

# Events and Situations

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## Abstract

If we inspect the role of events or situations in formal semantic theories of natural languages, a general strategy common to several theories emerges: Assume that certain linguistic constructions involve a reference to events or situations and appeal to their metaphysical properties to account for semantic properties of the constructions. I concentrate on some paradigmatic cases that illustrate this way of pursuing explanatory tasks in semantics: perception reports, adverbial modification, telicity, and attitude reports.

## 1. EVENTS AND SITUATIONS IN NATURAL LANGUAGE SEMANTICS

On July 14, 2014, *The Guardian* reported: “Germany’s World Cup final victory over Argentina smashed global records on Twitter, and has been the biggest sporting event in Facebook history” (Sweney 2014). On the same day, the paper also reported that “more than 20 million UK viewers watched Germany win” (Plunkett 2014). In ordinary language, we talk about events and attribute properties to them; in short, ordinary language takes events for granted. The task of the metaphysician, when reflecting on events, is to question this face-value assumption and ask what events are, whether they are part of the basic furniture of the world, or whether they are logical constructions built from entities belonging to more fundamental ontological categories. On this matter, opinion is divided: For example, whereas Davidson (1967, 1969) takes events to be irreducible to other categories, Montague (1969) takes them to be properties of times, and Kim (1976) constructs them as triples  $\langle o, P, t \rangle$ , where  $o$  is an object,  $P$  is a property, and  $t$  is a time (for a discussion of different metaphysical hypotheses about the nature of events, see Simons 2003 and Bennett 2002).

Similar observations also hold, to some extent, for situations. On the one hand, we commonly refer to situations in ordinary discourse: We worry about the political situation, we imagine ourselves in certain situations, and as the poet reminds us, “people talk about situations in buses and train stations” (Dylan 1965). On the other hand, one may wonder whether situations are constructed out of more basic entities, such as individuals and relations (as in Barwise & Perry 1983) or whether they are unstructured “particulars like sticks or bricks” (Kratzer 2002).

In principle, natural language semanticists need not commit themselves to a particular metaphysical account of the nature of events and situations in order to appeal to these entities. The decision to treat some entities as primitive in semantic theories does not necessarily imply a commitment to the thesis that they are basic entities from a metaphysical point of view; it may simply reflect a methodological decision to remain neutral about metaphysical issues that are not relevant for semantic explanation (Stalnaker 1986). This is not to say, however, that metaphysical properties of events and situations are useless for formal semanticists who appeal to these entities in their analyses. If we inspect the role of events or situations in formal semantic theories of natural languages, a general strategy (GS) common to several theories emerges:

GS: Assume that certain linguistic constructions involve a reference to events or situations and appeal to their metaphysical properties to account for semantic properties of the constructions.

(If the semantic account is successful, this may give the metaphysician something to consider.)

Although events and situations often crop up in ordinary discourse, they did not take center stage from the start in formal semantic theories. Despite the early appearance of Davidson’s (1967) paper on the logical form of action sentences, which argued that quantification on events provides an elegant solution to the treatment of some classes of adverbs, many linguistic constructions that today are accounted for by introducing events or situations in the formal system were initially analyzed without appealing to them. Work on the semantics of tense and aspect illustrates the point: Earlier accounts of these linguistic phenomena, which today are to a large extent event based, were initially based purely on time intervals. In some cases, as in Bennett’s (1977) account of the progressive, this strategy led to a peculiar situation: The formal account was purely interval based, but the conceptual motivation for the formal analysis was given in terms of events. Although this is not by itself a sufficient reason to forgo a purely interval-based account in favor of an event-based account, Parsons (1989, 1990) and others have argued that event-based accounts are ultimately more adequate empirically.

Today, events and situations figure prominently in many areas of formal semantics, too many to discuss here. For this reason, I do not try to present an exhaustive list of the uses that events and situations have in natural language semantics. Rather, I concentrate on some paradigmatic cases and follow their development in the literature.

## 2. WHAT ARE EVENTS GOOD FOR? SOME PARADIGMATIC CASES

### 2.1. Naked Infinitive Complements

A good example of the way in GS to pursue explanatory tasks in semantics is provided by event-based accounts of naked infinitive complements (NI complements) to perception verbs. Barwise (1981) claims that these complements are characterized by the following semantic properties, exemplified by the validity of examples 1, 2, and 3:

Veridicality: If  $\varphi$  is a simple NI sentence, then (A) if  $m$  sees  $\varphi$ , then  $\varphi$ .

(1) If Russell sees Moore get shaved in Cambridge, then Moore gets shaved in Cambridge.

Substitution: If  $\varphi(t_1)$  is an NI sentence containing the term  $t_1$  and  $\varphi(t_2)$  is the result of substituting  $t_1$  in  $\varphi$  with  $t_2$ , then (B) if  $m$  sees  $\varphi(t_1)$  and  $t_1 = t_2$ , then  $m$  sees  $\varphi(t_2)$ .

(2) If Russell sees Moore get shaved in Cambridge and Moore is the author of *Principia Ethica*, then Russell sees the author of *Principia Ethica* get shaved in Cambridge.

Exportation: If  $\varphi$  is an NI sentence, then (C) if  $m$  sees some  $x$   $\varphi(x)$ , then there is some  $x$  such that  $m$  sees  $\varphi(x)$ .

(3) If Russell sees someone leave, there is someone whom Russell sees leave.

Here is how one can try to account for properties A–C by appealing to events. Assume that (a) “ $m$  sees  $\varphi$ ” (where  $\varphi$  is an NI) means that the seeing relation holds between  $m$  and an event of  $\varphi$ -ing, (b) events have individual participants, and (c) the existence of an event of  $\varphi$ -ing makes  $\varphi$  true. Now, veridicality, substitution, and exportation follow.

Suppose Russell sees Moore get shaved in Cambridge. Thus, by assumption *a*, there is an event of Moore’s getting shaved in Cambridge and Russell sees it. Thus, there is an event of Moore’s getting shaved in Cambridge. Thus, according to assumption *c*, Moore gets shaved in Cambridge.

Moreover, because Moore is the author of *Principia Ethica*, an event of Moore’s getting shaved in Cambridge is, by assumption *b*, an event of the author of *Principia Ethica*’s getting shaved in Cambridge, given that both are identical to an event of the same individual’s getting shaved in Cambridge. So, suppose again that Russell sees Moore get shaved in Cambridge. By assumption *a*, he sees an event of Moore’s getting shaved in Cambridge. Thus, he sees an event of the author of *Principia Ethica*’s getting shaved in Cambridge. Thus, by assumption *a* again, Russell sees the author of *Principia Ethica* get shaved in Cambridge.

Finally, if *e* is an event of someone’s leaving, then, by assumption *b*, *e* will be

an event of  $a$ 's leaving or  
 an event of  $b$ 's leaving or  
 an event of  $c$ 's leaving or  
 ...

So, if Russell sees someone leave, by assumption  $a$  he sees an event of someone's leaving; that is, he sees one of the events in the above list. Thus, by assumption  $a$ , there is someone whom Russell sees leave.

Higginbotham (1983) gives a version of this account, which extends Davidson's (1967) analysis of the logical form of action sentences. In his account, the validity of instances of veridicality, substitution, and exportation is guaranteed by the form of these instances, which, at some underlying level, are formulae of a first-order language. For example, sentence 4 has logical form 5, where the existential quantifier over individuals is outside the scope of "see," as in the logical form of sentence 6:

- (4) Russell sees someone leave.
- (5)  $\exists e \exists x (\text{leave}(x, e) \wedge \text{see}(r, e))$
- (6) There is someone whom Russell sees leave.

