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Destruction, Alteration, Simples, and World-Stuff

Suppose that a tree is chopped down and run through a wood chipper, or that a sweater is unraveled. The matter of the tree still exists, as does the matter of the sweater. From this it sometimes is inferred that nothing has really been destroyed—that what has happened is just that this matter has assumed a different form or arrangement. This inference is, of course, of ancient lineage. It evidently begins with Thales; it continues through Kant's First Analogy; it is found in contemporary views according to which the workings of the world are really just alterations in the careers of the microparticles affirmed by current physics (Unger 1979a, p. 234; Wheeler 1979, p. 166), or of the "physical simples" which some successor theory will report[1], or of the "world-stuff"[2] of which everything is composed (Sidelle 1989, pp. 54-55; Jubien 1993). The contemporary views I mean do not deny that there are such things as trees and sweaters and people, but hold that these are just phases in the existence of something else—that when any familiar object appears to have been destroyed, what really has happened is that this something else has been altered.[3] This paper argues that no such view is defensible. Ontology may need to deny that some of the objects recognized by common sense really are substances, but it cannot warrantedly claim that none of them is.

I

On 19 April 1995 the Alfred P. Murrah Federal Building in Oklahoma City was blown up by two men angry at the government's treatment, a year before, of a religious sect in Texas. Suppose I were to claim that this explosion was not really a matter of anything's being destroyed, but just of something's being altered. Specifically, of my desk's being altered: suppose I claimed that what really happened is that my desk passed from coexisting with the Federal Building to no longer coexisting with the Federal Building. Just why would this analysis be so clearly silly and empty? Why would it be so different from a parallel claim one might make about the ice cube which I placed in a bowl on the counter an hour ago?

For one *could* say that when the ice cube melted, it only seemed as if something was destroyed, and that really all that happened was that the H_2O molecules within the cube altered, passing from arrangement in a lattice to a looser form of association. That claim would be far from empty; it would enable predictions and explanations not otherwise available. Why would the parallel claim about my desk fail to do so?

One answer would be that the so-called "alteration" in my desk was not really an alteration proper to its own course of existence, its own "life story". Neither the *before* stage of this "alteration" nor the *after* figured in the causal chains which linked earlier episodes to later ones in the existence of that desk. Neither stage reflected the desk's past nor had bearing on how, in actual and possible subsequent episodes, the desk would look or act. But the *before* stage in the mutual arrangement of the H_2O molecules reflected the cube's having been in the freezer, and the *after* stage bore on just what movement would occur if the bowl were tipped upward.

A different but related answer is that the alteration which my desk allegedly underwent seems ineliminably to involve there existing such a thing as the Federal Building. There seems to be no way of conceptualizing either the *before* stage or the *after* as an episode involving *the desk's* own nature and circumstances.

There are then two general requirements on any position claiming that when a familiar object appears to have been destroyed, what really has happened is that something else has been altered. First, the alteration in question must grow out of, and have bearing on, the course of existence of the "something else". Second, it must be possible to conceptualize the alteration as involving only the existence or actions or dispositions of the "something else"—i.e., without quantifying over the familiar object which appears to have been destroyed.

II

Is the apparent destruction of a familiar object always really just a rearrangement of the fundamental microparticles recognized by physics? Something very like that is claimed by any

philosopher who endorses an ontology of "simples". The motivations for endorsing such an ontology are various, and may have nothing to do with a wish to claim that apparent destruction is always really alteration. What led Unger (1979b; cf. 1979a) to suggest that the world may be populated by simples were worries about vagueness. What led van Inwagen (1990) to argue that it is populated by simples and by organisms were worries about composition. But once a philosopher claims that simples are, in ontological strictness, the sole substances in the world—or in all regions of the world except those occupied by organisms—he has come very close to saying that when a building or a sweater appears to be destroyed, what really has happened is just that microparticles have taken on a new arrangement. For simples are conceived as objects so small that division of them is physically impossible. This is very close to saying that simples are the leptons, bosons, and quarks posited as fundamental by current physics. For the purposes of the present paper, the distinction between these claims is insignificant.

