20

Events in semantics

ALEXANDER WILLIAMS

20. 1 Introduction

Event Semantics (ES) says that clauses in natural languages are descriptions of events. Why believe this? The answer cannot be that we use clauses to talk about events, or that events are important in ontology or psychology. Other sorts of things have the same properties, but no special role in semantics. The answer must be that this view helps to explain the semantics of natural languages. But then, what is it to explain the semantics of natural languages? Here there are many approaches, differing on, among other issues, whether natural languages are social and objective or individual and mental; whether the semantics delivers truth values at contexts or just constraints on truth-evaluable thoughts; which inferences it should explain as formally provable, if any; and which if any grammatical patterns it should explain directly. The argument for ES will differ accordingly, as will the consequences, for ontology, psychology, or linguistics, of its endorsement. In this chapter I trace the outlines of this story.[1]

I begin by saying what ES is. Section 20. 3 then describes its main motive: with it we can treat a dependent phrase and its syntactic host as separate predicates of related or identical events. The next four sections, 20. 4–7, each sketch one argument in favor of this: ES can be used to state certain grammatical generalizations, formalize patterns of entailment, provide an extensional semantics for adverbs, and derive certain sentence meanings that cannot plausibly be derived otherwise. The last argument, while less familiar, is stronger than the others, compelling ES. But section 20. 8 sounds an alarm. The analyses that motivate ES will systematically validate inferences that are unsound, at least if we think conventionally about events and semantics. Sections 20. 9–12 each exemplify one response. The first rejects the analyses that motivate ES (Dowty, 1991); another dismisses our ordinary conception of events (Parsons, 1990); a third relativizes all event predicates to a perspective (Schein, 2017); and a fourth denies that semantics traffics in truth (Pietroski, 2018). The moral is, we cannot maintain both an ordinary metaphysics and a truth-conditional semantics that is simple. Those who would accept ES, and draw conclusions about the world or how we view it, must therefore choose which concession to make.

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[1] For overviews of events in philosophy and linguistics see Casati and Varzi, 1996b and 2014; Lombard, 1998; Simons, 2005; Reichard and Hinzen, 2016; Maienborn, 2011 and 2019. Useful compilations of essays include Casati and Varzi, 1996a; Higginbotham et al., 2000 and Truswell, 2019. Taylor, 1985; Lombard, 1986; Bennett, 1988; Parsons, 1990; Landman, 2000; Pietroski, 2000, 2005a, 2018 and Schein, 2017 are monographic engagements. Bayer, 1997; Beaver and Condoravdi, 2007, and Moltmann, 2007 are a few of the many empirical critiques. In this chapter I do not discuss what we learn about events or about grammar from accepting ES, in the interest of first asking what its acceptance comes to.

20. 2 Event semantics

Event descriptions are formulas like (1). Here e is a variable over events and P stands in for a predicate that is either simple or complex.

(1) $\exists e[P(e)]$

Such descriptions can be used for various purposes. Event Semantics (ES), as I will use the term, is the linguistic claim in (2), about meaning.

(2) Event Semantics (ES): The clauses of natural languages have a core that is a description of events.

If (2) is right, clause (3) has a core that is an event description like (4). Used truly it describes an event as related in a particular way to both 'Yo' and Jo.

(3) Jo yelled 'Yo'.

(4) $\exists e[(R(\text{Yo})(\text{Jo}))(e)]$

What is the core of clause and what is an event? The notions are to be developed in hand with ES itself. But a sketch will do at the outset.

   The core of a clause contains at least its main verb, plus positions bound by what we informally call its subject, direct object, or indirect object, whichever the clause contains. Other parts of the clause, such as auxiliary verbs and adverbial phrases, may or may not be in the core: each case requires analysis. In turn the full clause will express some function of the description at its core. If the core of (5) expresses (4), for example, then the whole sentence will express something derived from this, maybe (6).

(5) Must Jo yell 'Yo'?

(6) $\{\Box\exists e[(R(\text{Yo})(\text{Jo}))(e)], \neg\Box\exists e[(R(\text{Yo})(\text{Jo}))(e)]\}$

I will ignore tense, negation, quantification, modality and mood, among other things, and pretend that the whole clause has the same meaning as its core.[2]

   As for "events," little is presupposed about what the term implies. The emphasis is instead on logical form—the core of a clause is a first-order description—and the domain of that description is whatever it needs to be to make this consistent with other scruples. For linguists the basic view derives from Vendler (1967) and Davidson (1969): events are objective individuals with a distinctive relation to time, contrasting in the first place with facts. Unlike facts, events take place at or in times. Obama won his first presidential election. The event took place in 2008, but the fact did not, and is exactly the same now as it was ten years ago. Events are also less abstract than facts,

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[2] Champollion, 2015 implements ES within a compositional semantics that includes negation, tense and quantification, countering some prior concerns. Schein, 2019 has extensive discussion of negation in ES.

at least in one way. Two sentences that differ in sense, like (7a) and (7b), can describe the same event but express different facts. So while facts might plausibly (if not correctly) be identified with true propositions (Vendler, 1967), this cannot be done for events.

(7) a. Obama commanded the U.S. military.
    b. Obama commanded the U.S. military for eight years.

There is also an apparent contrast with objects, understood as three-dimensional. Perhaps events but not objects are constituted in part by their time. Perhaps Obama's command occupies time in the way that his body occupies space, and therefore could not move through time in the way that the body does (Dretske, 1967). But this contrast is suspect, and not immediately important to ES, unlike the difference from facts. See Hacker 1982 and Simons 2005 for more.[3]

There is one way that proponents of ES often depart from typical philosophers in their usage of "events." Often they use it not only for things that are temporally dynamic, like changes, but also for states as well, like the state described by (8).

(8) Obama was president of the U.S. for eight years.

The choice coincides with the position, common but not universal (Katz, 2000; Maienborn, 2008), that all clausal cores are descriptions, whether they describe their satisfiers as dynamic, as in (7), or as stative, as in (8). Given this, no distinction is needed in the semantics between the dynamic and the stative. Emmon Bach (1986) introduced "eventuality" as a cover term for the two, but "event" wins on brevity, and I will use it here.

Finally, what is it for ES to be a linguistic claim, about meaning? Three contours of this are worth marking. First, ES is not merely the claim that, when a clause is true, there is a certain kind of event in the world. This we could grant without much discussion. ES is the richer claim that a clausal core not only entails an event description, but is one. Second, ES therefore presupposes some distinction between what a clause means, versus what its uses entail, even if the former necessarily restricts the latter. More generally, what is explained by meaning need not be part of it. I can use *banana* to refer to fruits with three seed chambers, and to cause thoughts of monkeys, owing to what the word means. It does not follow that its meaning has 'trilocular' or 'associated with monkeys' as parts, not if meaning has its intended theoretical role. Third, if an event description is used truly as an ES hypothesis about a clause, then its structure must align with semantic structure in that clause. Specifically, separate predicates in the event description must be expressed by syntactically separate parts of the clause. Either that or some of the syntactically atomic parts themselves have meanings with logical structure, expressing a conjunction of event predicates; but many semantic theories in the orthodoxy do not allow for this option.

Different theories of meaning will accommodate these demands very differently. For instance, if languages are social, and semantics is just a recursive specification of reference and truth conditions, then there are few clear distinctions between what a

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[3] For speculation on neural correlates of how we represent objects versus events, see Kable et al., 2005; Wu et al., 2007; Bedny et al., 2014; Lapinskaya et al., 2016 and Matchin et al., 2019. See He and Lidz 2017 for data suggesting that English-learning infants expect clauses to describe events, and not objects, already at 18 months.

sentence means and what it entails other than the structure of its derivation (Davidson, 1967b). But otherwise meanings might readily be distinguished in terms of representational differences (Pietroski, 2018; Jackendoff, this volume). For reasons like this, the standards for evaluating ES depend strongly on the background philosophy of language.

