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PERSISTENCE, CHANGE, AND EXPLANATION[1]

1. INTRODUCTION

There is a tangle of philosophical problems about change and per-
sistence through change; some of the problems focus on change of
parts, some on change of matter, some on persons. Some of the
discussions begin with an ontology of momentary things, and worry
how momentary things constitute the temporally extended objects
familiar to us. Some of the discussions begin with an ontology of
enduring things, and worry whether or how change is possible at all.

When faced with the variety of problems and the variety of solutions
which are available on this one (albeit multi-faceted) topic, it is tempt-
ing to despair at the prospect of charting one's way to an understanding
of the workings of change. How are these problems related? Where
should our inquiry begin? What should we look for in a solution?[2]

In what follows I will focus on one problem, viz., whether (or how)
something can gain or lose a property and persist through that gain or
loss. My strategy will be in a loose sense Aristotelian. I will begin with a
number of assumptions which have a significant intuitive plausibility,
and I will show that there is a prima facie conflict between them.[3] The
apparent conflict among our intuitions offers the motivation to rethink
the assumptions and the argument which purports to show that they are
in conflict.

I begin by devoting considerable space to what may seem the
introductory task of setting up the problem. Although the problem may
seem familiar, it is important to see how it arises out of basic intuitions
about change, persistence, and identity. I propose that once we look
more closely at these intuitions, it becomes clear that the problem is
more difficult and more disturbing than it might first appear. My
project for this paper is not to offer a "solution" to the problem, but to

show that the model of change underlying the problem is one we
cannot lightly give up.

   After setting out the problem, I present and argue against one
possible solution to the puzzle, viz., the doctrine of temporal parts. This
solution has been popular in the philosophical literature at least since
Hume; it is perhaps the solution most often taken for granted. It is also
a solution which has been regularly employed in discussions of personal
identity. Unlike some proposed solutions, it is simple and can be
applied systematically; its elegance gives it a significant appeal. Unfor-
tunately, it has the disadvantage of yielding the result that things do not
persist (in the strict sense) through change, and thus it conflicts with
certain of our ordinary beliefs.

   The fact that the doctrine of temporal parts conflicts with our
ordinary beliefs (in the result that things do not strictly persist) is
sometimes treated as a reductio of the position. But taken at face value,
this basis for rejecting the view is unsatisfying. Since we have started
with a conflict between a set of intuitively plausible beliefs, there is
reason to think that any "workable" solution will require some revision
of these beliefs. If this is so, then why shouldn't we revise the notion
that things persist through change? In building philosophical theories
there are usually trade offs; at the very least we should determine what
this trade is costing us. Towards this end I consider the claim that
objects persist through change to determine what is lost if we give it up,
why it should matter to us at all. I argue that the notion that things
persist through change is deeply embedded in ideas we have about
explanation, and in particular, in the idea that the present is constrained
by the past. To give up the idea that the past sets constraints on the
present is to give up a key element in an important, and perhaps
essential, stragegy in providing explanations of change.

   My argument indicates a particular cost that the doctrine of temporal
parts will have to pay in opting for its solution to the problem of
persistence; I propose that this cost is too much to pay without further
work in exploring and developing the alternatives. Others already
committed to projects which can absorb the cost may feel differently.
Beyond the particular costs, however, my argument also suggests a
general picture of how metaphysical results are connected to demands
on theorizing. In its most complete form, this picture directs us to

achieve ontological results by looking at the presuppositions of the most general principles of rational inquiry.[4] I do not defend or elaborate the complete picture in this paper, though the argument concerning persistence makes plausible the more moderate suggestion that disputes over ontology derive from more fundamental disputes over forms of explanation. This suggests that we should seek to establish ontological results not, e.g., by weighing intuitions about what exists, and not by determining the ontological commitments of natural language, but by understanding the form and function of our most basic explanatory endeavors. Let us now turn to the problem.

2. THE PROBLEM

It is hardly deniable that some things change and persist through change. Even if they do not persist through all changes, they persist through some of them. The tree outside my window is coming into bloom; a new cluster of blossoms has opened since the morning. The southern wall of my office has recently been painted white. My pencil changes position as it rolls across the desk. In such cases there is something (e.g., the tree, the wall, the pencil) which exists both before and after the change; the object persists through the change. Nevertheless the persisting object is not exactly the same before and after the change.

The examples seem straightforward, and yet, if pressed, one might worry about claiming both that it is the very same object before and after the change, and also that it isn't the very same, because it has changed. Is there a problem lurking here?

Consider the intuition that some things persist through change. Changes in which the object under consideration persists through the change in question are standardly called "alterations". Alterations are naturally contrasted with generations and destructions, or simple successions.[5] For example, the candle on my window sill, a long white taper, softens in the sun and changes shape, but the candle persists through the changes. Thus, the candle is altered. However, if I melt down the wax of the candle to a liquid and, say, harden it in a mold of a bust of Aristotle, the candle does not persist. The candle does not exist after the change, the bust does not exist prior to it; the candle has been

destroyed and the bust has been generated. Presumably, however, the wax which composes the candle, is the very same wax that composes the bust. The wax persists through the generation of the bust and the destruction of the candle, and has been altered. With the distinction in mind between alterations and successions (i.e., the generation of one thing upon the destruction of another), we can see that one consequence of our initial intuition is that not all changes are simple successions; some changes are alterations.

One natural way of characterizing alterations is to say that they are those changes in which an object gains and/or loses a property, while persisting through that gain and/or loss. While being exposed to the hot sun, the candle loses the property of being straight and gains the property of being bent; as it is painted, the wall in my office loses the property of being grey and gains the property of being white. At this stage we need not get into the technicalities of the notion of properties and commitment to properties, for the details of the discussion do not demand it; so let us continue with a broad and loose notion of "property", allowing the term to range over qualities and relations of any degree.

Relying on this characterization of our initial intuition, we can formulate the following principle (the Persistence Principle):

PER: There are some objects which persist through alteration, i.e., through the gain and/or loss of a property.

In discussing the persistence principle, I have been relying on a notion of persistence which we might now explicate a bit further. It is very natural to see the persistence of an object as requiring its continued existence; in other words, if an object persists through a change, then it must exist both before and after the change. This suggests we should accept the following principle:

PE: If A persists through a change, then A exists both before and after the change.

Along with this we can introduce what is usually taken to be a basic logical principle:

EI: If A exists, then A is identical to something.

(If A exists, then of course it is identical to itself.)

Applying this to our ideas about alteration, it makes sense to say that if an object A undergoing change persists through the change, then it must exist (and so be identical to something) before the change, and exist (and so be identical to something) after the change. To avoid redundancy in the discussion, I will use the principle (PI) which follows from (PE) and (EI):

PI: If A persists through a change, then A must be identical to something before the change, and identical to something after the change.