It is as an alteration of microparticles, then, that we will first think of the apparent destruction of the Federal Building. When the Federal Building explodes, the microparticles in an enormous collection pass from being components of a building to being no longer components of a building. Does this in itself amount to an alteration proper to the microparticles' own careers, their own courses of existence? Let me first focus on what frankly is just a warm-up question: is this in itself an alteration proper to the career of any *individual* microparticle, or any individual causally salient grouping of microparticles—e.g. an individual proton, an atom, perhaps even a molecule? *Something* dramatic happens to many a microparticle in the Federal Building, when the building explodes. Each of this many is jostled violently by nearby microparticles. But the question is not whether its being *jostled violently* amounts to an alteration proper to the given microparticle's own career. The question is whether the given microparticle's figuring in a more widely-distributed state of affairs does so—whether it amounts to a change proper to that microparticle's physical career, that it no longer is contained within the building it once was.

To this question, the answer seems to be No. No one thinks that to give an accurate and explanatory account of the career taken by a microparticle (or a natural grouping of them), physics needs

to take note of whether the microparticle in question is contained within the boundaries of a building, or of an animal, or of a sweater. The reason for this is that the behavior of an individual microparticle in such a medium-sized object typically reflects only the microphysical behavior of its nearby neighbors in the object—or, in the case of microparticles at or near the object's boundaries, the behavior of nearby microparticles outside those boundaries. An individual microparticle typically does *not* respond to, or influence, the behavior of every last other microparticle within the medium-sized object which contains it. A fortiori, none typically responds to all *and only* those other microparticles. In the microphysical account of the behavior of an individual microparticle (or natural grouping of microparticles) in a typical medium-sized object, the boundaries of that object are not causally salient. From the standpoint of microphysics, a medium-sized object is typically a causally loose-knit cloud of microparticles.[4]

Now true, two thoughts might make one *doubt* whether familiar objects are as loose-knit as I am suggesting—and since the issue will be relevant later, both thoughts need to be addressed. The first thought is that all the molecules in a typical familiar object, and only those molecules, are joined to one another by a kind of lattice or network. Hence all atoms within the familiar object are thus joined to one another, and with them all subatomic particles, and with them all fundamental microparticles. Thus when the explosion first impinges upon the Federal Building, it sets up reverberations which shortly affect every last microparticle within that object. That is, the violent alterations undergone by the first microparticles within the building touched by the explosion become violent alterations undergone by all: the microparticles within the building react en masse, even if not at the same instant; their reactions are not loose-knit, but compose a single building-wide reaction.

But this thought is in a crucial respect deceptive. At the level of the microparticles themselves, the lattice which joins the molecules is not a single *thing*. It is a supervenient phenomenon, subvened by the ways the individual microparticles act on and respond to their nearby neighbors. The lattice, in other words, is not something which the first microparticles affected by the explosion *push*, thereby pushing all (and only) the other microparticles within the Federal Building. It is something which they help to make *be*. All other microparticles in the Federal Building also make *their* own contributions towards making

the lattice be, and many of these other contributions are triggered by microparticle events far removed from the original ones. The *way* the microparticles in the building make the lattice be is by pushing, each of them, *their nearby neighbors*. The causal ancestry of an individual microparticle's behavior typically extends no further than that.

But this reflection brings up the second thought: isn't causation transitive? If violent alterations in the behavior of the first microparticles touched by the explosion cause violent alterations in a second tier of microparticles, these in turn cause violent alterations in a third tier, and if the causal chain thus started eventually embroils every last microparticle in the Federal Building, does it not follow that the microparticles in the first tier have after all affected all the other microparticles in the Federal Building? Or, viewing the same causal chain from the opposite end, might it not happen that a given individual microparticle is acted on by every last other microparticle within the Federal Building? In that case it might after all be important, in the microphysical explanation of what happens to that individual microparticle, that it is spatially associated with exactly those other microparticles, i.e. that it is contained within the Federal Building—or that those other microparticles no longer are associated with it, and that the Federal Building has exploded.

But in fact it is false, as I have argued elsewhere, that causation *is* in general transitive ([reference deleted to preserve author's anonymity]). So we can set aside this second thought too.

III

If the apparent destruction of the Federal Building is really just an alteration at the level of microparticles, it is not an alteration proper to the career of any individual microparticle; within the career of any individual microparticle, as I've now argued, containment in a surrounding familiar object, or cessation of such containment, are both per se causally invisible. But there is a far more plausible suggestion. Perhaps the apparent destruction is really just an alteration in the *collection* of microparticles which makes up the Federal Building—which occupies exactly its volume—just prior to the explosion.

