

# Temporal Parts and the Possibility of Change

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## 1. Change

Things change. If anything counts as a datum of metaphysics, that does. Change occurs in many ways: it can be accidental or substantial; essential or non-essential; intrinsic or extrinsic; subjective (a change in the knower) or objective (a change in the known). Changes can be physical, spatial, quantitative, qualitative, natural, artefactual, conceptual, linguistic. Events are arguably best defined as changes in an object or objects. All change is from something and into something, and hence is at least a two-term relation, involving a term from which and a term to which.

Although not every change requires the survival of the subject of the change, every change entails a change in something which itself survives the change.<sup>1</sup> Hence every substantial change entails a non-substantial change. For instance, a block of wood does not survive being burned to ashes, but carbon atoms survive the changes brought about in their chemical arrangement by the combustion. A statue does not survive being broken to pieces, but the

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<sup>1</sup> It is sometimes suggested that quantum theory allows for substantial changes out of and into nothing, such as the creation and annihilation of pairs of virtual particles, which by implication would not involve the survival of anything throughout either event. In reply, it must be pointed out (assuming that quantum theory is correct for the purpose of argument) that the quantum vacuum out of which and into which such particle pairs emerge and vanish is not a literal *nothing*. For instance, Barrow and Tipler say: "It is, of course, somewhat inappropriate to call the origin of a bubble Universe in a fluctuation of the vacuum 'creation *ex nihilo*', for the quantum mechanical vacuum state has a rich structure which resides in a previously existing substratum of space-time, either Minkowski or de Sitter space-time." (*The Anthropic Cosmological Principle* (Oxford: Clarendon Press, 1986), p. 441; cited in W.L. Craig and Q. Smith, *Theism, Atheism and Big Bang Cosmology* (Oxford: Clarendon Press, 1993), p. 155.) The cause of virtual particles may be indeterministic (licensed by the Uncertainty Principle), but there is still a physical cause consisting of the set of physically necessary and sufficient conditions for the particles' existence, including the persisting space-time structure itself. To say that nothing survives the emergence or vanishing of virtual particles is to read more into QM than is actually licensed by the theory. The quantum vacuum is not a genuine void.

matter constituting it survives the same change. Survival through change is at the bedrock of ontology. And yet one of the most common current theories of diachronic identity, viz. four-dimensionalism or the theory of temporal parts, appears to deny the very phenomenon of persistence through change. The irony in this is that not only is four-dimensionalism inconsistent with a fundamental metaphysical datum, but some of its most vocal proponents, as well as denying the inconsistency, insist that their theory actually *explains* the phenomenon of change. Quine has attributed the allegation that four-dimensionalists deny change to “the misgivings of unduly nervous folk who overestimate the power of words.”<sup>2</sup> The paternal reassurance, however comforting, is nevertheless unwarranted. For a closer examination of the debate will reveal why it is that the four-dimensionalist is mistaken in thinking that he can either explain change or countenance its very existence.

## 2. What is four-dimensionalism?

First, a brief statement of the four-dimensionalist ontology is necessary.<sup>3</sup> According to the four-dimensionalist, material objects should be thought of as existing in four-dimensional spacetime rather than as existing in three-dimensional space and persisting through the dimension of time. Just as spatial parts of objects are those portions of matter which occupy sub-regions of the spatial region occupied by the whole object, so temporal parts of objects are those material portions which “fill up a sub-region of the time filled by the whole.”<sup>4</sup>

Temporal parts are as much parts of an object as spatial parts—they are chunks of matter extended through time, as spatial parts are extended through space, and as such are really parts of the object rather than modes or attributes of the object or ways of speaking about the object. Each temporal part is itself a four-dimensional object, and is composed of infinitely many temporal parts and so on for those parts and their parts, in the same way that spatial

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<sup>2</sup> W.V. Quine, ‘Things and Their Place in Theories’, in his *Theories and Things* (Cambridge, Mass.: Harvard University Press, 1981), pp. 1-23, at p. 10.

<sup>3</sup> For recent work see M. Heller, *The Ontology of Physical Objects* (Cambridge: Cambridge University Press, 1990), and his ‘Temporal Parts of Four Dimensional Objects’, *Philosophical Studies* 46 (1984), pp. 323-34, and ‘Varieties of Four Dimensionalism’, *Australasian Journal of Philosophy* 71 (1993), pp 47-59. See also *The Monist* 83 (2000), devoted to temporal parts; and T. Sider, ‘Four-Dimensionalism’, *Philosophical Review* 106 (1997), pp. 197-231, as well as his book of the same name (New York: Oxford University Press, 2001). For a detailed examination and critique of the theory see D.S. Oderberg, *The Metaphysics of Identity over Time* (London/New York: Macmillan/St Martin’s Press, 1993).

<sup>4</sup> Heller, ‘Things Change’, *Philosophy and Phenomenological Research* 52 (1992), pp. 695-704, at 695. Strictly, given the way the four-dimensionalist makes use of spacetime, there can be no purely spatial or temporal parts of physical objects, only spatio-temporal parts. Nevertheless, we can speak of spatial or of temporal parts *tout court* in the sense of spatio-temporal parts thought of under their spatial or temporal aspects only.

parts are further composed of spatial parts. Again, temporal parts, as Mark Heller says, “are ontologically no more or less basic than the wholes that they compose.... We do not start with parts and somehow build extended wholes out of them; we start with filled regions of spacetime and then look to the relationships between those regions to discover the part-whole relationships between objects.”<sup>5</sup> In fact this remark may make it sound as though four-dimensional wholes are more basic than their parts, but the basicness is only supposed to be epistemic: we know the parts via their wholes, but the wholes are not built out of parts. On reflection, however, the four-dimensionalist ought to regard temporal wholes as *ontologically and logically* more basic than their parts in the sense in which spatial wholes are ontologically more basic than their parts: the part of an *x qua part* depends on the *x* inasmuch as the former, *qua part*, comes into existence by virtue of the coming into existence of the latter. What makes a wooden pole the handle of a broom, for example, is the existence of the broom in the first place. The priority is one in the order of logic, not in the order of being: it may be that broom and handle can only come into existence simultaneously, though of course the bit of wood which *becomes* a broom handle must as a rule exist before the broom comes into existence.<sup>6</sup> And it may be that no broom handle can exist without a broom, and no broom without a handle—but it is the broom’s *being a broom*, i.e., its *form*, which imparts to the wood constituting its handle the form of broom handle.

The same, it seems, should apply to four-dimensionalism. Indeed Heller’s statement that we begin with “filled regions of spacetime” conceals important distinctions. For it is plausible to think of four-dimensionalism in this way. We begin with an undifferentiated ‘block universe’ as the ontologically basic whole from which other wholes are derived, and with spacetime sub-regions or ‘chunks’ as the ontologically basic parts from which parts of the derived wholes are themselves derived. We also begin with a “liberal notion of physical object,”<sup>7</sup> covering “the material content of any portion of space-time, however irregular and discontinuous and heterogeneous.”<sup>8</sup> Of the myriad ways of ‘gerrymandering’ spacetime regions so as to constitute derived whole objects, some are synthesized in a way that we count as privileged—these differentiated wholes are the material objects of our world.<sup>9</sup> The sub-regions or chunks, by virtue of such synthesis, become differentiated temporal parts

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<sup>5</sup> ‘Things Change’, p. 696.

<sup>6</sup> The exception being if the broom had a previous handle which was replaced by another made of a new piece of wood, in which case the point would apply to the previous handle.

<sup>7</sup> W.V. Quine, ‘Things and their Place in Theories’, pp. 8-15; see also ‘Worlds Away’, pp. 124-8 of *Theories and Things*, at p. 125.

<sup>8</sup> ‘Things and their Place in Theories’, p. 10.