So far we have considered intuitions about change and persistence; let us now consider identity. Certain intuitions about identity seem straightforward. For example, if A and B are identical, then there is only one thing. So, if something is true of an individual A which is not true of an individual B, then A and B are not the very same thing, i.e., they are not identical. Stating these intuitions in a more material mode, we might say that if A and B are identical, then whatever features, properties, or aspects that A has or relations A stands in, B also has and stands in. Again, there is only thing, and this one thing cannot both have and lack any property, or both stand in and not stand in any relation. Intuitions such as these make Leibniz' Law (or the indiscernibility of identicals) very appealing[6]:

LL: If $a = b$, then $(\emptyset)(\emptyset a \equiv \emptyset b)$

Once we have come this far, a puzzle begins to appear. Given that the object undergoing alteration persists, this would suggest that the object before the change is identical to the object after the change; but then we appear to be committed to saying that whatever is true of the object before the change is likewise true of it after the change; in other words, whatever properties the object has before the change it also has after the change. But if this is the case, then how can it be that the object has altered? How can it have gained or lost a property?

This suggests that as we have interpreted them, there is a conflict between our three principles. Can we gain a clearer focus on the apparent conflict? Let us suppose that all of (PER), (PI) and (LL) are true. Consider an object A which has a property Ø (and presumably does not both have and lack the same property). Suppose that A alters, and in accordance with (PER) loses the property Ø. What can we say

about A after the change? After the change, either A is identical to
something which has Ø, A is identical to something which lacks Ø, or
A is not identical to anything. Consider the first option, that A is
identical to something which has Ø. If A is identical to something which
has Ø, then A has not lost Ø; but this violates our hypothesis that A has
altered according to (PER) by losing Ø. Suppose instead that A is
identical to something which lacks Ø. According to (LL), A is (can be)
identical to only those things which have (and lack) those properties
that A has (and lacks). Since, by hypothesis A has Ø, A is not (cannot
be) identical to anything which lacks Ø. Thus, the supposition that after
the change A is identical to something which lacks Ø violates (LL).
Finally, suppose that A is not identical to anything. If A is not identical
to anything after the change, then by (PI), A has not persisted through
the change. But by hypothesis, A does persist, so this option too is
ruled out. Thus, we must reject either (PER) or (LL) or (PI).[7]

If this argument is sound, it appears that we are pushed into
choosing between several undesirable alternatives. If we want to hold
onto (LL) and (PI), both of which seem to be quite basic to our
intuitions about existence and identity, we must give up the notion that
objects persist through change. Thus, a wall is destroyed as it is painted,
a tree is destroyed as it blooms, the candle cannot exist long enough to
change its shape. Alternatively, if we choose to hold onto (PER) we
must revise our notions of existence and identity. How should we
proceed to revise them? Should we say that, e.g., identicals are dis-
cernible? But then how is identity to be distinguished from certain
kinds of similarity? Must we say that there no workable notion of strict
identity?

From the discussion thus far it appears that there is a way in which
our intuitive notion of alteration can be unpacked to yield a puzzle. The
question arises: is this a problem with the intuitive notion of alteration,
so forcing us to give up the idea that things persist through change? Or,
is there a problem with the other principles (or their application) we
have just considered?

3. STRATEGY

There are many ways one might go about trying to solve this puzzle.

Almost everyone has a gut reaction about where the argument goes wrong and what the solution is. On the face of it, there are several plausible ways to begin challenging the puzzle: by rejecting or revising (PER), (LL) or (PI), or by offering an interpretation which makes the three compatible. My bet is that the puzzle results from an insensitivity to time in the formulation of the principles; thus, a promising strategy for a solution will be to revise or reinterpret the three principles in a way that brings time explicitly into the picture.

How one should bring time into the picture is a difficult question. I am assuming, however, that simply saying that time or tense plays a role and leaving it at that is not enough; we want to know *what* role it plays. In other words, it is not enough to say, "Well, of course, the wall was grey yesterday, and is white *today*." Or, "Well, the wall *was* grey, but *is* white," with no more said.[8] Such claims are straightforwardly true, but in virtue of what are they true? In a technical sense one might ask what is the semantics of such statements, or what are their ontological commitments? More informally, one might ask what does the truth of such statements tell us about what the world is like, e.g., about objects and their changes, about properties and time?

A plausible strategy for working through a number of options is to introduce temporal indicators in the argument we have been considering. Let us consider the example of a leaf changing color in autumn. In September, the leaf is green; in October the leaf is not green, it is red. Nevertheless we want to say that the green leaf and the red leaf are the same; the green leaf has persisted through the change to being red. One might add temporal indicators to statements such as

> The leaf is green.

in various ways. For example, one might add the indicator to the subject:

(i)   The-leaf-at-t is green.

to the predicate:

(ii)   The leaf is-green-at-t.

to the copula:

(iii)   The leaf is-at-t green.

or to the whole proposition:

(iv)   At t, the leaf is green.

We can use these options to redescribe the cases of change.[9] In what
follows I will focus the discussion on one of the proposals mentioned
above, viz., the proposal that we add temporal indicators to the subject
position, or more generally, to the singular terms, in our talk of change.

In my discussion of the proposal that we add temporal indicators to
singular terms I will assume a "literal" reading of this move, i.e., I will
assume that it commits us to an ontology of momentary things, e.g., the
leaf-at-t, the leaf-at-t', etc. My arguments are directed against this
ontological position. Of course this is to assume that there is a very
close relation between one's choice of canonical language and one's
ontology. Admittedly, this assumption is open to question — one can
interpret one's canonical language in various ways. However, since my
goal is to criticize certain ontologies, I am not concerned with those
who choose to represent their positions by e.g., temporally binding all
singular terms, but have no intention of interpreting this in terms of
momentary things. Such positions have a superficial similarity to the
ones I am discussing, but my target is the ontology one opts for, not
how one represents it. The assumption that the linguistic form of one's
chosen language closely reflects the ontological commitments of one's
theory simply makes the discussion easier.

4. THE METAPHYSIC OF TEMPORAL PARTS[10]

If we choose to avoid problems about persistence through change by
temporally qualifying the singular terms in descriptions of alteration,
then (assuming, as above, that this reflects our ontology) we are
committed to providing an account of alteration in terms of what have
been called "temporal parts", "temporal slices", or "momentary objects".
If we speak about blossoming trees, melting candles, and autumnal
leaves, we must be prepared to offer an interpretation of our statements
employing temporally qualified singular terms as the proper (or pri-
mary) subjects of predication. For example, in saying that the leaf is
green, strictly we should say that the leaf-at-t (a momentary thing) is
green. Correspondingly it is the leaf-at-t' (a different momentary thing)

which is red.[11] This choice of interpretation will thereby commit us to an ontology of change relying to some extent on "momentary objects". Let us call this view: the Metaphysic of Temporal Parts (MTP).[12]

In accounting for alteration, it is typical for versions of the MTP to allow for the "construction" of continuants out of sequences of momentary objects. This "construction" might take a number of forms; yet in each case the result is that what we normally take to be a persisting leaf is properly viewed as a (4 dimensional) space-time "worm" built up from space-time "parts" or "slices". There is much controversy over the nature of the relation (often called the "unity relation") in virtue of which the parts or slices can be properly said to constitute an object; some maintain that any series of slices can constitute an object, others suggest that the slices must meet certain conditions, e.g., that they be spatio-temporally continuous.[13] However, without deciding on the details we can say that the relation between the slices of the worm and the worm is one of parts to whole, and the relation between the individual slices is "parts of the same whole". In neither case is it identity.

