Restricted Diachronic Composition, Immanent Causality, and Objecthood: A Reply to Hudson
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Composition, persistence, vagueness, and more constitute an inter-connected network of problems. My criticism of Hud Hudson's provocative claims made in a recent paper (Hudson 2002) was focused almost exclusively on the issue of diachronic composition (Balashov 2003). Hudson's response (2003) has highlighted the dangers of such isolationism. But I want to hold to my strategy to the end. Part of the reason is to evade the appalling responsibility of presenting a full-blown theory of all the above phenomena; I must confess that I do not have such a theory. At the same time, I contend that diachronic composition can be profitably carved out from the medley of the surrounding issues more or less at the joints provided by nature itself. And I do subscribe to some sort of realism about the joints of nature.

The most important of them is a broadly causal relation between successive stages of material objects that is revealed in mark transmission.[1] Following Hudson's suggestion (2003, 17)—and thus to avoid prejudging any important issues—let us refer to this relation as immanent causality rather than genidentity. I believe immanent causality places a natural restriction on diachronic composition and, hence, demarcates real perduring physical objects from 'separate and loose' series of temporal parts that do not compose anything. Hudson thinks, on the contrary, that whereas some line between these two cases has to be

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1 The concept of *mark transmission* occurs in a similar context in Reichenbach (1957, 136 and 271) and does a great deal of work in Wesley Salmon's theory of causal explanation (Salmon 1984). Mark transmission is a crude but graphic way of capturing the notion of immanent causality that is sufficient for my purposes here. For a comprehensive analysis of this notion in terms of nomic subsumption of events, see Zimmerman (1997).

drawn, its importance should not be exaggerated: the line separates two kinds of objects ('proper continuants' and 'ill-behaved continuants'), but it does not go as far as to demarcate existence from non-existence. The latter option, Hudson argues, is too expensive. The cost includes (but is not confined to) the familiar problems associated with any restriction on composition. The first such problem is how exactly to state the restriction.

One assumption at work here (and Hudson is not alone in adopting it) is that any reasonable restriction on composition should apply 'across the board' to all cases of composition, diachronic and 'synchronic' alike. If so, the trouble is just around the corner, since a restriction based on causality rules out instantaneous temporal parts of extended objects, such as human persons, for the spatial parts of such temporal parts fail to stand in a relevant causal relation.

I acknowledge that I do not have a theory of synchronic composition but I reject the underlying 'across-the-board' assumption. I think diachronic composition presents a very special case that should be treated separately. My response to the challenge of coming up with a statement of restriction is, therefore, rather anti-climactic: objects that are not connected by immanent causality do not compose anything *unless* they belong to the same moment of time in the rest frame of their center of mass, in which case they may or may not compose something, depending on one's theory of synchronic composition.

This is perhaps a bit too rough-and-ready. To make it more precise, let us say that any material objects, *the xs*, compose *y* if they compose^d it or compose^s it ('d' standing for 'diachronic' and 's' for 'synchronic'). A plurality of objects may compose another object either diachronically or synchronically. This is not to deny the univocal character of composition but only to distinguish two principal natural kinds of composition, which are mutually exclusive.[2] Diachronic composition requires pairwise *timelike*

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2 But not exhaustive, as Hudson has noted in correspondence. An object may decompose into a plurality of objects that neither compose^s nor compose^d it. For example, Cube ABCDEFGH from Balashov (2003, Figure 3, this issue, 4) could be thought of as being

or *lightlike* separation of *the xs* and synchronic composition their pairwise *spacelike* separation. The statement of restriction I defend can then be put as follows:

> (R) Objects that are not connected by immanent causality do not compose^d anything; they also do not compose anything unless they belong to the same moment of time in the rest frame of their center of mass, in which case they may or may not compose something (by composing^s it), depending on one's theory of synchronic composition.[3,4]

