Event Concepts

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Events are center stage in several fields of psychological research. There is a long tradition in the study of event perception, event recognition, event memory, event conceptualization and segmentation. There are studies devoted to the description of events in language and to their representation in the brain. There are also metapsychological studies aimed at assessing the nature of mental events or the grounding of intentional action. Outside psychology, the notion of an event plays a prominent role in various areas of philosophy, from metaphysics to the philosophy of action and mind, as well as in such diverse disciplines as linguistics, literary theory, probability theory, artificial intelligence, physics, and—of course—history. This plethora of concerns and applications is indicative of the *prima facie* centrality of the notion of an event in our conceptual scheme, but it also gives rise to some important methodological questions. Can we identify a core notion that is preserved across disciplines? Does this notion, or some such notion, correspond to the pre-theoretical conception countenanced by common sense? Does it correspond to a genuine metaphysical category?

1. Conceptual Tensions

Very broad umbrella notions such as that of *event*, but also *object* and *property*, are standard use in scientific practice for an obvious reason: their latitude allows for interdisciplinary circulation and theoretical track-keeping. The linguist's use of such notions may not cohere with (say) the vision sci-

entist's, and vision scientists may themselves have changed their use and understanding of such notions over the years.[1] Yet in some broad sense we do expect results of research about events, objects, properties to be at least partially commensurable across disciplines and across time, and this is why researchers tend to go along with umbrella notions rather than more technically refined concepts. On the other hand, such notions are easy hostages to disciplinary idiosyncrasies. The proper methodological way to regard certain entities—or their representations—as they are "introduced" in various disciplines is to consider them as *theoretical posits*. As such, they live a life that is in the first instance intra-theoretical. And we can understand what they are and how they live only by looking at their behavior within the theory that posits them—for instance, their behavior *vis-à-vis* certain inferences that are sanctioned by the theory.

There is thus a tension between the latitude of the umbrella notions and the invidious construal of each notion within each discipline. Latitude unifies, theory-specificity divides. This is particularly striking with regard to the notion of an object (Casati 2005), but the notion of an event suffers from a similar tension. In addition, the common-sense understanding of both notions is generally alive and kicking inside each of the specialized disciplines. In positing events as primary ingredients of semantic representation, for example, we may be using an event concept that is deferential to common sense (an event is "something that happens"), but the properties of the posits may have little in common with those of events as described by common sense (the posits may be treated as mere values of bound variables). Can we even hope to disentangle these issues?

The first thing to do, we submit, is to distinguish different *types* of notion, not only for *event* but for any umbrella notion of the same latitude. This is a necessary step to avoid equivocation, if not to achieve clarity. We take it that a first taxonomy should include at least the following four notional types:

— a pre-theoretical, common-sense (CS) notion;
— a philosophically refined (PR) notion, where the refinement is dictated by endogenous a priori considerations—e.g., considerations about certain internal inconsistencies of the CS-notion;

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[1] See Casati (1994) for a historical foray into the cognate notion of visual object.

— a scientifically refined (SR) notion, where the refinement is dictated by exogenous empirical considerations—e.g., considerations about the explanatory value of event-like notions for theories of space-time;
— a psychological notion: the I-representation ('I' for 'internal) of the CS-notion, or more generally the I-representation that subserves the explanation of a number of cognitive performances.[2]

Broadly speaking, we take it that PR- and SR-notions are typically introduced for the purpose of refining the CS-notion, or to replace it altogether, whereas I-representations may contribute to an explanation of why the CS-notion has the structure it has, among other things. We also assume that the CS notion may be inadequate in many a respect, and that it is precisely this inadequacy that opens the way to psychological inquiry. CS notions are, in the norm, illusions.

To illustrate, much of today's philosophical work in the metaphysics of material objects may be viewed as instantiating a refinement policy. Consider the classical puzzle of the Ship of Theseus. Exactly one ship, A, left port, but as a result of a familiar repair/assembly process, two ships, B and C, docked (one consisting entirely of new parts, carefully crafted to replace the old ones; one consisting of the old parts, first diligently stowed, then diligently reassembled). In certain contexts, we are inclined to identify A with B, the intuition being that a persisting object can survive complete mereological change so long as the change is gradual and the shape is preserved; in other contexts we may be inclined to identify A with C instead, the intuition being that sameness of material constitution is also sufficient for persisting through time (as when we take apart a bookcase, ship it across country in separate batches, and put it back together). Now, of course B and C are not identical. So our two intuitions are inconsistent (A is B, A is C, but B is not C), which is to say that the CS-notion of a material object is overdeterminate. Giving up either intuition (as in Chisholm 1973 or Wiggins 1980, respectively) yields a corresponding PR-notion that is immune to the contradiction while still partly adhering to common sense.