20. 3 The motive

ES has one central motive, (9), which I will call Separation, adapting the term from Schein, 1993.[4]

(9)   Separation: Event Semantics allows us to treat parts of a clause that are separate syntactically as separate predicates semantically, predicating of related or identical events.

Sentence (10) will serve to illustrate.

(10)   Jo yelled 'Yo' loudly.

The adverb *loudly* is separate syntactically from the remainder of its clause. Given ES, we can treat these two parts, adverb and remainder, as two separate predicates, predicated of the same event and conjoined, as in (11). This analysis is advanced in Davidson, 1967a.

(11) $\exists e$ [(YellingOfBy(Yo))(Jo)(e) & Loud(e)]

We might go further. Let us think of the subject and object relations, within the clausal core, as separate from the verb syntactically.[5] Given ES we can say they express separate predicates semantically as well. Analysis (12) says this just for the subject relation in (10), if it expresses S while the verb expresses YellingOf, a two-place relation between a yelling and what is yelled in it. Analysis (13) then says this for the object relation as well, if this expresses O while the verb expresses Yelling, a predicate true of any yelling. Analyses like these were floated in Castañeda, 1967 and are nowadays known as "Neo-Davidsonian."

(12) $\exists e$ [(YellingOf(Yo))(e) & (S(Jo))(e) & Loud(e)]

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[4] There are some motives that do not fit under this rubric. One is the Higginbotham's (1983) argument that bare nonfinite complements to verbs of perception, like "Mo leave" in "Lee saw Mo leave," denote events. But notice, this observation is not about clauses in general. Another motive comes from how we refer to events anaphorically, with clausal antecedents. But it is not clear how the discourse effects of using a clause relate to its internal semantic structure.

[5] More precisely, think this way about the syntactic relations in the core bound by what we informally call the subject and object. There are two ways to implement this technically. One is to posit a terminal in the syntactic derivation that is uniquely related to the subject, or to the object, either as its sister (Carlson, 1984; Krifka, 1992; Hornstein, 2002), or as the head of its sister (Kratzer, 1996; Marantz, 1997). The other is to employ different rules of combination for the subject and for the object, and to regard each rule-application as a part of the expression.

(13) $\exists e$ [Yelling(e) & (S(Jo))(e) & (O(Yo))(e) & Loud(e)]

In (13) our S and O relations are each bound by exactly one phrase in the syntax, S by the subject and O by the object. When a relation is used this way in the semantics, linguists call it thematic.[6] The thematic relations in (12) and (13) must be ones that only a yeller, and what he yells, have to his yelling, respectively (Dowty, 1989). But this leaves open a gamut of options. At one extreme, they might be very specific relations, such as Yeller and Yelled, that can be borne to only a few kinds of event. At the other, they might be very general, like Actor and Undergoer, Agent and Patient, Experiencer and Content. Beyond this, they be primitive at our chosen level of analysis, like Actor, or instead complex, like Volitional Participant in Some Event that Causes Another. Several mixtures of these options (specific or general, primitive or complex) are attested in the literature.[7]

These proposals rely on event descriptions to analyze clauses as a conjunction of separate predicates. Support for them is therefore support for ES, so long as the analyses are meant to show the meaning of the clause. So what kinds of arguments have been given in their favor? I will distinguish four in sections 20. 4–7.

20. 4 Stating patterns of linking

ES can be used to state linking generalizations (Gruber, 1965; Fillmore, 1968; Jackendoff, 1972; Carter, 1976; Perlmutter and Postal, 1984; Foley and Van Valin; 1984; Baker, 1988; Grimshaw, 1990). These are generalizations about the semantics of subjects, objects, and other grammatical relations. One example can be illustrated with (14).

(14)   a.   Jo sliced that ham
       b.   Lee trimmed those flowers.
       c.   Mo poured this wine.

Syntactically, these are all 'basic' transitive clauses, with a subject and an object. Semantically, they all describe an action with an actor: slicing, trimming, pouring. And in such clauses, if the actor is named by either the subject or the object, it is named by the subject. The reverse imagined in (15) is rare or absent, if we pretend that *zlice*, *drim* and *bour* name actions that are similar to slicing, trimming and pouring.

(15)   a.   *That ham zlised Jo.
       b.   *Those flowers drimmed Lee.
       c.   *This wine boured Mo.

Apparent deviations will often be marked formally, with a marker of what is then called voice, and can in turn be classed as 'nonbasic,' preserving the generalization.

One brief way to state this is by saying that Actors are Subjects. A single very general semantic relation (Actor) is then linked to a single grammatical relation (Subject), in abstraction both from the verb and from other grammatical relations

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[6] The term derives merely by analogy from the influential use of "theme" in Gruber, 1965: "We may conveniently call the entity which is conceived as moving as the theme" (Jackendoff, 1972: 29).
[7] Some linguists reserve the term "thematic relation" only for analytically simple ones.

(Object). In short, we invoke a general thematic relation to facilitate generalization. Thematic relations are standardly formalized in an event-based metalanguage: 'There is an event whose actor is Jo' (Castañeda, 1967; Parsons, 1980). And therefore event descriptions can be useful in stating linking generalizations.

But this is not an argument for ES. To generalize over clauses in terms of events and thematic relations is not to say that each clause has an event description as its meaning, or has syntactic parts that denote relations to events. Our generalization over the sentences of (14) demands no particular meanings for their various parts. It demands only that we can generalize over slicers, trimmers and pourers, as all being actors. And that generalization is about events, not sentence meanings or their derivation. It could be true even if we said that *slice* in (14a) just names the function in (16), whose domain is not events but ordinary objects.[8]

(16) λy [λx [True if and only if x sliced y]]

Linking generalizations need not carve at the semantic joints of the clauses they govern, and therefore cannot themselves provide an argument for ES.

Of course they might be combined with other premises to mount an abductive argument for ES (Baker, 1997; Pietroski, 2005a). Maybe thematic relations in the semantics proper will undergird the best explanation of linking? Perhaps, but even this would be contentious, since not everyone agrees that linking is best described in terms of general thematic relations, like Agent. Among the dissenters is Dowty (1991), whose influential view I sketch in section 20. 9. And if such dissent is correct, linking cannot itself support ES, even indirectly.

20. 5 Formalizing entailments

ES permits an elegant way to represent certain entailments as syntactic consequences, via Separation. Most important are dropping entailments like those from (17) to (18) or (19).[9] Here the conclusion is identical to the premise but for a 'dropped' dependent: (18) drops the adverb of (17), and (19), its direct object.

(17)   Jo yelled 'Yo' loudly.

(18) $\vDash$ Jo yelled 'Yo'.

(19) $\vDash$ Jo yelled loudly.

With ES we can represent the dropped dependent and its clausal remainder as two separate predicates, predicate them of the same event, and conjoin the result, representing (17–19) as something like (20–22).

(20) $\exists e$[Yelling(e) & (S(Jo))(e) & (O(Yo))(e) & Loud(e)]

(21) $\vdash \exists e$[Yelling(e) & (S(Jo))(e) & (O(Yo))(e)]

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[8] Specifying the same function in the argot of ES, with mention of events and thematic relations in the metalanguage, would not change the point, which is about the object language.
[9] The double and single turnstiles stand for semantic and syntactic consequence, respectively. "A⊨B" means that B is true whenever A is, while "A⊢B" means that there is a proof of B given A.

