SPATIOTEMPORAL AND SPATIAL PARTICULARS

The aim of this paper is to offer an exhaustive classification of particulars in terms of their relations to spatiotemporal and spatial regions. It begins with an examination of spatiotemporal particulars, and then explores the extent to which a parallel account can be offered of continuants, or spatial particulars that can endure and change over time, assuming such particulars exist. The paper also examines how the familiar categories of physical objects (which I refer to throughout simply as objects), states, events, and changes are to be understood within this framework. Throughout the paper I make use of the ordinary concepts of space and time as they arise in discussion of medium-sized particulars, ignoring the interesting puzzles that arise about space and time for high velocities, high energies, very small distances, or very short durations.

I take a spatiotemporal particular to be a spatiotemporal region or an occupant of a spatiotemporal region, and similarly for spatial particulars. I shall say that something occupies a region if and only if it exists throughout that region and nowhere outside it. The criterion I am using for something to be a particular of this kind is simply that there be a coherent account of it. In the case of particulars couched in terms familiar from ordinary discourse such as 'object', 'event' and 'state', I shall be concerned to capture any coherent account of these particulars that closely follows ordinary discourse, but I shall also pay attention to the philosophically motivated departures from ordinary usage that have come about for such purposes as providing semantic theories and accounts of causation.

My ulterior interest in this enquiry, which gets only very brief mention in this paper, is to examine psychophysical token identity theories. To this end I want to make sure that I cover all the kinds of particular which might provide

different token identity theses, so my attitude to particulars will be maximally liberal. I also take the enquiry to have an independent interest. Given its scope, much of what I say will be extremely sketchy.

Spatiotemporal Particulars

Consider first spatiotemporal regions. They are four-dimensional in that their location within a spatiotemporal framework essentially involves three spatial components and a temporal component. But their shape may reveal a degeneracy in one or more dimensions. That is, they may be instantaneous, i.e. have no temporal extension, or they may be spatially degenerate by lacking extension in one or more spatial dimensions. The limiting case of a "region" with no spatiotemporal extension at all is just a spatiotemporal point -- a bare spatiotemporal location.

Next let us consider what could be the occupants of a spatiotemporal region. An idea we get from Quine's discussion of objects and events in the following passage is that of the content of a region:

> Physical objects, conceived thus four-dimensionally in space-time, are not to be distinguished from events, ... Each comprises simply the content, however heterogeneous, of some portion of space-time, however disconnected and gerrymandered.[1]

Bennett suggests that it would be in the spirit of Quine's work to say that nothing is lost if we identify this notion of the content of a region outright with the region itself.[2] Now it may be that regions are the only particulars needed for scientific laws to quantify over. But it is natural to distinguish between a region and what's in that region. And there are some things one might want to say about a region but not about its content. We might want to make modal claims such as that the region could have had a different content, or that the content of this region could have occupied another region. And we might automatically say that a region is physical, but we might want to deny that its content is

physical if it contains immaterial minds.[3] So I shall take the content of a region to be one kind of occupant of a region, to be distinguished from the region itself. Only one particular of this kind may occupy a given spatiotemporal region, and I shall refer to particulars with this feature as coarse-grained.

Assuming that such regions possess properties, we may talk of an instance of a property of the region, also known as an exemplification or instantiation of a property by the region, and as a trope. I shall regard it as another kind of occupant of a region. Such particulars are isomorphic to <R,P> pairs, where R is a region and P is a property and R has P. The pairs themselves are sets and thus are not particulars but abstract entities in the sense that they do not have any spatiotemporal location and do not occupy spatiotemporal regions, though some have been prepared to identify events with sets.[4] There are two other kinds of property instantiation that may be regarded as occupants of a region. One is the instantiation of a property by the content of a region. These are isomorphic to <C,P> pairs where C is the content of a region and C has P.[5] And the other is the instantiation of a property by an object at a time (moment or interval) T. These are isomorphic to <O,T,P> triples, where object O has property P at time T. (For completeness I mention them here though I shall not discuss objects and their relations to spatiotemporal regions until later.) Property instantiations of each of these kinds are fine-grained in the sense that many particfulars of the kind may occupy a given spatiotemporal region.

These three kinds of property instantiation are similar but not exactly equivalent. For instantiations of a property by an object at a time are less general than the first two kinds, which neednn't involve objects. And it would appear that instantiations of properties by a region occupy their regions essentially while the other kinds of property instantiation do not. Furthermore,

the properties in question will differ according to whether they are instantiated by a spatiotemporal region, content of a spatiotemporal region, or object. But there will be relations among them. For any property P which applies to an occupant of a region there is a property which applies to regions, namely that of containing an instance of P. And for any property P which applies to a region there is a property which applies to an occupant of the region, namely that of occupying a region which is P. For any property P which applies to an object there is a property which applies to spatiotemporal regions, namely that of containing an object's having P at some time.

Are these property instantiations related in any way to the content of a region? Bennett offers a second suggestion for how we might understand the content of a region, namely to identify it with the instantiation by the region of the property consisting of the conjunction of all the properties of the region.[6] If this conjunction were to include all the relational properties of the region, the existence of this particular would entail all the information about the entire universe, rather as a Leibnizian substance has been thought to do. Such a property instantiation appears coherent. But more plausible as an interpretation of the content of a region is the idea that it is the instantiation by the region of the conjunction of all its intrinsic properties. This still appears different from the content of the region, for the two notions naturally invite different accounts of what it is to be physical. We might think it would be natural to take a property instantiation to be physical if and only if the property instantiated is physical, and that a conjunctive property is physical if and only if all its conjuncts are physical. This would mean that such a conjunctive property instantiation would be physical if and only if all the mental properties included in the conjunction are physical properties. One might think on the other hand that the content of a region could be physical without requiring psychophysical

property identity.[7] Later I will argue that there is further reason to distinguish the content of a spatial region from the instantiation of any property by a spatial region, and I take this to add further support to the idea that this distinction holds also for spatiotemporal particulars.

