grammatically relevant (see e.g. Grimm 2012 on the semantics of number morphology, and Wągiel 2018 on quantification over parts of discrete entities). We therefore might also naturally expect mereotopology to be useful for the analysis of expressions describing eventualities – as a theory of *event(uality) structure* in the most literal sense of the term. Perhaps surprisingly, then, it is difficult to find a fully formalized proposal that shares the popularity of predicate decomposition using CAUSE and BECOME, although such proposals do exist (e.g. Pianesi & Varzi 1996; Piñón 1997), and we will see in this section and Section 2.3 that there are widely assumed partial formalizations or implicit proposals (including Pustejovsky's 1991; 1995).

A first step in developing any such theory of eventuality structures is to decide what basic type(s) of entities should be posited in the first place. In the literature related to verb semantics we find not only (obviously) eventualities but also (as we saw in Section 2.1) times (see e.g., Kamp 1979; van Bentham 1983; Bach 1986; Link 1987 for antecedents to the other proposals discussed here). In fact, an important and highly debated issue is whether eventualities can be defined in terms of times, and thus done away with as primitive entities, or vice versa (see e.g. Casati & Varzi 1997 for references). I will avoid this issue, which goes far beyond the scope of this paper, and simply assume that a natural language ontology includes both times and eventualities as basic types of entities and that we can define relations between them.

A second question concerns whether, for a given basic type of entity we might posit, there is more than one basic subtype or *sort* of that entity. To offer just one familiar example, most linguists now assume that states are a primitive sort of eventuality, distinct from other sorts of eventualities in typically having some duration but lacking any kind of dynamicity (though see Davidson 1967, Katz 1995 for proposals making use of events but eschewing states as primitives). But within dynamic eventualities is there more than one *basic* sort? Pustejovsky (1991) claimed that the answer was negative: He posited just one sort of basic dynamic eventuality, which he called a *process*;[12] all other dynamic eventualities are constructed out of combinations of states or processes. However, there are other ways in principle that we could define basic sorts of eventualities – for example, grounded not in dynamicity but rather in temporal properties (see e.g. Moens & Steedman 1988, Piñón 1997, Truswell 2019: Chapter 4, as well as Section 3 below).

Finally, which basic sorts of entities we assume is intimately bound up with the third question any mereotopology has to address: What are the operations and relations that define how entities can be structured? Pustejovsky (1995: 69ff.) explicitly posits (11a)–(11b) and assumes (11c), all provided here with informal definitions; see Pianesi & Varzi (1996) for rigorous definitions and Grimm (2012: Chapter 4) for an introduction with accessible, illustrative examples.

(11) a. Part ($\preccurlyeq$): a primitive relation that is reflexive (all things are parts of themselves, $e \preccurlyeq e$), antisymmetric (e_1 can be a part of e_2 at the same time as e_2 is a part of e_1 only if e_1 and e_2 are identical), and transitive (if e_1 is a part of e_2, and e_2 is a part of e_3, then e_1 is a part of e_3).
b. Overlap ($\circ$): For all e_1, e_2, $e_1 \circ e_2$ just in case they have a part in common.
c. Sum ($\oplus$): For all e_1, e_2, $e_1 \oplus e_2$ is the unique e_3 that has all of e_1 and e_2, but nothing else, as its parts. Sum can be generalized from two entities to sets of arbitrarily large size.

In addition, he posits (12), which for the sake of discussion we can take as presupposing a mapping between eventualities and linearly ordered intervals of time – the so-called *temporal trace* of the eventuality.

(12) Precedence ($<$): a relation that is irreflexive (nothing can precede itself), asymmetric (if a given part of e_1 precedes a given part of e_2, then said part of e_2 cannot precede said part of e_1), and transitive. e_1 exhaustively precedes ($<_{\propto}$) e_2 if all parts of e_1 precede all parts of e_2.

To these definitions we can add, following Pianesi & Varzi (1996), a basic notion of *boundary*. Boundaries are intuitively what separate something from something else that is not a part of that thing. More formally, if any point is a boundary of (some part of) an entity or eventuality e, it must also be a boundary of (some part of) an entity or eventuality that is *not e*. We can assume for the sake of this discussion that eventualities are one-dimensional, and therefore that they have only left boundaries and right boundaries corresponding to their beginnings and endings.