Thus, at the level of logical form, sentence 3 is an instance of formula 7, whose truth follows by propositional logic:

- (7)  $\varphi \supset \varphi$

One should not be misled into thinking that, if the validity of the instances of veridicality, substitution, and exportation follows as a matter of form, metaphysical properties of events play no role in accounting for these properties of NI complements. To see why this thinking is wrong, contrast sentence 4 with sentence 8:

- (8) Russell sees that someone left.

Sentence 8 is analyzed as asserting that a certain relation holds between an individual and a proposition. Now, notice that sentence 8 may be true although there is no individual Russell saw leave. This is possible because there is such a thing as the proposition that someone left, which is not about any particular individual. This reading of sentence 8 is given by logical form 9, where the existential quantifier is in the scope of "*see-that*" (the symbol " $\hat{\phantom{x}}$ " is the intension operator of Montague 1973, which applied to a sentence yields an expression denoting the proposition expressed by the sentence. For an introduction to this notation, see Dowty et al. 1981, pp. 153–4):

- (9)  $\text{see-that}(r, \hat{\exists e \exists x \text{leave}(x, e)})$

Events of someone's leaving, in contrast, are not like that: There is no such thing as an event of someone's leaving that does not have a particular individual as a participant. So, if what John sees is an event of someone's leaving, what he sees is an event of  $x$ 's leaving, for some  $x$ , which is what logical form 5 says. So, logical form 5 reflects this feature of leaving events. Davidson's claim is that

“if the truth conditions of sentences are placed in the context of a comprehensive theory, the linguistic structure that emerges will reflect large features of reality,” or as he puts it more briefly, “semantically relevant structure is apt to demand ontology” (Davidson 1984, pp. 201, 206).

I return to Higginbotham’s account in Section 3.1, where I compare it with the situation-based account proposed by Barwise (1981). For the time being, let us follow the event-based account beyond the data discussed by Higginbotham in order to achieve a better formulation of some of the assumptions made above.

The instance of exportation in example 3 concerns the subject of the NI complement. But one finds valid instances of exportation with indefinite objects as well, as the validity of example 10 shows:

- (10) If Russell sees Moore kick\kiss\touch someone, then there is some  $x$  such that Russell sees Moore kick\kiss\touch  $x$ .

We may account for example 10 as we did for example 3 because an event of Moore’s kicking\kissing\touching someone is an event of Moore’s kicking\kissing\touching  $x$ , for some individual  $x$ .

But now suppose, contra assumption  $b$  above, that there are events of V-ing someone that are not events of V-ing  $x$ , for some  $x$ . Then, by our reasoning, we should expect sentence schema 11 to be invalid:

- (11) If Russell sees Moore V someone, then there is someone Russell sees Moore V.

Are there events of this kind? One obvious candidate is an event of Moore’s looking for a new coat. Clearly, an event of this kind need not be an event of Moore’s looking for a particular  $x$  that is a new coat. An event of Moore’s looking for a new coat may be a complex event  $e$  in which Moore visits several department stores and tries several coats on, without there being any particular new coat he is looking for. If Russell’s seeing  $e$  is a truth-maker of “Russell sees Moore look for a new coat,” then sentence 12 is false:

- (12) If Russell sees Moore look for a new coat, there is an  $x$  such that  $x$  is a new coat and Russell sees Moore look for  $x$ .

If this is correct, a better formulation of principle B is B’: Events in the denotations of extensional verbs (verbs, such as “leave,” “kick,” “kiss,” and “touch,” that express relations between individuals) have individual participants. Zucchi (1999) suggests that the logical form of sentence 13 below, under the reading that is made true by event  $e$  described above, is given by formula 14 (where “look for” denotes a relation between an individual, the intension of a generalized quantifier, and an event):

- (13) Moore looks for a new coat.  
 (14)  $\exists e \text{ look-for}(m, \hat{\wedge} a \text{ new coat}, e)$

The logical form of sentence 15, under this reading of “look for a new coat,” is given in formula 16:

(15) Russell sees Moore look for a new coat.

(16)  $\exists e (\text{look-for}(m, \hat{a} \text{ new coat}, e) \wedge \text{see}(r, e))$

Notice that, by this account, we also expect failure of substitutivity with “looking for.” Given that the *look for* relation may take intensional objects, a possible logical form for sentence 17 is formula 18:

(17) Russell sees Moore look for the youngest person in the room.

(18)  $\exists e (\text{look-for}(m, \hat{the} \text{ youngest in the room}, e) \wedge \text{see}(r, e))$

But the proposition expressed by formula 20 does not follow from formula 18 and the identity formula in 19:

(19) *the youngest in the room = the most cultivated in the room*

(20)  $\exists e (\text{look-for}(m, \hat{the} \text{ most cultivated in the room}, e) \wedge \text{see}(r, e))$

It does not follow, given that the intension of the definite description “the youngest person in the room” is not the same as the intension of the definite description “the most cultivated person in the room” (these descriptions may denote different individuals at some world). Because formula 20 is the logical form of sentence 21 below, this treatment of intensional verbs in the event-based account predicts, therefore, that the proposition expressed by sentence 17 fails to entail the proposition expressed by sentence 21 even if the youngest person in the room is the most cultivated person in the room, *contra* the principle of substitution C stated by Barwise (1981):

(21) Russell sees Moore look for the most cultivated person in the room.

Is the prediction correct? A truth-maker for sentence 17 may be an event in which Moore goes around in a room full of people, checking the age of everyone to find out who is the youngest. Clearly, there is no particular individual Moore is looking for in this case; anyone who turns out to be the youngest in the room will do. Russell may observe Moore do the checking. So, sentence 17 is true in this case. Yet, what Russell sees is arguably not an event of Moore’s looking for the most cultivated person in the room (Moore is checking people’s age, not their degree of cultivation). So, sentence 21 is false in this case. If this argument is correct, a better formulation of substitution must restrict the principle to NI complements whose verb is extensional.

Before concluding this section, let us single out two features of the Davidsonian account of the semantics of NI complements presented here. One main claim of this account is that the relevant semantic properties of perception reports with NI complements are captured by assuming that the verb *see* in these reports expresses a relation between individuals and events. The other claim is that one does not have to stipulate that NI complements introduce an event argument just for the purpose of dealing with their semantics: This argument is identified with the event argument posited by Davidson to account for adverbial modification in action sentences (the topic I discuss in Section 2.2, below). Whereas the first claim, under a broad understanding of the term “event,” is widely agreed upon, the second claim is disputed. I return to this issue in Section 3.1, where I present a competing situation-based account of the semantics of perception reports with NI complements.

In the meantime, here are some further readings on this topic. A critical discussion of Higginbotham's paper is given by Neale (1988) and Asher & Bonevac (1985), who argue in favor of Barwise's (1981) situation-based account. A neo-Davidsonian version of the semantics of NI complements is given by Parsons (1990). The Davidsonian account is taken up again by Higginbotham (1999). A non-Davidsonian, event-based account of perceptual reports with NI complements is given by Vlach (1983). As for events in the denotation of intensional verbs, a different treatment from the one sketched here is given by Forbes (2006), who argues that exportation and substitution with intensional transitive verbs should be accounted for by separate devices.

## 2.2. Adverbial Modification

The preceding section shows how the choice of logical forms in a Davidsonian analysis carries along certain views about the metaphysics of events. We may appreciate this interplay further by examining the Davidsonian account of adverbial modification.