(R) rules out SlowThread and FastThread, but not Thread. In addition, it does not rule out instantaneous temporal parts of spatially extended objects but leaves it to a theory of synchronic composition to decide whether they exist and when. In Hudson's words, (R) is 'targeting and restricting only a select group of fusions rather than proposing a principle on composition in general' (2003, 18). I agree. However, the select group constitutes a natural kind of composition that calls for special analysis, one based on the concept of immanent causality. But 'why think that objects would have to stand in causal relations to enter into composition relations across time, but not across space?' continues Hudson (ibid, 19). 'Indeed, such a restriction seems especially arbitrary in a relativistic setting, where so called 'objective distinctions' between time and space are compromised' (ibid, 19). Here I disagree. Although

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compose^d of all its momentary slices parallel to ABCD *except* ABCD itself plus all the threads composing this slice and parallel to AB. Taken as a whole, this heterogeneous plurality of objects neither compose^s nor compose^d Cube. Remarkable as they may be in their own right, such cases of composition have no bearing on the points I wish to make in this reply.

3 Michael Rea has suggested to me a simplified version of (R) which is free of double negation and silent on the distinction between synchronic and diachronic composition:

> (R′) Objects not connected by immanent causality compose something only if they belong to the same moment of time in the rest frame of their center of mass.

4 Restricting compositions to the rest frame of *the xs*'s center of mass is not the only option one might pursue, and surely there is more to say about this and other options. But the choice is irrelevant to the present debate, and I have to be brief in this reply.

the distinction between space and time loses much of its force in relativity, it is not compromised there in a particular respect that is relevant to the present debate. The distinction in question has to do with the invariant causal and chronological structure of Minkowski spacetime. While there is no objective temporal order between spacelike separated entities, there is such an order between timelike and lightlike separated items (see Figure 1 in Balashov (2003 this issue, 1)), illustrating the objective partition of Minkowski spacetime). This, in turn, makes it possible for such items to be causally related. Composition^s cannot be grounded in the same kind of causal relation as composition^d simply because it is not possible for spacelike separated objects—those that could, in principle, provide the material for synchronic composition—to stand in such a relation. Thus the distinction between the two kinds of composition remains objective and clearly defined in special relativity.

Is the concept of immanent-causality-interrelatedness vague? I submit that given the above distinction between two natural kinds of composition, we are free to make the concept in question precise by locating the relevant sort of vagueness in the notion of synchronic composition. Consider two temporal parts O_{t1} and O_{t2} of a putative spatially extended object O. Are these parts causally related? It may be that they are neither definitely related nor definitely unrelated. But do not hasten to put the blame on the composition^d-grounding causal relation itself. Consider a small enough spatial part of O_{t1}. It is never a vague matter whether it is immanent-causality-related to a corresponding spatial part of O_{t2}. This relation is simply a physical fact that could, in principle, be observed in mark transmission. But it may be a vague matter whether the corresponding pairwise-causally-related spatial parts of O_{t1} and O_{t2} compose^s temporal parts of the same object. O may or may not survive a loss, acquisition, or scattering of spatial parts, but this has nothing to do with the question of what objects existing at t_2 (in a certain frame) are pairwise immanent-causality-related to what objects existing at t_1 (in that frame). Composition^d is never vague at the microlevel. The problem of vague-ness is quite orthogonal to composition^d.

Another way to put it is by saying that immanent causality relation at the macrolevel supervenes on such relation at the microlevel and composition[s]. Micro-immanent causality is fundamental and strictly governed by the laws of physics, whereas its macroscopic counterpart is derivative and may be loose (in Bishop Butler's sense) because, in the end, it owes its worth to an underlying theory of synchronic composition. Suppose two instantaneous temporal parts of Hudson, Hud_{t1} and Hud_{t2} are such that $t_2–t_1 \rightarrow 0$, Hud_{t1} has the t_1-part of a certain atom, and Hud_{t2} does not have any temporal part of that atom (cf. Hudson 2003, 19f). Does this prevent Hud_{t1} and Hud_{t2} from standing in the requisite immanent causality relation? I hope not, but explaining why goes beyond the scope of the present debate. All I am concerned with here is to draw correctly the genidentity lines of all the atoms even remotely involved in the scenario, and I can do it based on the objective causal relation between their temporal parts. And then, if you say that Hud_{t1} and Hud_{t2} are also causally related in a more course-grained sort of way, I will gladly agree but ask you to address any further questions to a theory explaining the composition[s] of Hud_{t1} and Hud_{t2}.