[12] His processes corresponds to Dowty's *activities*.

Note that since an eventuality cannot simultaneously satisfy some description P and its negation ($\neg P$), and since boundaries are simultaneously boundaries of eventualities of type P and $\neg P$, the boundaries themselves cannot be associated with any temporal trace; see Piñón (1997) for further discussion.

(13) Boundary: $lb(e)$ is the initial or left boundary of e, $rb(e)$ is the final or right boundary of e.

Note that if $e_1 <_{\propto} e_2$, then it is possible that $rb(e_1) = lb(e_2)$.

Reifying a notion of boundary allows us to talk not only about eventualities including their boundaries, but also to refer to boundaries of eventualities alone, as distinguished from the internal parts of eventualities. This will prove crucial in Section 3.

The notion of boundary can also be used to define *connectedness*. Informally, two entities or eventualities are connected if they share a boundary or if they otherwise overlap. Two specific types of connectedness will be relevant below: *self-connectedness*, and *maximal self-connectedness* ((14a) is from Piñón 1997; (14b) combines the definition in Piñón 1997 with features of the related definition of maximal strong self-connectedness in Grimm 2012):[13]

(14) a. Self-connected: e is self-connected iff any way of splitting it into two parts yields parts that overlap (for all e_1, e_2, if $e = e_1 \oplus e_2$, then $e_1 \circ e_2$).
b. Maximally self-connected relative to a description: e is maximally self-connected relative to a description P ($MSC(e, P)$) iff e is self-connected and for all e' that satisfy P such that $e' \circ e$, $e' \preccurlyeq e$.

Self-connectedness is what distinguishes complex eventualities such as the transition described by *The baby awoke* from those that are simply aggregates of disconnected (atomic) eventualities – for example, a complex eventuality whose parts consist of it raining in Barcelona from 8:00–9:00 am on a Tuesday and it raining in the same place from 10:00–11.00 am on the following day, which is a sort of eventuality licensed by the definitions in (11)–(12), but not one that we might be inclined to think of as an intuitive unit. Self-connectedness also fails to hold when there is a temporal gap between one part of an eventuality (for example, Ali singing) and a result of that part (such as Ali later becoming hoarse). Maximal self-connectedness is what distinguishes an eventuality from a proper part of it fitting the same description: If it rains in Barcelona from 8:00–9:00 am on a Tuesday (and it is sunny just before and after), that event will be maximally self-connected; the event of raining from 8:00–8:15 am on that Tuesday will be self-connected, but not maximally self-connected.

[13] The differences between Piñón's and Grimm's definitions are due to the fact that the former cover eventualities, which are treated as unidimensional, while the latter cover 2- and 3-dimensional entities; these differences will not concern us here.

With a basic set of sorts of events and the above definitions, we can define a wide variety of complex eventuality structures. A partial list appears in (15), with tentative illustrative examples of eventualities that could in principle be described by these structures).

(15) a. e_s, $(lb(e_s) \oplus e_s)$, $(e_s \oplus rb(e_s))$, $(lb(e_s) \oplus e_s \oplus rb(e_s))$: a state, which may have (respectively) left, right or left and right boundaries

b. e_p, $(lb(e_p) \oplus e_p)$, $(e_p \oplus rb(e_p))$, $(lb(e_p) \oplus e_p \oplus rb(e_p))$: a process, which may have (respectively) left, right or left and right boundaries

c. $(e_{s1} \oplus rb(e_{s1})) \oplus (lb(e_{s2}) \oplus e_{s2})$, where $rb(e_{s1}) = lb(e_{s2})$: a state followed by a distinct state overlapping just on its right boundary (see (3))

d. $(e_p \oplus rb(e_p)) \oplus (lb(e_s) \oplus e_s)$, where $rb(e_p) = lb(e_s)$: a process followed by a state overlapping just on its right boundary (e.g., Joan cutting a cord followed by the cord having an incision in it)

e. $e_p \oplus e_s$, where $e_p < e_s$: a process non-exhaustively preceding a state (e.g., Fran holding two sticks together)

f. $(e_p \oplus rb(e_p)) \oplus (lb(e_s) \oplus e_s)$, where $e_p <_{\propto} e_s$ and $rb(e_p) \neq lb(e_s)$: a process exhaustively preceding a state, but not overlapping on a boundary with that state (e.g., Ali singing until 10:00 pm and Ali being hoarse starting at 11:00 pm on the same day)

g. $((e_p \oplus rb(e_p) \oplus (lb(e_{s1}) \oplus e_{s1})) \oplus (lb(e_{s2}) \oplus e_{s2})$, where $rb(e_p) = lb(e_{s1}) = lb(e_{s2})$: an eventuality of the sort in (15d), followed by a distinct state overlapping just on its right boundary (for example, Marc cutting a leash and his dog being loose)

h. $e_{p1} \oplus e_{p2}$, where $e_{p1} \circ e_{p2}$: two overlapping processes (e.g., Toni walking and Susanna walking at the same time and place)