Davidson (1984) summarizes thus the contribution of events to the semantics of adverbial modification:

Without events, there is the problem of explaining the logical relations between sentences like 'Jones nicked his cheek while shaving with a razor in the bathroom on Saturday', and 'Jones nicked his cheek in the bathroom', and 'Jones nicked his cheek'. It seems that some iterative device is at work; yet what, from a semantic point of view, can the device be? . . . By interpreting these sentences as being about events, we can solve the problems. Then we can say that 'Jones nicked his cheek in the bathroom on Saturday' is true if and only if there exists an event that is a nicking of his cheek by Jones, and that event took place in the bathroom, and it took place on Saturday. The iterative device is now obvious: it is the familiar collaboration of conjunction and quantification that enables us to deal with 'Someone fell down and broke his crown'. (Davidson 1984, p. 212)

Davidson's observation here is that sentence 22*a* entails sentence 22*b*, which entails sentence 22*c*, which entails sentence 22*d* (further entailments follow by transitivity):

- (22*a*) Jones nicked his cheek with a razor in the bathroom on Saturday.
- (22*b*) Jones nicked his cheek with a razor in the bathroom.
- (22*c*) Jones nicked his cheek with a razor.
- (22*d*) Jones nicked his cheek.

Following Parsons (2000), I call these entailments modifier drop-off.

Moreover, note that sentence 22*a* and sentences 23*a* and *b*, below, all entail each other; the adverbs can be shuffled without affecting the truth conditions (I refer to these entailments as modifier shuffle):

- (23*a*) Jones nicked his cheek with a razor on Saturday in the bathroom.
- (23*b*) Jones nicked his cheek on Saturday in the bathroom with a razor.

Davidson's proposal is that sentences 22*a–d* have logical forms 24*a–d* (ignoring tense):

- (24a)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{razor}(x) \wedge \text{with}(x, e) \wedge \text{in}(\text{the bathroom}, e) \wedge \text{on}(\text{Saturday}, e))$
- (24b)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{razor}(x) \wedge \text{with}(x, e) \wedge \text{in}(\text{the bathroom}, e))$
- (24c)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{razor}(x) \wedge \text{with}(x, e))$
- (24d)  $\exists e (\text{nick}(j, j's \text{ cheek}, e))$

Once we assume logical forms 24a–d, modifier drop-off follows by first-order logic. Moreover, modifier shuffle also follows by first-order logic, if sentences 22a, 23a, and 23b have, respectively, logical forms 24a, 25a, and 25b:

- (25a)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{in}(\text{the bathroom}, e) \wedge \text{on}(\text{Saturday}, e) \wedge \text{razor}(x) \wedge \text{with}(x, e))$
- (25b)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{on}(\text{Saturday}, e) \wedge \text{in}(\text{the bathroom}, e) \wedge \text{razor}(x) \wedge \text{with}(x, e))$

Finally, notice that sentences 22c and 26, below, do not entail sentence 22b, because Jones could have nicked his cheek with a razor and nicked his cheek in the bathroom on separate occasions.

- (26) Jones nicked his cheek in the bathroom.

By the logical form 24c of sentence 22c and the logical form 27, below, of sentence 26, this non-entailment is expected, because from the logical forms 24c and 27 it does not follow that there is an event of Jones's nicking his cheek that was done both in the bathroom and with a razor, which is what the logical form 24b of sentence 22b says.

- (27)  $\exists e \exists x (\text{nick}(j, j's \text{ cheek}, e) \wedge \text{in}(\text{the bathroom}, e))$

Parsons calls this nonentailment modifier nonconjunction. So, Davidson's theory captures modifier drop-off, modifier shuffle, and modifier nonconjunction very elegantly. This result, as Davidson points out, is achieved by the familiar collaboration of conjunction and quantification, except that the quantifier over events is not introduced by a determiner, but presumably by an existential closure rule at the sentence level (in this sense, it is an instance of what Bach et al. 1995 call A-quantification).

Notice that, at first glance, logical forms 24–25 seem to impose no particular requirements on what events are, provided that they are the type of entities that can occur at times and in places. What is relevant for capturing modifier drop-off and modifier shuffle is that predicates have an extra argument place and that the properties of being in the bathroom, on Saturday, with a razor may apply to the kind of object assigned to the variable that fills that argument place. Whatever entity satisfies these requirements will do, at least for the purpose of accounting for the logical relations among sentences 22a–d and 23a and b.

But things are not entirely as they seem. Consider the following examples from Taylor (1985), attributed to Gareth Evans:

- (28a) Shem hit Shaun with a shillelagh violently.
- (28b) Shem hit Shaun with a cudgel, but not violently.

Suppose with Evans that



a single time  $t_0$  is a time of an ambidextrous battery of Shem upon Shaun performed both by shillelagh and cudgel, and the assault with the shillelagh is violently done though the cudgel-dealt blows are comparatively mild. Then both [sentence 28a] and [sentence 28b] became true, and true just in virtue of the goings-on at  $t_0$ . (Taylor 1985, p. 100)

Clearly, for Davidson there must be two hitting events in this case, one of Shem's hitting Shaun with a cudgel and the other of Shem's hitting Shaun with a shillelagh. Otherwise, if the same event  $e$  were responsible for making both sentences 28a and 28b true, we should expect  $e$  to be both violent and not violent. Indeed, if logical forms 29a and 29b are made true by the same event, it follows by first-order logic that logical form 30 is true:

(29a)  $\exists e \exists x (\text{hit}(\text{Shem}, \text{Shaun}, e) \wedge \text{shillelagh}(x) \wedge \text{with}(x, e) \wedge \text{violent}(e))$

(29b)  $\exists e \exists x (\text{hit}(\text{Shem}, \text{Shaun}, e) \wedge \text{cudgel}(x) \wedge \text{with}(x, e) \wedge \text{violent}(e))$

(30)  $\exists e (\text{hit}(\text{Shem}, \text{Shaun}, e) \wedge \text{violent}(e) \wedge \sim \text{violent}(e))$

This observation highlights an important consequence of Davidson's account of adverbial modification for how events are individuated. As Taylor points out, if sentences 28a and 28b have logical forms 29a and 29b, an event of  $a$ 's hitting  $b$  occurring at  $t$  cannot be identified by  $\langle$ the property of hitting,  $a, b, t \rangle$ . More generally, in Davidson's account, given an event  $e$  that stands in the  $n$ -ary relation  $R$  with individuals  $a_1, \dots, a_{n-1}$  at time  $t$ , we cannot identify  $e$  with the complex  $\langle R, \langle a_1, \dots, a_{n-1} \rangle, t \rangle$ . So, the choice of logical forms 29a and 29b is not so ontologically innocent after all. Semantically relevant structure demands ontology.

Davidson's analysis of adverbs has been discussed extensively in the literature. Something Davidson was aware of is that not all adverbs are amenable to the kind of conjunctive analysis given for sentences 22a–d (Davidson 1967, 1985). For instance, modifier drop-off does not hold for "allegedly" or "halfway":

(31) Jones allegedly left  $\not\Rightarrow$  Jones left

(32) Jones opened the door halfway  $\not\Rightarrow$  Jones opened the door

The sentences containing these adverbs require a different analysis.

It is important to observe that, even for the modifiers Davidson's analysis is meant to apply to, modifier drop-off does not apply unrestrictedly. Consider the following examples from Verkuyl (1993):

(33a) At most three girls strolled through the streets of Bologna at 2 AM.

(33b) At most three girls strolled through the streets of Bologna.

(33c) At most three girls strolled.