What I have been suggesting so far is that we have several plausibly clear and coherent notions of spatiotemporal particulars. We have spatiotemporal regions, the contents of those regions, and the instantiations of a property by a region (or by the content of a region, or by an object at a time). Any of them are available for theoretical purposes such as understanding scientific laws or psychophysical relations. In the course of the following discussion of the event literature we will consider whether there are any further coherent notions of spatiotemporal particulars.

Events

Now let's look at the notion(s) of event. Is it a feature of the way we talk of events that they are spatiotemporal particulars? This has been denied by Hacker on the grounds that events do not have spatial dimensions, and Binkley agrees.[8] They acknowledge that events occur at places, imposing outer limits upon the spatial boundaries of an event. But it would be pointless, they say, to try to decide where to locate the spatial boundaries of an event like someone's falling downstairs, and hence to attribute spatial dimensions to it. They would presumably admit that we think of objects as having spatial dimensions even though it is sometimes difficult to say where their spatial boundaries are, as for example in the case of a mountain, but claim that this is a difficulty of a different kind.

One way of responding to this problem is to show that it dissolves if we regard the names and descriptions of the objects and events in question as vague. 'Mount Everest' can be seen as a vague name of an object, 'John's fall' as

a vague description of an event. On such a reading, there are numerous objects and events corresponding to slightly different spatiotemporal regions all with perfectly determinate spatial boundaries. There is no determinate answer to the questions which of these objects is the referent of 'Mount Everest' and which of these events is the referent of 'John's fall'. But there is no problem about the spatial boundaries of events.[9] And even if we do not adopt this semantic approach but regard the objects and events themselves as having vague spatial boundaries, I do not think this problem should lead us to deny the spatiotemporal status of events. There might be a sense in which the spatial boundaries of events are vaguer on average than those of objects. But this should not lead us to say that all objects have spatial boundaries while no events do so. There are many events, such as the rotating of a sphere, for which there could be no dispute over what spatial boundaries they have if they do indeed have spatial boundaries, and it would seem perverse to deny that such events have spatial boundaries while allowing that mountains do.

Assuming, then, that events are spatiotemporal particulars, there is one readily discernable feature of ordinary event discourse which shows that events are at most a special case of spatiotemporal particular. In the passage quoted earlier from Quine, it is suggested that every spatiotemporal region is occupied by an event. But this is a deliberate extension of familiar event discourse for theoretical purposes. As the concept of an event is ordinarily understood, it is only spatiotemporal regions of certain shapes (largely constrained by spatiotemporal connectedness) that can be occupied by an event. A spatiotemporal region comprising Antarctica during the pleistocene period and my apartment today, for example, would not be suitable for occupation by an event. This stems from our failure to find any similarity between, or common interest in, the component parts of this spatiotemporal region. I shall not try to

say any more precisely what shape a spatiotemporal region must have if it is to be occupied by an event or events as ordinarily understood.

Let us say, then, that events are particulars occupying spatiotemporal regions of suitable shape. Can we just leave it at that and say that events are basic, unanalysable spatiotemporal particulars?[10] This would be an intelligible position, to be examined on its merits, if it is just a way of saying that events are contents of spatiotemporal regions, since the notion of a content may not be further analysable. But it would not be acceptable to say that events are unanalysable spatiotemporal particulars if by this we mean that we do not need to know which of the spatiotemporal particulars we have been discussing our notion of event refers to. For it makes a difference which of these kinds of particulars we take events to be, both in making sense of ordinary event discourse concerning, for example, identity statements and double predications,[11] and for theoretical purposes such as understanding scientific laws and, as I have hinted, psychophysical relations involving events.

Nor would it be acceptable to say that there is an event notion different from those already discussed, which might be described as that of a basic unanalysable particular, if nothing more is said about it than this. Nevertheless, it is frequently claimed that there is a common sense event notion that is neither the content of a region nor a property instantiation. And this can be illustrated by the example of a person who smokes a cigarette while taking a walk. Let us suppose that the person's smoking and the person's walking occupy the same spatiotemporal region (the nicotine permeates the body). A common sense view has it that the walking is the very same event as the slow walking, but different from the smoking. Yet the content of a region notion of events would identify all three, and the property instantiation notion would distinguish all three.

We might try to accommodate these intuitions at the level of semantics without needing a metaphysical notion of events that is finer-grained than region contents and coarser-grained than property instantiations. For example, we might say that the instantiation of the property of walking slowly may be picked out in some contexts by the expression 'the walking slowly' and in others by the expression 'the walking'. And this explains our tendency to falsely identify the instantiation of the property of walking with the instantiation of the property of walking slowly. However, people can agree to this contextual view of event descriptions without shaking off their conviction that there is a perfectly coherent medium-grained metaphysics of events which falls between the property instantiation and region content notions.