By contrast, consider those theories that construe objects as the material content of spatio-temporal regions. Not only do such theories favor one par-

[2] 'I-representation' is a term of art mutuated by Chomsky (1992a, 1992b, 2000), who first urged the need to keep apart notions that are in different theoretical standing.

tial intuition about what counts as an object (i.e., material constitution) over the other. They also yield a genuine replacement of the pre-theoretical CS-notion of an object. According to the CS-notion, material objects are three-dimensional entities that occupy space and persist through time by being wholly present at each moment of their existence. According to the revised notion, they are four-dimensional entities that extend through time just as they extend through space, and that persist through time by being partly located at each moment of their existence. They have temporal parts just as they have spatial parts; they have spatiotemporal parts. Such a conception yields a PR-notion or a SR-notion, depending on the underlying motivation (philosophers espouse four-dimensionalism as a radical solution to the problem of change: see Sider 2001; physicists come to four-dimensionalism from Relativity Theory: see Balashov 1999). Either way, the revision yields a radical departure from common sense and determines a genuine replacement of the CS-notion. In fact, construed as a four-dimensional entity, an object acquires many of the properties that common sense attributes to events, so one may even view the replacement as taking place entirely within the conceptual resources available to common sense, at least initially: the CS-notion of an object is dispensed with in favor of a notion modeled on the CS-notion of an event (objects are recategorized as events), which in turn may be revised to fit specific theoretical desiderata.

Coming then to events, which are our present focus, here too common sense endorses conflicting accounts, and revisionary policies may in fact be equally varied. For example, common sense typically construes events as concrete, dated particulars, i.e., as non-repeatable entities with a specific location and duration: Sebastian's stroll took place in Bologna, not in Paris, and it took place last Sunday, not last Saturday. But common sense also favors a conception of events as abstract, timeless universals, i.e., as repeatable entities that may be said to recur many times and in many places: Sebastian takes the same walk every Sunday, and the lecture he gave in Bologna was the same he gave in Paris. These intuitions (non-repeatability vs. repeatability) are inconsistent, so again we can say that the CS-notion of an event is overdeterminate. And giving up either intuition (as in Chisholm 1970 or Davidson 1970, respectively) yields a corresponding PR-notion that is immune to the contradiction while still partly adhering to common sense.

As in the case of objects, there are, in addition, revisions that involve a more radical departure from the CS-notion. For example, there are philoso-

4

phical theories that treat events as properties of cross-world classes of individuals (Lewis 1986a), or properties of sets of world segments (von Kutschera 1993), or tropes (that is, particularized properties: Bennett 1996), and there are non-philosophical theories that treat events as very special theoretical entities, e.g., as qualified points in space-time (General Relativity) or as sets of outcomes (probability theory). Whether stemming from endogenous or exogenous considerations, such PR- and SR-notions go far beyond common sense and determine a genuine replacement of the CS-notion, at least in the contexts in which these notions play an explanatory role.

Finally, a psycholinguistic reading of formal semantics provides an example of an explanatory policy, whereby an I-notion explains some traits of the CS-notion. The notion of an I-representation of events arises in response to the need to explain certain linguistic or logical performances, such as the ability to draw and recognize the validity of the inference from 'Sebastian kissed Lisa on the cheek' to 'Sebastian kissed Lisa'. Such an inference is clearly valid, and its validity—it can be argued—is a matter of logic rather than lexical meaning: one need not know what 'on' or 'cheek' mean in order to reach the conclusion. Yet the inference does not wear the explanation of its validity on its sleeves, as it were. No sentential connective is available to account for the entailment between the two statements, and standard translations into first-order predicate logic are equally unable to do the job. On such translations, the premise would involve a three-place predicate (x kissed y on z) while the conclusion would involve a distinct, two-place predicate (x kissed y), and there simply is no logical link between two predicates owing to the number of their arguments. On the other hand, if we take the premise to assert that a certain event occurred (namely, a kissing between Sebastian and Lisa) *and* that it had a certain property (namely, of being on Lisa's cheek), then the entailment is straightforward (Davidson 1967a). In other words, the inference can be explained as a form of conjunction elimination—from 'Sebastian gave Lisa a kiss, and it was on her cheek' to 'Sebastian gave Lisa a kiss'. Now, the notion of an event that is mentioned in this explanation is a theoretical posit. Indeed, this explanation is possible at the cost of increasing the domain of admissible entities, i.e., the domain of those entities for which an underlying representation is available, so as to include events—*even though* such entities are not explicitly represented or visible in the surface grammar of the relevant statements. Their representation, as posited by the theory, is an I-representation. The same goes for many