Yet another way to see that composition[d] and composition[s] are different issues that should be disentangled for the purpose of analysis (even though they naturally mix together to generate the familiar puzzle cases of identity over time), is to observe that the second issue does while the first one does not go away at the level of atoms or pointlike objects. Going back to Figure 3 from Balashov 2003 (this issue), subtract the 'depth' dimension of space and restrict attention to the one-dimensional array of material points AD persisting through time and filling the rectangle AEHD. One can still pose the same sorts of questions about what makes the series AE of temporal parts of the point-like object A— call this series Point—different from SlowPoint AE′ and FastPoint AE″. Getting clear on composition[d] still requires a 'striation of the spacetime manifold' (Reichenbach 1957, 271). But there are no 'orthogonal' concerns about composition[s] or vagueness at this level.

The reader who has managed to get this far must have noticed that, while the debate was prompted by Hudson's claim in the original paper (2002) that, assuming the doctrine of temporal parts and a sufficiently liberal view of composition, there are material objects that move faster than light, superluminal motion turns out, at the end of the day, to be but an accidental (even if deeply troubling) feature of some 'pseudo-objects'. The real problem with them—and with their seemingly less offending (but no more real!) partners such as SlowThread—is the lack of immanent-causality interconnectedness. Superluminal motion has simply revealed one symptom of the underlying disease. Other symptoms include the violation of universal physical laws, such as the laws of motion, electromagnetic laws, perhaps even conservation principles (cf. Balashov 2003, 11-12). 'Do we really challenge anything sacred in maintaining that there are various material objects in superluminal motion?'[5] asks Hudson (2003, 21).

> The common assumption that the relevant laws must govern all things material might owe a great deal to the fact that they govern those material objects we happen to care about and have familiar sortal terms for classifying and to our unfortunate tendency to let our interests and our language drive our ontology (ibid.).

I couldn't disagree more. The laws of physics mentioned above are truly universal: by their very nature, they apply to all physical objects without exception, and this, I believe, has nothing to do with any system of classification we may impose on the world. The laws are out there to be discovered. And the system is good only to the extent that it gets them right. We have every reason to think that natural science has already discovered some universal physical laws and given their approximate statements. The approximation is good enough to allow us to detect

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5 Or, it might be added, in maintaining that there are objects that are 'ill-behaved' in other respects?

obvious offenders. Consider such a putative offender, O*.[6] A strong realist about laws, such as myself, has a simple argument against its existence.[7] For all x, if x is a physical object, then x is subject to the universal law L (pick your favorite). O* violates L. Hence O* is not a physical object. Or so it seems to me.[8]

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6 In light of (R), instantaneous entities composed (in accordance with some plausible principle of synchronic composition, if any) by spatial parts located in the rest frame of their center of mass do not, of course, count as offenders.

7 By 'strong realism', I mean not simply the view that the laws of nature are, in some way, part of the furniture of the world but a stronger view that they are not reducible to unrestricted 'cosmic regularities', although they normally imply the latter. There are two major brands of such strong nomic realism on the market today, the relations-between-universals theory and the causal powers theory, of which I favor the latter. To be fair, I should follow Hudson's example and acknowledge that strong realism about laws is a genuinely controversial (but popular?) assumption. Could the advocate of the best Humean contender, the Mill-Ramsey-Lewis theory, resist my simple argument, by trading the simplicity of genuinely universal laws for the simplicity of the resulting total theory of the world? I think not, but I cannot pursue the matter here.

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