For on the career of this *collection*, the explosion might plausibly be said to have had very visible and substantial causal impact. The explosion figures quite prominently, it seems, in the causal chains that link earlier stages in this collection's career to later stages.

But there is a question we must address as to just what the pre- and post-explosion stages of this collection *are*, just where they are to be found. What nature marks out this collection of microparticles, and permits us to trace its spatial boundaries at earlier and later stages? Two answers are possible. The first is that the "collection" intended here is really the *aggregate* of microparticles contained within the boundaries of the Federal Building at the instant prior to the explosion.[5] That very collection, then, will have existed at earlier and later instants exactly *where* those very microparticles were located; the contours of its career are fixed by the numerical identity of its components. Since the Federal Building, like any familiar object, was constantly in process of adding new microparticles (as its gutters oxidized, for example) and of losing old ones (as its bricks were eroded, for example), the collection which composed it at the time of the explosion will have existed in a somewhat scattered state even quite shortly before the explosion, and of course in a decidedly scattered state just after it.

The other answer is that the "collection" intended here is the *lump of matter* which composed the Federal Building at the moment before the explosion.[6] Its identity across time, at least for a long stretch leading up to the explosion, is given by the volume and shape of the Federal Building: it comprises numerically different microparticles at different moments in its career, but always all and only those microparticles that lie within the boundaries of the Federal Building.[7]

But there are problems with either answer. Let us begin by looking at the career of the aggregate of microparticles which composes the Federal Building at the tragic moment—if indeed this aggregate *has* a career. For vast periods of time prior to the construction of the Federal Building, as for vast periods after the explosion, this aggregate was strikingly scattered in space. For much of the time it was *too* scattered, it seems, to have as a whole caused anything, or to have undergone any unitary reactions to impinging events. Microphysics would have had no greater need to recognize its existence, during these vast periods, than the existence of any other gerrymandered or randomly-assembled collection of

microparticles. All that this collection *did*, during these vast stretches of its existence, was to *be* the collection that it is.

But still—the friend of this aggregate might rejoin—during the happy years when the Federal Building *was* intact, this aggregate might be said to have done many things. For the Federal Building itself can be said to have done so: it provided shelter and office space for federal workers, it withstood winds, it cast shadows, etc. It is true that not *all* of the aggregate present just before the explosion was present at the time of these effects, and subvened their production. But a vast majority of the microparticles in that aggregate were present, and their actions did subvene these causings. So surely—the friend of the aggregate might conclude—the aggregate could as a whole be said to have done many things, produced many effects, during the years that the Building was intact.

But of course it does not *follow*, from the premise that a part of *x* caused effect *e*, that *x* caused effect *e*, even if the part is large—that reasoning embodies the fallacy of composition. In a case like the present one, I have elsewhere argued, that conclusion is not just unwarranted but highly implausible ([reference deleted]). The premise of the argument is that a cause of effect *e* is a necessary component of circumstances and developments which preceded *e* and were jointly sufficient for *e*. Suppose then that moments before the explosion, a janitor caulked a sink in one of the bathrooms, and that for months prior to that moment the caulk he used was located in his house in a suburb of Oklahoma City. How then might it be true that aggregate *a*, comprising exactly those microparticles found within the Federal Building *at* the tragic moment, produced some effect *e' a week before the explosion*? Some state of affairs involving *a*, *including those microparticles in the janitor's house*, would have had to figure indispensably in the circumstances that obtained and were sufficient for *e'*. That is highly implausible. Any effect produced by the Federal Building a week prior to the explosion—e.g. casting a shadow, sheltering from rain—surely would have gotten produced anyway, even if that tube of caulk in the janitor's house had not existed.

It would seem then that the collection of microparticles which composed the Federal Building at the time of the explosion—if construed as an *aggregate*—had a "career" which was exactly one episode

long. To wit, it figured in the explosion. But then that explosion cannot figure prominently in the causal chains which link pre-explosion phases in that career to post-explosion phases. There are no such links, because there are no such phases. In fact it could even be questioned whether this aggregate is an entity in its own right at all. That position seems warranted only by the doctrine of Unrestricted Mereological Composition—the idea that any mereological sum of entities is itself an entity. But this doctrine has bizarre consequences for metaphysics ([references deleted]).

