

(August 2003): I no longer stand by everything I wrote in this paper; a more up-to-date version is incorporated in chapter 1 of my *How Things Persist*.

Katherine Hawley, Department of History and Philosophy of Science, Free School Lane, Cambridge, CB2 3RH. E-mail: kjh1002@cus.cam.ac.uk

Why Temporary Properties are not Relations between Physical Objects and Times

Proceedings of the Aristotelian Society, XCVIII.2 (1998), pp. 211-16.

Take this banana. It is now yellow, and when I bought it yesterday it was green. How can a single object be both green all over and yellow all over without contradiction? It is, of course, the passage of time which dissolves the contradiction, but how is this possible? How can a banana ripen? These questions raise the *problem of change*. The problem is sometimes called the *problem of temporary intrinsics*, but, as I shall explain below, this emphasis on intrinsic properties is misleading.

Perdurant theorists offer a solution to the problem of change¹. They say that the yellow thing and the green thing are different temporal parts of the same four-dimensional banana, which is neither wholly green nor wholly yellow. No single object is both yellow all over and green all over, so the apparent contradiction is dissolved.

Endurance theorists, on the other hand, must provide a different solution, since they do not believe that objects like bananas have temporal parts. According to endurance theory, the wholly yellow banana in front of me now is numerically, strictly identical with the wholly green one I bought yesterday, despite the difference in properties.

Some endurance theorists suggest that temporary properties are relations between objects and times². They claim that the single banana bears the *yellow-at* relation to today, and the *green-at* relation to yesterday, just as I bear the *taller-than* relation to the Queen Mother, and the *shorter-than* relation to Michael Jordan. In neither case does contradiction arise. I will call this the *relational solution* to the problem of change. The relational solution is often rejected for bad reasons. This paper examines the usual reasons, and gives better reasons for rejecting the relational solution.

First, a bad reason for rejecting the relational solution. David Lewis objects that if he knows anything, he knows that temporary properties like shape (his example) are intrinsic properties, not relations. It is "simply incredible"³, therefore, that all temporary properties are relations.

This is too fast. Lewis may know that a banana's shape is not a relation it bears to physical objects disjoint from it. It seems that a banana is curved regardless of the existence or non-existence of other physical objects, since we can imagine it curved

¹See, for example, Lewis (1986) pp.202-4, or Jubien (1993) pp.24-7.

²Mellor (1981) pp.111-14, van Inwagen (1990).

³Lewis (1986), p.204.

whilst alone in the universe. But does the banana have its shape regardless of the existence or non-existence of times?

We simply cannot tell directly whether an object's shape is a relation it bears to a moment. What properties would a physical object have if it were alone in a world which did not contain any moments? Attempts to imagine such a situation do not bring insight into the nature of temporary properties, but instead show us the limitations of our intuitions about these matters. We cannot move from the straightforward assertion that shapes are not relations to other physical objects to the assertion that shapes are not relations to anything at all.

The failure of this first objection to the relational solution is more obvious when we consider temporary relational properties. How can someone be childless one day, and a parent the next, without contradiction? The endurance theorist may say that parenthood is a relation to a time, as well as being relational in the more obvious way. Opponents of the relational solution cannot deny that parenthood is a relational property: they must claim simply to *know* that parenthood is not a relation to a time. The focus upon temporary intrinsics leads the debate astray, and the straightforward rejection of the relational solution is unconvincing.

A second response dwells upon the fact that, according to the relational solution, very many properties turn out to be relational. How many properties are involved? The relational solution claims only that temporary properties are relational, and most objects have many permanent properties; we might expect the number of relational properties to be fairly limited. Yet any property which is temporarily possessed by *some* object, or which *could* be so possessed, should be analysed as a relation to a time even where it is permanent. To deny this, whilst maintaining that temporary properties are relational, would be like denying that *being the tallest person* is a relational property, whilst maintaining that *being taller than the Queen Mother* is relational. Although the banana is always bent, its being bent is a relation it bears to many times, if a hinge's being bent is a relation it bears to a few times.

There may, however, be properties which, if possessed by an object, are necessarily possessed throughout that object's career. So the relational solution entails that very many, but perhaps not all properties are relational. Why is this thought to be unacceptable? The second objection to the relational solution runs as follows: if the banana bears different mass-relations to different times, then really it has no mass of its own, and this is false.