How does this ontology of momentary things offer us a way to solve the problem of persistence? Because time slices existing for only a moment are the primary subjects of those properties allegedly gained or lost in an alteration, we avoid having persisting subjects gain or lose properties. Given an ordinary claim to the effect that an individual has a property at one time which *it* lacks at another (that it gains or loses a property), we restate this in temporal part terms to avoid predicating inconsistent properties of the same subject. For example, let us call the continuant A and its parts alpha, beta, etc. Then rather than say that A has a property Ø at one time and lacks Ø at another, we say instead that an object A has a (temporal) part alpha which has Ø, and a part beta which lacks Ø. Therefore, the notion of a change of properties poses no problem; the slices of the continuant which have different properties (i.e., one has and one lacks the same property) are distinct. For example, since the-leaf-at-*t* is not strictly the same thing as the-leaf-at-*t'* (they are simply parts of the same thing), there is no inconsistency in saying that one is green and the other is not green. Furthermore, the continuant (as opposed to the slices), does not change *its* properties either. Whatever properties it has, e.g., being composed of alpha, beta,

etc., it has, so to speak, "timelessly". Because neither the continuant nor its parts comes to have or ceases to have any property, there is no conflict with (LL), and the original puzzle about persistence through alteration does not arise.

It should be clear by now how the MTP solution to the puzzle works; it works by denying that there are changes which satisfy the concept of alteration as we explicated it. If the MTP is employed as a general response to the problem about persistence through change, we should take it as applying systematically to all alterations (or what appear to be alterations). Extending the example we have just considered, if we imagine something (of any kind) undergoing an alteration, i.e., persisting through the genuine gain and/or loss of a property, we allow for the apparent alteration only by interpreting the change as a succession of stages in some object "constructed" from those stages. In other words, the MTP allows us to make sense of alteration only by taking the purported "altering" object to be a construction out of distinct temporary objects which have different properties.[14]

In short, the MTP offers a model of change on which all changes are successions: successions of momentary objects which are related in special ways. This is not to deny that there is change, for successions are a kind of change. But if we accept the MTP "solution" to the puzzle, we thereby sacrifice our original notion of alteration, and deny (PER). So the tree, the candle, the leaf, don't alter, i.e., don't persist through their changes, after all.

At this point the defender of the MTP might object that I have misrepresented the consequences of the position. Although on the simple or naive MTP it appears that we must give up the notion of objects persisting though their changes, we can develop a more sophisticated account of the notion of persistence, (and/or a more sophisticated account of the notion of predication), which enables us to accommodate the idea that there are things which (in some sense) persist through alteration. The strategy here is to devise a way to save the letter (if not the spirit) of (PER), by reinterpreting the conditions on "persistence" and "gain and loss of properties".

The moves here are what one might expect given the discussion thus far. For example, given the project of developing a notion of persistence consistent with the MTP, one might define new forms of

"persistence" such that either the momentary objects "persist" or the continuant "persists" in the new defined sense. For example, one might introduce a form of persistence (call it "continuing") for momentary objects, such that a momentary object "continues" through a period of time just in case it is part of a (unity-related) sequence of momentary objects which has parts (or members) at those times.[15] If we accept the notion of "continuing" as a form of persistence, then the MTP theorist can maintain (using the new interpretation) that there are things which "persist" through the "gain and/or loss of a property" because there are momentary objects which are parts of unity-related sequences having members with different properties.[16] From the point of view of the MTP, this happens all the time; in fact, as often as we might think things alter.

Here the MTP theorist has offered a move to save (PER), though clearly at the expense of (PI), viz., the principle which links persistence through time to identity through time. Here a determined MTP theorist might either bite the bullet and reject (PI), or might undertake reinterpretations of the notions of identity and existence in order to save (at least the letter of) (PI) as well. And the rationale behind these moves is familiar. If the original intuitions behind the principles lead to paradox, there is reason to think they are fraught with confusion. Once the concepts have been analyzed properly, one can see that the puzzle disappears. Although the MTP position may appear to conflict with the naive intuitions with which we began, those intuitions afford no coherent interpretation; some initial uneasiness is a small price to pay for coherence.

Perhaps this is so, but we should not be won over too quickly. The MTP is not offering only a minor adjustment to our ordinary ways of thinking. The new notions of "persistence" just suggested would be unrecognizable as a concept of persistence were it not for the context in which we have developed it. We want to know if something can persist through alteration; this is not to ask whether it is possible for certain momentary objects to be linked in ways to form a special kind of sequence. Saying that things do persist through alteration because there are "unified" sequences of momentary objects which have different properties provides an answer only by missing the point of the question.

Yet those of us who don't accept the MTP (and want to do more than baldly deny it) face a significant challenge. Why is it that we have the notion of objects persisting through the gain and loss of properties? What is important about this idea? Is this part of a larger picture which we want to accept and which depends on this notion? In addressing these issues we should focus on the following question: What is the point of persistence? And is the point of persistence accomplished by a notion which requires something weaker than the "strict persistence" and "strict identity" as indicated in the principles (PI) and (LL)? To this I shall now turn.

5. PERSISTENCE AND EXPLANATION

Why persistence? Why should we include in our ontology genuinely persisting things? Although it is likely that many will find the MTP unattractive because it fails to correspond to all of our ordinary beliefs, it does have some important appeals. As I mentioned before, it is beautifully systematic and offers a quite elegant way of solving the problem. And there is perhaps *some* intuitive appeal in the suggestion that, e.g., the individual we are acquainted with at one time is not really the *very same thing* we are acquainted with at another. What complaint do we have against the MTP other than that it forces us to trade off some of our beliefs?

Let me begin by pointing out that the defense of an account of change which includes "genuine" alteration (and "genuine" persistence) as captured in (PER) hinges on the defense of three theses.

(a) In some changes there is something which genuinely persists, i.e., something such that *it* exists both before and after the change.

(b) That which genuinely persists (as in (a)), is the direct subject of properties, (i.e., it is not the case that its properties are "indirectly" predicated of it in virtue of their being "directly" predicated of its temporal parts).

(c) The properties which are predicated directly of the subject (as in (b)), are (i) time-free properties, and (ii) are gained and/or lost in the change.

In the discussion which follows, I will consider (a) (and only (a)); (b) is relevant to a different way of working out the details of the MTP; (c)

is relevant to defend (PER) against the view that we should include temporal indicators in the predicate position rather than the subject position.[17]

Before I get into the details of the argument for Thesis (a), let met make a few comments about my general strategy.[18] I do not think there are considerations based on the concept of change, the experience of change, or on the logical form of change statements which can establish that there are things which genuinely persist, and so conclusively refute the MTP. The argument I shall present fits into a strategy which is different from each of these. In its boldest (and most general) form the strategy is this. We can ground ontological intuitions through considerations about what it is to undertake rational inquiry and rational theorizing. If there are certain kinds of (or principles of) explanation which are a necessary part of rational theorizing, then this will pose general constraints on what our best theory can intelligibly say that there is.[19] Ontologies which don't include the things which make rational theorizing possible, are not acceptable.[20] If this is our method in metaphysics, it becomes clearer why metaphysics has a place distinct from and in some sense prior to science.