<sup>9</sup> Quine, ‘Worlds Away’; N. Goodman, *The Structure of Appearance* (Dordrecht: Reidel, 1977, 3<sup>rd</sup> ed. [1951]), pp. 93-5.

of those wholes. The principle of differentiation might be evolutionary (Quine and most naturalists<sup>10</sup>) or it might be socio-cultural (Wittgenstein, Goodman and the social constructivists<sup>11</sup>). If a picture like this is the most likely one for the four-dimensionalist, it turns out that whilst neither the undifferentiated temporal parts nor their block universe whole are more basic than the other, they both are ontologically basic relative to the derived wholes synthesized from them, whether physical objects liberally construed or the privileged objects of our world: the only change the undifferentiated temporal parts undergo when the wholes are synthesized in the privileged way is the acquisition of an identity as, for example, a part of a table or a part of a tree.

### 3. Temporal parts and the Indiscernibility of Identicals

One argument for temporal parts based on the fact of change appeals to the principle of the Indiscernibility of Identicals (PII) and has most recently been proposed by Heller.<sup>12</sup> (Let us use his example for convenience.) Heller when young—call him Little Markie—is beardless. Heller when older—call him Dr. Mark—is bearded. So it seems Little Markie and Dr. Mark differ in their properties, which according to PII means they must be distinct. But how can they be distinct, given that they are both identical with Heller himself, who was beardless and now is not? The answer, says the temporal part theorist, is that Little Markie and Dr. Mark are not strictly identical with Heller. Just as PII entails, they are distinct from each other, and their relation to Heller is that of being distinct temporal parts of him. Therefore Heller did indeed change, but only by virtue of his possessing temporal parts with distinct properties.

The argument is every bit as suspicious as it looks, depending as it does on equivocation over the meaning of ‘differ in property’ and over the proper formulation of the principle of the Indiscernibility of Identicals.<sup>13</sup> For there is no way of explaining how Little Markie and Dr. Mark differ in their properties without *presupposing* what the argument sets out to prove, namely that they are distinct objects. If Little Markie is beardless in 1971, why doesn’t Dr. Mark also have the property of being beardless in 1971? If Dr. Mark is bearded in 2001, why isn’t Little Markie bearded in 2001? Or, speaking in terms of tensed properties, we can ask why, if Dr. Mark was beardless, Little Markie also was not beardless, and why, if Dr. Mark is now

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<sup>10</sup> See the works by Quine already cited, but also especially ‘Identity, Ostension and Hypostasis’, in *From a Logical Point of View* (NY: Harper & Row, 1961, 2<sup>nd</sup> ed. [1953]), pp. 65-79.

<sup>11</sup> For Goodman, see *Ways of Worldmaking* (Hassocks: Harvester Press, 1978), and also *Of Mind and Other Matters* (Cambridge, Mass.: Harvard University Press, 1984), sec. II.

<sup>12</sup> ‘Things Change’.

<sup>13</sup> See Lawrence Lombard, ‘The Doctrine of Temporal Parts and the “No-Change” Objection’, *Philosophy and Phenomenological Research* 54 (1994), pp. 365-73.

bearded, Little Markie is not also now bearded. These claims can be blocked by presupposing that Little Markie and Dr. Mark are time-bound individuals, but that is precisely what the argument is supposed to prove.

Lawrence Lombard also suggests<sup>14</sup> that the claims can be blocked by supposing that an object can never lack a property it has at any time, a supposition which he says denies the possibility of change: Little Markie and Dr. Mark are discernible because the former, once beardless, is always beardless, and the latter, once bearded, is always bearded. But this is not a separate proposal, rather the presupposition in other terms that Little Markie and Dr. Mark are time-bound individuals, i.e., temporal parts. Little Markie, we can assume, was at one time toothless; if he can never lack that property, then he can never become toothful. But unless he is allowed by Lombard's suggestion<sup>15</sup> to have contradictory properties, which is incoherent, toothless Little Markie can never reach toothfulness, so his existence must cease before that point and another individual must possess teeth; in other words, Little Markie would be a time-bound individual, a temporal part.

This criticism of the use of the Indiscernibility of Identicals to prove diachronic distinctness is a dialectical one. We begin with the prima facie truth that Little Markie and Dr. Mark are identical over time and so indiscernible. Heller then asserts that they are in fact distinguishable, but it turns out that this claim presupposes their distinctness (as temporal parts), which is what he wants to prove. He might reply that the critic himself presupposes the identity of Little Markie and Dr. Mark as the reason for asserting their indistinguishability, so there is a stalemate. But all such a reply would show is that neither party can use PII as a reason for asserting diachronic identity or distinctness, on pain of circularity.

The larger moral of this failed attempt to use the Indiscernibility of Identicals to argue for the theory of temporal parts is that you cannot use the principle as a criterion, either ontic or epistemic, of identity over time. The correct ascription of properties to individuals whose diachronic identity we are judging *depends logically* upon the identity of those individuals in the first place. It is because young Abe is the same person as President Lincoln that we can say truly that President Lincoln has the property of being, say, five feet tall at the age of twelve, and Young Abe the property of being six feet tall at the age of twenty-five. Even if the theory of temporal parts were true, and both young Abe and President Lincoln were distinct stages of the four-dimensional spacetime worm called 'Abraham Lincoln', this would not be because they were discernible; rather, their discernibility would be underwritten by their being distinct objects. And speaking epistemically, we could not

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<sup>14</sup> Ibid., pp. 366-7.

<sup>15</sup> Which suggestion, it must be emphasized, Lombard rejects.

judge them to be distinct on the basis of an ascription of properties: such a judgment, as we have seen, could only be given a circular justification.

There is, of course, a sense in which Little Markie and Dr. Mark differ in their properties: Little Markie is beardless in 1971 and Dr. Mark is bearded in 2000; but this is quite simply the sense in which Heller has a property at one time that he lacks at another. That sort of discernibility does not license the inference that Little Markie and Dr. Mark are distinct individuals any more than that Heller is distinct from himself. And this leads us to the more fundamental criticism that Heller's appeal to PII is based on a formulation of the principle which is false. The principle of the Indiscernibility of Identicals must mention the possession by objects of the same property *at the same time*. In other words, for any two objects and any time, if the objects are numerically identical then they share all their properties at that time.<sup>16</sup> But it does not allow Heller to infer the distinctness of Little Markie and Dr. Mark because they differ with respect to having a beard at *distinct* times. The reason PII needs to be formulated in terms of the times at which properties are possessed, and hence the reason it is a basic metaphysical truth, is that it is entailed by the Law of Non-Contradiction. Stated in its traditional general form as applied to the realm of the concrete,<sup>17</sup> the law holds that nothing can both be and not be *at the same time and in the same respect*. An application of it is that no object can both possess a property and lack it at the same time and in the same respect. So if x and y are identical, i.e., the same object, that object x (y) cannot be F and not-F at the same time and in the same respect. So if x is F, then it (y) must be F, and vice versa.<sup>18</sup>

#### 4. The problem of temporary intrinsics

Kant was puzzled by the phenomenon of change, in particular by the “combination of contradictorily opposed predicates in one and the same object.”<sup>19</sup>

<sup>16</sup> See further Lombard, ‘The Doctrine of Temporal Parts’, pp. 367-8. Trenton Merricks, in his ‘Endurance and Indiscernibility’, *Journal of Philosophy* 91 (1994), pp. 165-84 at p. 168, uses the same argument, in slightly different form, to set up the same pseudo-problem. He too makes implicit use of the incorrect version of PII.

