The Philosophical Quarterly Vol. 59, No. 235 April 2009
ISSN 0031–8094 doi: 10.1111/j.1467-9213.2008.589.x

EXTENDED SIMPLES AND QUALITATIVE HETEROGENEITY

By Kris McDaniel

The problem of qualitative heterogeneity is to explain how an extended simple can enjoy qualitative variation across its spatial or temporal axes, given that it lacks both spatial and temporal parts. I discuss how friends of extended simples should address the problem of qualitative heterogeneity. I present a series of arguments designed to show that rather than appealing to fundamental distributional properties one should appeal to tiny and short-lived tropes. Along the way, issues relevant to debates about material composition, persistence over time and existence monism are discussed.

An object is an *extended simple* if and only if it is extended through space, time or spacetime, but lacks proper parts. The possibility of extended simples is directly relevant to a number of interesting debates about mereological composition and persistence over time. Some examples: Josh Parsons appealed to extended simples in order to defend the view that objects persist though time by *enduring* rather than by having temporal parts.[1] I have argued that if extended simples are possible, then an interesting argument by Hud Hudson against the possibility of *gunky* objects is unsound.[2] Jonathan Schaffer has recently articulated a qualified defence of *existence monism*, the radical doctrine that the world is one giant extended simple. Schaffer argues that those who hold *mereological nihilism*, which is the view that mereological composition never occurs, should endorse existence monism rather than the view that there are many (presumably microscopic) mereological simples.[3]

When I was young and foolish, I naïvely (but firmly) believed that extended simples were impossible.[4] I later recanted, but remained puzzled by the question

[1] J. Parsons, 'Must a Four-Dimensionalist Believe in Temporal Parts?', *The Monist*, 83 (2000), pp. 399–418.

[2] See H. Hudson, *A Materialistic Metaphysics of the Human Person* (Cornell UP, 2001), pp. 84–90; K. McDaniel, 'Gunky Objects in a Simple World', *Philo*, 9 (2006), pp. 47–54. An object is gunky if and only if every part of that object has proper parts.

[3] J. Schaffer, 'From Nihilism to Monism', *Australasian Journal of Philosophy*, 85 (2007), pp. 175–91. For other defences of existence monism, see T. Horgan *et al.*, 'Blobjectivism and Indirect Correspondence', *Facta Philosophica*, 2 (2000), pp. 249–70; M. Rea, 'How to be an Eleatic Monist', *Philosophical Perspectives*, 15 (2001), pp. 129–51.

[4] See McDaniel, 'Against MaxCon Simples', *Australasian Journal of Philosophy*, 81 (2003), pp. 265–75.

Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK, and 350 Main Street, Malden, MA 02148, USA

of whether such objects could enjoy qualitative diversity.[5] I think I have now reached equipoise. Extended simples are possible, and they need not be qualitatively homogeneous.

The problem of qualitative heterogeneity is the problem of explaining how an extended simple can enjoy qualitative variation across its spatial or temporal axes, given that it lacks both spatial and temporal parts. Here I discuss how friends of extended simples should address the problem of qualitative heterogeneity. The problem of how a spatially extended simple could be qualitatively diverse is formally analogous to the problem of how a temporally extended simple – an object that persists via enduring, for example – can none the less undergo change. The latter problem has been called *the problem of temporary intrinsics*, and the former problem *the problem of spatial intrinsics*.[6] The problem of qualitative heterogeneity is the conjunction of both of these problems. I shall focus on the problem of temporary intrinsics first, since it is more familiar, but what I have to say about the temporal case will also apply to the spatial case.

A proper solution to the problem of temporary intrinsics will provide a metaphysical analysis of propositions of the form *x is F at t*, where *x*, F and *t* range respectively over substances, allegedly intrinsic features and times. According to the friend of temporal parts (e.g., Lewis), *x* has F at *t* if and only if *x* has a temporal part that is located at *t* and is F. However, the friend of temporally extended simples clearly cannot appeal to temporal parts! Probably the two most popular of the available solutions to the problem of temporary intrinsics are *relationalism* and *adverbalism*. According to relationalism, F is not really an intrinsic property, but rather a relation that *x* bears to *t*. 'Intrinsic' change, on the relationalist's view, amounts to bearing different external relations to a succession of times.[7] According to adverbalism, the exemplification relation that objects bear to their properties is actually a three-place relation with an extra slot for times. On this view, to have a property is to-have-it-at-a-time.[8] Both the advantages and disadvantages of relationalism and adverbalism have been extensively discussed elsewhere. I have nothing new to say about them here.