What we have at this point does not include any claims as to the possible mappings between language and these structures. We must therefore ask: Which of these structures are described by which kinds of verbs or other lexical items or phrases? What typological patterns to we find? What about the boundaries of eventualities? Are there linguistic expressions that specifically pick out these?

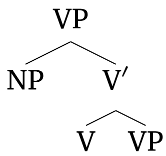
This description of what a mereotopology for eventualities involves is only partial (see especially Pianesi & Varzi 1996 and Piñón 1997 for additional details), but it will allow us to address these questions and to explore how the answers compare with those provided by approaches using primitive predicate-based decomposition. Before addressing them, however, it will be useful to briefly characterize the relation between the approaches discussed in this section and treatments of event structure in the syntax literature.

2.3 A brief comparison with event structures in the syntax literature

Going back to at least Hale & Keyser (1993), we find the intuition in the syntax literature that syntactic structure is correlated with semantic structure. Hale and Keyser note in relation to the structure in (16), below, that

> the semantic relations associated with [(16)] are unambiguous and fully determined by the [syntactic] projections of categories. The matrix V of [(16)] governs another V, the head of its complement. Corresponding to this syntactic relation, there is a similarly asymmetric (semantic) relation between two events, a relation that we will take to be that of *implication*. Accordingly, the matrix event "implicates" the subordinate event [represented $e_1 \rightarrow e_2$], a relation that makes perfect sense if the syntactic embedding corresponds to a "semantic" composite in which the subordinate event is a proper part of the event denoted by the structure projected by the main verb. (Hale & Keyser 1993: 68f.)

(16)



Different variants of this idea can be found in Rappaport Hovav & Levin (2001), Ramchand (2008), Beavers & Koontz-Garboden (2020), and many other works; see Truswell (2019) for additional overview discussion and references. The differences between these different proposals depend on two general parameters: 1) the specific syntactic structures posited (for example, the inventory of functional heads); and 2) what the specific syntactic structures map onto semantically. Here I will be concerned only with the latter.

With respect to the semantics, an important subset of proposals assumes predicate decomposition, with functional categories in the syntax introducing one or more operators of the sort discussed in Section 2.1 (e.g. v_{become}, v_{cause} in Beavers & Koontz-Garboden 2020). As the comments I make below concerning predicate decomposition will apply to these proposals as well, I will not discuss them separately here.

However, other syntactic approaches to event structure, including not only that of Hale and Keyser themselves, but also e.g. Ramchand (2008) or Alexiadou et al. (2015), use functional categories in the syntax to build event structures more similar to those proposed by Pustejovsky, without appeal to primitive *semantic* operators such as CAUSE or BECOME.[14] As Ramchand's proposal is, to my knowledge, the most detailed in its claims about semantics, I will use it here for comparison.

Ramchand (2008: Chapter 7), like Pustejovsky, assumes two basic sorts of eventualities: states and processes. She further assumes a basic Event Composition rule inspired in Hale & Keyser (1993) ((17)), which licenses complex events with two subevents.[15]

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14 Alexiadou et al. (2015) do use a v-CAUSE head in the syntax; however, they do not associate it with a CAUSE semantic primitive, assuming instead that "[c]hange-of-state verbs (of any type) are built on the basis of an eventive v head which can combine with a variety of stative elements" (p. 48). In this respect, their proposal shares the features of Pustejovsky's and Ramchand's that will be relevant in the following section, and so I will not discuss it further here.

15 No definition is provided of "causally implicates".

(17) Event Composition Rule: $e = e_1 \rightarrow e_2$: e consists of two subevents, e_1, e_2 such that e_1 causally implicates e_2.