Then what of the suggestion that the "collection" of microparticles which gets altered, when the Federal Building appears to get destroyed, is the *lump of matter* which composes it at the time of the explosion—and for long periods before? This suggestion is actually even worse. The identity of this *lump* across different times, as I put it earlier, is given by the volume occupied by the Federal Building at those times. Now, one way of reading "is given by" is as "consists in": that one or another assemblage of microparticles is an earlier stage of the *lump* present at the tragic moment *consists in* the fact that that assemblage then occupied the boundaries of the Federal Building. But now we have failed to meet the requirement of reducing the apparent destruction of the Federal Building to an alteration in something *else*. That *there are* earlier stages in the career of this lump then is logically inseparable from *there having existed* the Federal Building. Moreover, the lump gets destroyed when the Federal Building does! The other way of reading "is given by" is as "is evidenced by": that the Federal Building occupied volume *v* at earlier time *t* is *evidence that* the lump was found precisely within *v*, but may not be what the latter fact *consists in*. But then in what *does* the latter fact consist? From what other vantage point might we apprehend the nature of the lump, and see the features that mark it out as having filled exactly *v* at *t*, if not by projecting the career of the Federal Building downward onto the microparticles? Is there a rationale *from the standpoint of microphysics* for discerning a vast concatenation of microparticles having exactly the boundaries of the Federal Building? No, I have argued. In the transactions which microphysics documents and explains, the boundaries of a familiar object like the Federal Building are not causally salient.

IV

But microparticles and simples might not be the best vehicles for articulating the thought that when a familiar object appears to have been destroyed, what really has happened is that something else has altered. For what about the case in which a fundamental microparticle itself appears to have been destroyed? At one moment the properties distinctive of, say, a top quark are present at a particular location, and at the very next the properties of a bottom quark are there instead. Consistency seems to require that the basic thought be expanded: even when it appears that a *microparticle* has been destroyed, what really has happened is that some yet more fundamental stuff or object has taken on a different form. Microphysics may indeed determine that the case envisioned is fanciful—that it simply cannot happen, as a matter of physical law, that any fundamental microparticle *either* gets destroyed *or* turns into a microparticle of a different kind. But there would still be possible worlds in which the actual laws of physics do not hold—or so many philosophers suppose—and in many of them the case envisioned will really occur. Consistency does seem to require us to say that in such a case a parcel of more fundamental stuff merely alters—that it loses the top-quark form and acquires the bottom-quark form, while continuing to exist—and if so, we seemingly must say that in the actual world too, microparticles are just specifically formed parcels of the more fundamental stuff.

What nature should we think of this more fundamental stuff as having? Perhaps as having, intrinsically, no constitutive nature at all. For if we think of it as having any constitutive nature, we will have to face cases in which a chunk of it apparently is destroyed. It will be of no avail here, any more than before, to say that such cases are nomologically impossible. What we really must conceive of, then, is a substrate of change concerning which it is *logically* impossible, not just *nomologically* impossible, that it should lose its constitutive nature and thus cease to exist. This can only be a stuff which *has*, intrinsically, no constitutive nature. It will be such as to acquire a nature—an accidental nature—only when and to the extent that it comes to be formed in this way or that. I shall call such stuff "prime matter", since that is what Aristotle calls it, arguably.

When the explosion appeared to destroy the Federal Building, then, what really happened is that a large amount of prime matter acquired a different form. But did that event constitute an alteration proper to that prime matter's career, its own course of existence? Did that re-forming figure squarely in the causal chains which tied earlier episodes to later ones in that prime matter's existence?

A preliminary question: *are there* any such causal chains? If there are, they evidently cannot take the form that is familiar to everyday thought. Later stages in the career of a dog or a sweater or a building are shaped by earlier ones in ways *reflective of the kind* to which these items belong: a sweater responds differently to application of hot water, or to being folded, from how a building does, and both respond differently to angry shouts from how a dog does. But later states in the "life" of a particular amount or parcel of prime matter cannot, it seems, grow out of earlier stages in ways *reflective of its nature*, of the kind to which it belongs. For prime matter *has* no intrinsic nature.