[5] I have apparently joined the pious: Pascal claims that God is an extended simple, infinite in extent, but lacking parts: see *Pensées* (Harmondsworth: Penguin, 1966), 420/231, p. 153. Moreover, God is not the only possible extended simple: Pascal also explicitly endorses the possibility of what, in my 'Extended Simples', *Philosophical Studies*, 133 (2007), pp. 131–41, I call 'multi-located material simples'. Other friends of extended simples include N. Markosian, 'Simples', *Australasian Journal of Philosophy*, 76 (1998), pp. 213–26; Parsons, 'Must a Four-Dimensionalist Believe in Temporal Parts?', and 'Distributional Properties', in F. Jackson and G. Priest (eds), *Lewisian Themes* (Oxford UP, 2004), pp. 173–80; P. Simons, 'Extended Simples: a Third Way between Atoms and Gunk', *The Monist*, 87 (2004), pp. 371–84.

[6] For discussion of the problem of temporary intrinsics, see D.K. Lewis, *On the Plurality of Worlds* (Oxford: Blackwell, 1986), pp. 202–5; for discussion of the problem of spatial intrinsics, see McDaniel, 'Against MaxCon Simples'.

[7] Hugh Mellor defends this view in his *Real Time* (Cambridge UP, 1981), pp. 111–14, as does Peter van Inwagen in his 'Four-Dimensional Objects', *Noûs*, 24 (1990), pp. 245–55.

[8] This view is championed by S. Haslanger, 'Endurance and Temporary Intrinsics', *Analysis*, 49 (1989), pp. 119–25; M. Johnston, 'Is There a Problem about Persistence?', *Proceedings of the Aristotelian Society*, Supp. Vol. 61 (1987), pp. 107–35.

The solution to the problem of temporary intrinsics to which I am attracted was developed by Doug Ehring, and appeals to short-lived tropes.[9] A trope is both a particular and a quality. On the trope-theoretic view, x and y are both F if and only if they each exemplify their own F-trope. Properties such as *being F* are maximal classes or maximal mereological fusions of perfectly resembling tropes. According to Ehring's solution to the problem of temporary intrinsics, these tropes are very short-lived, perhaps even momentary. On this view, x is F at t if and only if there is an F-trope that exists at t and x exemplifies it. Intrinsic change, on this view, consists in a persisting object successively exemplifying non-resembling momentary tropes.

There is a pleasing symmetry between Ehring's view and the temporal parts solution. Ehring's momentary tropes are in effect temporal parts of properties. According to the perdurantist, an object has a property at a time by having a part which has the property and is located at that time. According to Ehring, an object has a property at a time by having a part of that property which is located at that time. On neither view is the property in question really a relation to a time, nor is the exemplification relation taken to be a fundamentally three-placed relation.

It is clear how Ehring's solution to the problem of temporary intrinsics can be generalized so as to apply to the problem of spatial intrinsics. If the object o shown in Figure 1 occupying $r_1 \cup r_2$ is a spatially extended simple, one cannot say that it has a proper part which occupies r_1 and is just plain grey. However, one can say that o exemplifies a greyness trope located at r_1. Qualitative heterogeneity across space consists in exemplifying non-resembling localized tropes distributed across space. It turns out that an extended simple can be qualitatively heterogeneous. I was wrong to think otherwise.

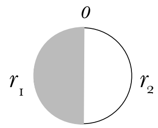

Figure 1

Jonathan Schaffer in his 'From Nihilism to Monism' discusses in the context of defending existence monism the problem of qualitative heterogeneity. It is an undeniable fact that our universe exemplifies remarkable qualitative heterogeneity both spatially and temporally. But one can reconcile this fact with existence monism by taking on board Ehring's highly localized and short-lived tropes.

However, Ehring's solution is not discussed by Schaffer. Schaffer indicates that he endorses a different solution, one first advocated by Josh Parsons, according to which *distributional properties* are taken as metaphysically fundamental:

> *Being polka-dotted* is an example of a colour-distributional property – the property a surface has when it has the right kind of colour distribution. *Being hot at one end and cold at the other* is an example of a heat-distributional property. *Having a uniform density of* 1 *kg/m³ throughout* is an example of a density-distributional property..... Intuitively ... a distributional property is like a way of painting, or filling in, a spatially extended object with some property such as colour, or heat, or density (Parsons, 'Distributional Properties', p. 173).

Circle o in Figure 1 enjoys a distributional property, *being half-grey-half-white*, without having a proper part that is grey. According to Parsons, this distributional

[9] D. Ehring, 'Lewis, Temporary Intrinsics, and Momentary Tropes', *Analysis*, 57 (1997), pp. 254–8.

property is metaphysically basic: the circle has the feature, but not in virtue of having any other feature, and not in virtue of having parts that have any other feature. To be qualitatively heterogeneous is to exemplify such a *non-uniform* distributional property. The object in Figure 2 exemplifies what might in some sense be a distributional property, but the property in question is *uniform*: this circle is not qualitatively heterogeneous.