But a coherent event notion has not been given without some way of telling whether one such event which occupies a region is the same or different from another such event occupying the same region. One way of trying to accomplish this is to stipulate that R's having P is the same event as R's having Q if and only if P-->Q or Q-->P.[12] This would support the intuition that my walking and my walking slowly are the same event. But it would have the unacceptable consequence that all events R's having P for a given R would be equivalent, for they would all be equivalent to R's having the conjunction of all its properties. And thus it would run afoul of the intuition that my walking and my smoking are different events. One might try to block this by barring the having of a heterogeneous conjunction of properties, such as the property of smoking and walking, from counting as an event in the sense at issue. However, the same problem arises if we consider not the conjunction of R's properties but the maximal physical property possessed by R, since on most views properties such as being a smoking and being a walking will conceptually supervene on fundamental physical properties.

One candidate for an alternative event notion, proposed by Brand, construes events as identical if and only if they are spatiotemporally coincident in all possible worlds.[13] Such a criterion would try to explain the intuition that my walking and my smoking, although coincident in the actual world, are different events by saying that they are spatiotemporally distinct in some other worlds. But there is no way of applying this criterion without a way of identifying an event across worlds. Is my walking in a world in which I don't smoke the very same walk as the one I take in the actual world in which I do smoke, or is it merely a similar one? It seems that we have no way of answering unless we know that the walking was the smoking in the actual world. So we cannot say that a and b are necessarily coincident without relying on knowledge that a=b. Thus, as Schlesinger has argued, Brand's criterion, while not false or circular, does not provide a new event notion.[14]

Consider next whether an alternative event notion can be provided by Davidson's original criterion that events are identical if and only if they have all the same causes and effects.[15] In order to apply this criterion we need to make judgements concerning singular causal statements. Consider, for example, Davidson's puzzle about the sphere that becomes warmer and rotates at the same time.[16] (We're not supposed to imagine the warming causes the rotation or vice versa.) Is the warming of the sphere the same event as the rotating of the sphere? Some might be inclined to think that the warming and the rotating are identical because both are identical with the sum of the motions of the particles that constitute the sphere. Others might think that the rotating and the warming are different changes and so are different events. If we're trying to use the criterion to figure out whether the rotating is identical to the warming, we need to know what their causes and effects are -- e.g. whether the action of the bunsen burner caused the rotating of the sphere, and whether the rotating of the

sphere caused the warming of the environment. Someone maintaining, as Quine does,[17] that the rotating of the sphere is the warming of the sphere will be inclined to say that the rotating of the sphere does cause the environment to warm, but that it is less revealing, less explanatory, to describe the cause of the environmental warming as the rotating of the sphere. What this points to, I think, is that judgements concerning singular causal statements are hopelessly dependent on judgements concerning event identity, so that a criterion of event identity that makes use of causal claims gets us nowhere.

Quine's account of what lies at the heart of the problem has recently led Davidson to abandon this causal criterion.[18] Quine argued that a successful criterion of individuation cannot quantify over entities which are not themselves individuated, and that the causal criterion fails in this regard because it involves quantification over events themselves. To illustrate, imagine that we have lists of all the causes and all the effects of events x and y whose identity is in question. The trouble is that we might still be faced with the problem of deciding whether an item on x's list is also in fact on y's list but under a different description. For example, we might have the warming of the environment on x's list but the disturbing of the environment on y's list. As events are not yet individuated, we wouldn't be able to determine whether these events are identical. And if we were to try using the criterion again on these events we'd be faced with the same problem when comparing their causes and effects. Thus an infinite regress would prevent the criterion from delivering a verdict on the identity of events.

Let us summarise the discussion of events and spatiotemporal particulars in general. Among the possibilities for spatiotemporal particulars we have encountered are spatiotemporal regions, the contents of those regions, and property instantiations by the region (or by its content, or by an object at a time).

As I have not encountered any further coherent notions of spatiotemporal particulars, and cannot imagine any further such notions, I shall assume that all spatiotemporal particulars are of one of these three kinds.

Events, then, are one or more of these kinds of spatiotemporal particular, or a special case of them. I do not know of anyone who has suggested that ordinary event talk picks out bare spatiotemporal regions, though this may be the most useful spatiotemporal particular for some theoretical purposes. Quine has argued in the passage previously quoted that events are contents of a spatiotemporal region, Kim that they are exemplifications of a property (or relation) by an object (or objects) at a time,[19] Lombard that they are changes in an object at a time,[20] Lewis that they are properties of spatiotemporal regions,[21] and Bennett that they are instantiations of a property in a spatiotemporal region.[22] Who is right? I do not think we should assume that there is a single answer to this question. It may well be that more than one of these kinds of particulars is referred to in our event talk. A full enquiry into this question would require a thorough examination of all the different kinds of discourse in which events might be involved, and I shall not undertake this, though later I shall argue that it is not an essential feature of ordinary event discourse that events be changes.

However, I do wish to suggest that any conflicting intuitions there might be over event identity statements could be accommodated by the view that both coarse-grained and fine-grained notions play a role in ordinary event discourse. Consider again Davidson's question whether the warming of the sphere is the same event as the rotating of the sphere. If we take 'the warming of the sphere' and 'the rotating of the sphere' to refer to the content of a region, the intuition that the warming is the rotating is supported. But if we take 'the warming of

the sphere' and 'the rotating of the sphere' to refer to property instantiations, the intuition that the warming is different from the rotating is supported.