5

other patterns of logical or linguistic competence, as with statements involving naked infinitives ('Sebastian saw Lisa cry'; see Higginbotham 1983) or inferences involving mixed implicit/explicit quantification ('In every burning, oxygen is consumed. Sebastian burned some wood. Hence oxygen was consumed'; see Parsons 1985). In all such cases, the positing of an I-representation of an event at the level of "logical form" contributes an explanation of why certain inferences are justified and why certain statements mean what they mean.

It is not important here do delve into the technical ramifications (and problems) involved in such accounts (see Bennett 1988 and Parsons 1990). What matters here is that the event notions involved in the revision of our pre-theoretical apparatus and the event notion involved in the semantic analysis of our logical and linguistic competence (for example) are of different types. The features ascribed to their respective objects by the CS-, PR- and SR-notions, and by I-representations, can display a large variance. This is pretty obvious for the former, as PR- and SR-notions are expected to improve on unsatisfactory features of CS-notions. But other misalignments are to be expected. The I-representation of an event may predicate things that no SR-notion would endorse, and that many PS-notions would reject; and there is no reason to suppose that the CS-notion of an event and its underlying I-representations share significant features either. Finally, there is no reason to suppose that the PR- and SR-notions are aligned. Russell (1914), for example, claimed that we only perceive events of finite extended duration and refused on such grounds to accept the point-events postulated by Relativity Theory (though, again, his full treatment of the subject required any finite part of an event to qualify as an event in its own right—an assumption that is arguably no closer to the CS-notion than the physicist's conception).

2. Conceptual Interactions

Distinguishing different types of event notions, all of which fall under the same umbrella *as a matter of common practice*, is a first necessary step towards answering our initial questions. As soon as we take a closer look at how these notions are actually employed within the context of specific theories, we must acknowledge that the hypothesis of a unique common core can hardly be confirmed. Is there, however, a common core shared by all event notions of the same type?

Consider the CS-notion first. Sure enough, unless we go with the option of relativizing it to cultures, history, or social contexts, we may suppose that there is just one broad common-sense picture of the world, shared by all individuals, hence a single CS-notion of event. But we have seen that this notion is both partial and incoherent, and any attempt to extract its core features immediately turns into a revisionary process that results in a corresponding SR- or PR-notion. SR-notions, in turn, are hopelessly idiosyncratic: scientific theories come in such a variety and with such diverging purposes that it would be surprising if *any* of the umbrella concepts that they employ shared significant common traits (though the possibility remains that a radical reductionist program will succeed in expressing every SR-notion in terms of a common vocabulary subject to a unified body of laws). With regards to the PR-notions, however, the question is by no means trivial: surely different philosophical theories will construe events differently, but that does not preclude the possibility that such notions share a common core of characteristic features—some sort of *conceptual invariants*. For example, the conception of events as concrete particulars and their conception as abstract universals diverge significantly; yet they may well agree on the invariant that every event must involve some material objects—i.e., some "participants"—and must be involved in some relations—e.g., causal relations— with other events. Indeed, the existence of a common core of features may seem plausible precisely on account of the fact that, typically, a PR-notion is developed in an attempt to overcome certain internal inconsistencies of the cognate CS-notion. And to the extent that the latter is not entirely inconsistent, the ensuing variety of PR-notions need not be entirely in conflict, either.

As it turns out, things are more complicated than that. For one thing, we have already mentioned that 'revision' is an ambiguous word: in some cases it may be construed as entailing a radical departure from common sense—a genuine replacement of the relevant CS-notion. Secondly, and more importantly, no philosophical revision is carried out in isolation. Typically, a philosopher's endeavors proceed by taking certain CS-notions and making them *interact* with other notions. And, typically, such interactions take place within the context of thought experiments designed to test the descriptive and explanatory strengths (and limits) of the notions in question. In the case of events, several such conceptual interaction projects have been put forward—most notably:

— How does the event notion interact with our understanding of *causality*?
— How does it feature in causal *explanations*?
— How does it interact with our concepts of *time* and *space*?
— How does it interact with the notion of intentional *action*?
— How does it interact with the notion of an *object*?
— How does it interact with the concepts of *identity* and *individuation*?