Moreover, Ramchand contemplates one addition level of embedding, such that complex events of the form $e_1 \rightarrow (e_2 \rightarrow e_3)$ are also licensed.

Ramchand uses specific functional heads in a limited set of possible configurations, and with the respective semantics in (18), to construct event descriptions with these structures and to introduce conditions on the participants associated with these events.[16]

(18)
a. *res*: $\lambda P \lambda x \lambda e[P(e) \wedge Q_{res}(e) \wedge \text{State}(e) \wedge \text{Subject}(x, e)]$
b. *proc*: $\lambda P \lambda x \lambda e \exists e_1, e_2[P(e_2) \wedge Q_{proc}(e_1) \wedge \text{Process}(e_1) \wedge e = (e_1 \rightarrow e_2) \wedge \text{Subject}(x, e_1)]$
c. *init*: $\lambda P \lambda x \lambda e \exists e1, e_2[P(e_2) \wedge Q_{init}(e_1) \wedge \text{State}(e_1) \wedge e = (e_1 \rightarrow e_2) \wedge \text{Subject}(x,e_1)]$

Finally, she adds additional conditions to further constrain event structures *(op. cit.*: 130):[17]

(19)
a. Init-Proc Coherence: Given a decomposition $e_1 \rightarrow (e_2 \rightarrow e_3)$, e_1 may temporally overlap e_2.
b. Proc-Res Coherence: Given a decomposition $e_1 \rightarrow (e_2 \rightarrow e_3)$, e_3 must *not* temporally overlap e_2 (although they may share a transition point).

Thus, in contrast to the system described in Section 2.2, this system is designed to license only a very restricted set of event(uality) structures; moreover, in the case of all complex events, some kind of causal relation between the subeventualities is also implied. Specifically, the inventory is the following:

(20)
a. e_s: a state
b. e_p: a process
c. $e_s \oplus e_p$ where $e_s <_{\propto} e_p$: a state exhaustively preceding a process
d. $e_s \oplus e_p$ where $e_s < e_p$: a state not necessarily exhaustively preceding a process
e. $e_p \oplus e_s$ where $e_p <_{\propto} e_s$: a process exhaustively preceding a state
f. $e_{s1} \oplus (e_p \oplus e_{s2})$, where $e_{s1} < e_p <_{\propto} e_{s2}$: a state exhaustively or non-exhaustively preceding a complex event consisting of a process exhaustively preceding a state

While there are obvious similarities between the inventories in (20) and (15), above, we can highlight three differences between them that will be relevant in the following section. First, although Ramchand mentions a “transition point” in (19b), there is no formal notion in her system

[16] The details of the conditions on the Subject participant vary according to the structure of the eventuality associated with each head: in some cases it will cash out as an Initiator role, and in others, as an Undergoer, Resultee, Resultee-Rheme or Path. The definitions in (18) are slightly modified from the original for clarity; Q_α stands for the lexical content that is eventually associated with the functional projection of type α in question.

[17] In the pre-publication of Ramchand (2008), Init-Proc Coherence is given a stronger definition in Chapter 7, on which “some proper subpart of e_1 precedes e_2”, although the discrepancy between this definition and the one earlier in the book (identical to (19a)) appears to be unintentional.

(or in Pustejovsky's or related proposals in the syntax literature) of *boundary part*, as ontologically distinct from strictly *internal part*. Second, complex eventualities consisting of two consecutive states, such as in (3), are not licensed in this system. Dynamicity is intimately connected to the presence of *proc*: All changes of state involve a process followed by a state or alternatively, processes that involve a scalar path. Third, it is not obvious that complex event structures can be "left branching", that is, consist of a transition followed by a state, while nothing in principle excludes this in the system presented in Section 2.2 (cf. (15g)). It is therefore worth considering whether, despite the *a priori* virtues of restricting the inventory of eventuality structures through constraints on syntactic configurations, this restrictiveness has any unwelcome consequences. For this purpose, change of state predicates are an ideal empirical domain to examine.

3 Mereotopological structure vs. primitive predicate-based decomposition in the analysis of change of state predicates

Let us assume a minimally restrictive definition of "change of state predicate" as any predicate that entails a change from some state not holding to holding of one of its arguments. If we define change of state predicates in this way, we make no commitments about the sort of eventualities the predicates themselves *actually describe* or their temporal properties. This notion of change of state predicate can therefore cover a potentially diverse set of eventualities, with varying linguistic properties across languages. While this observation is surely obvious, the approaches presented in the previous section differ in the way they facilitate thinking about these differences. Here I briefly illustrate with two examples.