(22) ⊢ ∃e[Yelling(e) & (S(Jo))(e) & Loud(e)]

The entailments are then represented as formal or syntactic consequences, licensed solely by proof rules for logical constants: Conjunction Elimination in the scope of an existential quantifier.[10]

By consensus, this is the most elegant way to represent these entailments as formal. It allows every droppable dependent of the relevant kind—subject, object, adverbs of various kinds, no matter their linear position, or how they describe their event—to have the same representation, as a conjunct predicate of events (Landman 2000). Without events, generality does not come so easy. Dropping entailments can still be licensed formally, by Existential Generalization (∃G). Representing (17) as (23), we could derive (24) by ∃G and assume that this shares the truth conditions of (18), thus formalizing the entailment from (17) to (18).

(23) $\text{Yelled}_3(\text{Jo, Yo, Loudly})$
(24) $\exists v[\ \text{Yelled}_3(\text{Jo, Yo, } v)\ ]$

But this is less attractive, as it requires verbs to express relations with as many places are there are (equivalence classes of) droppable dependents, like our 3-place Yelled_3 in (23) (Davidson, 1967a). It also fails in some cases (Parsons, 1990). Consider the entailment from (17) to (19). Using (23) to represent the former, we derive (25) by ∃G.

(25) $\exists z[\ \text{Yelled}_3(\text{Jo, } z, \text{Loudly})\ ]$

But (25) requires that Jo yell something, when some uses of (19) do not, witness (26).

(26) Jo yelled loudly but yelled nothing at all.

And while the negation of formula (25) is consistent with (27a), the latter seems categorically inconsistent with (27b), the negation of (19) in actual English.

(27) a. Jo emitted a loud yell that was not of anything at all.
       b. #But Jo did not yell loudly.

This suggests that intransitive clauses with *yell* have no use that entails something yelled. Therefore (25) cannot represent (19), and the entailment from (17) to (19) cannot be represented by ∃G.

But is any of this evidence for ES, the linguistic hypothesis, and not just logical regimentation? The answer can be Yes only given a premise in need of support: the event descriptions we use to model entailments between clauses must actually display their meanings. Their logical structure must align with semantic structure in the clause itself. Their separate predicates must be expressed by syntactically separate parts of the clause; either that or, on theories that would allow for this, some of the syntactically atomic parts themselves have meanings with logical structure, expressing a conjunction of event predicates. Such linguistic structure cannot just be stipulated for

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[10] Modifiers that do not contribute to what is asserted can also be dropped without changing what is asserted: "Unfortunately Alfred has not left yet; therefore Alfred has not left." But that is a different story.

the express purpose of formalizing inferences, without begging the question. It ought to be demonstrated using the sundry tools of linguistics.

Compare (17–19) and (20–22) to (28) and (29). While (29) formalizes (28), this is not by itself good evidence that (29a) gives the meaning of (28a) (Quine, 1951). That requires further justification.

(28) a. Doris is a doe.
      b. ⊨Doris is a deer.
(29) a. Female(d) & Deer(d)
      b. ⊢Deer(d)

The justification cannot be that every clear entailment is a matter of logic, since that is wrong. What it should be is a demonstration, on linguistic grounds, of semantic structure that matches the hypothesized logical structure (Pietroski, 2003). For (28) this would mean empirically confirming one of two hypotheses. Either the sound "doe" pronounces an expression with two syntactic parts, one used truly of females and the other used truly of deer, combined in a way that is interpreted as conjunction; or instead it pronounces a syntactically unstructured expression that has a structured meaning, FEMALE & DEER, if we allow for this. The first hypothesis is much stronger in practice, since linguists have many good tests for semantic structure in syntax, but almost none for semantic structure in its atoms.[11]

Now, for "doe" the hypothesis is dead in the water; but it remains live for separation of thematic relations from the verb, as we will see in section 20. 7. And without such corroboration from more narrowly linguistic evidence, patterns of entailment alone cannot justify ES.

20. 6 Avoiding meanings

Davidson (1967a) proposed Separation for certain adverbs, giving (17) an analysis like (20). This served a purpose announced in Davidson, 1967b: to make no use of relations over "meanings" in providing a recursive specification of truth conditions for the truth-evaluable expressions of a language. What Davidson called "meanings" includes at least Frege's senses, Russell's universals, and Carnap's intensions. All of these he regarded as both dubious and superfluous. And the ambition to do without them, he observed, is aided by an ES analysis of adverbs like *loudly*.

Without events the ambition is hard to achieve. To see why, imagine that the truth conditions of (17) were represented not by (20) but by the eventless (30), for example.

(30) (Loudly(Yelled))(Jo)

Assume that the extension of Yelled is those who yelled. Then Loudly in (30) would need in its domain not the extension of Yelled, but rather its meaning. For it may happen that Yelled shares its extension with Danced (those who yelled might be exactly those who danced) despite differing from it in meaning. But even then (30) should not entail (31), since Jo might yell loudly but still dance quietly.

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[11] A possible exception to the rule is Lidz et al., 2011, who present psycholinguistic evidence for structure in the meaning of *most*.

(31) (Loudly(Danced))(Jo)

Or imagine (32) instead of (30).

(32) (Yelled(Loudly))(Jo)

Without events, the extension of Loudly in (32) cannot be the loud events, of course. So perhaps it is instead those things that make loud noises, the noisemakers. But the noisemakers might be exactly the things that make rapid movements, giving Loudly the same extension as Rapidly. Unless (32) is to wrongly entail (33), therefore, the argument for Yelled in the interpretation of (32) cannot be the presumed extension of Loudly.

(33) (Yelled(Rapidly))(Jo)

It must be something that distinguishes Loudly from Rapidly. Prime candidates include its sense, its intension, or the quality of loudness. But again, these are things that Davidson means to do without. And without them, he needs events.

Of course there is a limit to the appeal of this motive for ES. It compels only those who share Davidson's aversion to "meanings," and that is not everybody. Few who defend ES today do so on Davidson's ultimate grounds.

20. 7 Deriving meanings

The best evidence for ES would be cases where the meaning of a clause has no plausible derivation without it, or specifically the separation that it enables. Such evidence cannot come solely from the use of event descriptions to state patterns in linking or entailment, since these patterns can be stated independently of the compositional semantics. And it can come from Davidson's rejection of "meanings" only for those who accept that position.

It can come, however, from a distinctive prediction that Separation makes at the level of compositional semantics, based on (34), which I take to follow, all else equal, from principles and practices that are standard in current linguistics (Chierchia and McConnell-Ginet, 1990; Gamut, 1991; Larson and Segal, 1995; Heim and Kratzer, 1998).

(34) Only if two syntactically separate parts of a clause express separate predicates semantically could a third part have one but not the other in its semantic scope.

Given (34), we can use the "third part" as a diagnostic wedge, to test whether two syntactic parts of a single clause are semantically separate as well, by asking whether it can take one but not the other within its semantic scope. If it can, and those two parts must furthermore be regarded as expressing predicates of related or identical events, then this will require ES.

The literature offers a few arguments of this form, with diagnostic wedges that include causative constructions, directed motion constructions, and modal adjectives.

I survey some of these in Williams, 2015; and Schein, 2017 is an exhaustive pursuit of the topic. Here I will just summarize one, from Schein, 1993.[12]

Schein targets sentences like (35), with a plural in the subject (*three videos*) and a distributive quantifier in the object (*every quarterback*), capable of binding further phrases in its scope (*four new plays).*

(35)   Three videos taught every quarterback (four new plays).