<sup>17</sup> It should be noted that the principle as stated applies only to the realm of the concrete. As applied to the abstract time is not a factor and the principle simply states that nothing can both be and not be in the same respect. When I say ‘Circles are not both round and not round’ it is not the simultaneous possession of contradictory properties that is at issue, but their *timeless* possession by the same object; though it is true we sometimes use the term ‘simultaneously’ in this context. (“Circles can’t be round and not round at the same time!”) The reason for the occasional usage of temporal language is: (i) we have in mind *particular concrete* instances of circles (for instance), for which it is as true as it is of any concrete object that they cannot have contradictory properties at the same time; or (ii) we are speaking loosely, using temporal language for what is really timeless.

<sup>18</sup> This claim does not appear susceptible of non-circular formal proof in first order logic, which already has extensionality built into it.

<sup>19</sup> Kant, *Critique of Pure Reason* A32/B48 (trans. N. Kemp Smith, London: Macmillan, 1933 p. 76).

Why, since the properties of being F and not-F are contradictory, is it not a contradiction to say that an object x changes from being F to being not-F? The answer, of course, has something to do with the fact that x has F and not-F at different times, and Kant says that if the representation of time “were not an a priori (inner) intuition, no concept, no matter what it might be, could render comprehensible the possibility of an alteration...”<sup>20</sup> Kant is right to bring time into the discussion, but it is hard to see why the comprehensibility of change requires time to be an a priori intuition rather than a necessary a posteriori property of persisting objects.

In any case, David Lewis echoes this puzzlement by stating the so-called ‘problem of temporary intrinsics’: how can an object x have the intrinsic property F at  $t_1$  and not-F at  $t_2$  and yet be wholly present at both times?<sup>21</sup> Now, although Michael Rea takes the problem as Lewis sees it simply to be the same problem, involving the indiscernibility of identicals, which was dissolved earlier,<sup>22</sup> Lewis does not state the problem in those terms. Rather, it appears that he is motivated by his prior ideological commitment to the ontological parallels, as he regards them, between space, time, and modality. In the case of modality, Lewis’s worry is a familiar one: how can an object x have property F in possible world  $w_1$  and not-F in world  $w_2$  and yet be wholly present in both worlds? Surely x cannot have contradictory properties and yet really be in two worlds (one of which might of course be the actual world). One might think this not to be a problem if x is not taken *really* to be in any world but the actual one, and this thought would be correct. But Lewis is committed for other reasons to the reality of non-actual worlds, and so *he* has the problem of accounting for x’s contradictory properties in two worlds both of which really contain x. That is indeed a metaphysical worry for him, which is one of the reasons he abandons the real presence of an object in distinct worlds in favour of counterpart theory, which holds that all objects are world-bound. That Lewis bases his argument for temporal parts<sup>23</sup> on the alleged parallel between space, time, and modality is clear from this passage:<sup>24</sup>

Endurance through time is analogous to the trans-world identity of common parts of overlapping worlds; perdurance through time is analogous to the ‘trans-world identity’, if we may call it that, of a transworld individual composed of distinct parts in non-overlapping worlds. Perdurance, which I favour for the temporal case, is closer to the counterpart theory which I favour

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<sup>20</sup> Kant, loc. cit.

<sup>21</sup> D. Lewis, *On the Plurality of Worlds* (Oxford: Blackwell, 1986), pp. 198-209.

<sup>22</sup> M. Rea, ‘Temporal Parts Unmotivated’, *Philosophical Review* 107 (1998), pp. 225-60, at 240-1.

<sup>23</sup> ‘Perdurance’, as he and Mark Johnston call it, mutilating the term’s original meaning (which is equivalent to what they as well as the opponents of temporal parts technically call ‘endurance’).

<sup>24</sup> *On the Plurality of Worlds*, p. 203.

for the modal case; the difference is that counterpart theory concentrates on the parts and ignores the trans-world individual composed of them.

Why, however, should we think there is a parallel problem in the case of properties possessed by an object at different times rather than at different worlds? Certainly there does not seem to be one. Kant may have been wrong about time as an inner intuition, but right about the need for time to explain change. What is problematic about asserting that it is precisely *because* *x* exists at different times that it is capable of possessing *F* and not-*F* at those respective times? The traditional formulation of the Law of Non-Contradiction given above surely captures the truth which explains Lewis's pseudo-problem.<sup>25</sup> Of course the Lewis-style reply is, 'But then why isn't an object's possessing contradictory accidental intrinsics explicable by its being in *different* worlds?' The rejoinder is that *for the Lewisian modal realist* it is logically impossible for *x* to be *F* and not-*F* in different worlds, not because this would entail *x*'s being *F* and not-*F* simultaneously (there are no spatio-temporal connections between worlds), but because it would entail *x*'s being *F* and not-*F* *timelessly*.<sup>26</sup> This is as much an impossibility as, say, a number's being both odd and even or an argument's being both valid and invalid. Hence for Lewis, given his version of modal realism, there is a genuine problem of accidental intrinsics, and his resort to the even more bizarre counterpart theory solves the problem—though at the cost of an absurd ontology. The moral of the story, then, is that we should not believe Lewis's version of modal realism, and hence refuse his commitment to the parallel between space, time, and modality which leads to the theory of temporal parts as the supposed solution to his pseudo-problem of temporary intrinsics.

### 5. The semantics of change

We have looked at two recent arguments for temporal parts from the phenomenon of change and found them both wanting: there is no problem gener-

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<sup>25</sup> It is important to be clear about the dialectic involved in Lewis's argument. His ostensible reason for adopting four-dimensionalism is that three-dimensionalist solutions to the problem of temporary intrinsics do not work (viz. relationalism about intrinsics, adverbialism about property possession, and presentism); and one can agree with him as far as *these* proposals are concerned. But were it not for his prior commitment to metaphysical parallels between time and modality, he ought to rest content with the assertion that, *metaphysically* speaking, there is no problem of temporary intrinsics since an object can be both *F* and not-*F* in virtue of being so *at different times*. Any residual concern would then be purely *semantic*, i.e., concern at whether there is a contradiction in asserting that an object is *F* at *t*<sub>1</sub> but not-*F* at *t*<sub>2</sub>; and a semantic concern needs a semantic solution, such as the one I propose (the ones which reflect one of the discredited three-dimensionalist metaphysical positions just mentioned being ipso facto flawed). It is Lewis's ideas about the parallel between time and modality which, however, militate against his being satisfied with this way of proceeding on the part of the three-dimensionalist.

<sup>26</sup> Leave aside the fact that *x* would also have to bilocate if worlds were spatiotemporally disjoint.

ated by the principle of the Indiscernibility of Identicals properly formulated; nor is there a problem analogous to Lewis's problem of accidental intrinsics unless we accept his version of modal realism. But this response might still be thought unsatisfying, since it does not say how or why it is metaphysically possible for an object to have contradictory properties at different times. Merely to say 'because the times are different' is not illuminating, one might think. On the other hand, it is hard to know what else the person puzzled by the phenomenon of change is asking for, if not perhaps a semantic account of change that does not entail contradiction. This is certainly a valid request which the endurantist (as, following recent terminology, I shall call the three-dimensionalist opponent of temporal parts) must respond to. In this section I will make some remarks about the solutions on offer,<sup>27</sup> and although a full semantics of change must wait for another occasion I will make a proposal in favour of the most neglected yet most acceptable account. One of the chief matters to bear in mind is that any semantic theory of change (like semantic accounts in general) has metaphysical implications, and so must be assessed in part on whether those implications are correct.

First, one might propose treating intrinsic properties as relations to times. The reason 'Bill is thin at  $t_1$ ' and 'Bill is fat at  $t_2$ ' are not contradictory is that they should be paraphrased as 'Bill is thin-at- $t_1$ ' and 'Bill is fat-at- $t_2$ '. Bill does not, on this paraphrase, possess contradictory properties. The price, however, is that the proposal denies the reality of intrinsic properties, properties that an object has solely in virtue of the way it itself is, and such a denial is false. Being square is not a relation to a time any more than it is a relation to a place, and yet the relationalist wants us to believe this evident falsehood.

