Ratio (new series) XXI 1 March 2008 0034–0006

ESSENTIAL STUFF

Kristie Miller

Abstract

Here is a common view. There exist things, and there exists stuff, where roughly, 'thing' is a count noun, and 'stuff' is a mass noun. Syntactically, 'thing' functions as a singular referring term that takes 'a' and 'every' and is subject to pluralisation, while 'stuff' functions as a plural referring term that takes 'some' and is not subject to pluralisation. Hence there exists *a* thing, and *some* stuff. Usual versions of the common view endorse two principles about portions of stuff. The first principle is that (temporal) mereological essentialism is true of portions (parcels, masses, quantities) of stuff, where mereological essentialism is the thesis that for any persisting object or portion of stuff, that object or stuff has the same parts at every time at which it exists.[1] The second principle is that portions of stuff obey a principle of stuff composition: for any two portions of stuff P_1 and P_2, there exists a portion of stuff that is the fusion of P_1 and P_2.[2,3] I argue that these two principles are inconsistent. In particular, since I am sympathetic to PSC, I argue that mereological essentialism is false of portions of stuff.

Sometimes talk of stuff is talk about portions of stuff that are of a certain kind: 'some water', just as talk of things is sometimes talk about things of a certain kind: 'an apple'. Talk of 'some water' or 'an apple' is talk of portions or instances of what we might call non-fundamental kinds, where roughly, *K* is a non-fundamental

[1] I insert 'temporally' in brackets to distinguish this from the view that stuffs are modally mereologically essential, that is, that necessarily, they have the same parts in every possible world in which they exist, as they do in the actual world.

[2] This is commonly how this is expressed. If stuff is strictly speaking mereologically essential, then stuffs have mereological parts and hence are fusions. There are those who deny this latter claim. Some think of portions of stuff as sets, where sets are not fusions of singleton sets, and others think of portions of stuff as pluralities. In neither of these two cases do portions of stuff have mereological parts. With those cases in mind, we can reconstrue the claim that stuffs are 'mereologically' essential, as the claim that any portion of stuff has its sub-portions essentially. Then the principle of composition is the claim that for any two portions of stuff P_1 and P_2, there exists a portion of stuff that has each of those portions as sub-portions. I discuss this further shortly.

[3] Defenders of something like the common view include Markosian (2004) and Zimmerman (1995) and also perhaps Quine (1960), and Cartwright (1975).

kind just if the fundamental particulars, whatever they are, are not of kind *K*. When I talk of stuff, I am talking about the fundamental stuff, whatever it is, that makes up (in whatever sense) the various portions of stuff of non-fundamental kinds.[4] That is, I am talking about stuff in a perfectly general way, a way that does not imply that any portion of stuff need be a member of any *particular* kind.[5] I return later to the issue of how talk of stuff in general, is related to talk of portions of stuff of non-fundamental kinds.

Let us say that objects or stuffs[6] that have the same parts at every time at which they exist are mereologically continent, while those that do not have the same parts at every time at which they exist, are mereologically incontinent. Then if any stuffs are mereologically incontinent, mereological essentialism is false of stuffs. In what follows I argue that at least some portions of stuff are mereologically incontinent, and I do so by considering a number of worlds in which different hypotheses about the nature of stuffs turn out to be true. I consider worlds in which 'stuff-simples' are temporally unextended, and worlds in which they are not temporally extended. I consider worlds in which portions of stuff are fusions of particulars, and worlds in which portions of stuff are sets or pluralities. I conclude that on any combination of these hypotheses, stuffs are not continent.

Let us begin by considering world W_1 under a particular hypothesis about the nature of stuff: that portions of stuff are mereological fusions or sums, of particulars.[7] On this common view of stuff, the syntactic difference between 'thing' and 'stuff' does not reflect an underlying metaphysical difference. Ultimately, this view embraces an ontology of things. Nevertheless, there are genuine differences between the sorts of things picked out by thing terms, and the sorts of things picked out by stuff terms. For clarity, call the former *objects*, and the latter *stuffs*. Then the difference between objects and stuffs is broadly a difference in

[4] Throughout I talk about *the* fundamental stuff. This is just a simplifying assumption. Of course, it might be that there is more than one kind of fundamental stuff. Maybe there will turn out to be four fundamental stuff-particles. That would make no difference to the arguments I present.