These have one interpretation that is *cumulative*. On this interpretation, (35) is true so long as each of the three videos did some teaching, between them they taught all the quarterbacks, and each quarterback learned four new plays in all of this. Thus (35) is true in scenario (36), where V, H and S are the videos, the quarterbacks are numbered 1–5, and the plays are excluded for simplicity.

(36)   V taught 1–3, H taught 2, and S taught 4 and 5, all separately.

The same scenario fails to verify any of three other interpretations. The collective interpretation requires the videos to teach together. The distributive interpretation requires each video to teach all the quarterbacks. And the inverse interpretation requires each to be taught by three videos. Thus the cumulative interpretation is truth-conditionally distinct.

What is the semantic analysis of (35), then, under its cumulative interpretation? What Schein proposes is paraphrased coarsely and informally in (37).

(37)   'In some events, three videos were teachers, and every quarterback was a learner (of four new plays).'

This captures the cumulative reading by giving independent scope to the subject and the object. The subject scopes only over the relation of 'teacher,' while the object scopes only over that of 'learner.' Still the analysis relates the activities of the videos and the quarterbacks, since the relations of 'teacher' and learner 'predicate' of the same events, some teachings.

A meaning like this can be derived if the two thematic relations, glossed for the nonce as "teacher" and "learner," are expressed by separate parts of the syntax, call them Subj and Pred. Then if every quarterback combines syntactically with a phrase that includes Pred but not Subj, the scope of the quantifier it expresses will include 'learner' but not 'teacher,' yielding the desired result in (37).[13]

In contrast, suppose instead that one indivisible part of the syntax were to express both the relation that a teaching has to its teacher, and the relation it has to its learner. Concretely, suppose that the syntax includes an atom, the verb *teach*, that expresses a function mapping e, x and y to true just in case e is x teaching y something. Semantically this has to be in the scope both of the subject and of the object, since these bind the variables x and y, respectively. But in that case, given the usual scheme

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[12]Among linguists, two of the best-known arguments for Separation come from Kratzer, 1996 and Marantz, 1997. But these are importantly weaker than Schein's, or certain others, for reasons I discuss in Williams, 2015.

[13] Schein is quiet about the required derivation. But presumably it would need to have the relation bound by the subject phrase as a derivational sister to it. Such derivations are assumed in Carlson, 1984; Krifka, 1992; Hornstein, 2002, and elsewhere. But they are not the norm among linguists endorsing ES, who usually introduce such relations as part of the verb phrase, following Kratzer, 1996 and Marantz, 1997. See Kratzer, 2000 and Williams, 2015 for a bit more detail.

for interpreting quantifiers, either the object will depend quantificationally on the subject or vice versa—exactly the result we seek to avoid. One apparent way out is a less usual scheme for interpreting quantifiers, such as branching quantification (Sher, 1990). But Schein (1993) argues that this will not give the right result in the general case. Other ways out are plumbed in Bayer, 1997; Champollion, 2010; Brasoveanu, 2013; and Haslinger and Schmitt, 2018, which shift predicates of individuals to predicates of their sums, or have predicates apply to parts of sums denoted by the arguments. But these too seem to miss some of the cases that Schein covers.

Thus there is an argument that the full range of cumulative interpretations cannot be derived without Separation in the compositional semantics—specifically, unless the relations bound by the subject and the object are introduced by two separate parts of the syntax, not by one. Inasmuch as such Separation is supported by ES, we therefore have a direct argument for ES, finally. The argument does not by itself call for thematic relations that are general, and is consistent with specific relations like 'teacher' and 'learner.' But this is unattractive for other reasons. Most obviously, we should not like to say that the subject relation has nearly as many meanings as there are verbs. And given this, we have a direct argument for general thematic relations in the compositional semantics, hence for ES, inheriting whatever probative value we impute to Schein's analysis. For elaboration, see Schein, 2012 and Schein, 2017, as well as Pietroski, 2005a and 2018.

20. 8 Puzzles

The preceding sections have given some reasons for ES. The best show that syntactically separate parts of a clause express separate predicates of the same variable—not just in the statement of generalization over patterns in linking or inference, but in the compositional semantics. And the values for that variable, we call events.

Unfortunately this leads quickly to puzzles. If we accept ordinary intuitions about events and their identity conditions, ES with Separation will validate inferences that seem unsound, systematically (Davidson, 1969; Huddleston, 1970; Carlson, 1984; Lombard, 1985; Taylor, 1985; Wiggins, 1985; Parsons, 1990; Delancey, 1991; Higginbotham, 2000; Landman, 2000; Schein, 2002; Pietroski, 2000, 2005a, 2015 and many others). In this section I review a few examples.

Suppose we use (38a) and (38b) to recount the same three hours of a Friday night. It would then seem right to say that the two sentences are made true by one and the same three-hour event. But if that is right, there is trouble for the Davidsonian who would represent them as (39a) and (39b), since (39c) would then be provable.

(38) a. Lee drank lager for three hours
      b. Lee drank six lagers in three hours.
      c. *Lee drank lager in three hours.

(39) a. $\exists e$ [LeeDrinkingLager(e) & For(e, 3hrs)]
      b. $\exists e$ [LeeDrinkingSixLagers(e) & In(e, 3hrs)]
      c. $\exists e$ [LeeDrinkingLager(e) & In(e, 3hrs)]

Given this, we should expect the inference from (38a) and (38b) to (38c) to be valid. But this prediction is not easy to assess, since (38c) is unacceptable. What we can say is that, if the inference is valid, it is ineffable in English, and if it isn't valid, then (38a) and (38b) must describe different events, contrary to intuitions. Both results are surprising, and drop a fly into Davidson's ointment.

Neo-Davidsonians, with their palette of general thematic relations like Agent and Patient, might say that (40a–c) mean (41a–c), respectively. Initial intuitions might also imply that every selling is a buying, and vice versa, as ventured in (42).

(40) a. Lee bought sausage (from Mo).
   b. Mo sold sausage (to Lee).
   c. Mo bought sausage.

(41) a. $\exists e$ [Agent(e, Lee) & Buying(e) . . .]
   b. $\exists e$ [Agent(e, Mo) & Selling(e) . . .]
   c. $\exists e$ [Agent(e, Mo) & Buying(e) . . .]

(42) $\forall e$ [Buying(e) $\leftrightarrow$ Selling(e)]

Granting this, however, makes (41c) a consequence of (41a) and (41b). Yet the inference to (40c) from (40a) and (40b) would appear to be invalid. So unless the appearance is illusory, and the inference is valid but not recognizably so, defense of (41) without modifications means shedding (42).[14] That loss may not be grievous, since intuitions here are fickle. But things get worse.

Huddleston (1970), and also Schein (2002), discuss the challenge of symmetrical predicates like *abut*. The devoted Neo-Davidsonian will want to pair (43) with (44), for some choice of S and O.

(43) a. The jail abuts the bank.
   b. The bank abuts the jail.
   c. The bank abuts the bank.

(44) a. $\exists e$ [S(e, jail) & Abutting(e) & O(e, bank)]
   b. $\exists e$ [S(e, bank) & Abutting(e) & O(e, jail)]
   c. $\exists e$ [S(e, bank) & Abutting(e) & O(e, bank)]

But surely there is just one abutting, described differently by (43a) and (43b)? If so, then (44c) is a provable consequence of (44a) and (44b), despite the inference from (43a) and (43b) to (43c) being absurd. So again, if we hold to our analyses, we have to retract our intuition of identity and double the abuttings, an uncomfortable result.