It is only by looking at such interaction projects, as opposed to the common CS-notion that inspires them, that we may be in a position to assess the relative similarities among the ensuing PR-notions. In the following sections, we review the relevant literature in this spirit. In addition, a closer look at some of these conceptual interactions may also be seen as providing useful heuristics for other projects, such as that of contributing a better understanding of the CS-notions and, possibly, an explanation of such notions in terms of underlying I-notions.

Events and causation. The first two of these projects—on the interaction between the notion of an event and the notion of cause—provide a good illustration of the difficulties involved in this task. Some authors (e.g., Kim 1973) have argued that whereas concrete particular events seem to be necessary for an analysis of causation in terms of the temporal priority of causes with regard to effects, abstract events (event types) seem necessary when it comes to analyzing causation in terms of constant conjunction of cause and effect ('All events of type *C* are regularly followed by events of type *E*'), and also to account for the possibility of subsumption under a law. If so, then there would exist no single event notion able to satisfy the requirements of a unified theory of causality, with obvious discouraging consequences for the intuition that we may look at causality to identify a core ingredient common to all PR-notions.

Significantly, the same consequences follow also on the so called singularist conception of causation, which denies the necessity of a two-fold theory of causality. On this view (Ducasse 1926), the causal relation that may obtain between two particular events *c* and *e* is conceptually and ontologically prior to any causal law or regularity: although *c* and *e* may instantiate a regularity, it is not in virtue of this instantiation that their relationship qualifies as causal. The supposition of recurrence would therefore be irrelevant to the notion of causation, and this means once again that causal efficiency

does not by itself identify a core feature of events common to all PR-notions (in particular, to the two notions under discussion—events as particulars and events as universals). Even those authors who attempt to reconcile the singularist conception with the conception of causation as regularity, or constant conjunction, would reach the same conclusion. Such authors (e.g., Davidson 1967b) draw a sharp distinction between causal *relation* and causal *explanation*. The former relates concrete particular events and holds between a cause *c* and an effect *e* no matter how these events are described or identified. (If 'Sebastian's kiss' and 'Sebastian's declaration of love' pick out the same event, then Sebastian's kiss caused an uproar if and only if Sebastian's declaration of love caused an uproar.) This means that we can make true assertions about singular causal transactions of the form '*c* caused *e*' without knowing a corresponding general proposition 'All events of type *C* are followed by events of type *E*'. For we may pick out the events *c* and *e* without knowing them under the descriptions '*C*' and '*E*'. On the other hand, such descriptions are relevant when it comes to providing a causal explanation of what happened, for the relata of a causal explanation are sentences, or statements, not events. (If we have a law that says that every kiss causes an uproar, we don't have an explanation of why Sebastian's declaration of love caused an uproar unless we know that Sebastian's act was a kiss, i.e., unless we know that his declaration of love was a kiss.) Thus, if this distinction between causal interactions and causal explanations is accepted, then again there is no need to posit abstract event types in addition to particular events, and even if such event types were posited, there would be no need to suppose that they share the same causal features that characterize particular events: the two PR-notions would, in this respect, have nothing in common.

Incidentally, that the terms of the causal relation are events is by itself a controversial philosophical tenet. There are authors who think that the proper causal relata are not events but *facts*—always (Mellor 1995) or at least in some cases (Vendler 1967, Bennett 1988). We say, for example, that the fact that the dollar fell was caused by the fact that oil had gradually become more expensive, and it is difficult to account for the truth of such statements without taking facts (as opposed or in addition to events) at face value. Nor are facts the only competitors on the market. There is also a long tradition in the philosophy of action according to which the causal relation may be said to hold between *agents* and events (von Wright 1963, Chisholm 1964, Bach 1980). We say, for example, that Sebastian caused a fight, or

that it was the sun that caused this year's crop. Finally, there are authors who construe causal relata as *properties* (Crane 2001), or *features* (Dretske 1977), or *aspects* (Sanford 1985), or *states of affairs* (Armstrong 1997), or *situations* (Menzies 1989). Obviously, once terminological issues have been disentangled and these terms are shown to refer to different entities, such a variety of views introduces considerable complications for any project designed to assess the conceptual interaction between events and causality.