It is worth noting that the form of argument I am suggesting is not a simple case of "argument from the best explanation". Typically arguments which draw ontological conclusions from "good" explanations take a given instance of a good explanation and argue that what that particular explanation presupposes must exist. The kind of argument I am suggesting is (at least) more general than that. What I want to say is that there are general demands on a kind of explanation, in particular, natural explanation, which require that there are persisting things. Because I also want to suggest that giving natural explanations is part of what it is to undertake rational inquiry with respect to a world in which there is change, the conclusion that there are things which persist is not merely conditional on a particular explanation being a good one, but rather on a general form of explanation (or a whole project of rational inquiry) being a good one.[21]

As I mentioned, this is a bold statement of the strategy, and there are many aspects of both the strategy and the statement of it which are problematic and difficult. In this paper I will *not* provide all stages of the argument from constraints on theorizing to persistence. Rather, in

what follows I shall concentrate on arguing for this more limited claim: if some changes are explicable in terms of natural explanations, and if natural explanations require the assumption that the past constrains the present, then there are things which persist through change. This more limited claim adds two qualifications to the outright persistence claim: first, that some changes are explicable in terms of natural explanations; and second, that natural explanations depend on the idea the past constrains the present. I will not argue for either of these claims here, although I take both to be (at the very least) extremely plausible. My present purpose is to show the connection between persistence and what I take most will grant are important (and common) explanatory strategies.

6. EX NIHILO BECOMING

In an effort to gain some insight into our puzzle, let us briefly consider some ancient puzzles about change. Some of the most important puzzles about change were developed by the Eleatics, in particular, Parmenides. These puzzles formed the context in which Aristotle developed his theory of change. The Parmenidean puzzle is in some ways remarkably similar to the one we have been discussing, though there are important and illuminating differences. Briefly, (in Aristotle's words) the puzzle is this:

> Whatever comes to be must do so either from what is [ex ontos] or from what is not [ek mē ontos], and neither is possible. What is cannot come to be since it is already, and nothing can come to be from what is not ... (Aristotle adds: since there must be something underlying). 191a28f *Physics* A:8

Admittedly there are many difficulties in interpreting this puzzle, but a few things are clear. In particular, Aristotle and Parmenides (?) are looking at changes from a different vantage point than we have been. In discussing our own puzzle, the perspective from which we have been considering the change is primarily forward looking; given that we have an object A which undergoes change, what will happen to A after the change (will A be identical to something or nothing, etc.)?[22] In the Parmenidean puzzle, the perspective is primarily backward looking; given that we have an object A which is the product of the change, what

can we say about the origin of the change? He (They) answered: One thing is certain, nothing can come to be from what is not . . .

Leaving open how this last claim is to be (precisely) understood, this shift in perspective allows us to highlight the demand that changes be explicable. We look from the present to the past for explanations. If we require that change be explicable or intelligible, then this places constraints on the relation between the origin and the product of the change. E.g., the origin of the change cannot be nothing because comings to be from nothing are inexplicable.[23] Let me emphasize here: the point is not that it is in some sense unimaginable or "conceptually impossible" for things ever to come to be from nothing, but that such a coming to be would be impossible to explain. If we believe that some changes are explicable (specifically in terms of natural explanations), then at least in those changes there must be something which serves as the origin of the change.[24]

There are two specific questions which are important now to address: first, what is it about the claim that something comes from nothing that makes it unintelligible? What are the constraints on explanation which rule this out? Second, even if there are considerations which rule out the possibility that something comes from nothing, what justifies us in extending this conclusion to say that there must be something which persists? In other words, what is the relationship between the plausible claim that in changes for which there are natural explanations there must be *some* origin for the change, and the controversial claim that in such changes there must be something *persisting* through the change?

Let us begin with the first question. What is it about the claim that something comes from nothing which makes it unintelligible? The common (and perhaps simplistic) pattern of most explanations of change consists in citing certain external factors acting on something to produce the result in question. Presumably in the alleged case in which something comes from nothing, either some or all of the preceding factors in the change do not exist, thus preventing the explanation from even getting started; either there is nothing acting, or nothing acted upon, or both.

One way (though perhaps not the only way) to motivate the worry is to note that a past which is nothing, i.e., in which nothing exists, can set no constraints on the present. But without such constraints, any coming

to be would be arbitrary or random, and if arbitrary or random, then inexplicable. For example, in explaining the coming to be of a red tomato on a plant in the garden, one would normally cite facts about the plant having produced a green fruit which has ripened in the sun, etc. In a case in which the red tomato comes to be from nothing, there are no prior facts to cite which "set the scene" so to speak, for the tomato's coming to be. One has the sense that there is nothing "constraining" or setting limits on the change, thus, there is nothing to call upon to explain why a red tomato appears as opposed to something else. (Of course there may be logical limitations even on what might "pop" into existence, e.g., a red-and-not-red tomato cannot possibly come into existence; but such limitations are not sufficient as a basis for explaining that change. We look to the past for non-logical constraints on change.)

Thus, the alternative that something simply "pops" into existence *ex nihilo*, either demands an entirely different mode of explanation, or cannot be explained. The plausible conclusion in this case is to say that it cannot be explained (at least not in terms of natural phenomena). If changes are (in general) explicable, then things don't (in general) come from nothing.[25]

7. CAUSAL MESSAGES AND THE PAST

So given the considerations of the previous section, let us say that in general, (or usually) when something comes to be, it comes to be from something, i.e., there are preceding factors which may be cited in an explanation of its coming to be. Let us now turn to the situation envisioned by the MTP. On this view (or at least on one version of this view), the world consists of "time slices" or "momentary entities" which do not persist through change; on some views they do not persist for more than an instant. Thus, if this world is to be explicable, then it must be possible to provide explanations of change understood as a continual generation and destruction of these "momentary entities". (Note it may be that if we allow that a change in something results in at least a relational change in everything else, then everything is undergoing change moment by moment. And the task for the MTP is to explain the

destruction and regeneration of the universe moment by moment.) How would such explanations work?

Suppose we continue with the model that the coming into existence of an entity B is to be explained by external factors C acting on something A. The question becomes how, and to what extent we can apply this model, if none of the items in question persists through the change (or, in fact, through any time at all). For example, if A is distinct from B and in fact ceases to exist before B comes into existence, it is not clear how any sort of external factors acting on A could be such as to bring B into existence. What is the relationship between A and B such that not only does the emergence of B occur, but is, in some sense, necessitated? Must we introduce some occult power to transmit the action on A to B? How is the case in which A exists prior to B, but is distinct from B, different (especially from B's point of view) from the case in which nothing exists prior to B?