Suppose that at 2 AM only Clotilde, Elisa, and Chiara were strolling through the streets of Bologna and that at 2:15 AM Lea joins them in the stroll. In this case, sentence 33a is true, whereas sentence 33b is false. Suppose, moreover, that while only Clotilde, Elisa, and Chiara were strolling through the streets of Bologna, Maria was strolling through the streets of Milan. Sentence 33b is true in this case, whereas sentence 33c is false.

What does Davidson's theory predict in this case? Since the logical forms of sentences 33a–c contain both a quantifier on events and a quantifier on individuals, the issue of how they should be

scoped arises. In this respect, we observe that sentence 33a should have logical form 34 and not logical form 35 (here I rely on Verkuyl's notation):

- (34)  $[At\ most\ 3x:girl(x)]\exists e(stroll(e,x)\wedge$   
 $through(the\ streets\ of\ Bologna,e)\wedge at-2_{AM}(e))$
- (35)  $\exists e(stroll(e,[At\ most\ 3x:girl(x)])\wedge$   
 $through(the\ streets\ of\ Bologna,e)\wedge at-2_{AM}(e))$

Indeed, what logical form 35 says is that there is an event of at most three girls' strolling through the streets of Bologna at 2 AM. Such truth conditions are compatible, for example, with the occurrence of an event of four girls' strolling through the streets of Bologna at 2 AM. But sentence 33a lacks a reading compatible with the occurrence of that event. Logical form 34, however, asserts that there are no more than three events of a girl's strolling through the streets of Bologna at 2 AM, which, intuitively, reports the meaning of sentence 33a correctly.

If the quantifier over individuals must have scope over the event quantifier, then sentences 33a, 33b, and 33c have, respectively, logical forms 35, 36a, and 36b:

- (36a)  $[At\ most\ 3x:girl(x)]\exists e(stroll(e,x)\wedge$   
 $through(the\ streets\ of\ Bologna,e))$
- (36b)  $[At\ most\ 3x:girl(x)]\exists e(stroll(e,x))$

This analysis correctly predicts that modifier drop-off should not hold for sentences 33a–c. Indeed, given that the quantifier “at most three girls” is monotone decreasing, then from the fact that its denotation includes the set of  $x$  such that there is an event of  $x$ 's strolling through the streets of Bologna at 2 AM, it does not follow that it also includes a superset of that set, like the set of  $x$  such that there is an event of  $x$ 's strolling through the streets of Bologna or the set of  $x$  such that there is an event of  $x$ 's strolling. So, assuming that the scope of quantifiers over individuals with respect to the event quantifier is uniform across different types of quantifiers, the Davidsonian theory is committed to ascribing wide scope to quantifiers over individuals with respect to the event quantifier.

Now let us consider a problematic case described by Pietroski (2013). Suppose that Miss Scarlett played the sonata on the piano in 16 minutes. Call that event *moonlight*. Clearly, *moonlight* is an event of playing the piano. So, *moonlight* is a truth-maker for the Davidsonian logical forms of the sentences in 37 and 38:

- (37) Miss Scarlett played the sonata on the piano in 16 minutes.  
 $\exists e(play(the\ sonata,Scarlett,e)\wedge on(the\ piano,e)\wedge in(16\ minutes,e))$
- (38) Miss Scarlett played the piano.  
 $\exists e(play(the\ piano,Scarlett,e))$

Because *moonlight* took 16 minutes, and *moonlight* makes the logical form in 38 true, it follows that formula 39 is true:

- (39)  $\exists e(play(the\ piano,Scarlett,e)\wedge in(16\ minutes,e))$

Because formula 39 is the logical form of sentence 40, that sentence should also be true. In fact, sentence 40 is odd:

(40) #Miss Scarlett played the piano in 16 minutes.

Notice that a symmetric problem may be raised for the modifier “for 16 minutes.” If *moonlight* is a truth-maker for sentence 38 and it lasts for 16 minutes, then sentence 41 is true:

(41) Miss Scarlett played the piano for 16 minutes.  
 $\exists e(\text{play}(\text{the piano}, \text{Scarlett}, e) \wedge \text{for}(16 \text{ minutes}, e))$

Then, because *moonlight* is also a truth-maker for sentence 37, it is a truth-maker for formula 42:

(42)  $\exists e(\text{play}(\text{the sonata}, \text{Scarlett}, e) \wedge \text{for}(16 \text{ minutes}, e))$

Because formula 42 is the logical form of sentence 43 below, that sentence should also be true. In fact, sentence 43 is odd (except on an iterative reading, not at issue here):

(43) #Miss Scarlett played the sonata for 16 minutes.

This problem brings us to the last application of events I consider, which is discussed in the next section.

Parsons (1990) extensively discusses how to analyze different types of adverbs in a Davidsonian framework; also see Higginbotham (2000). For a defense of the Davidsonian approach and a discussion of quantification in a Davidsonian framework, see Landman (2000).

### 2.3. Telicity

Recalling Aristotle’s distinction between *kinesis* and *energeia* in Book IX of *Metaphysics*, Vendler (1957) distinguishes between actions that are directed to an end (telic) and actions that are not (atelic):

... while running or pushing a cart has no set terminal point, running a mile and drawing a circle do have a “climax”, which has to be reached if the action is to be what it is claimed to be. (Vendler 1957, p. 145)

Bach (1986) suggests that the distinction should be captured by introducing in the domain of quantification two kinds of occurrences, which correspond to Vendler’s telic and atelic actions: events proper and processes. In Davidsonian terms, this suggestion would amount to saying that, whereas sentence 44 asserts the existence of an event of John’s walking from his apartment to the park, sentence 45 asserts the existence of a process of John’s walking:

(44) John walked from his apartment to the park.

(45) John walked.

According to this proposal, these two sentences cannot be made true by the same occurrence, given that “walked” and “walked from his apartment to the park” are not predicates of the same type of entities: The former is a predicate of events, and the latter is a predicate of processes. Of course, if *e* is an event of John’s walking from his apartment to the park, that event necessarily co-occurs with a process of John’s walking that shares its spatiotemporal location with *e*. But the process and the event are nonetheless distinct.

Notice that the problem raised by Pietroski no longer arises for this account. If we apply Bach's distinction between predicates of events and predicates of processes to "play the sonata" and "play the piano," it turns out that sentence 37 asserts the existence of an event of Miss Scarlett's playing the sonata, whereas sentence 38 asserts the existence of a process of Miss Scarlett's playing the piano. Thus, contrary to what is assumed in Pietroski's example, there is no unique event which is a truth-maker for both sentences 37 and 38.

By assuming that "in 16 minutes" is a predicate of events and not of processes, we may account, moreover, for the fact that sentence 40 is odd. Likewise, the oddness of sentence 43 follows from the assumption that "for 16 minutes" is a predicate of processes and not of events.

Bach's proposal raises two issues. On the one hand, as he acknowledges, if "walked" in sentence 45 is a predicate of processes, whereas "walked from his apartment to the park" in sentence 44 is a predicate of events, a question arises as to how this result can be derived compositionally. Because the switch from being a predicate of processes to being a predicate of events is a quite general process, as shown by sentences 37–38 and 44–45, and by sentences 46–47, below, one must have a general account of how complex predicates turn out to be predicates of events or predicates of processes:

- (46a) John ate an apple in 2 minutes.
- (46b) #John ate an apple for 2 minutes.
- (47a) John ate apples for 2 minutes.
- (47b) #John ate apples in 2 minutes.