3.1 Simple change of state entailments via boundaries vs. transitions

Consider first simple change of state entailing sentences such (1b), repeated in (21):

(21) The baby awoke.

The approaches discussed in Section 2 afford at least four possible analyses of this sentence and others involving so-called inchoative verbs. Predicate decomposition (using Beavers & Koontz-Garboden 2020 for the sake of illustration) provides the truth conditions in (22), that is, what is entailed to be the case if an assertion of (21) is true.

(22) $\exists e \exists s[\textsc{become}(s, e) \wedge \mathbf{awake}(\iota x.\mathbf{baby}(x), s)]]$

As noted in Section 2.1, while this representation commits us to there being an event of "becoming" and a state of the baby being awake, it it not committal about the type of eventuality an awakening is – in other words (and perhaps surprisingly), it says nothing about the *event*(*uality*) *structure* of (21), because that is not what it is intended to do.

(23)–(25) respectively provide four event(uality) structures that could be considered in principle for (21). The first two are similar in describing complex events with non-homogeneous parts, each of which must have some minimum duration (however brief), as must, therefore, the complex event as a whole. These structures are characteristic of telic (eventive) predicates. (23a) is Pustejovsky's analysis: a transition consisting of one state followed by another.[18] (23b) is based on Ramchand (2008)'s analysis of similar change of state verbs: an event consisting of an unidentified process followed by a result state.

(23) a. $e = [_{s1}\ \neg\mathbf{awake}(\iota x.\mathbf{baby}(x), s_1)] \oplus [_{s2}\ \mathbf{awake}(\iota x.\mathbf{baby}(x), s_2)]$
b. $e_2 = [(e_1\ Q_{proc}(e_1) \wedge \text{Undergoer}(\iota x.\mathbf{baby}(x), e_1)] \oplus [_s\ \mathbf{awake\ (}s\mathbf{)} \wedge$ $\text{Resultee}(\iota x.\mathbf{baby}(x), s)]$

The principal difference between these structures is in the initial subevent, which is a state in (23a) but a dynamic event in (23b). However, note that an eventuality that satisfies *either* of these structures will also make (22) true. In this sense, both of them constitute stronger claims about the semantics of (21) than does (22). I will leave for future research the question of how they might be distinguished empirically from each other; perhaps one place to look for evidence would be the sorts of data discussed in Spathas & Michelioudakis (2021).

Alongside these two analyses, the mereotopology presented in Section 2.2 affords two additional, very different structures, both of which are nonetheless *also* compatible with (22), if not necessarily plausible for (21) specifically. One is an eventuality structure consisting of a state of the baby being awake, including crucially the initial left boundary of that state (the initial left boundary being the left boundary of the maximally self-connected state including the state described by the sentence; *b* indicates a boundary).

(24) $s = [_b\ lb(\iota s.MSC(s, \lambda s.\mathbf{awake}(\iota x.\mathbf{baby}(x), s))] \oplus [_s\ \mathbf{awake}(\iota x.\mathbf{baby}(x), s)]$

This eventuality is a state, not a (dynamic) transition. It has some duration, and its internal part is homogeneous; it will therefore not be an appropriate representation for the semantics of a telic eventive predicate. (24) is inspired in Marín and McNally's (2011) analysis of the *aburrirse* 'to get bored' subclass of (inchoative) reflexive psychological verbs in Spanish, which they showed to fail dynamicity and telicity diagnostics.[19] That said, any state that satisfies (24) will guarantee the truth of (22), because the inclusion of the initial boundary of the state entails that prior to

[18] I use brackets to associate each subeventuality with its corresponding description and for the sake of discussion assume that the final boundary of the left-hand subeventuality overlaps with the initial boundary of the right-hand subeventuality.

[19] Marín and McNally formalized their account using specific definitions from Piñón (1997), but the differences of detail are not important here.

the state holding, a state of the baby not being awake must have held, and therefore that some change took place in the baby's state of awakeness.

Finally, (25) is inspired in Marín and McNally's analysis of a second subclass of Spanish reflexive psychological verbs, exemplified by *enfadarse* 'to get angry'. This structure is simple, consisting exclusively of the initial left boundary of a state of the baby being awake, without any of that state's internal part. This boundary is simultaneously the right (final) boundary of a state of the baby being not awake.