[5] It does not imply that if there are multiple fundamental kinds, that a portion is a member of one of those kinds, or that it is a member of a non-fundamental kind. It implies only that it is a member of the kind 'stuff'.

[6] Despite my claim that 'stuff' cannot be pluralised, I will sometimes use 'stuffs' as shorthand for portions of stuff.

[7] What Zimmerman calls the sum view of masses (Zimmerman 1995). Defenders of this view include Cartwright (1965; 1975; 1970); Quine (1960) and Burge (1977).

their composition and persistence conditions. Roughly, stuffs can survive any re-arrangement of their parts, but not the loss of any of their parts. Objects can survive only some re-arrangement of their parts, and the loss of some of those parts.

Let us suppose that in W_1, there exist stuff-atoms – mereological simples of which stuffs (and things more generally) are composed. In W_1, these stuff-atoms are temporally unextended.[8] Recall that the principle of stuff composition (PSC) states that for any two portions of stuff P_1 and P_2, there exists a portion of stuff that is the fusion of P_1 and P_2. So we can suppose that at t_1, there exists a fusion of stuff-atoms $A_1 . . . A_n$ – call it S_1 – and at t_2 a fusion of stuff-atoms $A_1^* . . . A_n^*$ – call it S_2. S_1 and S_2 are instantaneous portions of stuff. Notice that as stated, PSC does not distinguish between fusing co-existing portions of stuff,[9] and fusing non co-existent portions of stuff, that is, cross-temporal fusing. Assume for a moment PSC ought be construed only as a claim about co-existent portions: the claim that for any two portions of co-existing stuff P_1 and P_2, there exists a fusion of P_1 and P_2. Then we rule out the existence of any cross-temporal fusions in W_1, and hence rule out that there exist any persisting stuffs. If stuffs do not persist, then their persistence is not governed by the thesis of mereological essentialism.[10]

So let us take PSC at its word, and assume that cross-temporal fusing is permissible. Then there also exists a portion of stuff – S_3 – that is the fusion of S_1 and S_2. That portion of stuff persists. It perdures: it has S_1 and S_2 as maximal temporal parts. Is S_3 mereologically continent? Well S_1, S_2, $A_1 . . . A_n$, and $A_1^* . . . A_n^*$ are all parts *simpliciter* of S_3. So in *some* sense, S_3 never loses any of its parts. But that is the sense in which *all* four-dimensional objects tenselessly have all their parts *simpliciter*, and clearly *that* is not the sense of mereological continence we have in mind. For there is a perfectly good tensed sense in which four-dimensional objects have different parts at different times. A cross-temporal fusion F has a part P at a time t, just if P is part of F *simpliciter* and P exists at t. And in this sense S_3 certainly has different parts at different times. It is

[8] I leave it open whether or not they are spatially extended, or point-sized across space.

[9] Portions of stuff that exist at the same time.

[10] If we thought of mereological essentialism as the claim that: for any stuff S that exists at a time t, if S exists at any other time t^*, then S has the same parts at t and t^* then we might think that a case of instantaneous stuff is a limiting case of essentialism. However, I take it that those who endorse the common view think that stuffs do persist, and intend their claim that stuffs have their parts essentially, to be substantively rather than trivially true.

an example of this *par excellence*: for there is *no* part that S_3 has at t_1 that it also has at t_2. So S_3 is not mereologically continent, and hence mereological essentialism is false of S_3.

But now consider a world, W_2, where particulars that are mereologically simple at a time, immanently causally propagate themselves through time: they perdure. These objects are not mereologically simple. They have maximal temporal parts each of which is a simple. The difference between W_1 and W_2 is that in W_1 we supposed that there was no immanent causation between any of the simples at t_1, and the simples at t_2. In W_2, let us suppose that each of the simples at t_1, that is a part of S_1, is immanently causally related to each of the simples at t_2, that is a part of S_2. Then we have *spatially* mereologically simple objects that are *temporally* composite: particulars that at any time, lack spatial parts, but which cross-temporally have temporal parts. Let us say that we have a perduring spatial simple S^* just if S^* is a fusion of temporally contiguous mereological simples such that between any two temporally contiguous simples there exists a relation of immanent causation.