Deeper shocks ripple from the principle stated loosely in (45), which is standard among advocates of ES, if in minor variants and under different names (Carlson, 1984; Dowty, 1989; Krifka, 1992; Schein, 1993; Lasersohn, 1995; Landman, 2000; Pietroski, 2005a).

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[14] There is some history in ES of denying the appearance of falsity or invalidity. Some Davidsonians who say that the killing of Lincoln was the shooting of Lincoln (Davidson, 1969) have therefore been prepared to say, contra common judgment and Thomson 1971, that Booth killed Lincoln nine hours before he died.

(45) Thematic Exhaustion: The phrase binding a thematic relation $\Theta(e)$ names everything that bears Θ to e.

Among its several virtues, (45) explains (46) (Schein 1993).

(46) a. Tony and Geezer lifted the amp and the piano.
      b. ⊮Tony lifted the piano.

To see why, imagine that (45), Thematic Exhaustion, were wrong. Then the subjects and objects in (46) might name only some of the lifters and only some of what was lifted. As a result, (46a) would have (46b) as a logical consequence: (46b) would require only that Tony was among the lifters, and the piano, among the lifted, which (46a) guarantees with the help of mereology. This is plainly false, justifying (45). But Exhaustion requires even finer individuation of events. For now if Mo touched Lee because her nose did, there would have to be two different touchings, one by Mo and one by her nose, since the two are not identical. The divisions ramify onwards—via the skin of Mo's nose, its cells, and so on—into an infinitesimal ontology of events that lessens their distance from facts on the spectrum of abstractness: if events are concrete individuals, why is it so hard to describe one with two different sentences? Something seems funny.

Collectively, the cases just reviewed appear to imply that natural languages are systematically unsound, if ES is true. Systematically, that is, the logical structure of their sentence meanings licenses proofs that seem unsound. The appearance rests most saliently on the four premises in (47–50).

(47) Sentence meanings involve general thematic relations.

(48) The right event ontology is conservative, in agreeing roughly with naïve intuitions about event identities.

(49) General thematic relations are objective relations between a thing and an event.

(50) Sentences of natural languages themselves determine truth-conditions, given an assignment of values to their variables.

To avert unsoundness, we must therefore dismiss at least one of these premises, or some other that is less salient. In the next four sections I review four different dismissals, one for each stated premise, and each from a different author: David Dowty for (47), Terence Parsons for (48), Barry Schein for (49), and Paul Pietroski for (50).

20. 9 Semantic innocence

David Dowty (1989, 1991) holds firm on premises (48), (49) and (50). He presupposes a semantics based on truth and reference, and insists that predicates deployed in the semantics, including Agent or Patient, must have determinate truth-conditions, up to vagueness. In accord with (49), these conditions also cannot depend variably on other predicates in the clause, or on the perspectives of those using the clause, for example. Some of these commitments are implied by (51).

(51) "A thematic role system [. . .] permits (real-world, non-linguistic) objects to be distinguished from one another by virtue of the distinctive properties they have as they participate in an event named by the verb, properties that can be identified ('in the real world') independently of a language or its 'semantic representations.' [. . .] I will follow the strategy [. . .] that one should try to justify and explain the cognitive semantic significance of language in terms of its referential semantic significance." (Dowty, 1989: 73)

If "Agent" and "Patient" denote anything, it must therefore be a set of ordered pairs, comprising only a thing and an event, or a function from these to a truth value. As for how finely grained these events are, Dowty does not say much. But he is wary of mistaking our perspective on things for properties of the things themselves, and seems to hope for an innocent ontology in line with (48).

These are orthodox views in formal semantics. But anyone holding them must doubt whether "Agent" or "Patient" have bona fide truth conditions. If (41a) is the meaning of (40a), then judging "Agent(e, Lee)" true depends categorically on viewing e as a buying, not as a selling—and not merely on Lee being active or intentional in the transaction, no matter how vague our standards for agency. To question this appearance would mean questioning other premises to which Dowty is committed. So Dowty instead discredits (47), doubting that there can be such relations as Agent or Patient. Their purported generality makes them untenable. Verb-specific relations, such as Buyer and Seller, remain possible, since these must have truth conditions if their source verbs do. But Dowty makes no use of them.

This leaves open a Davidsonian account of adverb dropping entailments, using a spare form of ES, as long as some solution is provided for puzzles with adverbs, such as (38). Unavailable, however, is a structural account of dropping entailments for subjects and objects that generalizes across different verbs, since such generality would require general thematic relations. But like most theorists in the tradition of Montague, Dowty is content to model systematic patterns of inference with meaning postulates in an intensional logic, whenever desired (Dowty, 1979).

About linking he has more to say. Influentially, he argues in Dowty 1991 that our imagined thematic relations are less helpful in this role than advertised. Linking generalizations are more accurately stated, he contends, in terms of a comparison between the specific entailments associated with the subject versus the object (for *slice*, the concomitants of slicing versus being sliced) with respect to prototypes of agency and patiency. The relation closer to the prototype of agency, and further from that of patiency, is more likely to be linked to the subject, while the reverse is true for the object. This account invokes no general thematic relations, and prototypes don't have extensions or truth conditions. Relations specific to each verb suffice, and these don't require the apparatus of ES: again, *slice* could just denote the function in (16), which maps x and y to true just when x slices y. All the theory requires is that "x slice y" entails more prototypically agentlike properties for x than for y, and fewer prototypically patientlike properties, since subjects of *slice* name slicers.[15]

Thus Dowty can do without thematic relations for logic or for linking. But what of the facts that most strongly motivate their Separation in the compositional semantics,

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[15] Dowty speculates, plausibly, that toddlers might use links between grammatical relations and concepts of agency and patiency heuristically, to bootstrap into the semantics of their language (Pinker, 1984; Naigles, 1996; Scott and Fisher, 2009; Perkins, 2019), even if the concepts lack clear extensions. But even this, he rightly assumes, would entail nothing about the compositional semantics of the language acquired.

exemplified by Schein's 1993 argument from cumulative plurality? These will need a different explanation, and this is not an easy charge.

20. 10 Ontological liberty

Parsons (1990) shares the assumption that semantics should deliver truth conditions. Yet he is also committed to a structural account of dropping entailments, and views thematic relations as objective relations between a thing and an event. To quell the puzzles that result, he lets his event ontology be guided by the ES account of those inferences. The innocence of (48) is then jetsam, and events are whatever they must be to support Separation for adverbs and grammatical relations. If this means that a buying is not a selling, a drinking of six lagers is not a drinking of lagers, and touching Mo's nose is not touching Mo, so be it. Parsons agrees with Barry Taylor:

(52)   "[I]t would be metaphysically churlish to take exception to these [fine-grained events] simply on the ground that they diverge from some cherished paradigm of the really real—bricks, electrons, or sensations; for the fact, if it is one, that invoking events brings the best explanation for puzzling features of language is reason enough for over-riding metaphysical prejudice. (Taylor 1985: 24-5)

Of course similar remarks might be made about the supposed extensions of our adjectives and nouns, if these predicates are viewed as monadic. Nothing has a front or an apex, for example, except relative to a description and a perspective from which it applies.

Still, the metaphysical scruples have pressed more sharply in the ES literature, and many authors remain "churlish," for fear of confounding representation with reality. Those who in addition stick to a truth conditional semantics are left with very little wiggle room. Arguably, they must either reject separation of adverbial predicates and thematic relations, losing the best motive for ES, or somehow enrich our semantics for them. The latter approach is taken by Barry Schein.