(25) $b = lb(\iota s.MSC(s, \lambda s.\mathbf{awake}(\iota x.\mathbf{baby}(x), s)))$

This eventuality has no duration nor internal structure. Marín and McNally posited this sort of analysis for *enfadarse* verbs because those verbs failed diagnostics not only for telicity and dynamicity (like the *aburrirse* class), but also for duration.

While there is no evidence that either of these latter two analyses is appropriate for *to awake* (or indeed even for all simple change of state verbs in Spanish), arguments for similar analyses of psychological verbs have also been made not only for Spanish but also for Polish (Rozwadowska 2012), Korean (Fritz-Huechante, p.c.), and Japanese (Shimoyoshi 2016). The reader is referred to these authors for examples and discussion.

Just from this example, we can make at least two observations. First, an analysis that decomposes verb meaning into primitive predicates may provide correct truth conditions but prove insufficiently granular to account for important linguistic differences within a language or across languages. A version of the analysis in (22) could be extended to a Spanish sentence such as (26a), as in (26b). However, this analysis sheds no light on why (26a) fails telicity diagnostics, unlike (21).

(26) a. El bebé se aburrió.
the baby REFL bore-PST
'The baby got bored.'

b. $\exists e \exists s[\text{BECOME}(s, e) \wedge \mathbf{bored}(\iota x.\mathbf{baby}(x), s)]]$

While one can certainly define additional primitive predicates alongside BECOME to account for the different types of simple change of state entailing predicates, the more primitive predicates that need to be defined, the less added value the primitive-based decomposition becomes, unless it is accompanied by an independently motivated theory of what constitutes a natural set of such primitives.

Moreover, because the result of decomposition into primitive predicates may lack granularity, it can actually increase uncertainty about what is being proposed. As an example, consider the claim in Bar-el (2005) that there are inchoative, nontelic stative psychological verbs in

Sḵwx̱wú7mesh. These would seem on this description to be essentially the same as the Spanish psychological verbs described above. However, Bar-el analyzes the Sḵwx̱wú7mesh verbs as describing a type of eventuality consisting of a BECOME subevent as defined by Rothstein (2004) (similar to (23a) in picking out events that span over an interval at which a state first does not hold and then does) followed by a state subevent. On this analysis, inchoative states appear not to be states at all but rather the concatenation of a dynamic event followed by a state. Whether this was what Bar-el intended or not is unclear, as she does not discuss the specific (non)dynamicity characteristics of the inchoative statives. But what is clear is that decomposition without the appropriate inventory of primitives not only has little added value but may also may impede the development of a typology of crosslinguistic variation.

The second observation is that neither Pustejovsky's nor Ramchand's systems for generating event structures, as defined, offer analyses of data for which a distinct notion of boundary is required. In the case of Pustejovsky's system, this is trivially remediable by simply adding boundaries to the inventory of basic subsorts of eventualities, and defining additional structures that include them – his system is not importantly different from the more general system sketched in Section 2.2. In the case of Ramchand's system, however, as event structures are constructed through syntax, introducing the notion of boundary will require either adding to the inventory of functional heads in (18), or loosening the isomorphism between functional heads and event structures. If the former path is taken, the empirical consequences of an even richer abstract syntax will have to be evaluated; if the latter, one must evaluate whether the abstract functional structure in the syntax retains whatever added value it had over a less abstract syntax.

Developing a meretopological model for eventualities on its own terms allows decisions about structural possibilities to be defined independently of specific language data. A theory of the space of possible mappings to language must then be developed separately. While this might be viewed initially as inelegant, it has the advantage of offering increased flexibility in handling cross-linguistic variation in the syntax-semantics interface, and does not preclude that an interesting theory of that variation could emerge. Moreover, it allows for the grounding of the basic features of the mereotopological model in a theory of human perception which could well be universal even as the language data vary.

3.2 Unselected object resultatives, the typology of events linked to result states, and subevent connectedness

So-called unselected object resultative constructions afford a second example illustrating how a richly developed mereotopological system can help sharpen the analysis of data that have not received a fully satisfactory account either through primitive-based decomposition or through less fully articulated theories of event structure.