Another issue concerns the metaphysical commitment required by Bach's theory, as the theory introduces a systematic duplication of entities, events and spatiotemporally coinciding processes, for which there is no independent metaphysical rationale. Bach & Chao (2012) address this issue by distinguishing the task of metaphysics from that of natural language semantics:

What is there? is the fundamental question of metaphysics.  
What do people talk as if there is? is the fundamental question of linguistic semantics. (Bach & Chao 2012, p. 175)

According to this view, semanticists positing ontological distinctions should not be understood as making claims about what there is, but rather about what kinds of things are necessary to give an account of the semantics of natural languages. The kinds of things needed for the latter purpose need not reflect what there is, but rather how language speakers see the world. So, demanding metaphysical evidence for the distinction between events and processes is simply an incorrect request, because the distinction is not about what there is.

Although this is a legitimate reply, there is tension between the claim that the ontology of semantic theories of natural languages need not reflect what there is and the fact that these theories aim at providing truth conditions for natural language sentences. One way to resolve this tension is to reconsider the aim. A different way of spelling out the telic/atelic distinction that does not involve such a radical reorientation is suggested by Krifka (1998; also see Krifka 1989, 1992):

... it is misleading to think that particular events can be called "telic" or "atelic." For example, one and the same event of running can be described by *running* (i.e., by an atelic predicate), or by *running a mile* (i.e., a telic, or delimited, predicate). Hence the distinction between telicity and atelicity should not be one in the nature of the object described, but in the description applied to the object. (Krifka 1998, p. 207)

Krifka is arguing that the telic/atelic distinction should be spelled out at the predicate level, not at the event level. Let us illustrate with an example. Let  $e$  be the walk that John takes from his apartment to the park. This event of walking will have many parts that are walkings. For example, if John walks to the park by walking to the Duomo, then to the castle, and then to the park, then John's walking to the Duomo and John's walking to the castle are all parts of  $e$  that are walkings. So, the denotation of the predicate "walk" will normally count among its members  $e$  and all the parts of  $e$  that are walkings. The predicate "walk to the park," however, will count  $e$  among its members, but not any proper part of  $e$ , because a proper part of  $e$ , not ending at the park, cannot be described as a walk to the park. So, the predicates "walk" and "walk to the park" may be true of the same event; however, although "walk" may have an event and proper parts of it in its denotation, the predicate "walk to the park" may not. The same goes for the predicates "play the piano" and "play the sonata." On the one hand, the predicate "play the piano" will have *moonlight* and all the proper parts of *moonlight* that are events of playing the piano in its denotation. The predicate "play the sonata," on the other hand, will have *moonlight* in its denotation, but not any proper part of it, given that a proper part of *moonlight* is not a complete performance of the sonata.

Let us describe as quantized a predicate that may not have in its denotation an event and a proper part of that event. The pattern in sentences 37, 40, 41, and 43 may now be explained by supposing that "for 16 minutes" is a function that takes predicate denotations as arguments and is defined only for denotations of nonquantized predicates, whereas the function denoted by "in 16 minutes" is defined only for denotations of quantized predicates (here, I am modifying Krifka's account of *in*-adverbials for simplicity's sake). Notice that, if Krifka is right, sentences 37 and 41 may no longer be represented as in formulae 48*a* and *b*, because "for 16 minutes" and "in 16 minutes," from a semantic standpoint, do not apply to events but rather to predicate denotations:

(48a)  $\exists e(\text{play}(\text{the sonata}, \text{Scarlett}, e) \wedge \text{on}(\text{the piano}, e) \wedge \text{in}(16 \text{ minutes}, e))$

(48b)  $\exists e(\text{play}(\text{the piano}, \text{Scarlett}, e) \wedge \text{for}(16 \text{ minutes}, e))$

Higginbotham (2000) argued, *contra* Krifka (1998), for a treatment of durational *in*- and *for*-adverbials that brings them back in line with the Davidsonian analysis of modifiers as predicates of events. Recall that according to Bach's theory, if there is an event of John's walking from his apartment to the store, then there is a process of John's walking that occupies the same spatiotemporal position. Krifka's analysis of durational modifiers as second-order properties stems from the view that it is preferable to avoid this kind of duplication. According to Higginbotham one can avoid multiplying events in the following way while keeping close to the view that durational *in*- and *for*-adverbials are predicates of events. Consider sentences 46–47 again:

(46a) John ate an apple in 2 minutes.

(46b) #John ate an apple for 2 minutes.

(47a) John ate apples for 2 minutes.

(47b) #John ate apples in 2 minutes.

Higginbotham's idea is that sentences 46*a* and 47*a* involve two different verbs "eat." In the former, "eat" is telic and expresses a relation between an agent, a patient, and an event pair, whereas in the latter, "eat" is atelic and expresses a relation between an agent, a patient, and an event. Thus, the logical forms of these two sentences are the following:

(49a)  $\exists \langle e, e' \rangle \exists x (\text{apple}(x) \wedge \text{eat}(j, x, \langle e, e' \rangle) \wedge \text{in}(2 \text{ minutes}, \langle e, e' \rangle))$

(49b)  $\exists e \exists x (\text{apples}(x) \wedge \text{eat}(j, x, e) \wedge \text{for}(2 \text{ minutes}, e))$

On the one hand, the clause “ $\text{eat}(j, x, \langle e, e' \rangle)$ ” in logical form 49a may be read as “ $e$  is a process of eating directed toward  $x$  of which John is the agent and  $e'$  is a state of  $x$ 's being inside  $j$ .” On the other hand, “ $\text{eat}(j, x, e)$ ” in logical form 49b is read as “ $e$  is a process of eating directed toward  $x$  of which John is the agent.” The role of durational *in*-adverbials is that of measuring the distance between the two events in the pair; more precisely, “ $\text{in}(2 \text{ minutes}, \langle e, e' \rangle)$ ” may be read as “the temporal distance between the onset of the process  $e$  and the onset of state  $e'$  is 2 minutes.” By contrast, durational *for*-adverbials measure the duration of the process; thus, “ $\text{for}(2 \text{ minutes}, e)$ ” simply means “the run time of  $e$  is 2 minutes.”

Why is sentence 46b odd, then? If “eat” in this sentence is telic, it is odd because the semantic type of “for 2 minutes” is wrong: “for 2 minutes” is a predicate of processes and does not apply to a complex consisting of a <process,state> pair. Why is sentence 47b odd? On the one hand, if “eat” in this sentence is atelic, then it is odd because the semantic type of “in 2 minutes” is wrong: “in 2 minutes” applies to <process,state> pairs, whereas the verb provides only a process argument. On the other hand, if “eat” in sentence 47b is telic, then that sentence is odd because the denotation of a mass noun or a bare plural is incapable of providing a telos, given that the telos of there being a state of eating apples must exist if the process obtains. Notice that we still lack an explanation of why sentence 46b is odd if “eat” is atelic. So, we must suppose that, somehow, atelic “eat” selects only for mass nouns or bare plural denotations. A similar account may then be extended to other verbs that show telic/atelic alternations, such as “walk” and “play.”

According to this account, *in*- and *for*-adverbials are, respectively, predicates of <process,state> pairs and predicates of processes. However, whereas telic and atelic “eat,” “walk,” and “play” are not predicates of the same entity (because the former are predicated of <process,state> pairs and the latter of processes), no spatiotemporally coinciding processes and events are required. Indeed, a process of John's eating an apple in the pair in the denotation of telic “eat” may very well be identical to a process of John's eating in the denotation of atelic “eat.”

Note, moreover, that in this account we can no longer construct Pietroski's problem, because there cannot be a single event that is a truth-maker for both sentences 37 and 41. Whereas the former is made true by the existence of an  $\langle e, e' \rangle$  pair, where  $e$  is a process of Miss Scarlett's playing the sonata and  $e'$  is the state that results from this process being completed, the latter is made true simply by a process of Miss Scarlett's playing the sonata.