20. 11 Semantic liberty

Schein is our most ardent Separationist and partisan of general thematic relations. He has developed "Supermondacity" (2012, 2017), the extreme claim that a clause expresses a composite relation among as many events as the clause has dependents. Each dependent then binds a highly general thematic relation to its own event, and the relations among these several subevents decide the roles their participants play in the main event. Yet Schein still wants sentences to issue in truth conditions, and is resolute on a coarse ontology of events, arguing that its rejection would lead to paradox (Schein, 2002).

The puzzles of section 20. 8 therefore lead Schein to reject only premise (49), the simple view of thematic relations. In its place he has thematic relations denote sets of triples, comprising not only an entity and an event, but also a perspective on the event, which he calls a "scene" (Schein, 2002). With this elaboration, our unsound proofs can be blocked, given distinct perspectives on the same event. Between Lee and Mo there is a trade of cash for sausage, *e*. But in relation to one perspective, *e* is a buying whose agent is Lee, (53a), while in relation to another it is a selling whose agent is Mo, (53b).

These perspectives are not identical. Consequently there is no entailment, from (53a) and (53b), of a perspective on which it is also a selling with Lee as its agent, (53c).

(53) a. $\text{Buying}(e, \pi_1)$ & $\text{Agent}(e, \pi_1, \text{Lee})$
      b. $\text{Selling}(e, \pi_2)$ & $\text{Agent}(e, \pi_2, \text{Mo})$
      c. $\nvdash \exists\pi[\text{Selling}(e, \pi)$ & $\text{Agent}(e, \pi, \text{Lee})]$

Deeper puzzles can be resolved via two further liberties. First, two perspectives may differ only in the resolution with which they depict an event: for example, while one perspective on the event of Lee touching Mo may show them just as two people, without physical detail, another may bring finger and nose into focus. Second, perspectives may change from one part of a clause to another, for instance from subject to object.

These innovations demand independent justification, and Schein (2002, 2012, 2017) offers some. Intraclausal shifts of ultrafine perspective, he argues, are what blocks substitution of coreferential phrases in identity sentences, and what permits cumulative interpretations of sentences with plurals, among other effects. For the latter, consider (54) from Schein 2002.

(54) 248 engineers assembled, as a detail crew, 27 airplanes.

This implies 27 events of assembling airplanes, one for each plane. But none of those 27 events needs to have 248 engineers as assemblers. It would suffice if the engineers formed 15 detail crews that each performed a weeklong event of assembling certain components. But that yields 15 events of engineers assembling. So how can the engineers and airplanes be agents and patients of the very same events, which cannot number both 27 and 15? Schein says that they are the same only relative to two different perspectives, which carve out different ways of counting the assemblings.

Challenges of course remain, both descriptive and philosophical. Descriptively, Schein's view requires (at least) new principles that manage modification in the grammar, to explain the exact range of available meanings. When is it possible for part of a clause to describe its event directly, independently of perspective? When is it impossible for perspectives to shift from one part of a clause to another? And why aren't things otherwise? Philosophically, event perspectives need to be squared with the presumption of truth conditional semantics. If we are conservative about events, should we accept that perspectives not only shape our judgments of truth and validity (which cannot easily be denied) but are furthermore what make sentences true? This may feel uncomfortably subjective.

20. 12 Pragmatic liberty

Pietroski endorses Separation and ES (2000, 2003, 2005a, 2015, 2018). In his view they contribute essentially to the explanation of inferential and grammatical facts, like why dropping certain dependents is judged valid, and why natural languages arrange these dependents in certain patterns. He refrains from Schein's enrichments, however, and is unwilling to let linguistic patterns drive our ontology, as Parsons does. The right way out of our puzzles, he argues, lies in relinquishing premise (50), the assumption of truth conditional semantics.

For Pietroski, clauses of a natural language do not determine truth conditions, even relative to an assignment of values to variables. They merely restrict the contents of their uses, in the first place by restricting the range of concepts (or parts of thoughts) that may be activated in mentally tokening them (cp. Carston, 2002). Sometimes these uses have contents that are truth evaluable: we can use them to have true thoughts or make true claims. But often this takes social coordination, ad hoc practical knowledge, and scientific work, to impose extensions on our names and predicates, as Chomsky (2000: 148ff.) insists in response to Putnam (1973, 1992) (cp. Searle, 1978, 1980). There should be no general expectation that uses of natural language expressions have extensions or truth values (Pietroski, 2005b). The further presumption that the expressions themselves do, per (50), is accordingly well out of place (cp. Travis, 1996). The normal situation is that we use a single, semantically unambiguous word or phrase to express a variety of concepts, many of which picture the world in ways inconsistent with our considered judgments, and most of which have Waismann's (1945) "open texture," not categorical truth conditions.[16]

This revision changes little about our understanding of grammatical patterns, where truth plays no obvious role. But it casts a new light on puzzles about inference. Our premises seem true, and our ES analyses of them render the argument as formally valid. Yet the conclusion, let us grant, is false, while the logic of conjunction is impeccable. This would seem to overturn the ES analyses. But it does so only if the expressions in the argument have truth values. And this we should not grant, argues Pietroski. The logical form of our analyses explains why speakers judge these arguments valid. That the sentences in them lead us to unsound conclusions shows, not that our analysis of their meanings is wrong, but rather that these meanings sometimes generate thoughts that cannot be made jointly consistent, with each other or with other beliefs, much less be made true. Pietroski compares the situation to the "framing effects" studied by Kahneman and Tversky (Kahneman, 2011). Often the way our sentences "frame" events the world leads us to bad arguments and bad judgments of truth, almost ineluctably.

Pietroski's conception of semantics is thus unorthodox, and different from many other exponents of ES in being strictly internalist and Chomskyan. Entirely off its docket is the referential relation between language and world. That falls to pragmatics, in a radical sense: producing an expression with a truth-value may draw on the entirety of human thought and social interaction. The job of semantics, as part of a tractable science, is instead to explain the meaning-relevant aspects of the human faculty for language. The child grows lexicons and grammars in response to language use in their community. These produce expressions that restrict, in characteristic ways, the ingredients of thoughts we have in using them. The job of the semanticist is to describe those ways—given evidence from patterns of argument structure, bound anaphora, quantifier scope, rules of composition, inferential judgments, performance limitations, language acquisition, and many other provinces where truth has, at most, an envoy at large. Further ambitions—fueled by the presumption that the expressions of natural languages ordinarily have extensions that we would accept as genuine parts of our world—are recast as misplaced projects for an ideal or regimented language of scientific communication, whether in the key of Frege or Quine. Accepting the presumption, argues Pietroski, means having no way to explain the linguistic data.

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[16] See Jackendoff (this volume) for related thoughts.

20. 13 Conclusion

We seem to think and talk about events. Event Semantics is a further claim about meaning. The core of a clause in a natural language, it says, is a description whose domain is something like events. This is not easy to justify. Davidson's initial motivation was to specify truth conditions without adverting to intensions, senses, universals or their kin. But few share his zeal. More popular arguments observe that event descriptions are useful in stating patterns in grammar or entailments. But those patterns need not be stated directly over meanings, and so do not mandate the resources of ES. These are mandated only by meanings that cannot plausibly be derived without treating separate parts of a clause as expressing separate predicates of related or identical events. Some linguists have argued persuasively that there are such meanings, arguably vindicating ES, and in turn licensing it as a premise in potential explanations of the logical or grammatical facts. But the victory demands concessions, if granted. For ES systematically yields unsound inferences, when combined with common assumptions about event identities, the logical form of clauses, and the explanatory domain of linguistic semantics. Those who plump for ES must therefore yield on at least one front. Maybe our initial intuitions about when two descriptions are satisfied by a single event are deeply mistaken (Parsons, 1990). Maybe our clauses include many more predicates and variables than we expected (Schein, 2017). Or maybe linguistic semantics is not about deriving truth conditions, because the clausal expressions in its domain are not themselves true or false (Pietroski, 2018). Something has got to give.