One intuition underlying this concern is that something must "carry the causal message" from one slice to another. As J. L. Mackie puts it, "The universe needs to know where to go next".[26] But how can we suppose that the information is passed along unless there is something to carry it, i.e., something which persists from the initial slice to the later slice? For example, suppose we have two ball-slices made out of (i.e., constituted of) a malleable substance, in other words, two ball-slices are temporal parts of a single temporally extended ball, one slice earlier than the other. Suppose we hit the earlier one with a hammer. Presumably there is a dent in the later one. How do we explain the dent in the later one? *IT* wasn't hit with a hammer, the earlier one was. Here we have a gap that it is not clear how to cross; in the case where we postulate something persisting there is no gap. The ball with the dent is just *the very same ball* as the ball which was hit with a hammer; no wonder it has a dent in it!

The idea here is that the past can get a hold on the present only through things presently existing. If an object does not exist at *t*, then it itself cannot "make demands on" thing at *t*. This does not rule out all causal influence of no-longer-existent things; for no-longer existent things may "communicate their message" through other things. For facts about you to *directly* causally effect me, you must co-exist with me. But

you may *indirectly* causally effect me (even if we don't co-exist) through
your effects on other things with which I do co-exist. For example,
Aristotle has affected me although he and I have never co-existed. How
is this possible? Because Aristotle has affected things which have
affected things ... which have affected me. Facts about no-longer-
existent things are sometimes causally efficacious; but this is only
because they play a role in the histories of things directly and indirectly
affected by them.

Where do we stand now in answering our questions about the
relation between coming to be *ex nihilo* and coming to be without
persistence? What is it about the suggestion that there is no genuine
persistence through change that makes it relevantly like the suggestion
that things come to be from nothing? The argument against *ex nihilo*
becoming rests on the claim that there must be a past (or things existing
in the past) to ground an explanation of the changes and the products
of those changes.[27] On the succession model of change there *is* a past
(and there are things in the past), which one would think could do the
work required. Can we get more focus on the problem?

Let us return to our sketch. Suppose C acts on A to produce B. A is
distinct from B and nothing persists through the change. The problem is
how we are to explain the change which results in B (or facts about
B). We ask: why should facts about C acting on A make a difference to
B, if A and C cease to exist?

How do we explain facts about B? Let us suppose that B is produced
at *t*, presumably there are facts about how things are prior to *t* which
are causally efficacious at *t* in bringing about B. We use these facts
about the past to explain the facts about B we are interested in.[28] But if
a fact is to be causally efficacious at a time *t*, it must be a fact about
something existing at *t*; facts about things which do not exist cannot
"act on their own" (without an existing agent?) to bring about changes.
On the succession model, however, neither A nor C exists at *t*, the only
things existing at *t* are things which exist *only* at *t*. Thus, on this model
there are no past facts we are entitled to draw on in the explanation of
B because no past facts are facts about presently existing things. But if
the past cannot be used to explain the present, then the situation is
relevantly similar to the case of something coming to be *ex nihilo*. In
short, from the point of view of the present, the past is nothing.

There are two principles about natural explanation which we can draw from this discussion, but before we do so it is important to make one more distinction, viz., between "primary" and "derivative" facts. My characterization of this distinction will be rough, but sufficient to indicate the general idea. I will rely here on what is naturally called the "propositional" view of facts, in contrast with the "gerundive" view.[29] (It is called the propositional view because it corresponds nicely to the grammatical (propositional) locution: the fact *that p*.) On this view there are two kinds of fact about an object, "primary" facts e.g., the fact that the tomato is (presently) exposed to the sun, and "derivative" facts, e.g., the fact that the tomato *was* exposed to the sun (say, yesterday). The fact that the tomato was exposed to the sun is a *present* fact about the tomato which corresponds to (or "derives from") the fact which obtained in the past, viz., of the tomato's being exposed to the sun (yesterday). The fact that the tomato was exposed to the sun and the fact that the tomato is exposed to the sun are two different facts; they both obtain in the present, though one of them concerns a state of affairs in the past and obtains in virtue of that past fact (and the other does not). In some sense the "derivative" present facts about an object "capture the history" of the object. (Since of course derivative facts about you will obtain even after you cease to exist.)[30]

Given the distinction between these two kinds of facts, there may seem to be some plausibility in maintaining that it is the present "derivative" facts about things which are causally efficacious. For example, in explaining why the tomato is red, it is natural to point to the fact that it was exposed to the sun all afternoon. Such explanations appear to rely on the causal efficacy of "derivative" present facts about things. But this is misleading. Within the propositional mode of talking about facts, such remarks relying on present derivative facts are the way to make reference to the past from the point of view of the present. In some sense, we speak of past facts through their derivative present counterparts. So to accommodate our intuition that the way the world was constrains the way the world is, we should say that the fact which is causally efficacious is the past *primary* fact, viz., the past fact about the object which is the basis for, i.e., which is logically responsible for, the derivative fact.

Let us now return to the "causal message" argument. Our discussion

suggests some limitations on the notion of causal efficacy. A fact is directly causally efficacious at a time only if it is about something which exists at that time. Facts which are not about anything presently existing may be part of present history, e.g., they may be present derivative facts about things which no longer exist, but history only affects the present through things which presently exist. Making a stab at these intuitions we can formulate the "Past is Nothing Principle"[31]:

PNP: If a fact is (directly) causally efficacious at t, then it is fact about something which exists at t.

From the discussion of the impossibility of coming to be *ex nihilo*, we found that past facts are relevant in explanations of change. The reason why past facts are relevant is that such facts set (non-logical) constraints on the present; that is to say they are causally efficacious in determining facts about the present. If some changes are explicable, then in those cases there will be causally relevant facts about the past to play a role in explanation. Keeping in mind the distinction between primary and derivative facts, we should formulate this as the "Causal Relevance of the Past":

CRP: In some changes (specifically natural changes), past primary facts about things are directly causally efficacious in the present.

or: In some changes (specifically natural changes), if t is the time of the change, then primary facts which obtain prior to t are directly causally efficacious at t.

Since primary facts which obtain prior to t are facts about objects, all of which exist prior to t, it follows from the CRP that:

CRP+:   In natural changes, facts about things all of which exist in the past are directly causally efficacious in the present.

or: In natural changes with results at t, facts about things, all of which exist prior to t, are directly causally efficacious at t.

Given PNP and CRP+, we can validly conclude:

P: In natural changes there is something which exists both prior to the change and at the time of the change (i.e., prior to t and at t).

This, in effect, establishes Thesis (a), viz., that in some changes there is something which genuinely persists, i.e., something such that it exists (and is identical to something) both before and after the change.

So do we now have an answer to our questions? What can the argument against *ex nihilo* becoming teach us about the question of persistence? What is the force of the "causal message" argument? What does persistence have to do with intelligibility?