Moreover, it is significant that when it comes to *arguing* for (or against) such views, philosophers tend to rely on considerations about the *logical form* of natural language sentences expressing causality and, therefore, on theoretical posits concerning the I-representation of events. The main arguments in favor of the view that the causal relata are events are by themselves indicative of this tendency. For what such arguments are meant to establish is that reference to or quantification over events is needed in order to account for a speaker's understanding of action and causation sentences; no other rendering of the logical form of such sentences could fit the bill. To illustrate, consider a singular causal statement such as 'Sebastian's kiss to Lisa caused an uproar'. It might be thought that such a statement can be analyzed as having the logical form of a sentential compound in which the predicate 'caused' is replaced by a connective, as in 'There was an uproar *because* Sebastian kissed Lisa'. As Davidson (1967b) has argued, however, such an analysis would have to do justice to the following two intuitions. First, the connective 'because' would have to be extensional, i.e., admit of substitution *salva veritate* of co-referring singular terms: if Sebastian is Fred's cousin, then the proposed paraphrase should have the same truth-conditions as 'There was an uproar because Fred's cousin kissed Lisa'. Second, the connective in question would have to be non-truth-functional, i.e., it should not admit of unrestricted substitution of materially equivalent sentences: although 'Sebastian strolled in Bologna' may have the same truth-value as 'Sebastian kissed Lisa', the proposed paraphrase need not have the same truth-value as 'There was an uproar because Sebastian strolled in Bologna'. Since these two intuitions clash with the thesis that every extensional connective *is* truth-functional (a thesis that seems to go back to Frege 1892), Davidson concludes that the proposed paraphrase is inadequate, i.e., that the statement 'Sebastian's kiss to Lisa caused an uproar' cannot be analyzed as having the underlying logical form of a sentential compound. For Davidson it is a genuine relational statement, hence its semantic analysis requires that

10

we take the terms 'John's kiss to Lisa' and 'an uproar' at face value (as event-referring expressions). Whether this conclusion is compelling need not concern us here.[3] It is significant, however, that it depends so crucially on the need to account for the logical semantics of ordinary language statements. As with the conjunction elimination argument reviewed in Section 1, the I-notion of an event representation is posited in order to justify a certain PR-notion, for the explanatory strength of the latter is tested against the need to explain certain linguistic or logical performances of competent speakers of English.

Events and objects. Consider now the suggestion that every admissible PR-notion of an event will agree on there being a certain link between events and objects: every event must involve some "participants". Since *object* is itself an umbrella notion, it is hard to assess the strength of this suggestion in generic terms. We have seen that there are PR-conceptions of material objects that are radically different from the ordinary CS-notion, for instance conceptions that construe objects as four-dimensional entities that extend across time just as they extend across space. On such radical conceptions, the project of testing the interaction patterns between the two notions loses much of its heuristic value. Indeed, some philosophers would simply deny that the conceptual distinction between events and objects reflects a genuine metaphysical difference and would simply treat the distinction as one of degree: as Goodman put it, objects and events would only show a discrepancy in the pattern of variance among their temporal parts—"a thing is a monotonous event; an event is an unstable thing" (1951: 286). Quine holds a similar view, when he describes both sorts of entity as species of the same "material inhabitant of space-time" genus (1970: 30): whereas events appear to develop fast in time, objects are relatively "firm and internally coherent" and cohere only slightly and irregularly with their spatio-temporal surroundings; events are short-lived, objects long-lived fillings of spatiotemporal regions.

But let us stick to the conception of objects as three-dimensional entities—arguably a more plausible conception from the perspective of common sense. How exactly should we characterize their role as event partici-

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[3] In the literature, several authors have countered Davidson's conclusion; see e.g. Horgan (1978, 1982), Needham (1988), Bennett (1988), and Mellor (1995).

pants? First of all, does every event require the presence of one or more objects? Some philosophers disagree, citing as counterexamples events such as changes in light or weather conditions (Brand 1977: 335) or, perhaps more plausibly, flashes and bangs (Strawson 1959: 46). On the other hand, perhaps such counterexamples are just a sign of a parochial conception of what counts as a genuine object: if we allow for objects in a wider sense, then arguably whenever a flash occurs there are *photons* that move; whenever a bang occurs there is *air* that ondulates; and so on (Bennett 1988: §5).