Secondly, one might adopt the adverbial proposal<sup>28</sup> and assert that the *possession* by an object of an intrinsic property is modified by a time. 'Bill is thin at  $t_1$ ' and 'Bill is fat at  $t_2$ ' become, respectively, 'Bill is-at- $t_1$  thin' and 'Bill is-at- $t_2$  fat', or, on the alternative more awkward formulation, 'Bill is  $t_1$ ly thin' and 'Bill is  $t_2$ ly fat'. There is thus no contradiction between the propositions; contradiction only arises if Bill is both thin and fat in the same temporal way.

Now Merricks objects to the adverbial proposal on several grounds, but his discussion is obscure and somewhat strange. First, he says: "It would, however, be an advantage of a solution to the problem if it did not force one to deny that exemplifying complementary [contradictory] properties was

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<sup>27</sup> For recent discussion see: Trenton Merricks, 'Endurance and Indiscernibility', at pp. 167-71; Heller, 'Things Change', pp. 697-8; Rea, 'Temporal Parts Unmotivated', pp. 240-6. For the source of the debate see Lewis, 'On the Plurality of Worlds', pp. 198-209, and M. Johnston, 'Is There a Problem about Persistence?', *Aristotelian Society (Supp. Vol.)* 61 (1987), pp. 107-35.

<sup>28</sup> Johnston, 'Is There a Problem about Persistence?', and S. Haslinger, 'Endurance and Temporary Intrinsics', *Analysis* 49 (1989), pp. 119-25.

impossible.”<sup>29</sup> Then he states the following desideratum: “A solution should deny that it is possible for an object to exemplify complementary properties (for example, ‘being bent’ and ‘being not bent’).”<sup>30</sup> So not only, according to Merricks, should a solution not force one to assert the possibility of an object’s having contradictory properties, but it should force one to do the *opposite*, i.e., deny the very possibility. Surely, however, he does not *mean* to stipulate as a desideratum of the semantics of intrinsic change that a solution must deny the possibility of an object’s having contradictory properties? On the contrary, the desideratum must be that the solution *allow* the very possibility and *explain* it! In other words, the solution must allow the possibility of an object’s being F and not-F, and explain it by appeal to the times at which the properties are possessed.

So Merricks’s first point is absurdly wrong. His second is just plain wrong. He says:<sup>31</sup>

Solution I [relationalism] seeks to avoid the problem by denying that real change of the sort that seems to cause contradiction can occur (objects cannot lose properties like ‘being-bent-at-*t*’ or cease to stand in the ‘bent at’ relation to *t*). Likewise with adverbialism: if I have an intrinsic property in any way, then the fact that I have that property, in that way, can never change. Once *tly* bent, always *tly* bent. The possibility of such change is, I think, something worth preserving.

The second point seems to be that the relational and adverbial solutions both deny the possibility of intrinsic change, and this looks like the very opposite objection to the first point: first Merricks says that a solution should *deny* the possibility of possessing contradictory properties, and then he implies that it should not! Or maybe Merricks’s first point is solely that a solution should not allow contradictory properties to be possessed at the same time—but how does the adverbialist allow that? On the contrary, the adverbial proposal, by temporally modifying property possession, specifically claims that it *would* be a contradiction were *x* to be *t*<sub>1</sub>*ly* F and *t*<sub>1</sub>*ly* not-F. It would not be a contradiction for *x* to be *t*<sub>1</sub>*ly* F and *t*<sub>2</sub>*ly* not-F, and the absurdity of Merricks’s first point highlights the need to allow just such a state of affairs (though we need not put it in adverbial terms). Similarly, how do the relational or adverbial proposals deny real change as a means of avoiding contradiction? On the relational view, there is no contradiction between *x*’s being F-at-*t*<sub>1</sub> and not-F-at-*t*<sub>2</sub> because these are not contradictory properties, not because there is no real change. On the adverbial view, there is no contradiction because the admittedly contradictory properties are not possessed in the same way. Merricks says: “Once *tly* bent, always *tly* bent,”<sup>32</sup> as though this

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<sup>29</sup> Merricks, ‘Endurance and Indiscernibility’, p. 169.

<sup>30</sup> Merricks, loc. cit.

<sup>31</sup> Merricks, loc. cit.

<sup>32</sup> Merricks, loc. cit.

meant a denial of change. Read in one way this statement is false: *x* might be *tly* bent but if it is *t<sub>1</sub>ly* not-bent ( $t_1 > t$ ) it is not *tly* bent, though it *was tly* bent. One might, however, read the statement tenselessly; but, this reading no more involves a denial of change than the adoption of tenseless language generally does so: *x*'s being tenselessly *F* at  $t_1$  and not-*F* at  $t_2$  is consistent with *x*'s having changed properties from  $t_1$  to  $t_2$  (unless one adopts along with the tenseless interpretation a thoroughgoing B-theory of time).<sup>33</sup> Merricks's problem, then, is hard to discern.

He is perhaps on stronger ground when he poses a dilemma for the relational and adverbial proposals. On one horn, they get the order of explanation the wrong way around by seeking to explain 'being *F*' in terms of 'being *F-at-t*' or 'being *tly F*'. On the other, they deny what he calls the having 'simpliciter' of properties. Yet both implications look decidedly implausible. If you want to give a relational analysis of the possession of colour properties, you cannot do it by crudely seeking to explain 'being green' in terms of 'being green for an observer'. And you cannot explain, say, 'S runs' in terms of 'S runs quickly', so why think it is possible to explain '*x* is green' in terms of '*x* is *tly* green'? Merricks calls such properties 'esoteric', but it is more than that—they are metaphysically dubious, and our semantics for change should reflect metaphysical truth. If we are to treat the possession of properties at times as an adverbial matter, should we treat their possession at places as adverbial? Analogies between space and time are by no means always justified, as the very approach to change being defended here will suggest,<sup>34</sup> but we are on safe ground when we assert that if possession of a property at a place is not a mode of property possession—as it does not appear to be—then neither is possession at a time.

What Merricks does not mention, however, is the problem of temporal adverb dropping. Johnston says the adverbialist refuses to have a general rule for the dropping of temporal adverbs.<sup>35</sup> From '*x* is *t<sub>1</sub>ly F* and *x* is *t<sub>2</sub>ly* not-*F*' we are not semantically licensed to infer '*x* is *F* and *x* is not-*F*'. But he does not tell us why there is no such rule. The short answer is that the adverbialist

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<sup>33</sup> In other words, one might adopt, along with a tenseless *reading* of the relevant propositions, a *metaphysical* B-theory of time according to which there is no temporal becoming, no real flow of time (though there may still be *direction* or arrow of time), and hence no real change. The step from this to a view of the universe as a space-time block containing four-dimensional worms made up of temporal parts is a short one. Indeed B-theorists who do not believe in temporal parts are a rare breed (if not a null class): one can easily see from the earlier sketch of four-dimensionalism how the B-theory and temporal parts are made for each other.

<sup>34</sup> See further *The Metaphysics of Identity over Time*, pp. 93-103, where it is shown that spatial-temporal analogies drawn for the purpose of arguing for temporal parts fail because they presuppose the existence of temporal parts in order to generate the analogies in the first place.

<sup>35</sup> 'Is There a Problem about Persistence?', p. 128.

wants to avoid contradiction; but the problem is that adverb dropping is hardly uncommon.<sup>36</sup> On the contrary, it is a commonplace. From

(1) John runs quickly

we can infer

(2) John runs.

It is in fact rare not to be allowed such an inference. There is of course the illegitimate move from

(3) John runs quickly but does not run willingly

to

(4) John runs but does not run

but this is not analogous to

(5) John is  $t_1$ ly happy and John is  $t_2$ ly not happy

since one must avoid confusing internal and external negation. From

(6) John willingly does not run

we can infer

(7) John does not run.