Briefly, the argument against *ex nihilo* becoming taught us that some changes, at least changes for which there are natural explanations, must be constrained by what precedes them; for natural explanations of the products of change rely on a (causal) story about the past. So if a change is explicable, the past cannot be nothing. The causal message argument taught us that the past can be causally efficacious in the present only through things presently existing. Therefore, if nothing from the past persists to the present, the past can set no constraints on the present; the "causal message" cannot be communicated across the gap. Thus, on the succession model of change, because the past is causally ineffective, it is "from the point of view of the present" nothing. From this we can see that persistence does provide us intelligibility in explanations of change. Natural explanations work by showing the systematic causal interconnections between things. Without persistence, the causal story becomes unconnected; neither the past nor the future can get a hold on the present in a way that is causally efficacious.

8. OBJECTIONS

Let me comment briefly on a couple of the most natural objections to what I have said so far. First, I would be naive to think that there aren't substantive theories of causation and explanation which deny many of the claims I have made here. For example, typically those who hold a temporal parts view about objects also hold a characteristic view about causation and explanation. Specifically, it is common to find those who buy temporal parts holding something like a regularity view about causation (Think of Hume). But if one does hold a regularity view about causation, then it is not clear how disturbing the results I have mentioned will be. Granted, for a regularity theorist, there is nothing more to say in explaining why the dented ball-slice follows the spherical

ball-slice except that it's typical of ball-slices to occur in successions of this kind, when there are certain kinds of hammer-slices and people-slices around. But on their view, this is sufficient to provide an explanation. No mysterious powers are invoked to cross the gap (as I suggested there might be), rather the explanation simply attempts to do less and is satisfied with that.

It's clear that I haven't addressed many of the issues which arise in a discussion of the Regularity Theory of causation or a corresponding theory of explanation, but the possibility of developing a Regularity Theory does not undermine my argument for the more limited claim with which I am concerned here. As I indicated above, my primary concern is to show the connection between certain assumptions about explanation and persistence. A regularity theorist (for example) might deny the assumptions about explanation and could still acknowledge the connection I am concerned to establish.

Admittedly, at this stage I am counting on the intuitive plausibility of assumptions about causal constraint in contrast to the assumptions of a Regularity Theory; but this does not leave my argument without interest. First, it is important to note that not all MTP theorists are Regularity Theorists; and my argument presents a challenge to those who want to combine the MTP with a richer account of explanation and cause. Second, even for those of us who do not need to be convinced of persistence, it is important to see the role persistence plays in our explanatory endeavors. For example, the considerations I have raised provide reason to undertake the projects of working out views on substance, explanation, and causation, consistent with the principles articulated above. Although these are clearly difficult tasks, there is much already achieved on this front; and they are not tasks to forsake before further investigation. Third, if the methodological comments I have made along the way are correct, this should have strategic implications for any inquiry into ontology.

The second objection I want to mention is more difficult. In short the worry is this. Suppose we do grant that on the MTP there is an explanatory gap between origin and product of the change. Is this gap filled when we introduce a persisting thing? What does the persisting thing contribute that enables us to provide a better explanation?

My remarks here will only be gestures towards an answer because a

complete answer will depend on a more detailed account of persisting things which draws on the traditional notion of substance. It is tempting, however, to claim that what persistence contributes is simplicity. One gains simplicity by having a more stable world, one which is not being regenerated moment by moment. One gains simplicity by being able to rely on Leibniz's Law to simplify the articulation and application of laws concerning things across time (note that "unity relations" are not, in general, indiscernibility relations). For example, the MTP would have to restate laws relying on "dispositional properties" in order to bring in the preferred "unity relation".

However, I hesitate to offer simplicity as the answer. First, simplicity is a slippery notion. For example, local simplicity is not, in general, a good indicator of global simplicity. What is metaphysically simple may be epistemologically messy; what is epistemologically simple may be morally messy, etc. Further, even if we restrict ourselves to metaphysical simplicity, I doubt that persistence offers overall a more simple position than the MTP. For example, even regarding a point just mentioned, to the extent that the MTP must account for continual regeneration of the world, the persistence theory must account for continual alteration of the world (since what places the demand on the MTP for a succession just is the appearance of an alteration). Is there a substantial difference? Perhaps, but it is not obvious.

I am inclined instead to say that what persistence offers is intelligibility: the possibility of understanding the change, and of understanding the products of it.[32] Although admittedly this suggestion is obscure, it might be spelled out in several ways. One way is to emphasize the importance of structural explanations in making change intelligible, and to link structural explanations to substances, and thereby to persisting things. Another way is to explore the ways that the postulation of persistence precludes certain skeptical worries from getting started. For example, the MTP offers a picture such that from the point of view of the present (which is our point of view), the past is (so to speak) a whole different world. On what basis do we form beliefs about that world? How do we (who are in the present) take advantage of that world in understanding our own? On the persistence view, there are parts of that world amidst us (including ourselves); thus the knowledge of the past which enables us to understand the present is available. To

spell out these considerations it would be fruitful to look more closely at the epistemological role of causation to determine what is needed in order that the causal links between past and present can function to make the world (past and present) intelligible to us.

As I mentioned, such suggestions are only gestures towards lines of inquiry. The lines of inquiry are partly motivated by a curiosity about what it is in virtue of which the world, or some part of the world, becomes intelligible to us, keeping in mind that the starting point of our inquiry is within the world we are trying to understand. This curiosity is combined with the belief that it is part of the task of metaphysics to explore and systematize the basis on which the world is, or can be made, so intelligible. I believe that the MTP is mistaken because it offers an ontology which fails to establish the interconnection between past and present crucial to our understanding of change; I have con-structed here one stage of the argument in support of this belief.

NOTES

[1] I would like to express my deepest gratitude to George Myro for his wonderful insight, advice, and support, in writing this paper. I would also like to thank Ermanno Bencivenga, John Broome, Janet Broughton, Alan Code, Paul Grice, Mark Johnston, David Lewis, Paul Kube, Dugald Owen, Steve Yablo, and Colloquium participants at University of Virginia and Ohio State University for their very helpful discussions.

[2] These questions indicate a long line of inquiry which goes beyond discussions of persistence into questions of methodology in metaphysics. For example, in constructing metaphysical theories, what weight should we give correspondence with "ordinary beliefs" or with "intuition" and why? Do metaphysical theories "explain", if so what and how (is it right to count them as "theories" at all)? What counts as philosophical simplicity or elegance? Should philosophical solutions to local problems fit together into a global theory? What should the global theory encompass? What is a metaphysical theory a theory of? Answers to such questions would be very helpful in exploring the issues which arise in this paper. Unfortunately I will not provide answers to them here.

[3] It is worth noting here that although I do believe they are "common sense" assump-tions, it is not part of my argument that they are. The Aristotelian method of working from aporia allows one to use as starting points not only what is said by "the many", but also what is said by "the wise", including philosophers (contra M. Nussbaum, The Fragility of Goodness, (Cambridge: Cambridge U. Press, 1986) Ch. 7.). See for example Aristotle's introduction to the discussion of change in Physics A. This point is also convincingly argued in W. Mann's 'Endoxa in Aristotle' (typescript). I do not mean to dismiss, however, the importance of relying on common sense or what seems most plausible "to us".

[4] A contemporary version of this can also be found in Paul Grice's work. See for example, 'Reply to Richards', in Philosophical Grounds of Rationality, ed., R. Grandy and R. Warner, (Oxford: Oxford Univ. Press, 1986) 43—106, esp. pp. 86—106.