Thus, Higginbotham's proposal does not treat *in*- and *for*-adverbials as second-order properties. But the account is incomplete (why are *for*-adverbials barred with atelic verbs and indefinite singular objects?), and it comes at the cost of positing systematic ambiguities for verbs.

Let us conclude our discussion by trying to assess where we stand. As we have seen, Krifka and Higginbotham characterize telicity differently. For Krifka, on the one hand, telicity has to do with the way we describe events, rather than with the events themselves. For Higginbotham, on the other hand, telicity is a property of event complexes consisting of a process and its resulting state (telos). Are there substantial empirical differences correlating with these ways of viewing telicity? At a first glance, it might seem that the latter option has more difficulties in accounting for the role of singular indefinite objects in yielding telic predicates: Whereas Higginbotham fails to provide a full account of sentence 46b, Krifka correctly predicts that this sentence is anomalous because the predicate “eat an apple” turns out to be quantized in his semantics. However, it is not clear why predicates like “write a sequence,” “find some fleas,” “find most of the fleas,” “find less than a half

of the fleas,” and “find less than  $n$  fleas,” which are anomalous with *for*-adverbials, should turn out to be quantized, because, on the face of it, events in the denotations of these predicates should have proper parts that are also in their denotations. The conclusion is that, whereas appeal to events provides valuable insights into the nature of the Aristotelian telic/atelic distinction, a full-fledged account of why complex predicates of natural language may turned out to be telic is yet to come, whether we see telicity as a matter of event description or as a property of event complexes.

Verkuyl (1993, 2000) and Zucchi & White (2001) present a critical discussion of Krifka’s (1998) proposal. For a way of dealing with the problem posed by nouns like “sequence,” see Krifka (1998) and Rothstein (2010). For a recent treatment of *for*-adverbials, see Champollion (2010).

### 3. WHAT ARE SITUATIONS GOOD FOR? SOME PARADIGMATIC CASES

I now turn to situations. As pointed out in Section 1, we commonly refer to situations in ordinary discourse. Again, one may wonder what they are and also how they differ from events. Indeed, situations and events seem to be similar enough in kind that it is perhaps no surprise that in some cases they play the same role in semantic accounts. Thus, for instance, both situations and events have been invoked in the analysis of perceptual reports with NI complements. Barwise & Perry provide a situation-based account of these reports, and they characterize situations in a way that is similar to how Kim (1976) characterizes events. In Section 3.1, below, I compare this account with the Davidsonian event-based account presented in Section 2.1.

Situations have also been used to model propositions. In Barwise & Perry (1981, 1983) and Kratzer (1989), propositions are sets of possible situations. These authors differ, however, about the nature of situations: Unlike Barwise & Perry, Kratzer takes them to be primitive entities ordered by the part-of relation. This way of modeling propositions has been invoked to deal with some problems that arise for possible world analyses of the semantics of attitude reports. I discuss this use of situations in Section 3.2.

#### 3.1. Naked Infinitive Complements

A semantics for NI complements to perception verbs based on situations was originally proposed by Barwise (1981) and subsequently developed by Barwise & Perry (1983). A situation (or course of events) in Barwise & Perry’s account is a set of triples  $\langle l, r, i \rangle$ , where  $l$  is a spatiotemporal location,  $r$  is a sequence consisting of an  $n$ -ary relation and  $n$  objects, and  $i$  is a truth-value. Thus, for instance, this is a situation:

$$\{\langle l_1, \langle \text{run}, \text{Plato} \rangle, 1 \rangle, \langle l_2, \langle \text{asleep}, \text{Socrates} \rangle, 1 \rangle\}$$

Roughly speaking, the interpretation of a sentence (in a context) is a collection of situations. For example, the interpretation of (tenseless) sentence 50, relative to a location  $l_1$ , is the collection of situations that have  $\langle l_1, \langle \text{run}, \text{Plato} \rangle, 1 \rangle$  as a member:

(50) Plato runs.

$$\begin{aligned} & \{ \{ \langle l_1, \langle \text{run}, \text{Plato} \rangle, 1 \rangle \}, \\ & \{ \langle l_1, \langle \text{run}, \text{Plato} \rangle, 1 \rangle, \langle l_2, \langle \text{asleep}, \text{Socrates} \rangle, 1 \rangle \}, \\ & \{ \langle l_1, \langle \text{run}, \text{Plato} \rangle, 1 \rangle, \langle l_4, \langle \text{awake}, \text{Socrates} \rangle, 0 \rangle, \dots \} \end{aligned}$$

Now, let us say that

a situation  $e$  supports the truth of a sentence  $\varphi$  (in a context) iff  $e \in$  the interpretation of  $\varphi$  (in that context).

The idea, to deal with NI complements of perception verbs, is this:

‘ $a$  sees  $\varphi$ ’ is true iff  $a$  sees a situation  $e$  that supports the truth of  $\varphi$ .

Veridicality follows by requiring that, if  $a$  sees a situation  $e$  that supports the truth of  $\varphi$ , then there is an actual situation  $e$  that supports the truth of  $\varphi$ . Exportation and substitution follow for reasons similar to the ones given in the Davidsonian approach. In particular, exportation follows from the fact that any situation supporting the truth of “someone runs” is a situation of a particular individual’s running. Substitution follows because, given that Moore is the author of *Principia Ethica*, any situation that supports the truth of “Moore get shaved in Cambridge” is also a situation that supports the truth of “the author of *Principia Ethica* get shaved in Cambridge” [situations supporting these sentences will all contain the triple  $\langle \text{Cambridge}, \langle \text{get shaved}, \text{Moore} \rangle, 1 \rangle$ ].

However, Barwise & Perry’s (1983) situation approach and the Davidsonian approach make different predictions in other respects. According to Davidson (1967), the same event may fall under different descriptions. One example proposed by Davidson to illustrate this point is this: My shooting the victim and my pulling the trigger are the same event. Consider now the following case proposed by Asher & Bonevac (1985). Suppose David is walking down an ill-lit street at night. He sees Buck pull the trigger, but he does not see the victim. In this case, it seems that sentence 51 is true but sentence 52 is false:

(51) David sees Buck pull the trigger.

(52) David sees Buck shoot Ed.

Because the event of pulling the trigger and the event of shooting Ed are the same event, the Davidsonian account has trouble explaining why the first sentence is true but the second is false. For Barwise & Perry’s (1983) situation account, however, this case is no trouble at all. Indeed, a situation supporting the truth of “Buck pull the trigger” is a situation containing a triple  $\langle l, \langle \text{pull}, \text{Buck}, \text{the trigger} \rangle, 1 \rangle$ , whereas a situation supporting the truth of “Buck shoot Ed” is a situation containing  $\langle l, \langle \text{shoot}, \text{Buck}, \text{Ed} \rangle, 1 \rangle$ , so the situation approach is not forced to say that if sentence 51 is true, so is sentence 52.

The objection raised by Asher & Bonevac (1985) depends on a certain way of individuating events. However, nothing in the Davidsonian approach forces one to say that the event of pulling the trigger and the event of shooting Ed are the same event. So, the event theorist may simply reply that what sentences 51 and 52 show is that we should individuate events finely enough to distinguish the two events.

Consider, however, the following examples suggested by Wyner (1989):

(53a) Poppaea saw Brutus leave the house.

(53b) Brutus left the house with a knife hidden under his coat.

(53c) Brutus left the house only once.