Secondly, to the extent that objectless events are uncommon, so are eventless objects. Every object has a life, and the life of an object is an event. So the interesting question is not whether every event involves some object, or vice versa, but whether such involvement displays interesting patterns. In a radical mood, one can think of the entities in one category as being metaphysically *dependent* on entities in the other. For instance, it has been claimed that events *supervene* on their participants: two possible worlds cannot be alike with respect to the truth and falsity of propositions concerning what objects there are and what properties they have and yet fail to be alike with respect to the truth and falsity of propositions concerning what events occur and when and where they occur (Lombard 1986). But then, again, a similar thesis has been put forward with respect to the dependence of objects on the events in which they partake (Parsons 1991). In a more moderate way, one can grant equal ontological status to objects and events but maintain that either objects or events are primary *in the order of thought*. And here, interestingly enough, philosophers and psychologists tend to agree in according priority to objects. Treisman (1986), for instance, has argued that although both objects and events feature as "the fundamental units of conscious perceptual experience" and may be taken as "the basic units from which to build a descriptive system", the primacy of objects is strongly supported by phenomenological considerations. And Strawson (1959) has claimed that a pure event-based ontology would not suffice for the success of our re-identifying practices, which require some stable all-encompassing frame of reference, adequately provided by objects instead. In other words, in order to make reference to events in thought and language, thinkers and speakers must be able to make reference to objects. On the face of it, this is a psychological claim, anecdotally captured in the fact that ordinary parlance has expressions such as 'the birth of this person' but not 'the personification of this birth'. On the other hand, such asymmetries must be

carefully evaluated to the extent that objects, too, may and sometimes must be identified via reference to events. For example, if we track down the father of Sebastian or the author of *Waverley*, it is by identifying certain events in the first place—of fathering and of writing, respectively (Davidson 1969; see also Moravcsik 1968, Lycan 1970, Tiles 1981).

All of this suggests that the question of the respective primacy of event and object representations in explaining certain common-sense intuitions—among which the intuition according to which all events must involve some participants—may have to be settled at a deep level which can only be unearthed through empirical investigation. It may turn out that the I-representation of an object controls the unfolding of the I-representation of an event; or it may turn out that there is a single I-representation, only accessed differently in different contexts or by different systems, which fact generates the intuition that events and objects are, at the common-sense level, two distinct categories (Casati 1994, 2005; Casati and Varzi 1999). Some interesting and seldom noticed symmetries between the notion of an event and the notion of an object (Mayo 1961, Wiggins 1980) point in that direction.

Events, time, and space.[4] On many PR-conceptions, an important difference between objects and events concerns the way in which they are said to relate to space and time (Quinton 1979, Hacker 1982). We have already mentioned the fact that objects, construed as three-dimensional entities, endure over time, whereas events, construed as particulars, *extend* over time: they have temporal parts. In addition, there is the fact that objects, being material, appear to be invidiously located in space—they appear to *occupy* their spatial location—whereas events seem to tolerate co-location. To use a standard example, if a metal sphere is simultaneously rotating and getting warm, then its rotation and its getting warm appear to be distinct events with the same spatiotemporal location (Davidson 1967a).

If events are construed as universals, of course, it is only in an indirect way that events can be said to extend over time: they do so whenever they are instantiated. But there are variants. Some authors, for instance, would go as far as saying that events are nothing but properties of times (Montague 1969), or times *cum description* (van Benthem 1983). On the latter view, this morning's rising of the sun is identified by an ordered pair $\langle i, \phi \rangle$ where i is

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[4] This paragraph and the next draw on Casati and Varzi (2002).

the relevant time period (corresponding to the descriptor 'this morning') and φ is the sentence 'The sun rises'. (A more general account would construe events as *spatiotemporal regions* cum description, distinguishing e.g between this morning's rising of the sun in London and its rising in Paris.) Of course, such PR-conceptions do not do justice to some features of the CS-notion—for instance, the intuition according to which events can be perceived but times cannot (Gibson 1975). The rationale for such conceptions lies, rather, in the fact that they can rely on fully developed theories of intervals along with fully developed interval-based semantics (Cresswell 1979, Dowty 1979). This gives them outstanding descriptive power when it comes to the fine-grained interactions between events and time.