⁵ The distinction drawn here between alterations and successions is not precise. The distinction may be neither exclusive nor exhaustive. For example, it may turn out that some changes are both successions and alterations, and that some changes do not fit conveniently into either category.

⁶ I add the bit of formalization here with some hesitation, especially because at this point I do not want it to carry any particular formal interpretation. The clarity added by this formula is apt to be illusory since the devices employed are arguably less clear than the intuitions we are trying to sort out. Nevertheless, I include it as a handy reference which we can perhaps interpret, perhaps emend, and perhaps reject in the course of the discussion.

⁷ One might complain that as I have sketched the puzzle, it is more complicated than it need be. After all, can't the problem be stated using only (PER) and the Principle of Non-Contradiction (PNC)? Crudely, when something alters, it is $\emptyset$ before the change and not-$\emptyset$ after the change; but nothing can be both $\emptyset$ and not-$\emptyset$. (Chisholm, for example, discusses this version of the puzzle in Person and Object (La Salle, Ill.: Open Court Pub. 1976) pp. 141—142). One might also characterize the problem as an apparent breakdown in the transitivity of identity. Although the puzzle I have sketched is clearly a close relation of these potentially simpler alternatives, I prefer the more complex formulation because it makes explicit some of the many principles that might be tinkered with in developing a response. This will become clearer as we proceed.

⁸ Chisholm's comments in Person and Object, p. 142 amount to little more than this. And although B. Brody in Identity and Essence (Princeton: Princeton U. Press 1980) uses quantifiers and variables which range over times, he is not clear what the temporal qualifiers modify, or how they function. This leaves his position ontologically unsatisfying.

⁹ There is a very real sense in which these proposals are underdescribed. For example, there are several ways that one might interpret the addition of temporal indicators to the predicate, e.g., one might take the temporal indicator to be an operator on the predicate, or to function as a singular term. There is also much debate concerning how time might modify whole propositions. At this stage, however, I intend the classification to be general and suggestive rather than technical. For a sample of those who defend proposal (i) see note 12 below. N. L. Wilson defends a version of (ii) in 'Space, Time, and Individuals' Journal of Philosophy 52 (Oct. 1955) 589—598, and in 'The Indestructibility and Immutability of Substances' Philosophical Studies 7 (April 1956) 46—48 (both papers are discussed by A. N. Prior in 'Thank Goodness That's Over' Philosophy 34 (1959) 12—17). I myself have been partial to (iii) and worked towards a motivation of that position in my Ph.D. Dissertation 'Persistence, Change, and Explanation' U. C. Berkeley, 1985; and M. Johnston has discussed a version of (iii) in his recent paper 'Is There a Problem About Persistence?' Aristotelian Society Supplementary Volume 61 (1987). G. Myro has defended a version of (iv) in 'Identity and Time', in R. Warner and R. Grandy, op. cit. pp. 383—410.

¹⁰ I owe the name 'Metaphysic of Temporal Parts' to J. J. Thomson. She refers to the view this way in 'Parthood and Identity Across Time,' The Journal of Philosophy 80 (1983) 201—219.

¹¹ It is worth noting that most ordinary predicates, i.e., predicates which apply to persisting things, cannot be accurately predicated of temporal slices or momentary entities. For example, a momentary object could not be a horse, or soluable in water, or even hot or cold. As a result, such "transformations" or "reductions" from apparent continuant talk to slice talk would have to involve some sort of "transformation" of the predicates. Whether or not a systematic connection can be established might depend, in part, on how revisionary one is willing to be in one's choice of canonical predicates. For simplicity of exposition I will assume that a range of ordinary properties (e.g., shape and color) are predicable of momentary objects.

[12] The view that temporal parts are the primary subjects of (change) statements or that objects are strings or sequences of temporal parts has been held by various people at various times. Some of the strongest contemporary defenders of the view include, W. V. Quine, 'Identity, Ostension, and Hypostasis,' in From a Logical Point of View (New York: Harper, 1963), and Word and Object (Cambridge: M.I.T. Press, 1960), R. Cartwright, 'Scattered Objects,' in Analysis and Metaphysics, ed., Keith Lehrer, (Dordrecht: Reidel, 1975), Eli Hirsch, The Concept of Identity (Oxford: Oxford Univ. Press, 1982), Part I: 'The Persistence of Objects', David Lewis, On the Plurality of Worlds (Oxford and New York: Blackwell, 1986) Ch. 4, and 'Survival and Identity' and 'Appendix to "Survival and Identity"' in Philosophical Papers, vol. I (Oxford: Oxford U. Press, 1983).

[13] The term "unity relation" comes from John Perry's articles: 'The Problem of Personal Identity,' in Personal Identity, ed., John Perry (Berkeley, Los Angeles, London: Univ. of California Press 1975), and 'The Importance of Being Identical', in The Identities of Persons, ed., Amelie O. Rorty (Berkeley, Los Angeles, London: Univ. of California Press 1976), p. 71. Although the standard proposal for a "unity relation" has been spatio-temporal continuity, there is much debate on this issue (see, e.g., Eli Hirsch, op. cit.). For example, D. Lewis in 'Survival and Identity,' in A. O. Rorty op. cit., and C. Swoyer 'Causation and Identity', Midwest Studies in Philosophy, vol. IX (Minneapolis: University of Minnesota Press, 1984) 593—622, have suggested that causal or counterfactual dependence is also necessary.

[14] As I have been presenting it, the MTP is consistent with the possibility that all talk about the continuant is simply an abbreviation for talk about temporal slices which are unity-related. However, a supporter of a sophisticated MTP might defend a more complex relation between parts and whole such that the properties of the continuant are not all reducible in a systematic or formal way to properties of its parts. The question then arises: is the MTP entitled to make use of the notion of continuants themselves *persisting* or *altering* without explicating these notions in terms of unity-related temporal parts, i.e., might these be some of the non-reducible features of continuants? The answer must be no (at least not without compromising the position); for these are the problematic notions the MTP proposes to reconstruct in order to avoid the original puzzle. Without the alternative MTP explications in terms of unity-related parts, we are back where we started.

[15] Alternatively, following D. Lewis and M. Johnston one might employ a notion of "perdurance" for MPT continuants. Lewis and Johnston have used the term "perdurance" for a form of persistence consistent with the MTP. "Something *perdures* iff it persists by having different temporal parts, or stages at different times, though no one part of it is wholly present at more than one time . . ." See D. Lewis, On the Plurality of Worlds, p. 202.

[16] Strictly speaking, this should involve a reconstrual of the notion of "gain" and "loss" of properties as well; but nothing turns on the details of such a project here. It is worth noting that although the notion of "continuing" may appear bizarre, it is reminiscent of various philosophers who maintain that there is no *identity* through change, but there is *persistence* if we are willing to make do with a relation weaker than identity. An example makes it more plausible. It is not altogether odd for someone to say, e.g., of a tadpole that it persists as a frog, or of a caterpillar that it persists as a butterfly. With the locution "persists as" in mind, one could say that the green-leaf-at-t persists as the real-leaf-at-t', or that the straight-candle-at-t persists as the bent-candle-at-t'. Isn't "continuing" a way of interpreting this "persists as" locution?