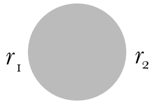

Figure 2

Although taking distributional properties as metaphysically fundamental is intriguing, I have several reservations about this strategy. Ultimately, I think the friend of extended simples (and by extension, the friend of existence monism) is better off endorsing Ehring's solution.

I remark, first, that the friend of Ehring's tropes can definitely endorse the existence of distributional properties, taking them to be mereological sums of localized tropes. For example, the half-grey-half-white circle exemplifies a distributional property in virtue of exemplifying a localized white trope and a localized grey trope. This distributional property is the sum of these two tropes. On Ehring's view, a thing can have a localized trope without having a proper part that occupies the region where the trope is localized. So something can have a distributional property without having any proper parts: it is the distributional property rather than its bearer that has proper parts. Things have distributional properties by exemplifying all of the parts of those properties.

Moreover, the friend of Ehring's tropes can offer an analysis of the notions of uniformity and non-uniformity: a distributional property is *non-uniform* iff it is not uniform; a distributional property P is *uniform* if and only if there are some *x*s such that P is the mereological sum of the *x*s and the *x*s perfectly resemble one another.

This analysis of uniformity does not imply that a thing exemplifies a non-uniform distributional property only if it has proper parts. The analysis is also consistent with the alleged possibility that there are distributional properties 'all the way down'. Such distributional properties would be *gunky*: every part of a distributional property would have a proper part. Moreover, they would be *increasingly uniformly gunky* in the following sense: for any gunky distributional property D and degree of resemblance *n*, for all *x*s such that the *x*s compose D and resemble one another to degree *n*, there are some *y*s such that the *y*s compose D and resemble one another to some degree greater than *n*. I am not inclined to think such properties are really possible. But the analysis of uniformity offered here does not rule them out. Moreover, the analysis does not require that the material objects that exemplify gunky distributional properties are themselves gunky.

Being able to give an analysis of uniformity is neat. However, as far as I can see, Parsons ought to take the distinction between uniform and non-uniform distributional properties as primitive. He suggests two alternatives to taking the notion of uniformity as primitive: take the uniformity of properties to consist in some role those properties play in our thinking or best theories, or take the uniformity of a property to be a function of dispositions to call the properties 'uniform'. Both alternatives strike me as non-starters.

One might think that Ehring is no better off, since his theory also makes use of an unanalysed notion, namely, *resemblance*. But it seems to me that Parsons must also take the notion of resemblance as a primitive. Suppose the objects in Figure 3 are extended simples. Each of them resembles each of the others in virtue of exemplifying numerically distinct distributional properties that none the less resemble one another. No account of this resemblance is forthcoming. Moreover, it seems clear that Parsons must appeal to a primitive resemblance relation which not only comes in degrees but also appeals to respects. In Figure 4, objects *a* and *b* are perfectly alike with respect to *shape* and *percentage of whiteness* in virtue of exemplifying their respective fundamental properties, whereas *b* and *c* are alike with respect to *how blackness is distributed*. Since the respective properties are all fundamental, the notion *resemblance with respect to F* cannot be analysed away in Parsons' theory.

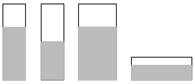

Figure 3

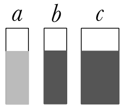

Figure 4

My second reservation is that Parsons' solution implies that he cannot provide a finite analysis of propositions of the form '*x* is F at *t*' (and similarly, for '*x* is F at region *r*').[10] As I showed earlier, both the temporal parts solution and Ehring's solution can provide an analysis. For suppose *t* is the first moment of *x*'s life and that F is *being grey*. There are infinitely many colour-distributional properties whose exemplification ensures that at the beginning of one's life one is grey. The best that can be said is that to be grey at *t* is in effect to exemplify some distributional property whose exemplification ensures that one is grey at *t*.

My third reservation is that it is unclear to me that Parsons' solution even allows one to say this. First, strictly speaking, the mere exemplification of a distributional property does not entail anything about where an object is located in time, and hence for any F and *t* the mere exemplification of a distributional property does not entail that *x* is F at *t*. This is clear from Figure 5: o_1 and o_2 exemplify the same distributional property, and both exist at t_2. Nevertheless, only o_1 is grey at t_2; o_2 is white at t_2. So one needs to be more careful: to be grey at *t* is in effect to be located at some interval *i* which includes *t* and to exemplify some distributional property D such that anything which occupies *i* and exemplifies D is grey at *t*. Although the 'analysis' is more complicated, it has still not succeeded in eliminating talk of an object's having a property at a time.

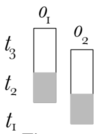

Figure 5

Actually, it is not clear that this even works. Now for a hard question. In Figure 6, o_1 and o_2 exemplify the same distributional property D. Does o_3 exemplify D? Intuitively, the answer is 'Yes'.[11] But if so, it is not true that being located at t_2–t_4 and exemplifying D suffices to be grey at t_2, since o_3 is not grey at t_2 but, rather, white at t_2.