In (6) the negation is internal: the willingness modifies the non-running (the refraining from running).<sup>37</sup> But from

(8) John does not run willingly

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<sup>36</sup> Johnston (at p. 128) concedes that “[i]n ordinary parlance we tend to drop temporal adverbs when we are reporting the present properties of things,” and wonders whether this is a source of the idea that having a property is really having it now. But he fails to recognize that we can drop temporal adverbs when we are reporting non-present properties of things, e.g. moving from ‘John ran on Wednesday’ to ‘John ran’. The source of the idea that the present is the default time of speaking is that it is the default time of importance when making judgments.

<sup>37</sup> On a predicate modifier account of adverbs we would have something like W~Rj, from which follows ~Rj according to standard rules of adverbial elimination. (For a brief statement of the syntax see B. Taylor, *Modes of Occurrence* (Oxford: Blackwell, 1985), pp. 13-15.) On a Davidsonian account, since there is only sentential negation in first order logic, we would have to have a predicate of events like ‘...is a non-running’ or ‘...is an omission to run’. This would give us, for example, (Ee’)(Ne’ & By(e’j) & We’), from which follows (Ee’)(Ne’ & By(e’j)).

we cannot infer

(9) John does not run

since in (8) the negation is external: 'It is not the case that John runs willingly' does not entail 'It is not the case that John runs'.<sup>38</sup> But in

(5a) John is  $t_2$ ly not happy

the negation has to be read internally, since we are talking about contradictory properties, viz. happiness and non-happiness<sup>39</sup>—so why can't we analogously infer

(5!) John is happy and John is not happy?

We need a reason for going against the general rule allowing adverb dropping by not allowing temporal adverb dropping.

There is also, of course, the typical case of the illegitimate move from 'John is allegedly a thief' to 'John is a thief', or 'John is possibly a genius' to 'John is a genius'; but the reason these moves are not allowed is because they involve opaque constructions whose paraphrase is: 'It is alleged that John is a thief', or 'It is possible that John is a genius' (or in the latter case a *de re* construction which equally does not allow dropping of the modal operator). In other words, being allegedly an F or possibly an F are not *modes* of being an F. And this is where an alternative to adverbialism suggests itself, one that does give a principled reason for not allowing the derivation of a contradiction in the case of intrinsic change. The proposal, which has received very little attention,<sup>40</sup> is to treat expressions of the form 'at  $t$ ' as non-truth-functional operators on closed sentences—I call this the *sententialist* solution.<sup>41</sup> Just as 'Possibly  $x$  is F' does not entail ' $x$  is F', so '(At  $t$ )  $x$  is F' does not entail ' $x$  is F'. Hence from '(At  $t_1$ )  $x$  is F and (At  $t_2$ )  $x$  is not-F' we cannot infer ' $x$  is F and  $x$  is not F'. The reason we cannot get ' $x$  is F' from

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<sup>38</sup> On the predicate modifier account,  $\sim WRj$  does not entail  $\sim Rj$ . On the Davidsonian account,  $\sim(Ee')(Re' \ \& \ By(e',j) \ \& \ We')$  does not entail  $\sim(Ee')(Re' \ \& \ By(e',j))$ .

<sup>39</sup> The external reading of (5a), viz. 'It is not the case that John is  $t_2$ ly happy', on usual conversational understanding is taken as equivalent to the internal reading, but of course it is not strictly equivalent since the external reading can be true when John does not  $t_2$ ly exist whereas the internal reading cannot.

<sup>40</sup> See e.g. Heller, 'Things Change', p. 698, where he notes without further comment that one may "treat time as an operator working on the predicative sentence." See also *The Metaphysics of Identity over Time*, p. 153 (where the proposal is suggested), and G. Myro, 'Identity and Time', in R. Grandy and R. Warner (eds.), *Philosophical Grounds of Rationality* (Oxford: Clarendon Press, 1986), pp. 383-409, where temporal sentential operators are employed for the defence of a system allowing contingent identity but without examination of the sorts of problem discussed in the present paper.

<sup>41</sup> What follows is an outline: the details must await another occasion.

‘(At t) x is F’ is that we would need the extra conjunct ‘t = now’, and in so saying we can endorse the claim by Merricks that the only properties an object has are the ones it has now.<sup>42</sup> That is precisely why we judge ‘x is F and x is not-F’ to be a contradiction, as we supply the missing ‘now’ and take the sentence to express the proposition that an object has contradictory properties *at the same time* (and in the same respect).<sup>43</sup> (Compare the sentence ‘At some place p, x is F’, from which we can (and do) infer ‘x is F’ because of the implicit temporal restriction of such a sentence to the present. On the other hand, ‘(At p<sub>1</sub>) x is F and (At p<sub>2</sub>) x is not-F’ does not allow us to infer the contradiction because the implicit prohibition on bilocation means that each conjunct is restricted to a different time; and so the rule against dropping the temporal operator applies.<sup>44</sup>)

It is instructive for endurantists to see the advantage of sententialism in terms of simplicity and elegance over the convoluted solution proposed by Merricks.<sup>45</sup> He claims that the semantic unit that needs to be accounted for in an expression such as ‘x at t is F’ is ‘x at t’, and so he then has to show how ‘x at t’ need not be construed as referring to a temporal part ‘x-at-t’. This takes him into an unnecessarily complicated descriptive analysis of ‘x at t’ leading finally to the proposal that ‘x at t is F’ is equivalent to ‘x exists at t and is F’, which in turn is equivalent to ‘When t is present, x is F’.<sup>46</sup> Now the endurantist can happily accept Merricks’ assertion that the only properties an object has are the ones it has now, whilst at the same time rejecting his semantic proposal as confused and confusing. Take the first equivalence. Merricks tells us: “My exemplifying ‘being *F* at *t*’ does not imply I exemplify ‘being *F*’, for *t* may not be present. My being *F* at *t*, therefore, is compatible with my being not *F*.”<sup>47</sup> Now the sententialist ought to agree with this thought, but how does Merricks’s semantic proposal disallow the inference? If ‘x at t is F’ is equivalent to ‘x exists at t and is F’, then it is equivalent to ‘x exists at t and x is F’, and so by conjunction elimination we can infer ‘x is

<sup>42</sup> ‘Endurance and Indiscernibility’, p. 178.

<sup>43</sup> See note 17.

<sup>44</sup> Of course, if one of the conjuncts were restricted to the present one could drop the temporal operator for that conjunct but not for the other: ‘(At p, t)(John is happy & p=Paris & t=now) & (At p<sub>1</sub>, t<sub>1</sub>)(John is not happy and p<sub>1</sub>=Paris)’ allows one to replace the left conjunct with ‘John is happy’ but not the right one with ‘John is not happy’.

<sup>45</sup> ‘Endurance and Indiscernibility’, pp. 175-80.

<sup>46</sup> *Ibid.*, pp. 178-9. In *The Metaphysics of Identity over Time*, ch.2, I also allow that expressions of the form ‘the x at t’ can have a semantic value, but as singular terms (not Russellian incomplete symbols) referring to persisting objects existing at (over) times. This was said in the context of giving a non-metalinguistic and non-Fregean interpretation of identity statements with distinct singular terms. It is consistent with the sentential operator solution to the problem of temporary intrinsics on the condition that there are rules for translating one kind of expression into another. The ontology underlying and unifying both is simply the ontology that takes every object to be necessarily self-identical.

<sup>47</sup> *Ibid.*, p. 177.