The link between events and time has also been explored in the opposite direction, though. If events are assumed as a primitive ontological category, then one can dispense with time instants or intervals and "construe" them as derived entities. The most classical treatment of this sort proceeds by construing time instants as maximal sets of pairwise simultaneous (or partially simultaneous) events (Russell 1914, Whitehead 1929, Walker 1947), but other treatments have been put forward. For example, it has been suggested that the mathematical connection between the way events are perceived to be ordered and the underlying temporal dimension is essentially that of a free construction (in the category-theoretic sense) of linear orderings from event orderings, induced by the binary relation *x wholly precedes y* (Thomason 1989). Treatments such as these provide a reduction of time in terms of relations among events and are therefore especially germane to a relational conception of time (and, more generally, of space-time). Modal variants (Forbes 1993) as well as mereological variants (Pianesi and Varzi 1996) of such views are also available.

The relation events have to space is more problematic. Construed as particulars, events are in space as well as in time. Sebastian's walk took place in Bologna, not in Paris. But *where* exactly in Bologna did it take place? Suppose Sebastian strolled in Main Street. Is the location of the event provided by the whole street? By the sidewalk? By the narrow portion of the sidewalk that corresponds to the trajectory of the stroll? Some authors (e.g., Davidson 1967a, Lombard 1986) have suggested that the spatial location of an event is indeed given (indirectly) by the location of its participants: the location of Sebastian's walk would then coincide with the sum of the regions of space that, at each time during the walk, are occupied by Sebastian's

14

body. Yet this can hardly be generalized. Consider Brutus's stabbing of Caesar. Did this event spread *only* through Brutus and Caesar? Did it spread through their *entire* bodies? (Was Brutus's left ear involved at all in this event?) The CS-notion is indeterminate in such respects, and there are philosophers who take this indetermination to suggest that events are not truly spatial entities (Hacker 1982). On the other hand, it is not unreasonable to say that our difficulty in answering questions about the spatial location of events concerns the structure of our event talk, not the ontological make-up of events (Quine 1985, Lewis 1986b). According to this account, there are plenty of events out there, lots of things happening (each with precise spatio-temporal boundaries), but which ones among them correspond to the words that we use may be semantically indeterminate. When we speak of Sebastian's stroll or of Brutus's stabbing of Caesar, we use descriptive phrases that are extremely poor and imprecise, because poor and imprecise is the specification of the relevant event participants, and it is simply preposterous to suppose that such descriptions should pick out a unique event. If so, however, then again we see how questions pertaining to the CS-notion as well as to specific PR-notions interact crucially with questions pertaining to the I-representation of events, and the details of this interaction are no straightforward business (Varzi 2002, Borghini and Varzi 2005).

This in turn raises a further question that is nicely summarized in the title of a classic paper by Fred Dretske, 'Can Events Move?' (1967). When we say that events are in space—Dretske argues—the 'in' is not different from the 'in' of the spatial location of objects. Nevertheless, Dretske observes that events are linked to their location in a way material objects are not. A chair can be said to be in a building (at a particular time) even though most of its life is spent elsewhere, whereas a picnic cannot be said to occur in a building if it just starts there but eventually winds up in the garden (we can at most say that the picnic occurs in the place which is the spatial sum of the building and the garden). The alleged reason for this asymmetry is that an event expression refers to the entirety of an event, and also to the event as temporally extended. It follows that there is an incompatibility between our ascription of spatial location to events and the concept of movement—to put it in a catchy form, that events cannot move. This conclusion is forced upon us from a reflection on some features of the CS-concept of an event. However, as we do seem to think that event motion is all but an impossibility, the CS-concept appears to be, once more, overdeterminate.

15

Events and individuation. Another theoretical issue that appears to be unresolved is the issue of identity criteria, which has been the focus of an intense debate (Pfeifer 1989). Was Sebastian's walk the same event as his pleasant walk? Was his arm raising the same as his greeting? Some philosophers take questions such as these to be metaphysical questions—questions whose answers call for genuine identity criteria and which must therefore be answered before we are allowed to take our event talk seriously. In this sense, different PR-notions tend to suggest different answers and the many answers found in the literature extend very widely—from the radical "unifiers", who take events to be as coarse-grained as objects (Quine 1950) to the radical "multipliers", who take events to be as fine-grained as facts (Kim 1966, Goldman 1970, 1971). Other philosophers, however, regard questions of identity to be first and foremost semantic questions—questions about the way we talk and about what we say. On this view, no metaphysical theory can include a general recipe for determining the semantics of ordinary event talk, hence there is no effective way of determining the truth or falsity of an event identity statement exclusively on the basis of one's metaphysical views: what event a statement is about depends heavily (more heavily than with ordinary objects) on local context and unprincipled intuitions (Bennett 1988). If so, then the whole identity issue is undecidable as it stems from the hazardous attempt to bridge the chasm between semantics and metaphysics.