(53d) Hence, Poppaea saw Brutus leave the house with a knife hidden under his coat.

In the Davidsonian account, sentences 53a and 53b have logical forms 54a and 54b, respectively:



(54a)  $\exists e(\textit{leave}(\textit{the house}, \textit{Brutus}, e) \wedge \textit{see}(e, \textit{Poppaea}))$

(54b)  $\exists e \exists x(\textit{leave}(\textit{the house}, \textit{Brutus}, e) \wedge \textit{knife}(x) \wedge \textit{hidden}(x) \wedge \textit{with}(x, e))$

Because Brutus leaves only once, the event that is the truth-maker of formula 54b is also the event that Poppaea sees. So, formulae 54a and 54b entail formula 55:

(55)  $\exists e \exists x(\textit{leave}(\textit{the house}, \textit{Brutus}, e) \wedge \textit{see}(e, \textit{Poppaea}) \wedge \textit{knife}(x) \wedge \textit{hidden}(x) \wedge \textit{with}(x, e))$

But formula 55 is the logical form of sentence 53d. So, the Davidsonian account predicts incorrectly that sentences 53a–c entail sentence 53d. Here, the problematic conclusion is forced by the way we individuate events, but unlike in Asher & Bonevac’s case, this way of individuating events is forced by how adverbial modification works in the Davidsonian approach.

Barwise & Perry, however, may reject the conclusion because a situation supporting the truth of “Brutus leave the house” is a situation containing  $\langle l, \langle \textit{leave}, \textit{Brutus}, b \rangle, 1 \rangle$ , whereas a situation supporting the truth of “Brutus leave the house with a knife hidden under his coat” is a situation containing

$\langle l, \langle \textit{leave}, \textit{Brutus}, b \rangle, 1 \rangle$ ,

$\langle l, \langle \textit{hide}, \textit{Brutus}, k \rangle, 1 \rangle$ .

Does this mean that Barwise & Perry’s (1983) situation account is superior to the Davidsonian account because it allows a finer way of individuating events? The problem is that their account allows a way of individuating events that is too fine. Thus, for instance, if Russell saw Moore get up and Moore got up abruptly, we may be inclined to conclude that Russell saw Moore get up abruptly. But, again, Barwise & Perry’s situation account is not forced to this conclusion, as a situation supporting the truth of “Moore get up” is a situation containing  $\langle l, \langle \textit{get up}, \textit{Moore} \rangle, 1 \rangle$ , whereas a situation supporting the truth of “Moore get up abruptly” is a situation containing  $\langle l, \langle \textit{get up abruptly}, \textit{Moore} \rangle, 1 \rangle$ . Consider another case. If the secretary saw Nixon hide the letter, and by hiding the letter, Nixon tampered with the evidence, we may be inclined to conclude that the secretary saw Nixon tamper with the evidence. But Barwise & Perry’s situation account is not forced to this conclusion, because a situation supporting the NI complement “Nixon hide the letter” is distinct from a situation supporting the NI complement “Nixon tamper with the evidence.”

One possible way out of this impasse suggested by Landman (2000) is this: Give up the idea that the verb “see” in perceptual reports with NI complements expresses a relation between an individual and a Davidsonian event, and construct the object of “see” in these reports as a partial event, that is, a complex consisting of a Davidsonian event instantiating the NI complement and the role information expressed in the NI complement. Thus, according to sentence 53a, what Poppaea sees is a complex consisting of the Davidsonian event of Brutus’s leaving the house plus the information that the agent of that event is Brutus and the theme is the house, whereas according to sentence 53b, what Poppaea sees is a complex consisting of the Davidsonian event of Brutus’s leaving the house plus the information that the agent of that event is Brutus, the theme is the house, and the instrument is a knife. This way of construing the object of “see” blocks the inference in sentences 53a–d.

Another option is to question the claim that the inference in sentences 53a–d is invalid. Surely, if John did not see the knife, it may be misleading to describe the event Poppaea saw as an event of Brutus’s leaving the house with a knife, but this does not mean that sentence 53d is false. The man who was wearing a Cartier watch may be the identical to the man in the corner. Yet, if John saw

the man in the corner, but he did not see the watch, it may be misleading, but nonetheless true, to say that John saw the man who was wearing a Cartier watch.

### 3.2. Attitude Reports

Barwise & Perry's (1983) account embodies a particular view of the nature of situations, because their theory constructs them out of properties, actual individuals, and locations. However, for the purpose of semantic analysis, one may prefer to treat situations as primitives. As we have already observed, this choice does not imply a commitment to the view that situations cannot be analyzed further; it may simply reflect a methodological choice to remain neutral on their nature. Kratzer (1989) treats possible situations as primitives, much in the way possible worlds are treated as primitives in most versions of possible world semantics. Unlike worlds in possible-worlds semantics, however, Kratzer's account allows one to talk of situations that are parts of other situations, given that she structures the domain of situations by the part-of relation (a partial ordering), with a set of maximal elements (worlds) that are not proper parts of other situations.

Situations (à la Barwise & Perry or à la Kratzer) may avoid some difficulties raised by possible-worlds accounts of the semantics of attitude reports. Let us briefly review them. These accounts commonly assume that (a) the proposition expressed by a sentence (in a context) is the set of worlds in which the sentence is true and (b) ' $a$  believes that  $S$ ' means that  $a$  stands in the belief relation with the proposition expressed by  $S$ . This leads to at least three problems:

1. The problem of necessary equivalence. If two sentences  $A$  and  $B$  are true in exactly the same worlds, then ' $a$  believes that  $A$ ' entails that ' $a$  believes that  $B$ '. Thus, if one believes that  $2 < 4$ , one believes that first-order logic is complete.
2. The problem of closure under necessary consequence. A plausible principle about belief (Stalnaker 1983) is the principle of distribution of belief over conjunction: if  $a$  believes the proposition  $p$  and  $a$  believes the proposition  $q$ ,  $a$  believes the proposition  $p$  and  $a$  believes the proposition  $q$ . If we add this principle to the two assumptions at the beginning of this paragraph, it follows that, if  $B$  is a necessary consequence of  $A$ , if ' $a$  believes that  $A$ ', then ' $a$  believes that  $B$ ' (because, if  $B$  is a necessary consequence of  $A$ ,  $A$  expresses the same proposition as ' $B$  and  $A$ '). Thus, for instance, if one believes that chocolate is good, one also believes that first-order logic is complete.
3. The problem of necessarily false complements. If ' $a$  believes that  $A$ ' and  $A$  is necessarily false, then ' $a$  believes that  $B$ ' is true, for any  $B$  (because if  $A$  is necessarily false,  $B$  is a necessary consequence of  $A$ , for any  $B$ ). Thus, if I believe that first-order logic is incomplete, I believe everything.

Appeal to situations avoids these problems. Assume that the proposition expressed by a sentence (in a context) is the set of situations in which the sentence is true. Then, the problem of necessary equivalence no longer arises, because the proposition that  $2 < 4$  and the proposition that first-order logic is complete are different sets of situations [in Kratzer's terms, the former, but not the latter, will contain a minimal situation in which first-order logic is not present; in Barwise & Perry's terms, the former, but not the latter, will contain the situation  $\{\langle\langle\textit{less than}, 2, 4\rangle, 1\rangle\}$ ].

Moreover, constructing propositions as sets of situations avoids the problem of closure under necessary consequence. Indeed, the proposition that chocolate is good is no longer the same as the proposition that chocolate is good and first-order logic is incomplete (the former, but not the latter, will contain a minimal situation in which chocolate is good; the former, but not the latter, will contain the situation  $\{\langle\langle\textit{good}, \textit{chocolate}\rangle, 1\rangle\}$ ). Thus, we cannot exploit distribution of belief

over conjunction to derive that, if one believes that chocolate is good, one believes that first-order logic is complete.