Even though these spatially simple objects perdure, in W_2 it is still not true of S_3 – the fusion of S_1 and S_2 – that it has the same parts at t_1, as it has at t_2. Like all four-dimensional objects, on a tensed reading S_3 has numerically distinct parts at different times. So if we want to capture the idea that four-dimensional objects can be mereologically continent, we should reconstrue somewhat that notion. Let us say that a portion of stuff S is mereologically continent just if for any simple S_1 that is part of S at a time t,[11] there exists a simple S_2 that is part of S at any other time t^* at which S exists, and S_1 and S_2 are temporal parts of a perduring spatial simple S^*.

Now suppose that in W_2, there exist three perduring spatial simples, *A*, *B*, *C* and *D*. The first three of these exist from t_1 to t_8, the last, *D*, exists from t_1 to t_{10}. Then there exists a portion of stuff that is the fusion of *A, B* and *C simpliciter*, and the fusion of all of *D*'s temporal parts except for *D*-at-t_9 and *D*-at-t_{10}. Given our amended definition, that portion of stuff is mereologically continent. But given PSC there also exists a fusion of *A, B C*, and *D simpliciter*: a portion of stuff which, at t_9, has only one part: *D*. That portion of stuff is incontinent, for at t_1 there are spatial simples

[11] Where S_1 is part of S at a time t just if S_1 is part of the maximal temporal part of S-at-t.

that do not have temporal parts present at t_9. So some fusions, on the amended definition of mereological continence, turn out to be continent. But some fusions do not. So if stuffs are fusions of particulars – in particular, if persisting stuffs are fusions of instantaneous portions of stuff – then some portions of stuff are incontinent: stuffs do not have their parts essentially.

Now consider a world W_3, which is like W_2 except that the simples are temporally extended and thus partless both at and across time.[12] In W_3, *A*, *B C* and *D* are temporally extended simples. Call the fusion of these simples S_4. Like all fusions, it is tenselessly true of S_4 that it has parts *A-D simpliciter* and hence in this sense S_4 does not lose any of its parts: it matters not a bit how *A-D* are arranged, or whether we take *A* over to the other side of W_3: so long as *A* exists, it is part of S_4. But again, this tenseless sense in which S_4 does not lose parts, is not the sense we mean to employ when we say that portions of stuff are continent. Rather, we want to say that such four-dimensional fusions are continent just if they have the same parts whenever they exist: that is, if they tensedly have the same parts at different times. But S_4 has different parts at different times. S_4 is not mereologically continent.

So regardless of whether stuff-simples are instantaneous or temporally extended, if portions of stuff are fusions of simples then portions of stuff are incontinent. So it is not true that stuffs have their parts essentially. Or at least, it is not true so long as we consider worlds where it is not the case that *all* stuff-simples come into existence at the same instant, and pass from existence at the same instant. In such a world, portions of stuff are continent. But I take it that advocates of essentialism about stuffs are not presupposing such a controversial view about stuff-simples, so if this is what it would take to vindicate stuff essentialism, then it would not be much of a vindication.

Now consider a world W_4, in which we understand the nature of stuff slightly differently. Here, the different syntax of 'stuff' and 'thing' reflect a genuine metaphysical difference between portions of stuff and things. There are broadly two ways to construct this difference: one is to construe portions of stuff as sets, the

[12] We might either think of them as enduring, or as being akin to spatially extended mereological simples – four-dimensional, and hence not strictly identical across time, but partless like their spatial analogues. This is in contrast to spatially perduring simples, which have temporal parts.

other as pluralities.[13] Consider first the view that portions of stuffs are sets. Notice that mereological essentialism can be true of stuffs only if stuffs have mereological parts. This means that if stuffs are sets, we must embrace a particular view about sets – what I call the Lewisian view.[14] On this view sets are fusions of singleton sets, and thus sub-sets are parts of sets.[15] Where the singleton sets have concrete members, these sets derive quasi-physical properties from the properties of the concreta, and in turn the fusions of these singletons derive their properties from the derived properties of their singleton sets. If stuffs are Lewisian sets, then exactly analogous arguments to those just constructed will apply.