F'! In which case from 'x at t<sub>1</sub> is F and x at t<sub>2</sub> is not-F' we can, on his analysis, still draw the contradictory conclusion 'x is F and x is not-F'. Furthermore, since his account explains 'x at t is F' in terms of 'x at t exists and is F', we end up with the unfortunate situation, taking 'exists' for 'is F', that 'x at t exists' has to be analysed as 'x at t exists and exists', which barely makes sense. Indeed the whole analysis threatens to be circular or incomplete (perhaps both). Circularity threatens because having an arbitrary property at a time is defined in terms of having the particular property of existence at a time.<sup>48</sup> Incompleteness threatens because if, as Merricks allows, 'x exists at t' is interchangeable with 'x at t exists', the descriptive analysis of 'x at t' in 'x at t is F' leads to 'x exists at t and is F', but this is just the same as 'x at t exists and is F', and so 'x at t' remains unanalysed after all. To be sure, Merricks may want to make a syntactic distinction between 'x at t exists' and 'x exists at t' but he gives us no guidance on the matter, leaving open the conclusion that if one is going to use first order logic to analyse natural language propositions, one had better, at some point, leave hybrid formulations aside and put one's first order cards on the table, showing exactly *how* temporal expressions like 'at t' function in a sentence.

Now we also have the second equivalence, between 'x at t is F' and 'When t is present, x is F'. Unhappily, however, Merricks asserts that we can rely on our "intuitive understanding"<sup>49</sup> of such propositions, and he gives only a partial, negative analysis: they are not to be understood as material conditionals, subjunctive conditionals, or entailments. So what are they—are they unanalyzable? (Having an intuitive understanding of a proposition does not preclude its having an analysis, though Merricks does not tell us how things are for his proposal.) Presumably 'When t is present, x is F' does not allow us to infer 'x is F' because 'x at t is F' does not imply 'x is F'. But we are given no guidance as to the structure of 'When t is present, x is F' so as to elucidate why this is so. Indeed the few remarks that are made suggest the opposite. Merricks tells us "I exist at 1983, because when 1983 was present, I existed."<sup>50</sup> (Immediately we see how his account is complicated by the introduction of tensed sentences.) So it is true that when 1983 was present, Merricks existed. But why can't we infer that Merricks existed? It is both true and appears to follow from the prior proposition. And yet this seems to conflict with the stipulation that 'When t is present, x is F' does not entail 'x is

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<sup>48</sup> Let us go along with Merricks in treating *existence* as a property. It is hard to see how he could deny this, given that he explicitly asserts that *existence at a time* is a property and is defined in terms of *existence* (ibid., p. 176). It is possible, as he says, for x to exist without existing at t; but it is impossible to exist at t without existing simpliciter since the former is defined in terms of the latter. If the former is a property, as he claims, how can the latter not be? The onus is on Merricks to explain why not.

<sup>49</sup> Ibid., p. 177, n.16.

<sup>50</sup> Ibid., p. 176.

F': Merricks formulates his account using all the tenses indifferently, so if he wants to make a distinction between 'When t is present, x is F' on the one hand, and the same sentence with 'is' replaced by 'was' or 'will be' on the other, he needs to explain how this works. We also are not told whether, from 'When t is present, x is F', and 't is present', we can infer 'x is F'. We ought to be able to, and yet we are enjoined not to treat 'When t is present, x is F' as any sort of conditional! In short, Merricks's semantic proposal is ill thought-out and obscure.

Sententialism, on the other hand, suffers from no such obscurity and takes on board some of the requirements of endurantism as suggested by Merricks. First, it shows clearly how having properties at times is explicable in terms of having properties simpliciter: we start with sentences of the form 'x is F' and attach non-truth-functional temporal operators to them. Secondly, it shows how statements of identity simpliciter, synchronic identity and diachronic identity are all statements of identity, but with different contents. Merricks is right to highlight this desideratum, but his own proposal does not do it justice. For 'x at  $t_1$  is identical to x at  $t_2$ ' comes out as: 'x exists at  $t_1$  and x exists at  $t_2$  and  $x=x$ '. But all this tells us is that an object exists at two times and has the necessary property of self-identity: it conjoins certain facts without bringing them together in a way that is ontologically satisfying as far as describing persistence is concerned. Sententialism, however, can do better. As well as expressions such as 'At t' it proposes expressions such as 'From  $t_1$  to  $t_2$ ', and so the statement of diachronic identity comes out as: '(From  $t_1$  to  $t_2$ ) $x=x$ '. This captures the same insight that Merricks's proposal emphasizes, namely that diachronic identity is just identity, and identity is what everything has to itself; but it ties that very self-identity, in the case of persistence, to a temporal interval over which it holds, rather than leaving it as a semi-detached conjunct following upon a statement of existence. Thus the ontological tie between identity as self-identity and identity as persistence is mirrored in the semantics. (The same goes for identity statements involving distinct names, both diachronic and synchronic.) Thirdly, Merricks is too strict in requiring a solution to the problem of change to follow directly from an account of endurance. Indeed it is probably this stipulation that leads him into such obscurity and needless complexity by causing him to insist that 'x at t' is a proper syntactic part of a sentence and so must have its own semantic value (viz. the x that exists at t). All we (as endurantists) need from our semantics of change is that it be consistent with the phenomenon of endurance (hence exclude singular terms for temporal parts of persisting objects and any other expressions that undermine the endurantist ontology, such as time-indexed predicates), and that it not issue in contradiction. Sententialism cannot be 'read off' the ontology of endurance—but it makes room for it, which is good enough.

## 6. Temporal part theory does not allow change

The theory of temporal parts, then, derives no support from the use of the principle of the Indiscernibility of Identicals, nor from David Lewis's argument based on the alleged analogy between space, time, and modality. Secondly, there is another way, metaphysically innocent, to prevent the derivation of contradiction from statements of change. But we can go further and argue that the theory of temporal parts, invoked as it is to *explain* change, in fact denies it altogether.

The three-dimensionalist/endurantist takes seriously the ontological implications of a remark such as that by Peirce:<sup>51</sup> "Phillip is drunk and Phillip is sober would be absurd, did not time make the Phillip of this morning another Phillip than the Phillip of last night." What this means is that, for the temporal part theorist, change is actually a kind of *replacement* of one thing by another, one temporal part which is F by another which is not-F; there is not, literally, one single thing which is both F and not F. And this, says the endurantist, means the denial of change.

Heller denies that his theory is a replacement theory, saying:<sup>52</sup> "I am not composed of a series of short-lived people; I am composed of bits of matter that fill sub-regions of the region of spacetime that I fill. The correct picture is not one of people being replaced by other people, but rather one of a physical object filling all of its boundaries." Now some endurantists have put forward specious arguments for the charge that temporal part theorists deny change, and it is well to deal with these before seeing why the charge really does stick. Lombard, for instance, takes the following approach. If, he argues, Heller had died at the age of ten, he would have had the life-span of Little Markie; i.e., he would have had the exact temporal boundaries of Little Markie. So he would have *been* Little Markie. But then Little Markie must be a person in his own right. In which case "the 'cinematographic' and 'near doppelganger' caricatures of DTP's [Doctrine of Temporal Parts] account of change are really quite apt."<sup>53</sup>

Van Inwagen has a related objection.<sup>54</sup> Descartes's largest temporal part is his 54 year-old one, the one which has his exact life-span as its own length. But Descartes, says van Inwagen, just *is* his largest temporal part, which is the sum of all the smaller ones. Temporal parts, however, cannot have different boundaries from the ones they do have.<sup>55</sup> So Descartes, being his maxi-

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<sup>51</sup> C.S. Peirce, *Collected Papers*, vol. I (Cambridge, Mass.: Harvard University Press, 1931), 1.494. The sentence is quoted by Chisholm in *Person and Object* (Oxford: George Allen & Unwin, 1976), p. 141, and repeated by Merricks, 'Endurance and Indiscernibility', p. 167.

<sup>52</sup> 'Things Change', p. 700.

<sup>53</sup> Lombard, 'The Doctrine of Temporal Parts and the "No-Change" Objection', p. 370.