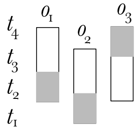

Figure 6

[10] Parsons in 'Distributional Properties' is clearly aware of this feature of the theory.

[11] It seems that objects like o_1 and o_3 are *temporally incongruent counterparts*, which, intuitively, are duplicates. It is not as intuitive that this is also true of temporally incongruent counterparts, but it is still plausible: see Hudson, 'Temporally Incongruent Counterparts'.

A similar problem arises with respect to space, provided that collocated material objects are possible.[12] Presumably, the two spatially extended simples in Figure 7 are duplicates, since one extended simple could be made to look like the other merely by rotation. Suppose they came to be collocated merely by moving in a continuous straight path without rotating on their respective axes. Then they would occupy the same region and enjoy the same fundamental feature. Yet clearly something would be different: one would be grey at the right-hand region whereas the other would be white at that region. This shows that this problem can arise for Parsons even when the objects in question are not 'incongruent counterparts'.

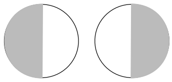

Figure 7

Strictly speaking, collocated material simples need not be really possible in order to generate this worry. What their alleged possibility shows is that Parsons must hold that no combination of merely exemplifying a non-uniform distributional property and occupying a region that includes *r* suffices for being grey at *r*. Suppose, for example, that the two circles cannot interpenetrate but can switch places without undergoing rotation on their axes. This is sufficient to generate the problem.

I am not sure what Parsons should say in response to it.[13] This problem does not arise for Ehring's solution. One of the circles exemplifies a grey trope which occupies the right-hand region but does not exemplify a white trope which occupies that region. The other circle exemplifies a white trope which occupies the right-hand region but does not exemplify a grey trope which occupies that region. This solution is available because distributional properties are complexes of localized tropes.

My fourth reservation is that if distributional properties are fundamental, how an object is *here* or *now* is metaphysically determined by how things are elsewhere. But should not the local intrinsic features of an object at a region be determined by the properties that are located at (and only at) that region? It is probably question-begging to use this brute intuition against the friend of distributional properties, and it is in this context a bit odd, since a non-local determination of some local matters of fact might be congenial to the friend of extended simples. Existence monists, for example, might wish to embrace the *global* determination of all local matters of fact. But by accepting Ehring's localized tropes, even existence monists could if they wished satisfy the intuition that local matters of fact determine global matters of fact.

There is a related advantage for existence monists which might be worth noting. Ted Sider has recently argued that the existence monist is unable to explain why the space of physical possibilities has the structure it has:

> Consider a world containing just a single computer screen with a 4x4 pixel resolution. Each pixel can be on or off. Since there are 16 pixels, and there are two states for each pixel, 2^{16} states are possible for the entire screen. The existence of this state-space is common ground between monists and pluralists. But only the pluralist can give a

[12] This will be a bit wild. Hold on to your seat.

[13] Thanks to Joshua Spencer for pointing this problem out to me. David Lu has suggested to me that Parsons should appeal to additional primitive facts about these properties are *orientated*. Suffice it to say that the friend of Ehring's tropes need not.

satisfying account of *why* the state-space has 2^{16} members. The pluralist can say: the state-space has 2^{16} members because (i) there are 16 pixels, each of which has two available fundamental states; (ii) the fundamental states of the system include *only* the states of the individual pixels; and (iii) the possibilities for the entire system are generated combinatorially from the entities in the system and the fundamental states those entities can inhabit. The monist can tell no such story. For the monist, the fundamental properties are the members of the state-space itself: the 2^{16} maximally specific properties of the entire screen. These properties are not generated combinatorially from more fundamental pixel-properties. Why, then, are there exactly 2^{16} of them?[14]

Perhaps the existence monist who befriends Parsons' fundamental distributional properties should be concerned with this objection. But it should be clear that if the existence monist endorses Ehring's solution, there is no difficulty in seeing how the state-space in Sider's scenario is generated. There are two fundamental kinds of tropes, which can be distributed locally even though the One that exemplifies them is simple. More generally, Ehring's solution allows the existence monist to agree with Sider on whatever the local fundamental properties end up being, even though all such properties will be properties of the One Giant Simple. There is no explanation available to Sider of why the state-space has the structure it has which is not also in principle available to the existence monist who embraces localized tropes.[15]

Syracuse University, New York

[14] T. Sider, 'Against Monism', *Analysis*, 67 (2007), pp. 1–7, at p. 3.

[15] I thank Ross Cameron, Hud Hudson, David Lu, Jonathan Schaffer and Joshua Spencer for helpful comments on an earlier draft.