The literature on resultatives is vast, and I cannot do justice to it here. I will limit myself to discussing just two sorts of examples. The first involves the contrast between what Rappaport Hovav & Levin (2001) call the "bare XP" resultative vs. resultatives with "fake" reflexives ((27a)–(27b), based on their (21a–b), respectively).

(27) a. Shelly kicked free.
b. Shelly kicked herself free.

Crucially, not all verbs licensing resultatives with fake reflexives have a bare XP counterpart, as the contrast in (28) shows ((28a) is adapted from their (2a); (28b) is their (3a)).

(28) a. ??Your niece sang hoarse.
b. Your niece sang herself hoarse.

(27b)–(28b) constitute examples with unselected objects insofar as the reflexives in these examples do not correspond to participants in the event described by the main verb: (27b) does not entail (29a), and (29b) is not felicitous at all.

(29) a. Shelly kicked herself.
b. ??Your niece sang herself.

Rappaport Hovav & Levin (2001) propose that the data in (27) and (28) can be explained by what they call the Argument-per-Subevent Condition (see (30), their (36)), which has antecedents in Grimshaw & Vikner (1993):

(30) Argument-per-Subevent Condition: There must be at least one argument XP in the syntax per subevent in the event structure.

Specifically, they take the presence of the fake reflexive as evidence that sentences like (27b) and (29b) describe events with two distinct, possibly temporally discontinuous, subevents. In contrast, the absence of the reflexive indicates a "simple" event structure: The event described has a single location and temporal trace. For example, the becoming free in (27a) is claimed to have to take place as Sally kicks, while (27b) might be compatible with a situation in which, for example, Sally is being held, she kicks, and then a split-second later is let go. The oddness of (28a) would ostensibly be explained by the fact that normally the hoarseness resulting from singing appears with some delay after the singing has stopped, rather than being a concomitant part of the singing.

Let us assume that the intuition behind the Argument-per-Subevent Condition is fundamentally correct. The problem is the following: On both a predicate decomposition analysis based on CAUSE and/or BECOME, as well as on the event structural analyses of the sort licensed by Pustejovsky's or Ramchand's systems, both sentences in (27) describe events with two subevents: a kicking process, and a state of being free. In what sense, then, can (27a) but not (27b) have a "simple" event structure? How can we capture Rappaport Hovav and Levin's intuition?

In the case of a predicate decomposition, the most obvious analysis, shown in (31), would truthfully describe both sentences in (27).

(31) $\exists v \exists e[\mathbf{kick}(\mathbf{s}, v) \wedge \textsc{cause}\,(v, e) \wedge \exists s[\textsc{become}(s, e) \wedge \mathbf{free}(\mathbf{s})]]$

An additional clause would have to be added to differentiate the two, either by enforcing some kind of link between the evolution of the kicking and the becoming free for (27a) or excluding one for the case of (27b). Either way, decomposition on its own offers limited insight into the data.

In contrast, a well-developed mereotopology offers a path to differentiating bare XP and fake reflexive sentences, via the distinction between an event whose parts are self-connected vs. one whose parts are not self-connected. Recall that it is possible to construct arbitrarily complex events through the sum operation. Nothing requires the internal parts of these complex events to temporally overlap. Thus, we could assign distinct eventuality structures to the sentences in (27) by doing something as simple as enforcing in the first case that the two component subevents overlap.

(32) a. (27a): $e_2 = [_{e1}\ \mathbf{kick}(\mathbf{s}, e_1)] \oplus [_s\ \mathbf{free}(\mathbf{s})] \wedge e_1 \circ e_2$
b. (27b): $e_2 = [_{e1}\ \mathbf{kick}(\mathbf{s}, e_1) \oplus [_s\ \mathbf{free}(\mathbf{s})]$

The Argument-Per-Subevent Condition could then be reformulated, for example, as an Argument-per-Non-Self-Connected-Subevent Condition. This reformulation would have a certain cognitive naturalness insofar as self-connected events constitute intuitive wholes in a way that non-self-connected events do not.[20] Other ways of appealing to the notion of self-connectedness could be explored.