<sup>54</sup> P. van Inwagen, 'Four-Dimensional Objects', *Noûs* 24 (1990), pp. 245-255, at p. 253.

<sup>55</sup> The notion of part appealed to here is that of *geometrical* as opposed to *physical* part, though not quite in the sense defined by E.J. Lowe in 'Substance, Identity and Time',

mal temporal part, could not have been older or younger than he actually is; which is absurd. The only alternative is to say that Descartes is his maximal temporal part in the actual world, but since he might have died at twenty (his biography being exactly the same but for the premature death), he is his twenty-year-long temporal part in some possible world. But since his maximal temporal part (in the actual world) and his twenty-year-long temporal part (in the actual world) are distinct, how could Descartes be identical with the former in one world and the latter in another? This would violate the necessity of identity, as well as the necessity of distinctness (which entails that an object which is distinct from another in one world is distinct from it in all worlds), as well as the (modalized) transitivity of identity.

The flaw in the related objections of Lombard and van Inwagen is that they both assume the relation between an object and its maximal temporal part must be one of strict identity (“what could the relation between them be but identity?”<sup>56</sup>), and yet one might assert that the relation is not one of identity but of *constitution*. Two things can have the same temporal extent and yet not be identical—a statue and a lump of bronze, for instance—as long as their identity conditions differ (the statue’s being governed primarily by its shape and the disposition of its parts, the lump of bronze’s by its matter and quantity). Descartes may be constituted by his maximal temporal part in the actual world and yet be distinct from it because he might have existed for longer than his actual maximal temporal part (54 years), in which case they would both have existed in some world; or he might have existed for shorter than his actual maximal temporal part, in which case he would have existed in some world in which it did not.

It might be objected that the statue analogy is false: whereas Descartes’s maximal temporal part is putatively a *part* of him, the lump of bronze is not a part of the statue and so may constitute it without violating the mereological principle that improper parthood is identity. By contrast, to suppose that Descartes’s maximal temporal part *constitutes* him is to imply that his improper temporal part is not identical with himself. In reply, it should first be questioned whether the lump of bronze is not a literal part of the statue: after all, if some arbitrary non-maximal lump of bronze is a proper part of the

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*Aristotelian Society Supp. Vol. 62* (1988), pp. 61-78. Temporal parts are defined by their temporal boundaries, and so are geometrically (or quantitatively) stipulated. Spatial parts can be geometrical—e.g. the four-inch square bit of wood at the left front corner of my desk—or physical—e.g. my desk’s left front leg. The difference between my characterization and Lowe’s, however, is that for Lowe a geometrical part survives a complete replacement of its matter—the four-inch square part of the left front corner of the desk remains the same part even if the matter of the desk is wholly rearranged. In other words, for Lowe a geometrical part is a *purely geometrical region*, whereas what I am calling a geometrical, or better geometrically-defined, part, is a particular lump of matter defined by its spatial boundaries.

<sup>56</sup> Van Inwagen, ‘Four-Dimensional Objects’, p. 253.

statue—as we should assert—then by what right is the entire lump not a part, albeit improper?<sup>57</sup> And since the improper part is *not* identical with the statue, we have at least a precedent for claiming that Descartes’s maximal improper temporal part need not be considered to be numerically identical with him.

Secondly, although the caveat must always be entered that spatial-temporal analogies are fraught with danger, there seems in this case to be a reductio of Lombard/van Inwagen-style objections based on an analogy with the spatial case. For consider van Inwagen’s objection recast in the spatial mode: Descartes’s largest spatial part is the one that consists of all of his matter at a given time, i.e., the one that has his exact spatial dimensions as its own. But Descartes, says the objector, just *is* his largest spatial part, which is the sum of all the smaller ones. Spatial parts, however (and remember that we are again speaking of geometrically defined parts, not physical or functional or otherwise-defined parts), cannot have different dimensions from the ones they do have. So Descartes, being his maximal spatial part, could not have been bigger or smaller than he actually is; which is absurd. The only alternative is to say that Descartes is his maximal spatial part in the actual world, but since he might have been a foot shorter than he is, he is in some possible world the maximal spatial part in that world which has the dimensions of the one in the actual world but for being one foot shorter. But since these spatial parts are distinct, how could he be identical with the former in one and the latter in another? This would violate, again, the necessity and transitivity of identity.

It is hard to see why the principles van Inwagen applies to the case of temporal parts to generate a repugnant conclusion do not carry over to the case of spatial parts: and yet we do *not* want to say that material objects lack spatial parts! What we may claim, though,<sup>58</sup> is that the maximal spatial part of an object constitutes but is not identical to the whole, and that the same

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<sup>57</sup> It might be objected that a non-maximal lump of bronze is not a proper part of the statue but of the entire lump of bronze that constitutes the statue; unlike the statue’s arms, legs, etc., which *are* its proper parts. But it is hard to see why the attribution of parthood in respect of the statue is legitimate in one case but not the other. To be sure, there is a distinction between what might loosely be called ‘functional’ parts, such as arms and legs, and purely material parts, such as a particular lump of bronze defined geometrically (e.g. the lump that is identical with the top six inches of the right arm). Yet if parthood is transitive, as mereologists generally accept (which is not to say that mereological axioms cannot be challenged, as indicated in the above discussion), how could we not concede that the said material part is a proper part of the *statue* given that it is a proper part of the arm and the arm is a proper part of the statue?

<sup>58</sup> Assuming we do not want to go down the route—unacceptable both to van Inwagen and to the present writer—of countenancing contingent identity to ‘solve’ the problem, and assuming also that geometrically defined spatial and temporal parts (including maximal spatial parts) have their dimensions essentially. Denial of the latter would avoid van Inwagen’s objection, but such a denial is ruled out by the very definition of a geometrical part.

would be true of the maximal temporal part of an object *if* objects had temporal parts, something both van Inwagen and I deny. What this means, however, is that there is reason to reconsider the classical mereological axiom that every part of an object is either a proper part of or identical to that object.

One of the thoughts generating the above misplaced objections is that the temporal parts of an object of kind F would themselves have to be short-lived Fs. Although there is no need to explore the question here, one reason for rejecting the thought is as follows. The constitution proposal implies the existence of coincident entities—Descartes would actually be coincident with his 54-year-long temporal part, but might have been coincident with his two-year-long temporal part in a world in which it was maximal. But if temporal parts of persons are supposed to be themselves persons, the four-dimensionalist would have to allow the coincidence of persons, as well as of other substances of the same kind. And this is a possibility we should not countenance.<sup>59</sup> (Perhaps the only way the four-dimensionalist can avoid coincident entities short of denying modal ductility—the idea that Descartes, say, *could* have existed in another world—and adopting counterpart theory, would be to deny the existence of temporal parts other than maximal ones and instantaneous ones. In that way, Descartes would exist in a world in which he died aged two, but there would be no two-year-long part, existing in either the actual world or that possible world, which Descartes had putatively become. Needless to say the stipulation looks ad hoc, if not downright implausible given the likely impossibility of reducing all properties to those possessed by instantaneous objects (whatever reality there may even be to an instantaneous object!).)<sup>60</sup>

Modal questions aside, the temporal part sceptic's charge stands on its own: four-dimensionalism is a replacement theory—by its lights no *x* literally changes because its apparently contradictory properties are possessed by distinct objects. Heller's reply to the charge is that on temporal part theory, at least as he formulates it, there are still objects which survive change. An object *x* exists at *t* if it has a temporal part at *t*; so even if there are temporal parts  $\tau_1(x)$  and  $\tau_2(x)$  which are F and not-F at  $t_1$  and  $t_2$  respectively, this is consistent with there being *x* at  $t_1$  and *x* at  $t_2$  and *x*'s being F at  $t_1$  and not-F at  $t_2$ . So there are still objects which change, i.e., which survive change. So what is the problem? Lombard's rejoinder is that if this is how the four-dimensionalist understands his position, then the theory does not do the explanatory work for which it is designed, namely to explain change: "But since, according to the opponents of DTP, a truly persisting thing (i.e., a

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<sup>59</sup> See D.S. Oderberg, 'Coincidence under a Sortal', *Philosophical Review* 105 (1996), pp. 145-171, where the case of persons in particular is discussed at length.