Objects and Spatial Particulars

Are all particulars spatiotemporal? I have referred a few times already to objects, and now wish to examine some aspects of the debate as to whether they too are spatiotemporal particulars. I shall not attempt to discuss all the difficulties for the spatial view of objects, but will assume that some coherent account can be provided of how there can be objects and other continuants that can change over time. Then I shall proceed to explore the extent to which the previous classification of spatiotemporal particulars can be applied to spatial particulars.

The principal motivation for assimilating objects to spatiotemporal particulars is to avoid certain theoretical difficulties perceived for the spatial view of objects in accounting for any kind of change, and especially for the gaining and losing of parts.[23] The view that both objects and events are spatiotemporal particulars was held by many philosophers of this century, including Russell, Broad, and Goodman. It receives perhaps its most famous expression in the passage quoted earlier from Quine. Russell and Quine were content to leave no distinction between objects and events.[24] But Goodman suggested that they are distinguished by their size -- objects are spatially small and temporally large events.[25] Broad suggested that they are distinguished by their size and their relations to change.[26] And more recently, philosophers such as Brand and Quinton have suggested that the distinction consists in the fact that there cannot be more than one object occupying a spatiotemporal region, while there is more than one event doing so.[27]

I shall be looking at some of these distinctions later. But first I want to survey our ordinary discourse about the distinction between events and objects.

This provides a prima facie case for the view that an object occupies spatial regions and is in this sense a spatial particular.

There is a very close association between every object and a spatiotemporal particular which may be described perhaps as the complete history of the object, or (as I shall say throughout, though it will sometimes sound awkward) the object's life. It is what Quine refers to in the quoted passage as 'the object conceived four-dimensionally'. It may turn out that we have to identify an object with its life, but to say this is to depart strikingly from ordinary discourse.

Typically one says that objects exist while events occur. But 'existence' is used very broadly, especially in philosophical talk, to apply to all ontological categories.[28] And there is a rare use of 'occur' in application to objects, similar in sense to 'are found', 'turn up' or 'appear', as for example in 'fig trees occur throughout southern Europe', and 'God's name occurs twice in this manuscript'. Another difference is that we say that objects may endure through time while events take time, though both objects and events are said to last for a period of time.[29] More telling perhaps is the fact that one would say that a whole object exists at one moment, whereas one would not say that a whole event exists at one moment (unless it is instantaneous).[30] And this leads to a difference concerning questions of identity across time.[31]

It might seem that questions of identity across time arise just as readily for events as they do for objects. We may ask whether a ship we are looking at now is the same ship we saw last year. And a spectator might ask whether a tennis match he is watching now is the same match he was watching an hour ago before dozing off. Such questions do not undermine the spatiotemporal status of events, so it would seem that they should not do so for objects. (These are to be distinguished from questions of identity across worlds, which can be

asked of both objects and events, such as whether a given object or event could have existed elsewhere in space or time.)

However, in the case of objects we may ask whether the particular, e.g. the ship or a vase, wholly before me now is the same particular that was wholly before me at an earlier moment. And we may ask whether this particular-part is a part of the same particular as the particular-part I was experiencing a while ago. A question such as "Is this the same island we landed on yesterday" is naturally to be interpreted as a question of the second kind (assuming it is a large island, not all of which is visible at once). But it is only questions of the second kind that can be asked in the case of events. In the above example it is not the whole event that is before me on the two occasions in which I watch a tennis match. Rather, the question in the case of events is whether the particular-part (in this case the match-part) that is before me now is a part of the same particular as the particular-part that was before me an hour ago. An account of objects as three-dimensional, spatial, particulars is needed to make sense of questions of identity across time of the first sort.

Now the advocate of the spatiotemporal view of objects will need to provide an explanation of these differences in the way we talk about objects and events. And the advocate of the spatial view will need to demonstrate how to construct a coherent account of spatial particulars that have temporal location and can change over time. I shall not attempt anything like a full account of this. However, we can at least make a start by considering spatial regions. It would be hard to make sense of a purely spatial region if by this we meant something with no temporal location. But we can make sense of referring to a spatial region at a time, and this is different from referring to a spatiotemporal region. For we may talk of the same spatial region at different times, while the spatiotemporal region is essentially nonenduring. As a spatial region can exist

at more than one point in time, this requires that there be some way of identifying it from one moment to the next. This can be done by way of a spatial coordinate system that in turn must be established in terms of stable local features of the universe. Since there may be many appropriate choices of coordinate system, the notion of same spatial region will be relative to such a choice. Thus we have a coherent account of spatial regions as one kind of spatial particular that endures through time (perhaps throughout time, in which case it would be omnitemporal).

But if objects are spatial particulars they are not just spatial regions but something occupying them. Recalling that by 'object' we mean physical object, let us examine the plausible idea that objects are material contents of spatial regions. This would not be strictly analogous to the Quinean notion of an event as the content of a spatiotemporal region, but rather to the material content of a spatiotemporal region.[32] On this view, if it is logically possible for a spatial region to have an immaterial content, then it may be occupied by some immaterial content as well as by an object. But on this account of objects, it is at least clear that no more than one object may occupy a spatial region at a given time.