<mark>New references</mark>

References

Bach, E. 1986. 'The algebra of events'. *Linguistics and Philosophy* 9: 5–16.

Baker, M. 1988. *Incorporation: A Theory of Grammatical Function Changing*. Chicago: University of Chicago Press.

Baker, M. C. 1997. 'Thematic roles and syntactic structure'. In L. Haegeman (ed.) *Elements of Grammar: Handbook in Generative Syntax*, pp. 72–137. Kluwer Academic Publishers.

Bayer, S. L. 1997. *Confessions of a Lapsed Neo-Davidsonian: Events and Arguments in Compositional Semantics*. New York: Routledge.

Beaver, D and Condoravdi, C. 2007. 'On the logic of verbal modification'. In *Proceedings of the 16th Amsterdam Colloquium*: 3–9.

Bedny, Maria, Dravida, S. and Saxe, R. 2014. 'Shindigs, brunches, and rodeos: The neural basis of event words'. *Cognitive, Affective and Behavioral Neuroscience* 14: 891–901.

Bennett, J. 1988. *Events and their Names*. Oxford: Clarendon Press.

Brasoveanu, A. 2013. 'Modified numerals as post-suppositions'. *Journal of Semantics* 30: 155-209.

Carlson, G. 1984. 'Thematic roles and their role in semantic interpretation'. *Linguistics* 22: 259–279.

Carston, R. 2002. *Thoughts and Utterances*. Malden, MA: Blackwell Publishers.

Carter, R. 1976. 'Some linking regularities'. In B. Levin and C. Tenny (eds.) *On Linking: Papers by Richard Carter*, pp. 1–92. Lexicon Project, MIT Center for Cognitive Science.

Casati, R. and Varzi, A. C. (eds.). 1996a. 'Events'. In R. Casati and A. C. Varzi (eds.) *Events*, pp. xi–xxxiii. Brookfield, VT: Dartmouth Publishing Company.

Casati, R. and Varzi, A. C. 1996b. 'Introduction'. In R. Casati and A. C. Varzi (eds.) *Events*. Brookfield, VT: Dartmouth Publishing Company.

Casati, R. and Varzi, A. C. 2014. 'Events'. In E. N. Zalta (ed.) *Stanford Encyclopedia of Philosophy*. Stanford, CA: CSLI: https://plato.stanford.edu/entries/events/.

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

Champollion, L. 2010. 'Cumulative readings of *every* do not provide evidence for events and thematic roles'. In M. Aloni, H. Bastiaanse, T. de Jager and K. Schulz (eds.) *Logic, Language and Meaning: Lecture Notes in Computer Science*, pp. 213–222. Berlin: Springer.

Champollion, L. 2015. 'The interaction of compositional semantics and event semantics'. *Linguistics and Philosophy* 38: 31–66.

Chierchia, G. and McConnell-Ginet, S. 1990. *Meaning and Grammar*. Cambridge, MA: The MIT Press.

Chomsky, N. 2000. 'Language from an internalist perspective'. In *New Horizons in the Study of Language and Mind*, chapter 6, pp. 134–163. Cambridge: Cambridge University Press.

Davidson, D. 1967a. 'The logical form of action sentences'. In N. Rescher (ed.) *The Logic of Decision and Action*. Pittsburgh: University of Pittsburgh Press.

Davidson, D. 1967b. 'Truth and meaning'. *Synthese* 17: 304–323.

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

Delancey, S. 1991. 'Event construal and case role assignment'. *Berkeley Linguistic Society* 17: 338–353.

Dowty, D. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Reidel.

Dowty, D. 1989. 'On the semantic content of the notion of 'thematic role''. In G. Chierchia et al (eds.) *Properties, Types and Meanings*, volume 2: Semantic issues, pp. 69–130. Dordrecht: Kluwer.

Dowty, D. 1991. 'Thematic proto-roles and argument selection'. *Language* 67: 547–619.

Dretske, F. 1967. 'Can events move?'. *Mind* 76: 479–492.

Fillmore, C. 1968. 'The case for case'. In E. Bach and R. T. Harms (eds.) *Universals in Linguistic Theory*, pp. 1–90. New York: Holt, Rinehart and Winston.

Fodor, J. 1998. *Concepts: Where Cognitive Science Went Wrong*. Oxford: Oxford University Press.

Foley, W. A. and Van Valin, R. D. 1984. *Functional Syntax and Universal Grammar*. Cambridge: Cambridge University Press.

Gamut, L. T. F. 1991. *Intensional Logic and Logical Grammar*. Chicago: University of Chicago Press.

Grimshaw, J. 1990. 'Argument structure'. Cambridge, MA: The MIT Press.

Gruber, J. 1965. *Studies in Lexical Relations*. Doctoral Dissertation, Massachusetts Institute of Technology.

Hacker, P. M. S. 1982. 'Events and objects in space and time'. *Mind* 91: 1–19.

Haslinger, N. and Schmitt, V. 2018. 'Scope-related cumulativity asymmetries and cumulative composition'. *Proceedings of SALT 28:* 197-216.

He, A. X. and Lidz, J. 2017. 'Verb learning in 14- and 18-month-old English-learning infants'. *Language Learning and Development* 13: 335-356.

Heim, I. and Kratzer, A. 1998. *Semantics in Generative Grammar*. Cambridge, MA: The MIT Press.

Higginbotham, J. 1983. 'The logic of perceptual reports'. *The Journal of Philosophy* 80: 100–127.

Higginbotham, J. 2000. 'On events in linguistic semantics'. In ed. J. Higginbotham, F. Pianesi and A. C. Varzi *Speaking of Events*, pp. 49–80. Oxford University Press.

Higginbotham, J., Pianesi, F. and Varzi, A. C. (eds.) 2000. *Speaking of Events*. New York: Oxford University Press.

Hornstein, N. 2002. 'A grammatical argument for a Neo-Davidsonian semantics'. In G. Preyer and G. Peter (eds.) *Logical Form and Language*, chapter 11, pp. 345–364. Oxford: Oxford University Press.

Huddleston, R. 1970. 'Some remarks on Case Grammar'. *Linguistic Inquiry* 1: 501–511.

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

Jackendoff, R. 1987. 'The status of thematic relations in linguistic theory'. *Linguistic Inquiry* 18: 369–411.

Kable, J. W., Kan, I. P., Wilson, A., Thompson-Schill, S. L. and Chatterjee, A. 2005. 'Conceptual representations of action in the lateral temporal cortex'. *Journal of Cognitive Neuroscience* 17: 1855–1870.

Kahneman, D. 2011. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.

Katz, G. 2000. 'Anti neo-Davidsonianism: Against a Davidsonian semantics for state sentences'. In C. Tenny and J. Pustejovsky (ed.) *Events as Grammatical Objects*, pp. 393–416. Stanford, CA: CSLI Publications.

Kratzer, A. 1996. 'Severing the external argument from its verb'. In J. Rooryck and L. Zaring (eds.) *Phrase Structure and the Lexicon*, pp. 109–37. Dordrecht: Kluwer.

Kratzer, A. 2000. 'The event argument, chapter 2: Schein's argument'. Manuscript available from: www.semanticsarchive.net.

Krifka, M. 1992. 'Thematic relations as links between nominal reference and temporal constitution'. In I. Sag and A. Szabolcsi (eds.) *Lexical Matters*. Stanford, CA: CSLI Publications.