The relational solution can seem to downgrade objects, picturing them as massless, colourless, shapeless and so on⁴. The supporter of the relational solution has a response to this second worry. If only the permanent is real, the banana has no real mass according to *any* solution to the problem of change. But the temporary is as real

⁴David Lewis may be expressing this objection when he suggests drawing circles to represent the "contents" of distinct moments (1988). Endurance theorists must draw overlapping circles, since they believe that the same object can exist at more than one time. Thus they face the problem of drawing a shapeless object if the object has different shape-relations to different times. Unsurprisingly, endurance theorists reject Lewis's attempt to represent their theory in this way (Lowe 1987, fn.5 and Haslanger 1989).

as the permanent. The fact that the banana has very few necessarily permanent properties tells us nothing about the reality or robustness of the banana. Having different masses at different times, by virtue of having different relations to different times, is not the same as being massless.

A third, related, worry is that, if the relational solution is true, then nothing remains of the objects which are supposed to stand in relations to times. The charge is that the relata have been eliminated by the proliferation of relations. This worry arises for those who believe that an object is composed, somehow, of its properties, for we can make little sense of the idea that an object is composed out of its relations. Objects seem to fade away if we combine the relational solution with this "bundle-of-properties" view of objects, and those who are tempted by this view of objects have a real reason to reject the relational solution. Of course, not everyone is so tempted.

There is, however, a fourth argument against the relational solution, one which does not rely on any particular view of objects. It comes in two parts: first I argue that the relations in question cannot be *internal* relations, then I argue that if they are taken to be *external* relations, the solution becomes so complex as to undermine the initial appeal of endurance theory. Temporal parts theory begins to appear straightforward by comparison.

Internal relations supervene on the intrinsic natures of the relata.⁵ Whether or not one person stands in the relation of *being taller than* to another at some moment is entirely determined by their heights at that moment, independent of the state of any other physical object. If heights are intrinsic properties of people, then *being taller than* is an internal relation.

Consider the *internal relational solution* to the problem of change. This says that temporary properties are internal relations between physical objects and times, fully determined by the intrinsic properties of the objects and of the times. There are two groups of objections to this, focusing either on the times or on the objects.

Times - moments - must have intrinsic properties if the internal relational solution is to be viable. Further, a single physical object with an unchanging intrinsic nature may have different relations to different times, so different moments must have different intrinsic properties. The endurance theorist cannot identify a time with either the set or the fusion of the objects which exist at that time, on pain of mistakenly identifying distinct times, but perhaps different moments have different intrinsic properties by virtue of their different places in the time series. This requires not only that relations between times amount to more than relations between events, but also that times have intrinsic properties beyond their mutual relations. Perhaps this rich structure is the price we must pay in order to avoid temporal parts.

Now consider the objects, rather than the times. If, as the relational solution suggests, temporary properties are relations, then most physical objects have very few intrinsic properties. Why is this a problem, given that we are not now assuming a bundle theory of objects? The trouble is that, according to the internal relational solution, an object's properties at a particular moment are all determined by the intrinsic properties

⁵In the sense I intend, internal relations need not supervene on the *essential* natures of the relata.

of the object on the one hand, and of the moment on the other. But this goes for every object existing at that moment. Most of the properties exemplified across the universe at a given moment are relations between the various objects and that single moment. The great variety in these properties must, on this theory, be accounted for solely by variety in the very limited intrinsic natures of the objects. We should not, incidentally, rely upon haecceities to do this work for us, else temporary properties will all turn out to be essential properties.

By attributing sufficient richness to absolute time, we may provide each time with a different intrinsic nature, but the physical objects themselves are a let-down. The internal relational solution does not allow for enough intrinsic properties to go around, to provide a basis for that vast and varied majority of properties which are supposed to be internal relations. Temporary properties are not internal relations.

Perhaps, then, the relations between objects and times are *external* relations. External relations are not determined by the intrinsic properties of the relata, but they are determined by the intrinsic properties of the fusion or composite of the relata. Spatial separation is often cited as an example of an external relation: the distance between you and me at some moment is not determined by our intrinsic properties, since duplicates of us could have a different separation. Our separation is, however, determined by the properties of our fusion at that moment. If the distance between an object's parts is one of its intrinsic properties, then spatial separation is an external relation.