The account may be unilluminating in other respects, however. As an object can move relative to any chosen spatial framework, the conditions for an object to endure are more complex than for the spatial particulars just considered. An object need not occupy the same spatial region within the spatial coordinate system from one moment to the next, but can occupy different spatial regions so long as there is spatial continuity between them. Thus in order for an object to endure, its spatial boundary will typically be identifiable in some other way than through its spatial coordinates. This requires some reasonably clear and stable boundary, either conventional, e.g.

the Greenwich meridian, or natural, e.g. between two kinds of solid, or between a solid and a gas. Furthermore, the kind of region which may be occupied by an object must be spatially connected (otherwise we would have not an object but an aggregate of objects). The conditions for an object to endure from one moment to the next are that it have the same boundary. A boundary may change over time. It need not keep the same shape and size, though changes in shape and size are subject to restrictions. Having the same boundary guarantees a certain similarity of material content, but exact similarity of material content is not required for identity of an object over time. There may be no way that precise conditions of identity over time for boundaries can be given. But this is no more fatal for the coherence of the spatial view of objects than the absence of any precise way of saying which occupants of spatiotemporal regions are objects is fatal for the coherence of the spatiotemporal view of objects. And nor do we think it fatal for the coherence of the notion of event as spatiotemporal particular that we have no precise way of distinguishing which spatiotemporal regions are occupied by events. Thus our failure to find precise conditions of identity over time does not give us reason to reject as a coherent spatial particular the notion of the material content of a spatial region given in terms of a suitably stable and connected boundary. Much of our ordinary talk of objects appears to be talk of such spatial particulars.

Fine-grained Spatial Particulars

As mentioned earlier, some have argued that there cannot be more than one object occupying a spatiotemporal region, while there is more than one event doing so. I have argued that we have a fine-grained notion of spatiotemporal particular as well as some coarse-grained notions. And it may well be that both fine-grained and coarse-grained notions are in play in

ordinary discourse about events, i.e. that there are both fine-grained and coarse-grained events. As mentioned earlier, it is beyond the scope of this paper to examine whether either the notion of a property instantiation by a region or the notion of the content of a region can accommodate all our ordinary talk about events. I have also argued that objects occupy spatial regions rather than spatiotemporal regions. So let us now consider whether there can be at most one object occupying a spatial region at a given time. Let us consider, that is, whether the grainedness of particulars might provide a further difference between the concepts of object and event.

It might be objected that there can be more than one object occupying a given spatial region at a given time on my view, since there could be different ways of identifying the same object over time, allowing for different objects coinciding. For example, there might be different ways of tracing a boundary into the future, one of which is more permissive than the other, e.g. in allowing major changes in shape. Take a clay statue. On one of these ways, when an arm breaks off the physical boundary between clay and air changes too much for the boundary and hence the physical object to count as the same after the break. But on another more permissive way, the boundary is sufficiently similar to count as the same after the break, and hence for the object to survive this loss of its part. My response is that the concept of a physical object is at the permissive end of the spectrum, and is vague concerning what changes are sufficiently great to bring the existence of the object to an end. This is to say that it is not a determinate matter when a physical object ceases to exist, not that there may be physical objects coexisting within a spatial region, some outlasting others.

Some may disagree with this coarse-grained view of objects, arguing that a statue and lump of clay, a hand and fist, may be distinct objects which occupy the same region at the same time. As in the case of event identity statements, I

think we have intuitions in both directions. If 'the statue' and 'the lump of clay' are taken as referring to the material content of the region, the intuition that the statue and the lump of clay are the same object is supported. But how are we to explain intuitions that the lump of clay and the statue are distinct objects? One response is that people are thinking of four-dimensional, spatiotemporal, particulars when claiming that the statue is distinct from the lump of clay. But analogously to the case of events, we might also be able to accommodate distinctions between object and lump of clay on the three-dimensional, spatial, view of objects by taking 'the statue' and 'the lump of clay' as referring to the instantiations of the properties of being a statue and being a lump of clay, respectively, by the object. Thus it appears that conflicting intuitions over identity statements for spatial particulars can be handled analogously to the way I suggested for spatiotemporal particulars. A minor disanalogy is that these fine-grained particulars would not be called objects, whereas both coarse-grained and fine-grained spatiotemporal particulars could be called events.

The above analysis used as fine-grained spatial particulars the instantiations of properties by the material contents of spatial regions. The same result could be achieved by taking 'the statue' and 'the lump of clay' as referring to the instantiations of the properties of containing a statue and containing a lump of clay, respectively, by the spatial region. Thus, as in the case of fine-grained spatiotemporal particulars, we have subtly different fine-grained spatial particulars. One difference concerns the properties that may be instantiated, as illustrated in the example of the statue and clay. There is also the modal difference that property instantiations by material contents of spatial regions, but not property instantiations by spatial regions could exist if the region had a different content.

Consider now whether the content of a spatial region can be identified with the instantiation of some property by the region, analogously to Bennett's suggestion for events. It appears that the content of a spatial region, and hence also an object, cannot be identified with the instantiation of any property by the region because their conditions of enduring are different. The content of a region can endure while some of its intrinsic properties change, but the instantiation of all the properties (or all the intrinsic properties) of the region endures if and only if the region continues to have all those properties. Furthermore, no proper subset of properties of an object has been found to be necessary and sufficient to identify it over time, and it is reasonable to take this to be true also of the content of a spatial region. So the content of a spatial region cannot be identified with the instantiation of any of its properties.