Finally, under Barwise & Perry's way of constructing situations, in principle one may have situations such as  $\{\langle\langle\textit{incomplete, first-order logic}\rangle, 1\rangle\}$ . This situation supports the truth of the false proposition that first-order logic is incomplete, but is not a member of every proposition, so we can no longer conclude that, if one believes that first-order logic is incomplete, one believes everything.

Soames (1987) has argued, however, that there is a variant of the problem of closure under necessary consequence into which any theory that identifies propositions with sets of truth-supporting circumstances runs, no matter whether these circumstances are worlds or situations. The problem arises if we accept the view that proper names are directly referential terms, namely the view that their semantic content is their reference. Consider the following sentences:

- (56) The ancients believed that "Hesperus" referred to Hesperus and "Phosphorus" referred to Phosphorus.
- (57) The ancients believed that for some  $x$ , "Hesperus" referred to  $x$  and "Phosphorus" referred to  $x$ .

Clearly, sentence 56 is true but sentence 57 is false, given that the ancients used the name "Hesperus" to refer to Hesperus and the name "Phosphorus" to refer to Phosphorus, without knowing that these names identify the same heavenly body. Yet, if proper names are directly referential and propositions are sets of truth-supporting circumstances, this fact is hard to explain. Indeed, if the semantic content of a proper name is its referent, the proposition that "Hesperus" referred to Hesperus and "Phosphorus" referred to Phosphorus is the same as the proposition that "Hesperus" referred to Hesperus and "Phosphorus" referred to Hesperus. Thus, sentence 58 follows from sentence 56:

- (58) The ancients believed that "Hesperus" referred to Hesperus and "Phosphorus" referred to Hesperus.

But if propositions are sets of situations (or sets of worlds), sentences 59*a* and *b* express the same proposition:

- (59*a*) "Hesperus" referred to Hesperus and "Phosphorus" referred to Hesperus
- (59*b*) "Hesperus" referred to Hesperus and "Phosphorus" referred to Hesperus, and for some  $x$ , "Hesperus" referred to  $x$  and "Phosphorus" referred to  $x$ .

Thus, given that sentence 58 is true, sentence 60 is true:

- (60) The ancients believed that "Hesperus" referred to Hesperus and "Phosphorus" referred to Hesperus, and for some  $x$ , "Hesperus" referred to  $x$  and "Phosphorus" referred to  $x$ .

By distribution of belief over conjunction, sentence 57 follows.

Thus, if we accept the view that proper names are directly referential, it seems that modeling the objects of attitudes as sets of possible situations (however they are individuated) leads to unacceptable consequences. Soames (1987, 2008) proposes avoiding this problem by assuming that

the proposition expressed by a sentence *S* is a structured entity whose constituents are the semantic contents of the significant constituents of *S*.

#### 4. CONCLUSIONS

I have discussed some semantic accounts that appeal to events and situations. The purpose of the discussion was not so much to argue in favor of a particular proposal as to point out how different accounts may involve different ontological commitments and how these commitments may have relevant empirical consequences. In this respect, the debate on perceptual reports with NI complements is paradigmatic: As discussed above, different ways of individuating what is seen (a Davidsonian event or a structured situation à la Barwise & Perry or a partial event à la Landman) make different predictions about entailment patterns. In the debate on telicity, the different accounts I have presented differ for the degree of ontological commitment. On the one hand, both Krifka's account and Higginbotham's account appeal to events; however, in Krifka's account the difference between events and processes is at the level of event description, whereas in Higginbotham's account the same difference is a matter of event structure. Bach's view, on the other hand, is that the analysis of telicity carries no commitment at all from a metaphysical standpoint, because the entities appealed to in successful formal semantic accounts reflect the way speakers see the world and not necessarily the way the world really is. In a sense, Bach's account calls into question the perspective through which the debate on events and situations has been viewed here, since, while formal semanticists may appeal to events, process and states (eventualities, as Bach calls them) in their accounts, according to Bach these are not metaphysical categories, thus semanticists need not be constrained by considerations of ontological parsimony in appealing to them (considerations of this kind seem to play a role in Krifka's and Higginbotham's discussion of the process/event distinction). On the other hand, as we have seen, the issue of how finely events are individuated is tied to relevant empirical consequences in all event-based accounts examined here, so this issue may be relevant from Bach's perspective as well, because the way events are individuated may reflect the way we see world, if not a deeper metaphysical fact.

An issue I have not addressed here is how situations differ from events. One way to think about it is to examine the roles situations and events play in some of the semantic accounts we saw. On the one hand, when we use situations to model propositions, situations are parts of worlds, entities which sentences are true in (or at). For example, we may say that the sentence "Maria left" is true in (or at) a certain situation, which may include not only Maria's departure but also John's arrival and a cat on a mat. On the other hand, if we look at Davidsonian semantics, events are more circumscribed entities: An event of Maria's leaving does not include John's arrival or a cat on a mat as parts. This suggests that Davidsonian events may be considered minimal situations of certain kinds. For example, an event of Maria's leaving may be considered a minimal situation in which it is true that Maria leaves. Because of space constraints, I cannot elaborate further. This view of events and situations is developed in different ways by Zucchi (1993) and Kratzer (1998).

#### DISCLOSURE STATEMENT

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# Contents

Suppletion: Some Theoretical Implications <i>Jonathan David Bobaljik</i> .....	1
Ditransitive Constructions <i>Martin Haspelmath</i> .....	19
Quotation and Advances in Understanding Syntactic Systems <i>Alexandra D'Arcy</i> .....	43
Semantics and Pragmatics of Argument Alternations <i>Beth Levin</i> .....	63
Events and Situations <i>Sandro Zucchi</i> .....	85
Vagueness and Imprecision: Empirical Foundations <i>Stephanie Solt</i> .....	107
Cross-Linguistic Temporal Reference <i>Judith Tonhauser</i> .....	129
Variation in Information Structure with Special Reference to Africa <i>Tom Güldemann, Sabine Zerbian, and Malte Zimmermann</i> .....	155
Diachronic Semantics <i>Ashwini Deo</i> .....	179
The Indo-European Homeland from Linguistic and Archaeological Perspectives <i>David W. Anthony and Don Ringe</i> .....	199
Correlational Studies in Typological and Historical Linguistics <i>D. Robert Ladd, Seán G. Roberts, and Dan Dediu</i> .....	221
Advances in Dialectometry <i>Martijn Wieling and John Nerbonne</i> .....	243

Sign Language Typology: The Contribution of Rural Sign Languages <i>Connie de Vos and Roland Pfau</i> . . . . .	265
Genetics and the Language Sciences <i>Simon E. Fisher and Sonja C. Vernes</i> . . . . .	289
Language Abilities in Neanderthals <i>Sverker Johansson</i> . . . . .	311
How Nature Meets Nurture: Universal Grammar and Statistical Learning <i>Jeffrey Lidz and Annie Gagliardi</i> . . . . .	333
Bringing Machine Learning and Compositional Semantics Together <i>Percy Liang and Christopher Potts</i> . . . . .	355
Bilingualism, Mind, and Brain <i>Judith F. Kroll, Paola E. Dussias, Kinsey Bice, and Lauren Perrotti</i> . . . . .	377
Taking the Laboratory into the Field <i>D.H. Whalen and Joyce McDonough</i> . . . . .	395

## Errata

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