[17] For discussion of Theses (b) and (c), see my Ph.D. Thesis, op. cit., Ch. 3.

[18] For further discussion of this general strategy and criticisms of other strategies, see my Ph.D. Thesis, op. cit. Chapters 2 and 3.

[19] The proposal that there are general constraints on rational theorizing is problematic, especially if one has in mind substantive constraints, as I do. It is interesting to note, however, that in recent discussions of philosophical skepticism one can find some support for the claim that rational inquiry requires a commitment to the possibility of

explanation, and in particular, a commitment to causal hypotheses. In this discussion, authors have argued that if the skeptic is to be taken seriously, he must accept some causal principle in terms of which he can provide some explanation of our experience. (Note Descartes' evil demon hypothesis.) See for example, Janet Broughton, 'Skepticism and the Cartesian Circle,' Canadian Journal of Philosophy 14 (1984) 593—615.

[20] I am especially interested in pursuing an argument here which relies on considerations raised in George Myro's paper, 'Aspects of Acceptability', Pacific Philosophical Quarterly 62 (April 1981) 107—117.

[21] I have suggested that I am concerned specifically with "natural explanation" and "natural change", though I have not spelled out what this means. An account of "natural" explanation or change is difficult, and although ultimately important for the success of my project, I will only gesture towards the bare bones of an answer here. To begin, natural changes are those which occur in a natural order, and natural explanations indicated their place in that order. This places the burden on offering an account of what it is to be a "natural order". Here one might begin with the idea that the objects and changes within a natural order form a systematic, internally interconnected, and self-contained whole. These latter notions themselves require elaboration, though I will not undertake that task here. (Sarah Waterlow's book Nature, Change, and Agency in Aristotle's Physics, (Oxford U. Press, 1982) offers much of interest on the notion of 'nature' and 'natural order' in Aristotle, see especially pp. 5—10.) I restrict myself to natural explanations because there may be other forms of explanation which are important in understanding the world, and I make no claims about them. In what follows, I intend my comments to apply to natural explanations, although for brevity I may sometimes omit the qualification "natural" and speak only of explanations.

[22] See especially section 2 above.

[23] Sarah Waterlow's excellent book Nature, Change, and Agency in Aristotle's Physics, (Oxford U. Press, 1982), especially Chapters 1 and 2, was very helpful in enabling me to see this shift in perspective. Her discussion is relevant to the issues throughout this paper. Although I am not offering here an interpretation of Aristotle's views on the Parmenidean puzzle, it is worth noting that it is plausible to see Aristotle's account of change in Physics A:7 (which offers a model of change in terms of alteration) as a direct response to worries about the incoherence of pure succession. Thus, one might see the MTP and the Aristotelian accounts as balanced off against each other, each responding to puzzles that the other engenders. In fact, this is how I see the current situation. I indicated in section 2 the puzzle which arises for the notion of alteration; in sections 6 and 7 I indicate the puzzle which arises of succession.

[24] Michael Slote, in his article 'Causality and the Concept of a Thing,' Midwest Studies in Philosophy, Vol. IV: Studies in Metaphysics, ed., P. French, T. E. Uehling, H. Wettstein (Minneapolis: Univ. of Minnesota Press, 1979), p. 389, claims that there is nothing "metaphysically or logically impossible" in something causelessly ceasing to exist, nor is there anything "inconceivable" in something causelessly coming into existence. It is worth noting that my claim does not contradict Slote's.

[25] It is worth noting that this argument yields the result that nothing comes from nothing only if we accept the suggestion that all changes are explicable. However, since I am only claiming that in some changes there is something which persists (not necessarily the same thing!!), I can make do with the claim that some changes are explicable in terms of natural explanations. I am assuming that it is unacceptable for a metaphysical theory of change to yield the result that no changes are explicable.

[26] J. L. Mackie puts it this way in his book The Cement of the Universe: A Study of Causation (Oxford: Clarendon Press, 1974) p. 225.

[27] I am assuming that the past, if it is not nothing, will have things existing in it; e.g., a past which consists only of conditional facts or general laws about things none of which exist at that time would not be sufficient to ground an explanation.

[28] Throughout the discussion I am aiming to use the notion of a "fact" without bringing with it all of its philosophical baggage. The "fact" locutions appear naturally in

common-sense thinking about these matters, and in teasing out and exploring some
ordinary intuitions, it is valuable to stick with these locutions. I am aware that in
introducing the notion of a fact being "causally efficacious", I appear to be crossing the
line into philosophical jargon and in doing so I am going against the grain of most
contemporary philosophical dogma on causal talk. Such dogma determines that it is not
facts but events which are causally efficacious. As far as I can tell, I am using the notion
of a fact in a way which is not dissimilar from the philosophical notion of a state of
affairs, or even the notion of an event — as some contemporary theorists are inclined to
construe the notion of event broadly enough to include states of affairs. However, I will
not provide here a sufficiently detailed account of facts to make such comparisons
precise. Admittedly, such a theory is desirable, but I hope that patient readers will be
able to understand the discussion with an ordinary non-technical notion of "fact".
Admittedly, the notion of a fact's being "causally efficacious" is less than clear; however
what I have in mind is perhaps captured by saying that the fact in question sets non-
logical constraints on the product of the change (see for example the discussion on p.
16 above).
^{29} I discuss these two accounts of facts in my Ph.D. Thesis op. cit., Ch. 3, esp. pp.
131—136.
^{30} I am not prepared at this stage to give a more precise characterization of the
distinction between "primary" and "derivative" facts, although such a characterization
would be helpful. One might begin with the suggestion that a primary fact about X at t
obtains in virtue of the properties X has at t; and a derivative fact about X obtains at t
in virtue of properties X has at times other than t. This suggestion is not adequate,
however, unless one also draws a distinction between primary and derivative properties
(primary properties being basically "time-free" properties, derivative properties being
"time-bound"), which does not rely on the distinction between primary and derivative
facts. I trust that with some care and attention, an adequate account can be given.
^{31} The name "The Past is Nothing Principle" may be misleading. It is worth noting for
those who believe in backwards causation, that if one thinks that the constraints on the
present come from the future, then because one is still committed to (PNP), it looks like
one will still be committed to persistence. (Perhaps its proper name is "The Non-
present is Nothing Principle"?) Admittedly, few maintain that the *only* causation is
backwards causation, so they would be committed to some persistence through cases of
forward causation anyway. The only problem comes from those who believe that it is
only facts about things, none of which exist outside the present, which condition the
results of change in the present (simultaneous causation?). Because this position would
allow no interconnectedness of things and their changes through time, I take it that such
a position is untenable.
^{32} One might suggest here that the demand I have stated roughly as a demand for
"intelligibility" is in some way reducible to a demand for simplicity. It may be, but it is
not obviously so; on the face of it, simplicity of theory is a somewhat formal constraint
which may or may not lead us to greater intelligibility.

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