This distinction between coarse-grained and fine-grained spatial particulars cannot, however, be applied to solve the puzzle over conflicting intuitions with regard to the identity of an object with a sum of its material parts, e.g. the identity of Tibbles the cat with Tib+Tail, where 'Tail' refers to Tibbles' tail, and 'Tib' refers to the rest of Tibbles. We cannot capture the sense in which we think Tibbles different from Tib+Tail in terms of different properties being instantiated by the same region or same object, because there is no single region or object instantiating both the property of being Tibbles and the property of being Tib+Tail after the parts have become separated. I am inclined to say instead that the boundaries with which we identify the region and its content are different for the object and its material parts. The sum of parts is what I would prefer to call an aggregate, not an object, and its boundary picks out connected regions of space that may be contiguous at one time but not at others. So Tib+Tail is an aggregate, not an object, and is in this sense different from Tibbles. The sense in which we think of them as identical is to be

explained by the fact that they are coincident. Thus we may say that no more than one object may occupy a given spatial region at a time, but many aggregates and many property instantiations may do so. In response to the different puzzle as to how Tib and Tibbles can differ at one time but later come to be identical, I favour relativising identity to time.[33] But it is unnecessary to pursue these puzzles here as I do not wish to restict this account of the relation between spatial and spatiotemporal particulars to a specific view of the relation between an object and its parts.

Let us summarise the parallelism and relations between spatiotemporal particulars and spatial particulars enduring through time, assuming that there are such spatial particulars. We have both spatiotemporal regions and spatial regions. We have coarse-grained particulars of the contents and material contents of these regions. We have fine-grained particulars of the instantiation of a property by the region, and the instantiation of a property by the content of a region. (And in the case of fine-grained spatiotemporal particulars we have the instantiation of a property by an object at a time). And by specifying that the property in question is some sort of complete conjunction of properties, we can produce a special kind of property instantiation that is coarse-grained. For every spatial particular there are spatiotemporal particulars consisting of the life of the spatial particular and parts thereof. For example, O's life is the material content of the spatiotemporal region traced out by O over the course of its temporal existence. And the life of the spatial particular of O's instantiation of P is simply the spatiotemporal particular of O's instantiation of P at the time during which O instantiates P. Conversely, not every time-slice of a spatiotemporal particular yields a spatial region with a boundary suitable for the hosting of a spatial particular.

States and Changes

I would also like to suggest that talk of an object's states provides a particularly plausible example of reference to the instantiation of a property by an object. States of an object should be regarded as spatial particulars, for we think of them as occupying spatial regions rather than as occupying a spatiotemporal region, and as enduring through time rather than as taking time.[34] And they should be regarded as property instantiations, as they too are isomorphic to pairs of an object and one of its properties. So an object's state of having a property, e.g. an apple's state of having the property of ripeness, or more concisely, an apple's state of ripeness, can be taken as a case of an object's instantiation of a property. Or, in the previous example, an object's instantiation of the property of being a statue may be regarded as its state of being a statue.

Thus for any[35] property P of object O's, I take there to be a metaphysical distinction between the fine-grained spatial particular, O's instantiation of P, and fine-grained spatiotemporal particulars, O's instantiation of P at t, even though there is not always a natural way of capturing the distinction grammatically, and both particulars are readily described by expressions of the form 'O's having P'. Many will object, however, that the ordinary distinction between state[36] and event does not correspond to the metaphysical distinction between spatial and spatiotemporal particulars. Many of those believing in fine-grained events will say, rather, that it corresponds to a distinction between static and changing particulars -- an object's having a property is either an event or a state, depending on whether or not the property is a change property. And many of those believing that there are coarse-grained events will say that in order to be counted as events, coarse-grained spatiotemporal particulars must be changes.[37]

Let us set aside the problems in distinguishing change properties from nonchange properties that arise, e.g. in the case of the property of turning grue.

Consider first the fine-grained case. Certainly we are apt to call a static particular such as an animal's hibernation a state, and to call changes such as wakings events. I maintain, however, that my view captures this linguistic data just as well, and that there are further linguistic intuitions which can be accommodated only on my view. While, on my view, for every fine-grained spatial particular there is a fine-grained spatiotemporal particular, its life, we are usually interested only in one of them. Where the property would be regarded as a change property, e.g. that of waking, we're more likely to be interested in causal relations, and hence in the spatiotemporal particular. Where the property wouldn't be regarded as a change property, e.g. that of hibernating, we're more likely to be interested in describing the object, and hence in the spatial particular. So on my view there is indeed a tendency to use event-talk for changes and state-talk for nonchanges. But sometimes we are interested in the spatial particular when the property is a change property, and then we do talk of states of flux, decay, rejuvenation, transition, etc.[38] And sometimes we are interested in the spatiotemporal particular when the property is not a change property, and then we talk of nonchanges as events, for example in circumstances in which changes are expected, such as the light's not coming on when the switch is flipped, or the soldier's standing motionless when called upon to salute. Thus a fine-grained particular such as a state or event (if there are fine-grained events) can be a change or a nonchange depending on whether the property in question is a change property or a nonchange property.

Consider now coarse-grained spatiotemporal particulars. It is hard to see how they could be nontrivially classifiable either as changes or as nonchanges, except under descriptions. For they are not associated with any particular property that might be so classifiable, and they pretty clearly have both change and nonchange properties. Unless they are at absolute zero temperature they

will have some properties pertaining to the motion of their internal parts, and it is hard to envisage an account of change on which all of these would escape designation as change properties. And they will have nonchange properties such as that of containing some oxygen (or some other element if they contain no oxygen). So it is hard to see how a change or nonchange could be defined in such a way as to discriminate nontrivially among coarse-grained particulars.