Landman, F. 2000. *Events and Plurality*. Dordrecht: Kluwer Academic Publishers.

Lapinskaya, N., Uzomah, U., Bedny, M. and Lau, E. 2016. 'Electrophysiological signatures of event words: Dissociating syntactic and semantic category effects in lexical processing'. *Neuropsychologia* 93: 151–157.

Larson, R. and Segal, G. 1995. *Knowledge of Meaning*. Cambridge, MA: The MIT Press.

Lasersohn, P. 1995. *Plurality, Conjunction and Events*. Dordrecht: Kluwer Academic Publishers.

Lidz, J., Pietroski, P., Hunter, T. and Halberda, J. 2011. 'Interface transparency and psychosemantics of 'most''. *Natural Language Semantics* 19: 227–256.

Lombard, B. D. 1985. 'How not to flip the prowler: Transitive verbs of action and the identity of actions'. In E. Lepore and B. P. McLaughlin (eds.) *Actions and Events: Perspectives on the Philosophy of Donald Davidson,* pp. 268–281. New York: Basil Blackwell.

Lombard, B. D. 1986. *Events: A metaphysical Study.* London: Routledge.

Lombard, L. B. 1998. 'Ontologies of events'. In S. Laurence and C. Macdonald (eds.) *Contemporary readings in the foundations of metaphysics*, pp. 277–294. Malden, MA: Blackwell Publishers.

Maienborn, C. 2008. 'On Davidsonian and Kimian states'. In I. Comorovski and K. von Heusinger (eds.) *Existence: Semantics and Syntax*, pp. 107–130. Dordrecht: Springer.

Maienborn, C. 2011. 'Event semantics'. In *Semantics: An International Handbook of Natural Language Meaning*, volume 1, pp. 802–829. Berlin: Mouton de Gruyter.

Maienborn, C. 2019. 'Events and states'. In R. Truswell (ed.) *The Oxford handbook of event structure*. Oxford University Press.

Marantz, A. 1997. 'No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon'. *Penn Working Papers in Linguistics* 4: 201–226.

Matchin, W., Liao, Ch.-H., Gaston, P. and Lau, E. 2019. 'Same words, different structures: An fMRI investigation of argument relations and the angular gyrus'. *Neuropsychologia* 125: 116–128.

Moltmann, F. 2007. 'Events, tropes, and truth-making'. *Philosophical Studies* 134: 363–403.

Naigles, L. 1996. 'The use of multiple frames in verb learning via syntactic bootstrapping'. *Cognition* 58: 221–251.

Parsons, T. 1980. 'Modifiers and quantifiers in natural language'. *Canadian Journal of Philosophy* VI: 29–60.

Parsons, T. 1990. *Events in the Semantics of English*. Cambridge, MA: The MIT Press.

Perkins, L. 2019. 'How grammars grow: Argument structure and the acquisition of non-basic syntax'. Doctoral Dissertation, University of Maryland, College Park.

Perlmutter, D. M. and Postal, P. M. 1984. 'The 1-advancement exclusiveness law'. In D. M. Perlmutter and C. Rosen (eds.) *Studies in Relational Grammar 2,* pp. 81–125. University of Chicago Press.

Pietroski, P. 2000. *Causing Actions*. Oxford: Oxford University Press.

Pietroski, P. 2003. 'Small verbs, complex events: Analyticity without synonymy'. In N. Hornstein and L. Antony (eds.) *Chomsky and his Critics*. Oxford: Blackwell.

Pietroski, P. 2005a. *Events and Semantic Architecture*. Oxford: Oxford University Press.

Pietroski, P. 2005b. 'Meaning before truth'. In G. Preyer and G. Peter (eds.) *Contextualism in Philosophy*, pp. 255–302. Oxford: Oxford University Press.

Pietroski, P. 2015. 'Framing event variables'. *Erkenntnis* 80: 31–60.

Pietroski, P. 2018. *Conjoining Meanings: Semantics without Truth Values*. Oxford: Oxford University Press.

Pinker, S. 1984. *Language Learnability and Language Development*. Cambridge, MA: Harvard University Press.

Putnam, H. 1973. 'Meaning and reference'. *The Journal of Philosophy* 70: 699-711.

Putnam, H. 1992. 'Replies'. *Philosophical Topics* 20: 347–408.

Quine, W. V. O. 1951. 'Two dogmas of empiricism'. *Philosophical Review* 60: 20–43.

Rappaport Hovav, M. and Levin, B. 2001. 'An event structure account of English resultatives'. *Language* 77: 766–796.

Reichard, U. and Hinzen, W. 2016. 'Are verbs names of events? A review of the event-argument hypothesis'. In P. Stalmaszczyk (ed.) *Philosophical and Linguistic Analyses of Reference,* chapter 3, pp. 43-64. Frankfurt am Main: Peter Lang.

Schein, B. 1993. *Plurals and Events*. Cambridge, MA: The MIT Press.

Schein, B. 2002. 'Events and the semantic content of thematic relations'. In G. Preyer and G. Peter (eds.) *Logical Form and Language*, chapter 10, pp. 263–344. Oxford: Oxford University Press.

Schein, B. 2012. 'Event semantics'. In G. Russell and D. Graff Fara (eds.) *Routledge Companion to Philosophy of Language*, pp. 280–295. Oxford: Routledge.

Schein, B. 2017. *'And': Conjunction Reduction Redux*. Cambridge, MA: The MIT Press.

Schein, B. 2019. 'Negation in event semantics'. In V. Deprez and M. T. Espinal (eds.) *The Oxford Handbook of Negation*, chapter 18. Oxford: Oxford University Press.

Scott, R. and Fisher, C. 2009. 'Two-year-olds use distributional cues to interpret transitivity-alternating verbs'. *Language and Cognitive Processes* 24: 777–803.

Searle, J. R. 1978. 'Literal meaning'. *Erkenntnis* 13: 207–224.

Searle, J. R. 1980. 'The background of meaning'. In J. R. Searle, F. Kiefer and M. Bierwisch (eds.) *Speech Act Theory and Pragmatics*, pp. 221–232. Dordrecht: Reidel.

Sher, G. 1990. 'Ways of branching quantifiers'. *Linguistics and Philosophy* 13: 393–492.

Simons, P. 2005. 'Events'. In M. J. Loux and D. W. Zimmerman (eds.) *The Oxford Handbook of Metaphysics*, pp. 357–385. Oxford: Oxford University Press.

Taylor, B. 1985. *Modes of Occurrence: Verbs, Adverbs and Events*. Oxford: Oxford University Press.

Thomson, J. J. 1971. 'The time of a killing'. *The Journal of Philosophy* 68: 115–132.

Travis, Ch. 1996. 'Meaning's role in truth'. *Mind* 105: 452–466.

Truswell, R. (ed.) 2019. *The Oxford Handbook of Event Structure*. Oxford: Oxford University Press.

Vendler, Z. 1967. 'Facts and events'. In *Linguistics in philosophy*, chapter 5, pp. 122–146. Ithaca, NY: Cornell University Press.

Waismann, F. 1945. 'Verifiability'. *Proceedings of the Aristotelian* Society 19: 101–164.

Wiggins, D. 1985. 'Verbs and adverbs, and some other modes of grammatical combination'. *Proceedings of the Aristotelian Society* 86: 273–304.

Williams, A. 2015. *Arguments in Syntax and Semantics*. Cambridge: Cambridge University Press.

Wu, D. H., Waller, S. and Chatterjee, A. 2007. 'The functional neuroanatomy of thematic role and locative relational knowledge'. *Journal of Cognitive Neuroscience* 19: 1542–1555.