Or might prime matter acquire a nature—or something close to one—from the accidents of its history? Perhaps it's a law of nature that prime matter which once held the form of a building is afterwards equipped with certain capacities for becoming differently formed—it can become paving material or lampposts—and specific incapacities for acquiring yet other forms—it cannot become a butterfly. In that case the alteration which the prime matter composing the Federal Building underwent might after all amount to an alteration proper to its own existence. *After* the explosion, the prime matter was freed to take on new forms, but the starting point of the explosion—the matter in en-buildinged form—narrowed these to paving material form and lamppost form.

But how firmly would the alteration have channeled this prime matter's future development; how deep would be the impress of this prime matter's past as a building? The proponent of prime matter might consider either of two answers, but the more promising answer is that the impress of the past is deep. Prime matter once formed as a building thereby becomes prime matter of a special kind, ex-building prime matter. Indeed the world is populated by prime matter belonging to many different kinds—ex-sweater prime matter, ex-animal, etc.

But now the proponent of prime matter himself faces a question much like one we've seen earlier. Earlier we asked, what if at one instant a top quark is present at point *p*, and the next instant a microparticle bearing the properties of a bottom quark is present at *p*? Destruction or merely alteration? Just so here. What if at one moment ex-building prime matter is present at a given location, and at the next moment prime matter with different capacities is present instead—say, the ex-animal prime matter? Was the original prime matter *destroyed*, and replaced with prime matter of a different kind? Or is the appearance of destruction is as misleading here as elsewhere—is the real truth that a parcel of Ur-prime matter, existent throughout the scenario, has simply assumed a new form?

It would be a mistake to give either answer. The choice between them should not even arise. For prime matter was supposed to be something for which the very suspicion of destruction *logically* could not arise—a stuff proof against destruction, not just nomologically, but logically. So rather than answer the question "what if it appears that a parcel of prime matter has been destroyed?", the proponent of prime matter should reject its premise. Prime matter, he must say, does not come in different kinds. Whatever the forms it has in the past assumed, prime matter is all alike.

But then the prime matter which composes the fragments and shards of the Federal Building is effectively unmarked by its past, and as ready to assume any other new form as any other parcel of prime matter. Hence whatever the forms which this prime matter does subsequently assume, *that* it assumes them in no way reflects its past as the Federal Building. *There are* no causal links by which the past of this prime matter shapes its present, or its present constrains its future. So the alteration which this prime matter undergoes during the explosion does not figure in such links. The change from *composing-a-building* to *no-longer-composing* a building is not a change proper to the career, the course of existence, of the prime matter which composed the Federal Building.

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[1] Peter van Inwagen is largely responsible for the currency of the phrase "physical simples", but his own view is that the workings of the world are *either* events involving organisms *or* events involving

simples: the apparent destruction of any familiar object *other than an organism* is really a rearrangement of simples (van Inwagen 1980, pp. 98-99 and 158).

[2] The phrase is from the discussion of Sidelle in O'Leary-Hawthorne and Cortens 1995; Sidelle himself generally uses just "stuff", as does Jubien.

[3] Peter van Inwagen holds a view of the sort I mean concerning all familiar objects except organisms—e.g., concerning chairs. But what van Inwagen *says* is "There are no chairs" (1990, p. 101)—which makes it sound as if he *does* deny that there are such things as chairs. Yet at the same time, van Inwagen tells us that "when people say things in the ordinary business of life by uttering sentences that start 'There are chairs…',…they very often say things that are literally true" (p. 102). My way of reconciling these assertions is to take van Inwagen as denying that chairs are *substances*—as do the other proponents of this sort of view whom I identify. But there is room for debate as to just how van Inwagen's assertions are to be put together; see O'Leary-Hawthorne and Michael, 1996.

[4] For elaboration of this view, see [reference deleted to preserve author's anonymity].

[5] The reflections which generate "the problem of the many" also suggest that there is no fact of the matter as to just which microparticles are contained within this aggregate. Indeed, for an analogous reasons, there may be no fact of the matter as to just which instant is "*the* instant prior to the explosion". These do seem to be problems confronting this first answer on the nature of the "collection" intended. But they are less instructive than the problem I discuss several paragraphs below.

[6] For a discussion of various kinds of lumps, see Sidelle 1998.

[7] Again (see note 6), the reflections which generate "the problem of the many" suggest that the microparticle membership of this lump is indeterminate, even at any given moment. This is a problem with this second answer on the nature of the "collection", but not the most serious problem.