Is there really a thing which has the banana and a certain time t as parts, as the external relational solution requires? If there is such a thing, what external relations hold between its parts? Consider, for example, the spatio-temporal separation of the banana and t : if anything, the separation is a *temporary* property of the banana- t fusion, since the banana gets closer to t , then further away from t , as time passes.

The proposal is that we analyse temporary properties as external relations between objects and times. These external relations must be rather different from spatio-temporal external relations, which turn out to be temporary themselves. Moreover, these external relations are not causal relations: t does not cause the banana to be yellow. Could there, nevertheless, be special, permanent, non-spatio-temporal, non-causal intrinsic properties of object-time fusions, which are not determined by the intrinsic properties of either the object or the time, and which are well-suited to play the role of temporary properties?

This is not obviously incoherent, but it is obviously complex. Temporary properties of physical objects are now to be analysed as permanent, intrinsic properties of *other* objects, of, for example, banana- t fusions. The intrinsic properties of these fusions are not relevantly determined by the intrinsic properties of the familiar objects which make them up. Moreover, the properties of the fusions in virtue of which the physical objects have their temporary properties are mysterious. The banana- t fusion is not itself yellow, yet the property in question is not to be understood by analogy to more familiar external relations. This air of mystery poses particular problems for

endurance theorists, who often seem motivated by the idea that temporal parts are just too exotic to be believable, and that perdurance theory must therefore be rejected⁶.

Now, however, the perdurance theory solution to the problem of change seems comparatively mundane. Perdurance theory also claims that temporary properties of physical objects are permanent, intrinsic properties of other objects. These other objects are (temporal) parts of the physical objects, rather than having the physical objects as parts, and their properties *are* determined by the intrinsic properties of the physical objects. Moreover, the properties of the temporal parts are independently understood and unmysterious: perdurance theory says that for the banana to be yellow at *t* is for it to have a temporal part at *t* which is yellow, plain and simple.

I have been considering a possible solution to the problem of change, a solution which claims that temporary properties are relations between objects and times. I rejected the idea that it is simply *obvious* that ordinary properties are not relations to times. I then outlined the objections which I take to underlie the first, less plausible claim, and showed that a bundle-of-properties view of objects causes problems for the relational solution. Finally, I gave an argument suitable for those who do not wish to rely on a bundle theory. I argued that temporary properties are not internal relations between objects and times, on the grounds that this suggestion cannot account for the sheer diversity of things in the world. I then showed that taking properties to be external relations leads to bizarre complexities, unsettling for any position, but especially troubling for endurance theorists. Temporary properties are not relations between objects and times⁷.

References

- Haslanger, S. (1989): 'Endurance and Temporary Intrinsic', *Analysis* 49, 119-125.
 Jubien, M. (1993): *Ontology, Modality and the Fallacy of Reference*, Cambridge: Cambridge University Press.
 Lewis, D. (1986): *On the Plurality of Worlds*, Oxford: Blackwell.
 Lewis, D. (1988): 'Re-arrangement of Particles: Reply to Lowe', *Analysis*, 48, 65-72.
 Lowe, E.J. (1987): 'Lewis on Perdurance versus Endurance', *Analysis*, 47, 152-4.
 Lowe, E.J. (1988): 'The Problems of Intrinsic Change: Rejoinder to Lewis', *Analysis*, 48, 72-77.
 Mellor, D.H. (1981): *Real Time*, Cambridge: Cambridge University Press.
 Thomson, J.J. (1983): 'Parthood and Identity across Time', *Journal of Philosophy*, LXXX, 201-220.
 van Inwagen, P. (1990): 'Four-Dimensional Objects', *Noûs*, 24, 245-255.

⁶Judith Jarvis Thomson, for example, calls temporal parts a "crazy metaphysic" (1983, p.210). Many endurance theorists reject the relational solution in favour of some other approach to the problem of change, and with good reason, since it is incompatible with their emphasis on the everyday.

⁷Many thanks to Helen Beebe, Tim Crane, Joel Katzav, James Ladyman, Fraser MacBride, Hugh Mellor, Eric Olson, John Taylor and Paul Teller.