Consider just one case, where stuff-simples are instantaneous. Then there exists at set, S_1, that is quasi-located at t_1 in virtue of each of its singleton sets having as a member, a stuff-atom that exists at t_1. So too, *mutatis mutandis*, for S_2 at t_2. And there exists a set, S_3, that is the fusion of S_1 and S_2. This all sounds familiar. S_3 is quasi-located at both t_1 and t_2. S_3 is a portion of stuff that persists from t_1 to t_2. Notice that the sense in which sets do not 'lose' sub-sets, is the same as the sense in which fusions of particulars do not lose parts: the sense in which each tenselessly has those parts *simpliciter*. But again, this is not the relevant sense of mereological continence. Just as a fusion considered at a time, might lack a part it has at some other time, so too might a set, at least where sets are Lewisian. Recall that *P* is part of some fusion *F* at *t*, just if *P* is part of *F simpliciter*, and *P* exists at *t*. All the sub-sets of a set are parts of it *simpliciter*, but in what sense do some of its sub-sets exist at one time and not at another? We don't normally think of sub-sets as existing or failing to exist in space-time. But on the Lewisian view, sets whose singleton sets have concrete members are quasi-located in space-time, as they had better be if portions of stuff just are such sets. So we will say that *P* exists at *t* just if either (i) *P* is a singleton set and *P* has a concrete member that exists at *t* or (ii) *P* is a set each of whose sub-sets are singleton sets, all of which have concrete members that exist at *t*. Then the portion of stuff S_3 has parts at one time that it lacks at another: it is mereologically inconti-

[13] Zimmerman considers both of these options in his (1995) and something like one of these options seems to be what Laycock (1972) and Markosian (2004) have in mind.

[14] Defended by Lewis (1991).

[15] Where crucially the empty set is treated as an individual and hence is never a part of any set.

nent. And the same arguments go through *mutatis mutandis*, where stuff-simples are temporally extended.

So if portions of stuff are fusions of particulars, or are Lewisian sets, then some portions of stuff are not mereologically continent, and thus mereological essentialism is not true of stuffs.

Now suppose that we had the view that stuffs are pluralities, or that they are sets, but not Lewisian sets[16] Then portions of stuff do not have mereological parts, and hence essentialism about such parts cannot be true. But something *like* mereological essentialism might be true. *Portion essentialism* might be true: a portion of stuff *S* that exists at one time *t* exists at another time *t** just if for any sub-portion of *P* that exists at *t*, *P* is a sub-portion of *S* at *t**.[17] But sub-portion essentialism will not be true if PSC is true. If portions of stuff are sets, then the sub-portion relation is the sub-set relation. Then all of the previous arguments go through except in terms of portions rather than parts. For although we drop the Lewisian thesis that sub-sets are parts of sets, we must still maintain that sets have quasi-spatio-temporal location. So we can still talk of the sub-portions at a time, of a portion of stuff: those sub-sets whose singletons' concrete members exist at that time. Then given PSC, there will be sets of stuff that are *portionally incontinent*: they have different sub-portions at different times. The same is true if we think of stuffs in terms of pluralities rather than sets. PSC tells us that any particulars can form a plurality. So there can exist a plurality of different particulars at different times. The plurality as a whole will have, *simpliciter*, each particular that is one of the plurality – this is the tenseless sense of the 'is one of' primitive. But considered at a time, different particulars will be one of the plurality, depending on which of the particulars exist at that time. So pluralities too can be portionally incontinent. So portion essentialism is false on either of these two views.

So if stuffs have parts, then those parts are not essential, and if they have portions, then those portions are not essential. So why it is commonly held that stuffs have their parts essentially? Recall the distinction I drew earlier between portions of stuff in general – portions of fundamental stuff[18] – and portions of stuff that are of a particular non-fundamental kind, such as a portion of water.