Instantaneous Spatiotemporal Particulars

So far in this paper I have been making use of a sharp distinction between spatial and spatiotemporal particulars. But how should we describe a particular which occupies a spatiotemporal region with zero temporal extension? Should we call it an instantaneous spatiotemporal particular, or a spatial particular, or does the distinction between them collapse? If the particular does in fact endure, then we must regard it as spatial, for spatiotemporal particulars do not endure. But if it is essentially instantaneous, i.e. essentially incapable of enduring, we must regard it as spatiotemporal, for spatial particulars are essentially capable of enduring. In the case of a contingently instantaneous particular we must regard it as spatial since it could have endured. Let us illustrate this.

Consider the fine-grained case. When a temporal instant is built into the property instantiated, as in the case of my feeling tired at noon today, the particular is essentially nonenduring and so must be regarded as an instantaneous spatiotemporal particular. The same is true when the property holds essentially instantaneously, either through implicitly involving a particular instant in time, e.g. in cases involving legal transitions, such as Hong Kong's incorporation into China, or through implicitly involving some instant or other, e.g. in the cases of my turning forty and my body's making contact with the North Pole. We would not talk of states of having properties which are

essentially instantaneous, such as Hong Kong's state of incorporation into China, or my states of turning forty or contacting the North Pole. But there are also properties, such as that of having a temperature of exactly 60 degrees F, which may as a matter of contingent fact apply instantaneously on an occasion. A fine-grained particular involving such a property, e.g. the room's having a temperature of exactly 60 degrees F, must be regarded as a state since it could endure.

In the coarse-grained case, a time-slice of a coarse-grained spatiotemporal particular at a specified moment is an instantaneous coarse-grained spatiotemporal particular, not an instantaneous object, since it is essentially nonenduring. But in contrast to the fine-grained case, there can be no contingently instantaneous coarse-grained spatial particulars, since a coarse-grained particular does not have any one property necessary and sufficient for its enduring which could apply contingently instantaneously. Another reason why there cannot be an instantaneous object is that a truly instantaneous object must have nothing sufficiently resembling it at adjacent moments before and after its existence. It would thus be unobservable, and any effect that might have been attributed to it would properly be attributed instead to what preceded it.

Conclusion

Spatiotemporal particulars fall into three types. And assuming there are spatial particulars that are essentially capable of enduring through time, a parallel account can be offered of them. For every spatial particular there are spatiotemporal particulars that can be described as its life and parts thereof. But not every time-slice of a spatiotemporal particular yields a spatial region suitable for hosting a corresponding spatial particular. Events are spatiotemporal particulars though not all spatiotemporal particulars are events.

Objects and states are spatial particulars though not all spatial particulars are objects or states. Spatial and spatiotemporal particulars can be either bare regions, or the contents or material contents of such regions, or property instantiations. I have not undertaken to argue whether events are contents of regions, property instantiations, or both. But I have suggested there is good evidence that objects are material contents of spatial regions while states of objects are property instantiations. Fine-grained spatiotemporal particulars can be changes or nonchanges. Coarse-grained spatiotemporal particulars cannot be nontrivially classified as changes or nonchanges. Events and states can be instantaneous while objects cannot.[*]

Notes

---

[1] Quine (1960) p 170.

[2] Bennett (1988) p 104.

[3] I argue this point in my [reference deleted].

[4] Quine (1985) suggests that we might have to construe an event as the pair of a physical object and a distinctive set, p 167. And Lewis (1986) cites ontological parsimony as a reason for identifying an event with a class of spatiotemporal regions, p 245.

[5] In any given world these will be isomorphic to <R,P> pairs. But the isomorphism will not hold across worlds, which would be required if modal claims are to be captured.

[6] Bennett (1988) p 104.

[7] This is also argued in my [reference deleted].

[8] Hacker (1982) p 11. Binkley (1989) pp 32-4.

[9] This has been proposed by Quine among others. See Quine (1985) p 168.

[10] This appears to be the view of Steward (1997), p 100.

[11] See, for example Bennett (1988) p 78.

[12] An account of this sort is suggested by Parsons (1989) and Beardsley (1975).

[13] See Brand (1989) p 65, or Brand (1977).

[14] Schlesinger (1984) pp 216-218.

[15] Davidson (1980) p 179.

[16] Davidson (1980) pp 178-9.

[17] Quine (1985) p 167.

[18] Quine (1985) p 166 raises the objection, to which Davidson (1985) responds p 175.

[19] See, for example, his "Causation, Nomic Subsumption, and the Concept of an Event" or "Events as Property Exemplifications", where he changes 'object' to 'substance' so as to include such things as bits of water. Both are in Kim (1993).

[20] The view he develops in Lombard (1986).

[21] Lewis (1986) p 245. His account is designed to fit his theory of causation, rather than to directly capture ordinary event discourse. I take his account to be similar to Bennett's as far as the actual world is concerned. I presume that the property he identifies with an event incorporates some properties that locate the spatiotemporal region, so as to secure uniqueness in the actual world.

[22] Bennett (1988) p 88. I follow Bennett and others in rejecting claims of Davidson's causal criterion and Brand's criterion to delineate well-defined event notions.

[23] For an overview see Loux (1997) pp 217-31, and for the problem of persistence through loss of parts, see Heller (1984) pp 323-334.

[24] Discussing material objects, Russell said, 'Speaking roughly, ... we may say that a piece of matter is all that happens in a certain track in space-time'. Russell (1956), p 329. See also Russell (1954) chapters 23 and 27.

[25] Goodman (1966) wrote, 'Our tables, steam yachts, and potatoes are events of comparatively small spatial and large temporal dimensions.' p 128.