Let me now turn to the second sort of unselected object resultative. This is the case of examples like (33), where the referent of the direct object is entailed to be in the described result state but is not involved in the event described by the main verb. Marc in (33a) does not cut the dog, but rather cuts something restraining the dog; the cutting in (33b) is metaphorical, but clearly analogous to (33a) insofar as whatever it involves, the banks are not metaphorically cut.[21]

(33) a. Marc cut the dog loose.
b. by cutting the banks loose […] one could expect them to fully return to the markets. (McNally & Spalek 2022: (57))

[20] See e.g. Grimm (2012) on this point in relation to physical objects.

[21] The sentences in (33) thus counterexemplify Beavers and Koontz-Garboden's claim (2020:170, fn. 8) that the direct object referent must be a subpart of the entity that undergoes the event described by the main verb. For example, the dog in (33a) could be trapped in a bag, but is not a part of the bag in any meaningful sense.

These examples are puzzling insofar as *cut* normally cannot be used intransitively; an intransitive use of *cut* in the sense of (33b) is unthinkable. They specifically raise the question of what sort of event *cut* is contributing as the first subevent in these complex changes of state.

Recall that Ramchand's combination of syntax and semantics licenses only the very limited set of complex event structures in (20): Specifically, the initial subevent of a complex event can be only a state or a process; there would not appear to be any way to license another complex event as the first subevent without creating a considerably richer syntactic structure than that required to account for the fake reflexive resultatives in (27b) or (28b).

In contrast, nothing in either a primitive-based decomposition in the tradition of Dowty (1979) or in the basic mereotopology sketched in Section 2.2 would prevent the sentences in (33) from describing events consisting of a complex event (specifically, a process followed by a change of state in some unnamed object) followed by a second change of state in the referent of the unselected object. Indeed, analyses using these tools face the opposite problem of explaining why such event structures do not appear to be more frequently attested in English or across languages, as well as why the true undergoer of the cutting in (33) can go unexpressed when that normally is not possible (though see e.g. Williams 2015 for interesting suggestions and additional relevant data).

It is beyond the scope of this paper to resolve these and the other questions raised by the different analyses of change of state predicates in this section. What I hope to have done is to highlight the range of differences between these analyses: in the granularity of the distinctions they facilitate; in the ease with which they can be insightfully adapted to account for within-language and cross-linguistic variation in different sorts of change of state predicates; as well as in the choices they force (or permit) for sharpening the theory of the typology of both simple and complex change of state predicates and their semantics. Here, as in the case of sentences entailing simple changes of state, the tools of mereotopology afford useful expressiveness: on the one hand, through the notion of self-connectedness; and on the other, by not forcing an otherwise unmotivated analysis of verbs like *cut*, on which the verb would have to make a distinct semantic contribution in sentences like (33) from what it makes in ordinary resultatives (e.g. *cut the apple in two*) or in the absence of a resultative altogether.

4 Conclusion

The literature on change of state verbs and constructions containing them is replete with proposals for capturing a range of semantically-grounded generalizations through decomposition, either using semantic primitives or systems for describing the internal structures of eventualities – so-called event(uality) structures. The variety in the proposals has arisen in no small part due to the complex variation in the behavior of change of state verbs both within and across languages.

However, decomposition through semantic primitives in the tradition of Dowty (1979) is deeply different from decomposition of events into parts, a fact which, while not previously unnoticed, has not received enough explicit attention. In comparing the two approaches to decomposition more systematically in contexts where their differences are especially apparent, and in highlighting the potential of appealing to less widely used mereotopological notions such as boundary and (self-)connectedness, I hope to have sparked interest in the development of new strategies for illuminating the cross-linguistic variation in the ways we describe changes of state.

Abbreviations

REFL = reflexive form, PST = past tense (*pretérito indefinido* in Spanish).

Funding information

This research was supported by an ICREA Academia award and an award from the Alexander von Humboldt Foundation.

Acknowledgements

I am grateful to Paola Fritz-Huechante, Antonio Machicao y Priemer, the Glossa reviewers, Fabio Del Prete, and audiences at the 2022 Deutsche Gesellschaft für Sprachwissenschaft, the University of Rochester, the University of Stuttgart and the University of Frankfurt for comments and suggestions. I also thank Berit Gehrke, Scott Grimm, Beth Levin, Fabienne Martin, and Malka Rappaport Hovav for discussions over many years that have shaped my thoughts on these topics; special thanks to Rafael Marín and Alexandra Spalek specifically for the collaborations that contributed important ideas to the research reported here.

Competing interests

The author has no competing interests to declare.

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