[16] It is not Lewisian in the sense that sub-sets are not parts of sets.

[17] I leave it open exactly what relation holds between portions and sub-portions.

[18] Though not necessarily portions of the same fundamental stuff, should there be multiple kinds of fundamental stuff.

Call the former generic fundamental-stuffs, and the latter non-fundamental stuff-kinds. The intuition is that if we remove some water from a portion of water, it is not the same portion anymore: the portion of water has its parts essentially. Then it seems that generic fundamental-stuffs must have their parts essentially. If a portion of water, *W*, has its parts essentially, and *W* is identical to some generic fundamental-stuff *S*, then *S* has its parts essentially. That is clearly right. So if generic fundamental-stuffs do *not* have their parts essentially, then what should we make of our the intuitions about non-fundamental stuff-kinds like *W*?

There is an option that goes some way towards preserving these intuitions. We deny that portions of non-fundamental stuff-kinds are identical to portions of generic fundamental-stuffs. Just as some things are not identical to fusions of simples – various mereologically incontinent things – but are related to different fusions at different times, so too certain portions of non-fundamental stuff-kinds are not identical to fusions of stuff-simples or to sets or pluralities or stuff. Rather, portions of non-fundamental stuff-kinds are related to generic fundamental-stuffs in some manner, perhaps by being constituted by them as incontinent things are constituted at times, by fusions. Then not all of the parts of the generic fundamental-stuff need be parts of the constituted non-fundamental stuff-kind.

Call the smallest part of a portion of a non-fundamental stuff-kind of kind *K*, a *K*-atom. Then some non-fundamental stuff-kinds might be such that their smallest part is a *K*-atom.[19] Then we might say that if a portion of non-fundamental stuff-kind *K* loses a *K*-atom, it ceases to be the same portion of stuff. But *K*-atoms *themselves* might be able to lose stuff-simples and remain the same *K*-atom. So the (generic) portion of stuff that constitutes the portion of non-fundamental stuff of kind *K* at a time *t*, might *itself* be incontinent with respect to these stuff-simples, but since these simples are not parts of the portion of the non-fundamental stuff-kind, their loss does not mean that the portion of the non-fundamental stuff-kind is in fact is incontinent. So we get to say that portions of non-fundamental stuff-kinds have their parts essentially, even though the generic fundamental-stuff of which these portions are constituted, do not have their parts essentially.

[19] In the case of water, perhaps the smallest part of some water that is itself some water, is an H20 molecule.

Actually, this is not quite right. Since portions of non-fundamental stuff-kinds are not identical to potions of generic fundamental-stuffs, non-fundamental stuff-kinds do not have strictly speaking have mereological parts at all – they are not fusions either of particulars or of singleton sets. Rather, they inherit things that looks like parts, parts*, we might call them, in virtue of being related by constitution to portions of generic fundamental-stuffs. So more correctly, we get to say that portions of non-fundamental stuff-kinds have their parts* essentially. But stuffs do not.

University of Sydney
NSW 2006 Australia
kristie_miller@yahoo.com

References

Burge, T. (1977). 'A theory of aggregates.' *Nous* 11: 97–117.
Cartwright, H. M. (1965). 'Heraclitus and the bath water'. *Philosophical Review* 74(4): 466–485
Cartwright, H. M. (1970).'Quantities'. *Philosophical Review* 79(1): 25–42.
Cartwright, H. N. (1975). 'Amounts and Measures of Amount'. *Nous* (9)2: 142–164.
Laycock, H. (1972). 'Some Questions of Ontology'. *Philosophical Review* 81(1): 3–442.
Lewis, D. (1991). *Parts of Classes*. Oxford: Blackwell.
Markosian, N (2004). 'Simples, stuff and simple people.' *The Monist* 87(3): 405–421.
Quine, W. V. O. (1960). Word and Object Cambridge, MIT Press.
Zimmerman, D. W. (1995). 'Theories of Masses and Problems of Constitution'. *Philosophical Review* 104: 53–110.