<sup>60</sup> Heller notes the possible move with disturbing equanimity: 'Varieties of Four Dimensionalism', p. 55.

thing without temporal parts) exists *simpliciter* whenever Heller would say that that thing, construed as composed of temporal parts, exists in the temporally neutral sense, we can see that Heller is simply endorsing the *ordinary* account of change and survival that the opponents of DTP have always advocated and that proponents of DTP, including Heller, believe to be problematic.”<sup>61</sup> Supplementing the ordinary account of change with temporal part theory, by saying that a thing survives change in virtue of having parts which do not, says Lombard, is not explanatory of that change.

Yet it is difficult to see the force of Lombard’s point. At the risk of putting words into the four-dimensionalist’s mouth, why can he not regard talk of an object’s changing as true but at the same time as a *façon de parler* which is explained by the metaphysical truth of four-dimensionalism: ‘Yes, objects change, but what this *really* means...’? On the other hand, suppose the four-dimensionalist who is committed to the reality of change were to resile from this unsolicited assistance. Maybe he wants to say that objects do, literally, change. On what basis? Consider this claim: the needle is sharp in virtue of its having a sharp point. The point really is sharp, and the needle really is sharp, but the latter truth is *explained* by the former. Analogously, why can’t the four-dimensionalist say that objects literally change, even though it is their parts that really possess the contradictory properties?

The analogy is suggestive; but what it suggests is that if the temporal part sceptic is to demonstrate the unreality of change inherent in four-dimensionalism, he needs to dig deeper into the metaphysics of change. Let us bring in the spatial analogy, of which the four-dimensionalist is so enamoured.<sup>62</sup> If time really is to be spatialized, as the temporal part theorist wants it to be,<sup>63</sup> and if, as Heller says, there is real change through time, would he agree that there is real change through space? This pole is green at the top and red at the bottom. So is it green and red? In one sense yes, but obviously neither wholly green nor wholly red. It is partially green and partially red, i.e., green and red *only* in virtue of its parts. If the spatial analogy is to be taken seriously, then the four-dimensionalist must say that in the case of putative change the object *x* is only partially *F* and partially not-*F*, where the

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<sup>61</sup> ‘The Doctrine of Temporal Parts...’, p. 371.

<sup>62</sup> That Heller is as committed to the analogy as other four-dimensionalists is shown by various remarks, for example his claim that “a very minimal form of four dimensionalism” requires “that persisting objects extend over time *in the same way* that they extend over space [emphasis added]”: ‘Varieties of Four Dimensionalism’, p. 49.

<sup>63</sup> In Minkowskian spacetime geometry the time co-ordinate is treated differently from the three spatial co-ordinates, but the four-dimensionalist nevertheless takes to heart Minkowski’s famous remark in his 1908 address to German scientists in Cologne: “Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.” (Quotation from G.J. Whitrow, *The Nature of Time* (New York: Holt, Rinehart and Winston, 1972), p. 124.)

partialness refers to the temporal dimension. But the endurantist does not countenance this as genuine change: he says that genuine change involves an object's being wholly F and wholly not-F at different times, in the sense of being wholly present at  $t_1$  and being F, and being wholly present at  $t_2$  and being not-F; and this is precisely what the temporal part theorist denies. So Heller can talk about an object's really having a property at one time and lacking it at another, but that is not the whole story: the whole story excludes precisely the phenomenon of real change that his opponent affirms. So Heller countenances something which he calls 'change', but only by changing the subject.<sup>64</sup>

But why *isn't* what he calls change a real kind of change, even if it is not what the endurantist calls change? Well, to return to the green and red pole: does its being green at the top and red at the bottom constitute a kind of change? No. The best one can say is that the pole really is green here and red there, i.e., it has a property at one place which it lacks at another. But this simply is not all there is to change. Change is not about the mere having and lacking of properties at different times or places: it is about *motion*, it is a fundamentally *dynamic* concept, and so can only occur in time, not in space (though motion occurs *through* space), and not outside time (e.g. in eternity). All change involves motion and all motion is the motion of something, whether it be of the parts of the thing that undergoes intrinsic change, or of objects or parts of objects standing in relations to the thing that undergoes extrinsic change.<sup>65</sup> Yet temporal part theory, although it countenances the existence of temporal wholes as well as their parts, decidedly does not countenance the motion of a temporal whole any more than of a temporal part. The vast majority of temporal part theorists adhere to the 'block universe' view (and hence the B-theory of time<sup>66</sup>) sketched earlier: for them motion is an illusion, and since change depends on motion, so is change. There is, however, reason for thinking that the temporal part theorist is not required to sign up to the block universe position.<sup>67</sup> So let him believe in temporal becoming (and hence the A-theory of time), but it will be of no avail. One way of viewing this second picture is to think of the space-time worm as

<sup>64</sup> Peter Geach briefly makes the same point (citing McTaggart) in 'Some Problems about Time', in his *Logic Matters* (Oxford: Blackwell, 1972), pp. 302-18, at p. 304.

<sup>65</sup> Even the ceasing to exist of an object requires disintegration or decomposition, and these involve motion of parts. (Contrast this with annihilation, which would have to be a miraculous act, i.e., not part of the natural order. One may say that God could annihilate an object or even the entire universe without there being any decomposition or disintegration and hence without any motion. Since we are examining change in the natural order, this sort of event does not undermine the general thesis that change requires motion. Indeed, annihilation is best not thought of as a kind of change at all. See also note 1.)

<sup>66</sup> See note 33.

<sup>67</sup> See the view of K. Denbigh in *Three Concepts of Time* (Berlin: Springer-Verlag, 1981), p. 62, which I quote in *The Metaphysics of Identity over Time*, p. 120.

‘growing’, as being added to by the accretion of new temporal parts. Perhaps one could call this a kind of change in a loose sense, namely the lengthening of the worm’s spatio-temporal extent. Yet still nothing moves, any more than when the green and red pole is spatially added to there is motion in what was there beforehand. The pole is now where it once was not, but it did not go anywhere, nor did any of its parts move. Rather, the pole was *added to*, just as the temporal whole of Descartes would have been added to if he had lived a few years longer: but *addition is not motion*. And so on this second picture, assuming it is a legitimate one for him to paint, the only change recognized by the temporal part theorist will be change of age.

We can put the same point in the form of a question: Why should time, rather than space, be regarded as the dimension of change? The answer suggested by both metaphysics and common sense is that in time alone is an object present *as a whole* at any location on the dimension at which it exists at all. For if it were not, what, exactly, would *differentiate* time from space as far as change was concerned? There might be some other factor, which it is the obligation of the four-dimensionalist to reveal. Or there may be no other factor, in which case the four-dimensionalist would have two options. (i) He could accept that there is change in space as well as in time, in which case the green and red pole is undergoing change as long as it is simply green and red, with nothing whatsoever appearing to *happen* to it. And this, the temporal part sceptic may fairly respond, is to reduce the concept of change to absurdity, or else to evacuate it of any content at all. (ii) He could accept that on his theory there is no change in time any more than in space—which is to concede the very point at issue.

In short, four-dimensionalism is not a theory that coheres with the existence of change, though it does entail the replacement of one thing by another (or the addition of one thing to another) as the metaphysical explanation of how a thing can possess a property at one time and it itself lack it at another. Change, however, is more than that. Which is what temporal part theory cannot countenance.<sup>68</sup>

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