[26] C.D. Broad wrote, 'A thing, as we have seen, is simply a long event, throughout the course of which there is either qualitative similarity or continuous qualitative change ...' (1923) p 393.

[27] Brand (1984) p 56, Quinton (1979) p 211.

[28] Hacker (1982) insists that events do not exist and hence should not be described as entities, p 3.

[29] I disagree here with Hacker (1982) who claims that events endure, p 3. But I do not know of anyone claiming that objects take time.

[30] A point made, for example, by Hugh Mellor, most recently in Mellor (1995) pp 122-3, and by Binkley (1989) p 24.

[31] I ignore any special sense that these questions might acquire if time travel were possible.

[32] In (1985) p 167, Quine says, 'A physical object, in the broad sense in which I have long used the term, is the material content of any portion of space-time, however small, large, irregular, or discontinuous. I have been wont to view events simply as physical objects in this sense.' This differs from the statement quoted from Word and Object in that it takes objects and events to be the material content of a spatiotemporal region. It yields a different notion if it is logically possible that a spatiotemporal region could have some immaterial content.

[33] See for example Myro (1986).

[34] Here I am in agreement with Steward (1997) pp 73-4.

[35] Actually, not all properties of an object give rise to states of the object or events. Those entailed by the sheer fact that they are properties of an object do not, e.g., the property of occupying a connected region. For discussion of further properties that may not, see Kim (1993) pp 36-7.

[36] I limit my discussion of states to states of objects, ignoring other uses of 'state' referring to states of regions, states of events, and states of affairs.

[37] Analogous to the distinction between changes and nonchanges is the distinction between spatial heterogeneity and homogeneity. But there is little interest in this since it is hard to see how any macroscopic properties could be classified this way.

[38] I agree here with Schmitt (1983) p 283. But I disgree with his view that events are changes in that they unfold or come into being over their entire duration, as my example of the nonsaluting soldier indicates. Such a view also counterintuitively precludes the possibility of instantaneous events.

* Thanks to Kit Fine and Achille Varzi for helpful discussion.

References

Beardsley 1975 "Actions and Events: the Problem of Individuation" American Philosophical Quarterly 12 pp 263-276

Bennett, Jonathan 1988 Events and their Names (Hackett)

Binkley, Robert 1989 "Particular Actions" in D. Stewart (ed) Entities and Individuation: Essays in Honour of Neil Wilson (Edwin Mellen Press) pp 19-38

Brand, M. 1989 "Events as Spatiotemporal Particulars: a Defence" in W.L. Gombocz, H. Rutte, W. Sauer (eds.) Traditionen und Perspektiven der analytischen Philosophie: Festschrift fur Rudolple Halle (Holder-Pichler Tempsky) pp 318-414

Brand, M. 1977 "Identity Conditions for Events" American Philosophical Quarterly 14 pp 329-37 Brand, M. 1984 Intending and Acting (M.I.T. Press: Cambridge, Mass) Broad, C.D. 1923 Scientific Thought (Routledge and Kegen Paul: London) Davidson, Donald 1980 Essays on Actions and Events (Clarendon Press: Oxford)

Davidson, Donald 1985 "Reply to Quine" in LePore and McLaughlin (eds.)

Actions and Events: Perspectives on the Philosophy of Donald Davidson (Blackwell) pp 172-6

Goodman, Nelson The Structure of Appearance, 2nd edn. (Bobbs-Merrill: New York 1966)

Hacker, P.M.S. 1982 "Events and Objects in Space and Time" Mind 91, pp 1-19

Heller, Mark 1984 "Temporal Parts of Four Dimensional Objects" Philosophical Studies 46, pp 323-34, reprinted in Rea (1997) pp 320-30.

Kim, Jaegwon 1993 Supervenience and Mind (Cambridge University Press: Cambridge)

Lewis, David 1986 "Events" Philosophical Papers Vol II (Oxford University Press: New York) pp 241-69

Lombard, Brian Events: a Metaphysical Study (Routledge and Kegen Paul: London 1986)

Loux, Michael J. 1998 Metaphysics: a contemporary introduction (Routledge)

Mellor, Hugh 1995 The Facts of Causation (Routledge)

Myro, George 1986 "Identity and Time" in R.E. Grandy and R. Warner (eds.) Philosophical Grounds of Rationality (New York: Clarendon Press) reprinted in Rea (1997) pp 148-72

Parsons, T. 1989 "The Progressive in English: Events, States and Processes" Linguistic and Philosophy 12, pp 213-41

Quine, W.V. 1960 Word and Object (M.I.T. Press: New York, 1960)

Quine, W.V. 1985 "Events and Reification" in LePore and McLaughlin (eds.) Actions and Events: Perspectives on the Philosophy of Donald Davidson (Blackwell) pp 162-71

Quinton, Anthony 1979 "Objects and Events" Mind 88, pp 197-214

Rea, Michael 1997 (ed.) Material Constitution (Rowman and Littlefield)

Russell, Bertrand 1954 The Analysis of Matter (Dover: New York)

Russell, Bertrand 1956 "Logical Atomism" in Logic and Knowledge, ed. R. C. Marsh (Allen and Unwin, London)

Schlesinger, G. 1984 "Events and Explicative Definitions" Mind 93, pp 215-29

Schmitt, Frederick 1983 "Events" Erkenntnis 20, pp 281-93

Steward, Helen 1997 The Ontology of Mind (Oxford: Clarendon Press)