Once more, intuitions pull in different directions according to the context in which the event notion is made to interact. Inserting events in a causal explanation context favors fine-grained intuitions: it isn't just Sebastian's arm raising, but his greet that made Lisa smile. Inserting events in a spatio-temporal context favors coarse-grained intuitions: Sebastian's greet happens exactly where his arm-raising occurs. Accordingly, multipliers and unifiers have privileged either class of contexts when formulating arguments for their respective positions. Goldman (2007) suggests a *cognitive resolution* of the debate that could be framed in the following way. The CS-notion of an event—if there is one—is overdeterminate, and the overdetermination is explained by *two* underlying I-representations of events. There is a *perceptual* I-representation of events that is movement-based (or change-based), hence based mostly on spatial and temporal features, yielding coarse-grained individuation; and there is a *conceptual* I-representation of events that is property or fact-based, yielding fine-grained individuation.

3. Conclusions

The concept of an event, and of event representation, is an umbrella notion. We should therefore speak about a plurality of concepts. We have provided an overview of different ways events have been dealt with in philosophy and in linguistics and, to a minor extent, in cognitive science. This variety of positions has been construed in part as the result of different descriptive and explanatory projects. In particular, we have urged that various types of notion be kept apart: common-sense, theoretically revised, scientific, and internalist psychological notions. The philosophical literature has applied the standard test of making different notions interact; the interactions of the notion of an event with neighboring notions, such as that of an object, of cause, of space and time, have been tested. Results so far are not conclusive. Contextual effects abound that can pull intuitions in very different directions. And the methodology itself is largely based on material that may be in need of close scrutiny, as it draws from linguistic evidence, non-linguistic intuitions, and sometimes examples from scientific descriptions of the external world.

On top of these largely methodological distinctions, the philosophical project of analyzing the event notion can be regarded as a contribution to psychology in the following (admittedly limited) sense. Philosophers in general articulate the CS-notion of an event by drawing on inferences that involve the *concept* of an event. This applies specifically to one particular brand of philosophy, so-called 'descriptive metaphysics' (Strawson 1959, Goldman 1992), whose declared aim is to spell out the content of our pre-reflective thought or perception of the world, hence, in our terms, the structure of CS-representations. Descriptive metaphysicians claim, for instance, that both objects and events are denizens of the world. By contrast, other brands of metaphysics have heralded revisions of the CS-notion, in particular under the pressure of scientific reconceptualizations of the world. In some cases, this has resulted in no less than a complete obliteration of the distinction between ojects and events. The contrast between the opposing claims, however, may be only seeming, for the theoretical demands on the notions of an event may diverge in different theories. For instance, Russell and Whitehead looked for a general theory of entities in space-time under the pressure of the new scientific image propounded by Relativity Theory. Admittedly, these are hardly issues that are likely to move the scholar of CS-

notions, as CS-notions have evolved under evolutionary pressure and were not meant to address scientific changes.

Arguably the revisions of the CS-notion have an import for psychology in the sense that they could be read as "warnings" about aspects of the CS-notion that could reflect just how a particular module of the cognitive apparatus contributed to the content of that very notion. If events really are not a distinct category from objects according to a PR-notion of an event, then there are good reasons to think that the CS-notion of an event is a form of illusion. The illusory aspects are precisely, then, those the PR-notion tries to expunge. This approach is expected to predict effects in the various interactions that the notion of an event has with other notions on our list (causality, objecthood, etc.). The study of these interactions could provide templates for empirical investigations into the underlying I-notions that explain why certain illusions occur at the level of the CS-notion. In particular, it would be worth investigating closely at the I-level the relationships between representations of events, of objects, of regions of space, without prejudging the possibility that some of these notions are disposed of in terms of other, deeper I-representations. (It may for instance turn out that the CS-notions of event and object are deep down tributary to a single I-representation; Casati 1995).

There are some consequences for philosophers as well. Contrary to the received view, the exact balancing of the philosophical issues involving the different notions at stake could be—to a surprising extent—a matter of empirical discovery.

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